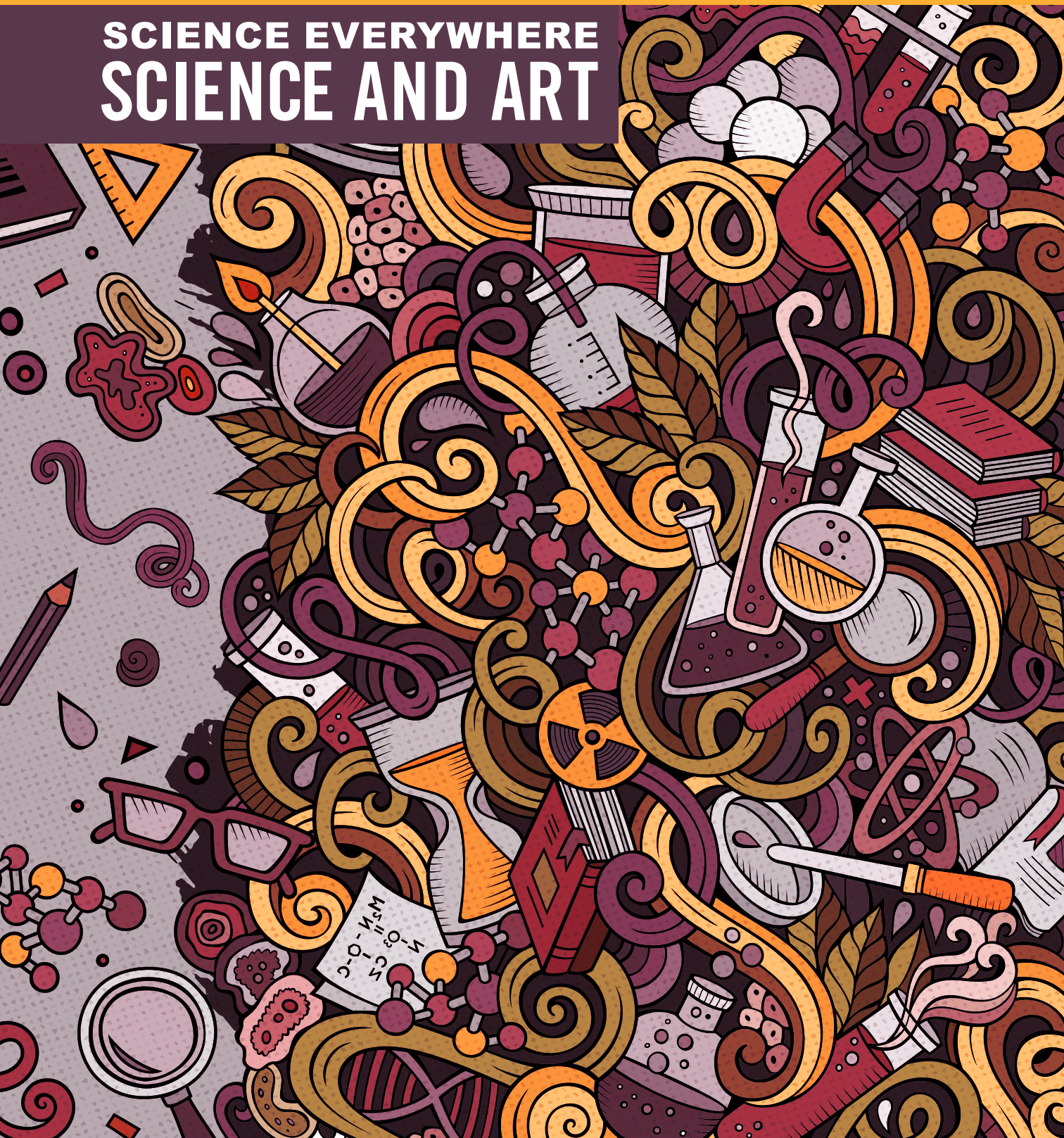


# Eye on Science planet

SCIENCE EVERYWHERE  
SCIENCE AND ART



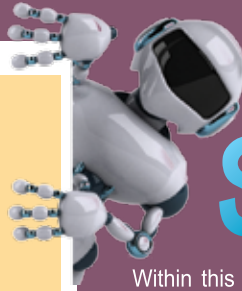
# The Curious Case of

By: Maissa Azab



and

# SCIENCE



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Within this year's annual theme, *Science Everywhere*, we have tackled the science in the two most important places humans occupy: home and work. We then diverted our attention to the two most vital extracurricular activities humans practice: sports and arts. For those who know me, or have followed my writings over the years, it would come as no surprise that the theme of this issue, *Science and Art*, is my absolute favorite.

I do not recall how many times I have written about the eternal, dare I say magical, bond between art and science. Indeed, I have often written about my passion for both and how this was the drive behind my work in science communication, particularly via media and publications, where the arts of writing and design intertwine to engage, inform, educate, and inspire the public.

In this issue though, I let my fellow editors and esteemed contributors express their views of this astonishing relationship between two realms that seemingly look at opposite ends of the human activity spectrum. As a result, in this Issue, you will read about renowned examples of scientists driven by the arts; we also delve in depth in the intertwining of art and science in bringing fiction to life.

You will also learn about the fantastic arts found in nature and how the arts can affect nature. We also discuss how therapeutic the arts are for mental and psychological ailments, and how they are a powerful means to influence people. That is all in addition to how science itself can be used to create amazing art, and how art is a potent way of demonstrating science.

As always, we hope you enjoy the Issue and encourage you to follow our online magazine at [www.bibalex.org/SCIplanet](http://www.bibalex.org/SCIplanet), where we will be posting further pieces about this topic. If you do not already receive our monthly e-newsletter and wish to, please write to us at [COPU.Editors@bibalex.org](mailto:COPU.Editors@bibalex.org).



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By: Inas Essa

# Bringing Science to Life

**Science and art are often viewed as opposites; science is driven by data, while art is based on expression and creation. However, in reality, they are intrinsically linked; the essence of both is creativity, and they both share discovery, imagination, and exploring new methods.**

In classrooms, as in life, children are always attracted to what is interesting and colorful; as such, it is necessary to facilitate the enjoyment of science as much as possible, to allow them to accept the data and equations that follow. One possible way to approach this is by bringing science to life through integrating arts and science in the classroom. The method is, however, a challenge; it should meet the needs of all students, not only those with passion for one of the two disciplines.

In her article, *Teaching Science through the Visual Arts and Music*, Carol Seefeldt, Professor of Human Development at the University of Maryland Institute of Child Study, 1971–1999, focused on the importance of knowing the main characteristics of the children's world, which would help in the way they are taught. "The role of a teacher is to take children's wonder and build on it, helping them come to know and understand the complex and confusing world they find themselves in", Carol says.

Teachers should keep in mind that the world to a child is novel and wonderful; to increase their willingness to discover in their early years, Carol suggests that teachers should encourage children to slow down, stop, look, and listen. Also, it is very important to provide experiences designed to develop their spontaneous explorations of their world into scientific investigation, and then planning ways for them to reflect on their experiences through art and music.

The next step in the process is how to teach scientific knowledge through the arts and artistic knowledge through science. As the arts have a vital role in developing a creative mindset, art-based activities can help students comprehend abstract scientific theories and improve their critical thinking skills. The following are some ways to employ art in the science classroom:

## Sound Waves

Sound and vibration: are they linked? Students hear sounds all the time but they do not know exactly what causes them; through art, students can explore frequency, amplitude, and wavelength.

Take a small plastic or paper cup and place a tight lid of aluminium foil on its top. Hold it in place with a rubber band, then spread salt or sugar granules on its surface. Let students make different sounds with instruments, clapping their hands, or using their voice near the cup. The salt will jump in response to the vibrations; students will notice bigger jumps for louder sounds, and they can observe the vibrations made by sound waves.

## Gravity, Force, and Motion

Does gravity affect motion? What is the link between masses and gravitational pull? You can use Pendulum Painting in the classroom to show students how it works.

Cut off the bottom of a plastic soda or water bottle, then attach a glue bottle's cap in place of the lid. Suspend the bottle from a tripod, and center it over a large sheet of paper. Fill the bottle with thin paint and set the pendulum in motion; the design of the pendulum will be tracked from the falling paint on the floor, creating a symmetrical splatter.

Different mediums can be experimented; try the experiment several times with different swinging speeds and rope lengths, graphing the results. Students learn about the effect of gravity, the movement of a pendulum, and how different forces react.

The scientific process is incomplete without reflection. Encourage children to explore the world, using the materials around them. Offering time, space, and materials is necessary for children to express their ideas and feelings, helping them develop the habit of reflecting on their work.



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Think  
Like an

ARTIST

Work Like a

SCIENTIST

By: Inas Essa

A genius of our era put it simply; his greatest scientific discovery was inspired by music. Indeed, biographies of many scientific geniuses reveal that they were polymaths. Several scientists noted that academic skills alone are not sufficient to produce creative scientific work; such creative work requires an entire range of abilities incorporated in arts and crafts, integrated and focused on specific problems and techniques.

A study carried out by the Department of Psychology at Michigan University to find the relation between being a scientist and having avocations reached a result that creative, non-scientific activities are essential in developing a scientific mind. Artistic ability—as in music, literary creation, and painting—goes well with scientific ability and wisdom. Those avocations help develop useful skills such as hand-eye coordination, knowledge of tools and processes, better visual imagination, improved ability to communicate using words, images, and models, and a refined scientific aesthetic sensibility.

The study also asserted that “geniuses” have a wide range of avocations carried out intensively, which inflame their creativity and innovation. Having at least one intellectually stimulating hobby is a predictor for career success in any discipline.

So, let us look back in history to some eminent scientists, who illustrate the link between a passion for art and scientific achievements.

*“The theory of relativity occurred to me by intuition, and music is the driving force behind this intuition. My new discovery is the result of musical perception.”*

—Albert Einstein



Albert Einstein (1879–1955)

*“Life without playing music is inconceivable to me.”* —Albert Einstein.

Perhaps not many people are aware of Einstein’s passion for music; it is even believed that, if Einstein was not a scientist, he would have become a musician. In fact, the German-born outstanding physicist and mathematician was a devoted amateur musician who played with some of the greatest performers of his time. Playing the violin is said to have been a role in the development of Einstein’s brain.

Einstein’s mother, Pauline Koch, was a talented musician; she introduced her son to the piano as a child and encouraged his passion for playing the violin, which he vigorously studied from the age of six to thirteen years old. He particularly liked Mozart’s Violin Sonatas, which he played throughout his life.

The effect of music on Einstein’s thinking sheds some light on how he developed his most profound scientific ideas. His example suggests that being intimately involved with

the scientific complexity of music enabled him to bring a uniquely aesthetic quality to his scientific theories. He wanted his science to be unified, harmonious, simply expressed, and to convey a sense of beauty of form.

Einstein stated that he thought about science in terms of images and intuitions, often drawn directly from his experiences as a musician, then later converting these into logic, scientific writing, and mathematics.



Santiago Ramón y Cajal (1852–1934)

Cajal was a Spanish neuroscientist who accomplished hundreds of drawings illustrating the delicate arborisation of brain cells. In 1906, he received the Nobel Prize in Physiology or Medicine jointly with Camillo Golgi for establishing the neuron, or the nerve cell, as the basic unit of nervous structure.

Cajal, the Father of Neuroscience, who set out to disentangle and catalog the brain’s neuronal wildlife, produced more than



2,900 neuroanatomical drawings during his 5-decade career. The drawings are not exact reproductions of the view under the microscope; instead, they were drawn by freehand, often combining the scientist's observations from multiple viewings of different brain sections. As such, Cajal formulated de facto hypotheses about brain connectivity through his sketches.

Cajal wrote once insisting on the importance of arts: "Those students who are somewhat headstrong, contemptuous of first place, insensible to the inducements of vanity, and who being endowed with an abundance of restless imagination, spend their energy in the pursuit of literature, art, philosophy, and all the recreations of mind and body. To him who observes them from afar, it appears as though they are scattering and dissipating their energies, while in reality, they are channeling and strengthening them".



**Sir Frederick Grant Banting (1891–1941)**

Banting is a Canadian scientist, physician, and painter, who co-discovered insulin and its therapeutic potential for diabetes in 1921. He was awarded a share of the 1923 Nobel Prize in Physiology or Medicine for his achievement.

Banting's achievements in science and in art were founded on hard work. His early exposure to art came from the illustrated books in the family's library; as a youth, he became interested in pyrography—the art of burning images into wood. He began painting watercolors to pass the time while waiting for patients; after his scientific success, painting became an escape from the fame and attention, which he disliked.

In his lifetime, Banting became one of Canada's best known amateur artists; he invested much time and effort into learning to sketch and paint. In a sketchbook from a trip to the Rocky Mountains in 1928, he wrote: "One gets out of life what one puts into it. It is the same with science or

the branches of art". Banting embraced challenge, both in his scientific research and in his art; in both realms, his methods were methodical, determined, and inspired by the love of discovery.



**Richard Feynman (1918–1988)**

Feynman is an American theoretical physicist who is widely regarded as the most brilliant, influential, and iconoclastic figure in his field in the post-World War II era. He remade quantum electrodynamics—the theory of the interaction between light and matter—thus, altering the way science understands the nature of waves and particles. He received the Nobel Prize for Physics in 1965 jointly with Julian Seymour Schwinger and Tomonaga Shin'ichirō.

Feynman had a deep passion for art, which emerged at the age of 44, when he took up the pursuit of drawing and painting for the rest of his life. Some of his drawings displayed an awkward, off-kilter perspective of the beginner, while many others look very accomplished indeed.

About his motivation to take up this particular avocation, he wrote: "I wanted very much to learn to draw, for a reason that I kept to myself: I wanted to convey an emotion I have about the beauty of the world. It is an appreciation of the mathematical beauty of nature, of how [it] works inside; a realization that the phenomena we see result from the complexity of the inner workings between atoms; a feeling of how dramatic and wonderful it is. It is—of scientific awe—which I felt could be communicated through a drawing to someone who had also had that emotion. I could remind him, for a moment, of this feeling about the glories of the universe".



**Samuel Morse (1791–1872)**

Despite claiming to have "an artist's heart" and being described by some as the Father of American Photography, Morse achieved his enduring success as the inventor of the practical electric telegraph. Yet, before Morse became an inventor, he had been an artist.

In an early age, Morse was trained as an artist in England. He brought tenacity and determination to everything he attempted, combining hard work with an unquenchable desire to succeed greatly in some field. For the first half of his life, Morse believed that he would achieve great success in art. However, when circumstances seemed repeatedly to prove him wrong, he was willing to switch gears and try new ventures.

He began to sketch out ideas for an electric telegraph during one of his voyages. Then, he took up the idea of telegraphy—sending a message electrically over a wire—at a time of feverishly expanding electrical experimentation excited by the work of the English physicist and chemist Michael Faraday (1791–1867). Morse spent twelve years of sporadic work before he had gathered enough knowledge and experience to attempt his historic demonstration in May 1844 when he sent the first telegraphic message.

In addition to being a scientist and a painter, Morse embraced photography, being a new technology at that time, and became one of the first to practice photography in America in 1838.

To sum up, art and science are both associated with creativity in general, which demonstrates openness to experience. Having a diversity of avocations and hobbies triggers curiosity, puzzle solving skills, and desire for learning and contemplation. A scientist cannot dismiss art from his way of thinking; it is essential for his scientific work.

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# ENGINEERING

THE



# IMAGINATION

By: Mona Shehata

Imagineering is the process of devising and implementing new or highly imaginative concept or technology in practical form. It is commonly associated with the Walt Disney Company, whose Imagineering Department creates, plans, and builds Disney amusement parks and attractive destinations all over the world. However, contrary to popular belief that Walt Disney coined this term by conjoining the words “imagination” and “engineering”, it was actually the Alcoa Corporation, an American industrial company, who created it.

Imagineering has since been used in various fields, such as geography, politics, and urban design. Imagineers have a wide-range skillset, where several jobs are entailed under this classification; this includes, but is not limited to, scientists, architects, engineers, artists, illustrators, graphic designers, lighting designers, and writers. Along the years, Disney Imagineers made several inventions and numerous innovations, such as Audio-Animatronics and WEDway.

Audio-Animatronics is a type of robotics used in attractions and shows in amusement parks, which enabled Disney to animate objects in 3D instead of 2D. The concept design was thanks to Disney's enchantment with a mechanical bird that he

bought in New Orleans, which resulted in the creation of “The Enchanted Tiki Room”; an attraction located in Disneyland with audio-animatronic chirping and singing birds. Audio-Animatronics are nowadays notably present in many famous destinations in Disney theme parks, and visitors are free to communicate with a few of the Audio-Animatronics, such as Lucky the Dinosaur, Remy from Ratatouille, and WALL-E.

WEDway was a system to move people through using linear induction motor technology to push vehicles on steel rails. The system was developed by Walter Elias Disney (WED) Enterprise, which is now known as Walt Disney Imagineering. Disneyland owns a unique variant of the system, which uses rubber wheels located

every approximately 2.7 meters on the guideway, which was utilized from 1967 until 1995.

With the passage of time, Imagineering created and designed galleries, hotels, and retail shops to maintain a certain atmosphere. When you visit a Disney amusement park, it feels like you enter a show and become immersed in the story. Furthermore, Disney Cruise Ships provide a sea adventure, which creates a beautiful mood. Restaurants and stores also in the amusement park have a tale to tell; all details are meticulously designed, from the menus to the actors' outfits.

Disney theme parks are enjoyed through using your senses, such as smelling fresh cookies on walking along Main Street, which complements the experience of small-town America at the beginning of the century. Moreover, Walt Disney World uses the forced perspective technique at the Cinderella Castle, where the architectural scale of the elements is considerably smaller in the upper castle parts, when compared to the foundation. This makes it look relatively taller than its actual height, which is approximately 58 meters.

Nowadays, due to the rapid technological development, people have higher expectations; for instance, in the “Sorcerers of the Magic Kingdom” game, guests start their adventure at the Secret Sorcerers Coaching Center in Main Street, then they are told that a group of Disney villains are threatening to take control of the Magic Kingdom. Those courageous enough to join are provided a map of five collectible spell cards, and mystic portals prior to being assigned 15–20 minute tasks, which include analytical roleplay, problem solving, and treasure hunts, whilst searching the park.

Another example for using technology is the “Fortuna” adventure, where guests search for pirate gold in the theme park, using clues and solving puzzles along the way. Fortuna is partially-scripted by computer software, and the rest of the story depends on the participants' actions. Nonetheless, Imagineers work on designing an experience where no two guests enjoy the same adventure, having varying ends. Tales unfold according to the people participating in them and are not scripted stories.

Disney was always about telling fascinating stories and communication between the characters and the audience, as well as the communication between audience members. That is why the human element is still important and cannot be replaced until robotics is drastically improved.

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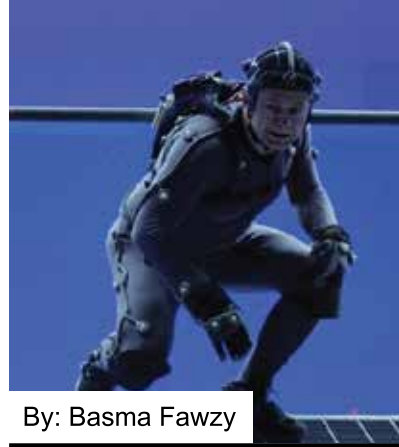
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# COMPUTER-GENERATED CHARACTERS:

## Bringing Fictional Characters to Life



By: Basma Fawzy



Computer-Generated Imagery (CGI), as the name implies, is an art that uses various computer software to create imagery. CGI is not limited to the movies industry; however, we will focus in this article on movies and especially talk about Computer-Generated (CG) characters. Many technologies are brought together to make the characters we see on the screen and fall in love with come to life. We will focus here on the CG characters of John Ronald Reuel Tolkien's Gollum, the twisted monster obsessed with the ring; Tolkien's Smaug, the dragon who is guarding the treasure; and Caesar, the ape from *Planet of the Apes*.

Creating imagery on the computer from scratch gives movie makers limitless possibilities that would not have been possible using regular methods. For example, think how difficult it would have been to bring an actual ape to perform the role of Caesar and make him act brilliantly, or about creating a real-life model of a dragon and trying to move it on set. CGI is handy in these situations.

Creating a CG character begins with drawing a sketch that shows the facial features and physical characteristics of the character in question. In this process, what matters is trying to figure out what the fictional character will look like on the screen. Many sketches are made before a particular design is selected; after that, a 3D model of the character is created. Sometimes, a 3D clay model of the character is created and then scanned into the computer.

Sketching the fictional character is easy; the challenge is to make the 3D model of the character move. To get the character moving, an articulated model is sometimes used; a character is built using materials that resemble bones and joints. When a joint moves, it moves other body parts with it; exactly like how a marionette works. Inverse Kinematics is a technique that uses certain equations to move any given articulated model or by using certain saved data of

movements itself. This method is useful in robotics and in movie-making. Yet, Inverse Kinematics is not the only method used to set motion in the body of a fictional character.

Motion Capture is another popular technique that is applied in creating memorable characters like Gollum, Smaug, and Caesar. We cannot mention motion capture without referring to Andy Serkis; out of the three characters mentioned here, he did motion capture performance for two of them—Gollum and Caesar. With motion-capture performance, Andy Serkis does not appear on the screen; however, his performance is what gives these characters their credibility.

With performance capture, the fictional character benefits from the actor's performance, including facial gestures, body movements, etc. The actor basically wears a certain outfit with sensors all over his body and face; all his movements and reactions are recorded and then applied to the fictional character on the computer. This technique brings the best of both worlds: the fictional characters, which would not have been possible without the computer, and the great performance of talented actors.

In 2017, Andy Serkis won the Austin Film Critics Association Award for his "exemplary motion-capture performance" for his role in *War of the Planet of the Apes*. When people think of these unforgettable characters in *The Hobbit*, *The Lord of the Rings*, or the *Planet of the Apes* series, they do not think of Andy Serkis whose great performance melted behind the scenes to give these characters a real presence, transforming them into live characters.

Characters that Andy Serkis performed have what we can call human-like bodies and faces, but that does not mean that motion-capture performance is limited to those characters. Motion capture was again used with Smaug, the dragon from J.R.R. Tolkien's *The Hobbit*; Benedict Cumberbatch played the role of Smaug. He had motion capture tracking spots put on his face to capture

the tiniest movements he makes while performing. The result was a fearful dragon that haunted the hearts and minds of the audience.

The beauty of CG characters lies within their creators' ability to make them seem real to the extent that, no matter how much we know about how they were eventually made, whenever we go to the movies we forget the truth and enjoy the most realistic fictional characters on the screen.

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# The

Anatomy has always been an essential science for artists as well as physicians; with animation, physics has become another vital topic for artists of the craft. Animators try to capture how life works and how things behave to make it all look plausible. They create believable, and realistic characters through understanding motion; that is what they really do: creating motion, or an illusion of life!

**“Someday you will be a real boy!”**  
—The Blue Fairy, *Pinocchio*

Ancient human arts show how Man has always been fond of depicting his surrounding world. In his drawings and sculptures, he made different representations of objects or animals, who share his daily activities. Later on, with the development of his artistic skills, he tried to add movement and life to his creations. Motion could be witnessed in still life drawings capturing a living moment in life, and sculptures bursting with energy.

Over the centuries, artists continued their quest for a medium of expression to capture the spark of life. Numerous devices were introduced with the aim of entertaining people before the advent of motion picture. They were regarded as optical toys, as they did not project their images, and were viewed only by a few persons at a time. A common example for these devices, still used today by students to learn the basic principles of animation, is the kineograph; also known as the flip-book, patented in 1868.

These early approaches displayed motion in art until the late 1800s' inventions made the illusion of life seem possible. With the development of Thomas Edison's motion picture camera, a new art form was born, which is animation. Through this new art form, artists became not only capable

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of representing actual characters, their movements, and actions; they could also caricature and satirize them.

Since conveying a certain message is the essence of communication, these characteristics have given animation a magical ability to reach inside any audience everywhere regardless of language barriers. Animators were able to embody their characters' feelings, emotions, and innermost fears, and skillfully created living characters that could think and make decisions.

**“Look! He is alive! He can talk!”**  
—Geppetto, *Pinocchio*

Today, we enjoy the luxury of high definition sound; however, by the early 20<sup>th</sup> century, things were not always audible. Animation went through a Silent Era until the late 1920s with the rise of sound technology. The first animated silent film using the stop-motion technique, *The Enchanted Drawing* (1900), was released. The stop-motion filming technique entails photographing objects in a series of slightly different positions; when the film runs continuously, the objects seem to move.

Other films later followed, using more developed techniques, such as *Fantasmagorie* (1908), the first animated film using hand-drawn animation; and *Gertie the Dinosaur* (1914), the first



# of Life

By: Esraa Ali

cartoon to feature a character with distinct personality traits. The hand-drawn animation, known as traditional animation or celluloid (cel) animation, is indeed a lengthy process.

Thousands of pictures are drawn by hand on acetate sheets, or cels; each picture differs slightly from the previous one. The cels are then photographed separately onto film frames so when the film reel is played, it creates an illusion of movement.

Rapidly, the cartoon industry expanded and several cartoon companies with their own cartoon stars emerged. The year 1923 marked the first notable success for Walt Disney Studios with the release of *Steamboat Willie* directed by Walt Disney (1901–1966) and Ub Iwerks (1901–1971), featuring “Mickey Mouse”, to become the first cartoon with synchronized sound, including character sounds and soundtrack.

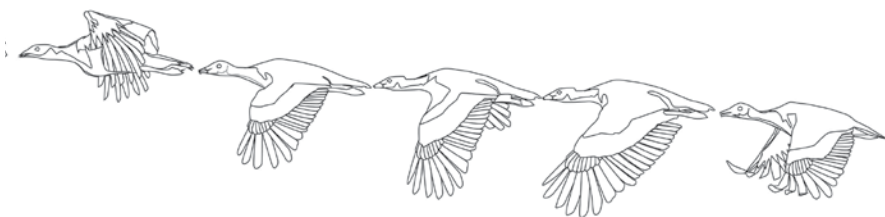
**“And... and I'm... I'm real. I'm a real boy!”**  
—Pinocchio, *Pinocchio*

Walt Disney rose to fame in the world of animation during the 1930s; he took advantage to move further with more innovations in animation. Although the hand-drawn animation was common throughout the Golden Age of Animation (1930–1950), Disney used further developed techniques, such as the three-strip Technicolor process.

In this process, animated material was filmed three times using three strips on black-and-white negatives and a beam splitter; they were then recombined in printing, making the films extremely bright, vibrant, and lifelike. Disney also applied the multiplane camera, which provides additional depth to the animation shots; as opposed to two dimensional drawings.

The Golden Age was defined by the rise of Walt Disney's “Mickey Mouse” and “Donald Duck”, and Warner Bros' “Bugs Bunny”. This Age marked too the release of the first animated feature using hand-





drawn technique, *Snow White and the Seven Dwarfs* (1937), as well as other famous classics, such as *Pinocchio* (1940), and *Fantasia* (1940), to name a few.

**“I’d rather be smart than be an actor.”**  
—**Pinocchio, *Pinocchio***

Later on, the animation industry started creating cartoons for television. Since animation making is very time consuming and expensive, shortcut techniques to speed up the production process were needed. This led to the emergence of the “limited animation” process, which depends on creating animated cartoons with simplified body movements without redrawing entire frames, but reusing common parts between frames. This process was applied, and a vast number of appealing cartoons with low-budget were produced for television, such as *The Flintstones* (1960).

In the 1960s, a gradual decline in the entire animation industry was witnessed and lasted for over twenty years. The stories started to lack both creativity and originality, where the studios started to move gradually from the realistic details of the 1940s to a less realistic style of animation. During these years too, the world lost one of the greats with the passing away of Walt Disney due to lung cancer in 1966. The Disney Company faced several problems, most important of which was finding a new direction.

On the other hand, other famous animation studios faced high production costs, and production became too expensive to manage. They refused to compromise the quality of their animations, which led to complete shutdown of their studios. Others chose entering the market with low-quality cartoons for television with mediocre results, such as the *Pink Panther* and *Tom and Jerry* series of the 1960s.

**“When you wish upon a star, your dreams come true.”**

—**Jiminy Cricket, *Pinocchio***

By the 1980s, the glorious old days of animation had been forgotten although animated feature films were displayed occasionally in theaters. Everyone was

taken by surprise with the reboot of a long-awaited Disney animation renaissance. The Company got back on its feet under new direction and a collaboration with Steven Spielberg to produce the animated film *Who Framed Roger Rabbit* (1988), featuring a groundbreaking mix of live action and animation.

Disney followed up with its famous *The Little Mermaid*, which recaptured the spirit of Walt Disney himself, *Beauty and the Beast* (1991), *The Hunchback of Notre Dame* (1996), *Hercules* (1997), amongst others, until the advent of computer animation. The illusion of movement is now created using computer animation, where images are replaced quickly on the computer screen by a new image similar to the previous one, but with slight shift.

To visualize this technique, imagine a colored circle drawn in the center of the screen, then the screen is blanked and the circle is redrawn slightly to the right of its previous position. As the process is repeated fast enough, the circle will appear to be moving smoothly from its original place. Since the eye and brain work together, they store whatever they look at for a fraction of a second and smooth out any minor leaps. To achieve that eye and mind trick, about 24–30 frames should be drawn per second using this technique.

Studios started to invest heavily in this new technology, which branched to two-dimensional (2D) and three-dimensional

(3D) computer graphics. Two–dimensions refers to the traditional animation method that has been used over the past years, but involves using computer software to one degree or another. For example, coloring the cels digitally and photographing them in the traditional method, moving the characters on key frames, and the computer automatically calculates the differences in appearance.

On the other hand, 3D animation uses the computer completely and allows you to do things that are not possible in 2D animation. Objects are created on a 3D animation program, then figures are equipped with virtual skeleton to be treated as a physical object. Using this technique, you can move a camera to look at the object from all angles; however, in 2D animation “moving the camera” means drawing everything from another angle. Examples of 3D animations are *Toy Story* (1995)—the first fully computer animated feature—as well as *Shrek* (2001), *The Incredibles* (2004), and *Big Hero 6* (2014).

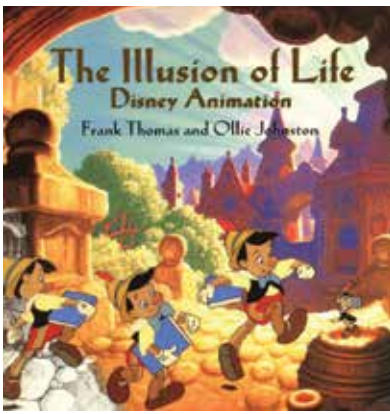
**“Be a good boy and always let your conscience be your guide.”**  
—**The Blue Fairy, *Pinocchio***

From hand-drawn to computer animation, audiences escape their reality and explore an imaginary and fantastical world; here lies its magic! To create this world, the laws of physics are taken into account to make that world believable.

Every movement has to adhere to the fundamentals of physics; otherwise, the audience will be reminded that what they are watching is not real. “Physics is integral to everything we do as animators, because when something does not feel like it is physically capable of happening, it pops the audience out of the moment,” says Cassidy Curtis, a character animator for DreamWorks.



Walt Disney drawing the iconic Mickey Mouse.

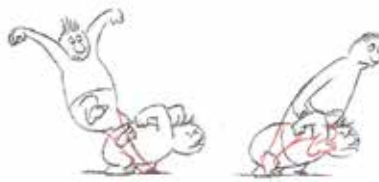


In 1981, Disney animators Ollie Johnston (1912–2008) and Frank Thomas (1912–2004) published their book *The Illusion of Life: Disney Animation*. The book introduced the twelve basic principles of animation, originally intended to apply to hand-drawn animation; however, the principles are still relevant for today's computer animation. The book has been regarded as the “Bible of Animation”, and was voted to be one of the “best animation books of all time”.

The twelve principles were developed by Disney's Nine Old Men\* during the 1930s. At that time, they were not old but young enthusiastic men at the forefront of exciting discoveries; contributing to the development of a new art form. The principles were reflections of their practice and have been adopted by some studios.

“As each of these processes acquired a name, it was analyzed, perfected, and talked about; when new artists joined the staff, they were taught these practices as if they were the rules of the trade. To everyone's surprise, they became the fundamental principles of animation,” says Thomas and Johnston in their book, on how the principles were developed in the 1930s, a short time before the production of *Snow White*, chapter 3.

In their book, Johnston and Thomas attempted to produce more realistic animations that express character and personality, and adhere to the basic laws of physics in twelve principles, which are:



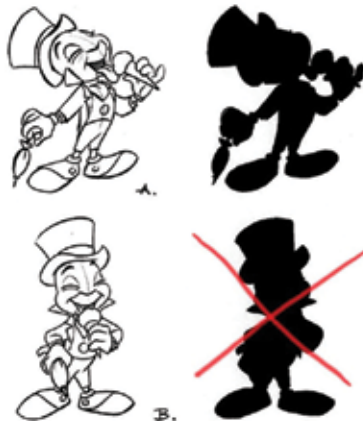
### 1. Squash and Stretch

Considered the most important principle, when it is applied, it provides objects and characters the illusion of gravity, weight, mass, and flexibility. You may think about throwing a rubber ball and how it squishes when it touches the floor then stretches as it travels up in the air. For example, in *How to Train Your Dragon* (2010), the audiences were convinced that the character of Hiccup's dragon, Toothless, not only could fly through explosive flames and spin all over the sky, but also that if it hits the ground it would die.



### 2. Anticipation

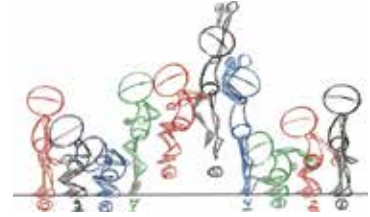
This principle helps the audience get prepared for what is about to happen, making the action appear more realistic. For example, the audience will not believe the body movement of characters when they are going to jump without bending their knees, or throwing something without pulling their arms to the back. That would make the motion seem awkward and lifeless.



### 3. Staging

As the word may imply, this principle is about the scene, and how it would look like, as on a theater stage; it directs the audience attention and eye to what is important within the scene. On the other

hand, it avoids any unnecessary details by keeping the motion of everything else with less importance to a lower degree. For example, the animator may place a character within a frame, make use of light and shadow, or move the camera to a certain angle.



### 4. Straight Ahead Action and Pose-to-Pose

Drawing animation adheres to two basic approaches: straight-ahead and pose-to-pose. The straight-ahead involves drawing one frame at a time, in sequential order, until the sequence is complete. The pose-to-pose entails drawing the first frame, the end frame, and a few key frames in-between.

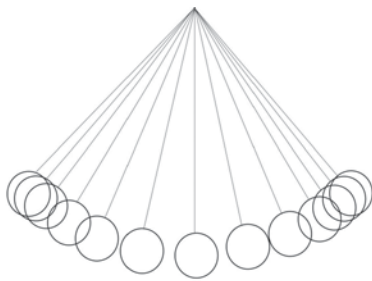
You may think of how a triangle shape could turn into a square, passing through a circle stage in between. In the straight ahead technique, this entails rounding the lines of the triangle sides slightly within each frame, until it reaches a rounded-circle, then straightening them back until it reaches four sides of a square. On the other hand, the pose-to-pose entails drawing a triangle, a circle, and a square, then going back and completing the remaining. The first technique creates a more dynamic illusion of movement, while the second works better for emotional scenes; a combination of both is often used.



### 5. Follow Through and Overlapping Action

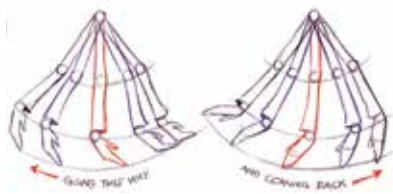
If an object is moving and stops suddenly, its different parts will stop at different times; that is what this principle is about. Similarly, as the object moves, its parts move with different rates. You may think of moving characters and how their arms and legs are moving with different rates from their head, and when they come to a standstill position, their hair may continue to move.





## 6. Slow In and Slow Out

This principle helps in giving objects more life in their movement. It deals with the gradual acceleration from a pose, or slowing down before approaching a pose. To understand that principle, think how a car starts moving slowly before speeding up, and the reverse when it brakes.



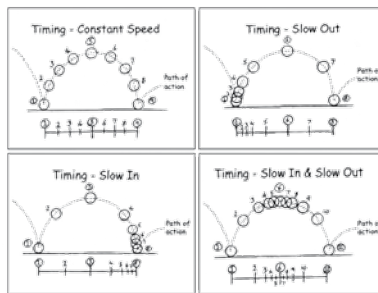
## 7. Arcs

The visual path of moving objects from one point to another always follows an arc, which should be reflected in animation. For example, throwing a ball in the air will be affected by gravity, so it will follow a natural arc as nature embraces movements in curves.



## 8. Secondary Action

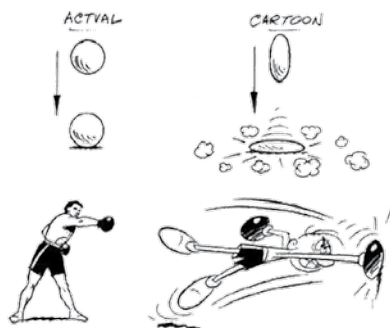
Secondary actions are used to emphasize the main action within a scene. They help in adding more dimensions to the characters and objects; for example, the movement of character's hair while walking, or expressing emotions using certain facial expression.



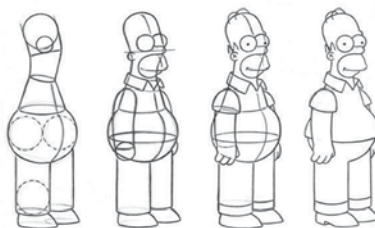
## 9. Timing

Timing, or the speed of an action, gives meaning to the action. Moving objects in animation more quickly or slowly than it would naturally move in the real world, based on the laws of physics, will make the whole scene implausible. It is the role of animators to use the correct timing, which allows controlling the mood and the reaction of the characters and objects.

## 10. Exaggeration



Animation helps in embodying an imaginary world by pushing the limits just beyond all what is possible in real life. Since excessive realism may ruin an animation and make it boring, exaggeration becomes one of its main principles. By adding some exaggeration to characters and objects, it will make them seem more dynamic.



## 11. Solid Drawing

This principle is about understanding the basics of drawing, three-dimensional space, form and anatomy, weight and volume, lights and shadows. As animators push the limits, they need to remain consistent; otherwise, things will fall apart.



## 12. Appeal

The characters and their entire world as well, have to be appealing to the audience. This includes the quality of drawings and designs, and creating appealing poses for characters with facial features that make them more appealing.

**"To infinity, and beyond!"**

—Buzz Lightyear, *Toy Story*

The possibilities of animation are infinite as we understand the major branches of science and their laws, which seem invaluable to this art form. *The Illusion of Life: Disney Animation* presents a unique opportunity to learn this art from two legendary Disney animators, Johnston and Thomas. Whenever you watch the two old men at the end of *The Incredibles* (2004)—believe it or not Cameo of Johnston and Thomas—saying "There is no school like the old school," remember the history of animation and its early pioneers.

## Glossary

\*Disney Studio's Nine Old Men, as known as "Disney Legends", were Walt Disney Studios' core group of animators. They created most famous works, such as *Snow White and the Seven Dwarfs* and *Pinocchio*. They are Ollie Johnston, Frank Thomas, Les Clark, Wolfgang Reitherman, Eric Larson, Ward Kimball, Milt Kahl, John Lounsbery, and Marc Davis.

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Walking through the streets, watching television, or streaming social media, we see hundreds of advertisements for different brands and companies. The main aim of marketers is to attract the attention of consumers or potential buyers; companies and organizations adapt and improve their marketing campaigns and strategies to effectively reach a wider range of consumers.

The study of consumers and their behavior helps marketers understand how they think, feel, reason, and react towards the way products are advertised. According to studies, people remember 20% of what they read and 80% of what they see. Sixty-five percent of people are visual learners whose attention spans are very short, which makes any content presented in big blocks of text very boring. Even in ancient civilizations, people used to convey their history by drawings on the walls.

Psychologists believe that visual elements help people remember and retain more details; they link with emotions in the brain, which further combine to make memories. Ninety percent of the information that reaches the brain is visual; any presentation with visual aids is 43% more persuasive. Accordingly, marketers depend on the visual marketing concept, which connects marketing messages to visuals; such as: photos, graphics, logos, and more.

The use of visual marketing concepts increased in social media; a study suggests that posts with images receive 18% more engagement than posts with texts only. Images are not the only visual element used in marketing. Using infographics is an excellent eye-catching tool to attract the attention of the viewers, as it is a combination of information and graphic design, in a way that

information is conveyed clearly and in an interesting way. They are ideal for sharing on social media; they can drive more traffic and increase engagement.

The purpose of branding is to build a strong relationship between consumers and the company. Studies have revealed that our brains prefer recognizable brands, which makes colors important when creating a brand identity. People make a judgement about a product or service in 90 seconds or less, and 90% of that judgement is influenced by the colors they see. Colors influence how consumers view the personality of the brand and play an important role in purchasing. Colorful ads are recognized more often than plain black and white ones.

**Marketers and graphic designers should keep in mind color symbols and meanings as they develop media and materials to promote a company or a brand to reach their targeted audiences. It is also important to consider what colors might mean in other cultures in case these brands desire to expand internationally.**

**Blue:** Financial companies and major social media brands use blue to communicate trust, strength, openness, dependability, calmness, and confidence. For example, Facebook and Twitter offer the people the power to create and share ideas and information instantly without barriers; LinkedIn connects professionals from all over the world to make them more productive and successful.

**Red:** It is a popular color among fast-food restaurants, as it stimulates appetite; it also evokes many emotions, including power, passion, and excitement. Moreover, it creates a sense of urgency that is why it is effective with sales. Red is highly visible; that is why it is usually used to attract attention to key messages the marketers need to convey.

**Yellow and Orange:** They communicate optimism, clarity, and youthfulness; brands that use yellow show that they are fun and friendly. These two colors stimulate mental activity and generate muscle energy.

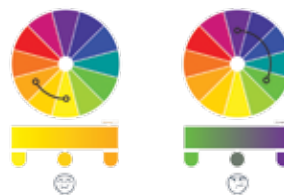
**Purple:** In most countries, purple is associated with royalty, wealth, and luxury, making it a popular choice in luxury and beauty industries. In some cultures, however, purple represents sorrow and grief.

**Green:** It is the symbol of freshness, growth, peace, and nature. This color is used to promote products or services that are environmentally friendly.

**Black:** It is a powerful, classy, and protective color, which is used by companies that wish to boast a classic sophistication, and works well for expensive products.

**White:** It represents cleanliness, simplicity, and purity, which makes it a popular choice for health care and child-related products and services.

As a consumer, I am attracted to ads with images and colors; I can even recognize a brand or a company just by its color. While walking around the shopping mall, I feel happy and enthusiastic once I recognize the red signs on the shops; they mean there is a sale!



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# THE SCIENCE BEHIND SCENOGRAPHY

By: Dr. Ola Mohammed  
Lecturer, Faculty of Fine Arts, Alexandria University

We live within worlds of stories, and we use stories to shape these worlds. People love stories; a good story is always entertaining. Stories are a set of techniques and tools that transform information into emotion by translating data elements to communicate with the audience. The story is the written description of the narrative content for an exhibition or a museum; stories add context to design. Storytelling can be found in the picture, the movement, and the rhythm; narrative, on the other hand, relates only to the theme and the presentation of the storytelling.

The development of “story” in design involves two main elements: theme and narrative. The role of the designer is to create attractive spaces that translate complex stories into a presentation that engages the visitor into a complete experience of content. Different methods can be identified in designing the spaces of narrative designs.

One such method is adopting theatrical and cinematic language to enrich the aesthetics of contemporary exhibition design through studying the concepts of theater, to write the exhibition and re-imagine it as a theater. Another is enhancing the exhibition space using these new narrative tools and innovative techniques, similar to the theater group where the main characters are the same things; a complete set with special effects and play tricks designed to entertain the spectator and visitor to keep his attention always during his trip within the exhibition.

Scenography can be defined as the art of coordination and control of space to achieve the objectives of the performance, which forms the framework in which events take place. In other words, scenography is

a representation of theatrical space and its formation through furnishing it with a series of audio and visual signs to clarify the meanings of the dramatic text.

Scenography translates content into physically accessible 3D environments, resulting in “narrative spaces”. The narrative space is a comprehensive structure that uses and implements various tools to prepare the stage in order to generate theatrical and emotional spatial themes. The narrative space, thus, constitutes a physically accessible environment, which acts as a means of conveying information or emotions. It makes it possible for the visitor to participate; hence, impressions remain longer in the visitors’ memory.

Scenography science uses a multifaceted set of scene preparation tools for various creative disciplines; such as architecture, interior design, photography, light, sound, media design, performance, fine art, installation art, theater, opera, and cinema. The interaction between different disciplines, the dynamic processing of space and the scenography can create experimental spaces that can be physically explored, characterized through an aesthetic experience and a growing orientation to the visitor.

The “Parameters of Scenography”—content, object, space, and recipient, as well as parcours and dramaturgy—are the basis and starting point of every move to develop a content-generated exhibition concept and holistic design:

- 1) The “Object” represents the source, the authentic thing, the bearer of meanings, and the storyteller.
- 2) The “Content” represents the overall narrative, the storytelling, the plot, and the message.

- 3) The “Space” defines the physical borderlines and the venue; it represents the narrative, the choreographed and dramatized exhibition space.
- 4) The “Recipient” is the main addressee, the visitor; his/her perception stands in relation to object, content, space, scenography, and dramaturgy.
- 5) The “Routing and Dramaturgy” represent the guiding thread through the exhibition and structure the visitors’ experience.

Scenography creates fascinating spatial dramaturgies and choreographies. Scenography tools enable the designer to create an imaginary experience that stimulates all senses. Recent scenography displays offer a series of different strategies for presenting elements and content; thus, showing a new and surprising perspective in exhibition design.

Strategies are the third pillar in scenography after “parameters” and “scenography tools”; they create the scene, complement the parameters and tools, to integrate them. Theater strategies include re-contextualization, information on demand, comparison, reconstruction, deconstruction, zooming, transformation, exploration, spatial conversion, and maps.

Display spaces explore a series of theatrical performances and scenography. Theatrical thought opens opportunities for narrative experience and visual images to create new possibilities to display ideas in display spaces. Scenography aims to motivate, participate, and engage the audience with the exhibition space through attractive displays.

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# And I think to myself...

By: Hend Fathy

I would not describe myself as a classical arts' fan, although music finds its way to my mind and heart, and I keep humming almost all the time and everywhere. What I know for sure, however, is that I am a keen lover of nature, its miraculous systems and magnificent creatures. It is, hence, particularly enjoyable for me to find links between music and nature.

# What a Wonderful Song!

For example, I can clearly hear and visualize the soft movement of the ocean in Disney Pixar's *Finding Nemo* soundtracks by musician Thomas Newman. Similarly, I hear the waves crashing on Alexandrian shores in the final part of Egyptian composer Omar Khairat's piece *Alexandria*. Listening to the famous Greek composer Yanni's fascinating piece *Spirits of Nature* takes me across the forests where I can hear the twittering birds. Moreover, I have always cherished the idea of the splendid Egyptian radio operetta "*Eid Milad Abo el-Fasad*" (The Birthday of the Wagtail); namely, that a party held by birds would not lack music because mankind musical compositions were originally inspired by birds sounds.

Undoubtedly, birds are skillful singers and their beautiful morning chirping signals a pleasant awakening. The musical abilities of birds have not gone unnoticed by musicians who used instruments to mimic them, or even included real bird songs into their compositions.

In 1808, eminent musician Ludwig van Beethoven presented imitations of the nightingale and quail—performed by flute and oboe respectively—in his famous Pastoral Symphony No. 6. French composer Olivier Messiaen was known for his lifelong interest in ornithology—the study of birds—and particularly bird songs.

In 1952, he composed his piece *Le merle noir* (The Blackbird); a flute and piano piece based on the songs of the blackbird.

A few years later, he expanded the use of bird vocals to create his orchestral work *Réveil des oiseaux* (Awakening of the Birds). Moreover, Finnish composer Einojuhani Rautavaara produced his orchestral composition *Cantus Arcticus*—subtitled *Concerto for Birds and Orchestra*—in 1972, in which incorporated recordings of bird songs featuring the shore lark and the whooper swans. Some recent endeavors even include compositions made entirely of bird sounds.

However, birds are not the only music performers out there; there are other chanters that we are unlikely to encounter in everyday life. In 1967, biologists Roger Payne and Scott McVay revealed that humpback whales produce complex vocalizations or songs that can last up to 30 minutes. Urged to let the world hear these unique sounds, Payne gave the recordings to American singer Judy Collins, who included them in her 1970 album *Whales and Nightingales*.

In the same year, the songs were also released in the *Songs of the Humpback Whale* music album produced by Capitol Record, which has been the best-selling nature album of all time. It is worth mentioning that these artworks have contributed to changing the world's attitude

towards whales drastically, inspiring people to support whale conservation efforts of international commissions and campaigns.

Yet, why do birds or whales sing? Generally speaking, different creatures can produce sounds, being one tool of communication among others, such as chemical signals<sup>(1)</sup>, postures, gestures, and visual signals<sup>(2)</sup>. While their languages are much more basic and less developed than human language, animals still puzzle us with their vocal abilities<sup>(3)</sup>; as in our case in point, beautiful and sometimes mysterious performances.

## On Treetops

Songbirds make up almost half of the world's bird species and are characterized by a special vocal organ called the syrinx. The syrinx is a very small organ located at the junction of the trachea and the bronchi in the bird's lungs. The varying structure of the syrinx in different species allows for different sounds. However, not all bird songs are pleasing to the human ear; think for example of the owl's hooting.

Non-songbird species are only capable of making simple sounds that are instinctive; they hatch knowing the sounds they will make as adults. Songbirds, on the other hand, have to learn how to communicate. While nestlings, they listen to the sounds produced around them. Then, during the fledging phase, they attempt to replicate the sounds they hear until they become capable of repeating them.

Some songbirds can even learn to mimic other species' sounds. It is worth



mentioning that songbirds have local dialects that are passed on to the following generations. Consequently, the songs of one population would over time become very distinctive from that of populations of the same species that are isolated by geographic features.

Typically, bird sounds can be classified into calls and songs. Each species and individual has a variety of songs and calls used in different contexts, which together make up its repertoire. Studying bird calls and songs gives scientists insight into the secret language of birds, helping them better understand their behavior.

Calls are usually short sounds with specific communicative functions. For example, there are warning calls—usually short strong ones—which birds use when they feel threatened and want to warn companions of danger. There are also contact calls—characterized by moderately strong chirps—that function more or less like us making sure friends are fine. Baby birds produce low-intensity chirps to attract their mother's attention, often flapping their wings simultaneously. Last but not least, there are mid-flight calls that are considered the most accurate calls to go by when trying to identify different species.

Bird songs, on the other hand, are relatively longer and more complex vocalizations. Typically, it is male birds that produce the songs as a means of showing off their good health, attracting potential mates, or defending a territory. In tropical areas, however, males and females commonly engage in duets to maintain and strengthen their pair bond. A very popular phenomenon signaling a daily bird singing event is known as the dawn chorus, where songbirds from a variety of species participate and sing their hearts out.

### Under the Sea

Whale songs were first recorded by Bermudian Frank Watlington in the 1950s. Watlington worked with the US Navy, and he was assigned to develop underwater microphones intended to locate Russian submarines. During his mission, he recorded remarkable sounds that he could not decipher, so he played them to some fisherman who identified the sounds as whales singing.

Being of excellent quality, his recordings, along with others taken few years later, were used in Roger Payne and Scott McVay study, published in 1971, that pinned these sounds to humpback whales. Not only did the scholars reveal the astounding whale songs to the world,

but their seminal study also paved the way for much research work that analyzed the songs and correlated them with the behaviors of humpback whales.

Although other whale species are capable of producing sounds, none is a more famous singer than the humpback whale. Like birds, it is the male whales that produce songs, that can be heard from as far as 30 km away. Usually, all males in a population sing the same song, forming a chorus; these songs change and evolve from one year to another. Elements of songs can be learnt by other whale populations, in a process referred to as cultural transmission. Some popular songs, as studies revealed, can even spread across the oceans.

Whale songs represent complex acoustic displays that can be syntactically analyzed into smaller components. The most basic elements are referred to as “units”; they include wails, moans, and shrieks. Units combine to form “phrases” that, when repeated for few minutes, form “themes”. Themes, in the same fashion, are repeated to form “songs” and repeated songs form “sessions”. Typically, a whale song can last up to 30 minutes and a session can last for up to 20 hours.

Although scientists have learnt much about whale songs, they still have not been able to definitely nail down their exact purposes. For example, it has been suggested that they serve as sophisticated means of communication for individuals to form close bonds with one another, to let their companions know where they are and what they are doing. Many scholars have linked these songs to mating, or maintained that they at least play a role in reproduction. In that sense, they can be viewed as acoustic contest of strength through which the males try to attract females. However, a counter argument is that the singing does not only take place in whales' breeding grounds, but also in feeding grounds and across migration routes.

Other studies linked whale songs to physiological reasons that have to do with respiration. Whales are believed to produce sounds as air flows across internal membranes within the respiratory system. Yet, they do sing underwater without any air escaping from either the blowhole or mouth. As such, they are believed to be producing sounds underwater, by recirculating air internally between the lungs and another respiratory chamber during dives. Shifting the ratios of oxygen and carbon dioxide during this process is also believed to change the resonant frequency of the singing organ.

Unfortunately, acoustic pollution produced by humans has negative impacts on the wellbeing of whales and the functionality of their songs. Sources of noise include ship traffic, oil and gas exploration, underwater explosions, acoustic deterrent devices, and scientific and military sonar systems. These noises drown out the whale songs, shutting down their long-distance communication system. Some marine biologists suggest that may be whales had to alter their calls over the past half century in order to hear each other over this ceaseless noise. Additionally, they can cause whales hearing damage, or in some cases, cause internal bleeding and lead to death. Scientists are also concerned about the effects of excessive or prolonged noise on the long run, causing behavioral changes that interfere with whales' health and survival.

We humans should be grateful for the wonderful world we have. It blooms with marvelous creatures adding beauty to our lives and inspiring the people of arts and sciences. Perhaps what we all need is to dedicate some time to appreciate nature, even once a month, wandering around the parks or going on sailing trips, to be more familiar with our precious partners. I believe it is the duty of all of us to revisit our practices against other creatures and bear the responsibility towards the well-being of our planet.



### Further Reading

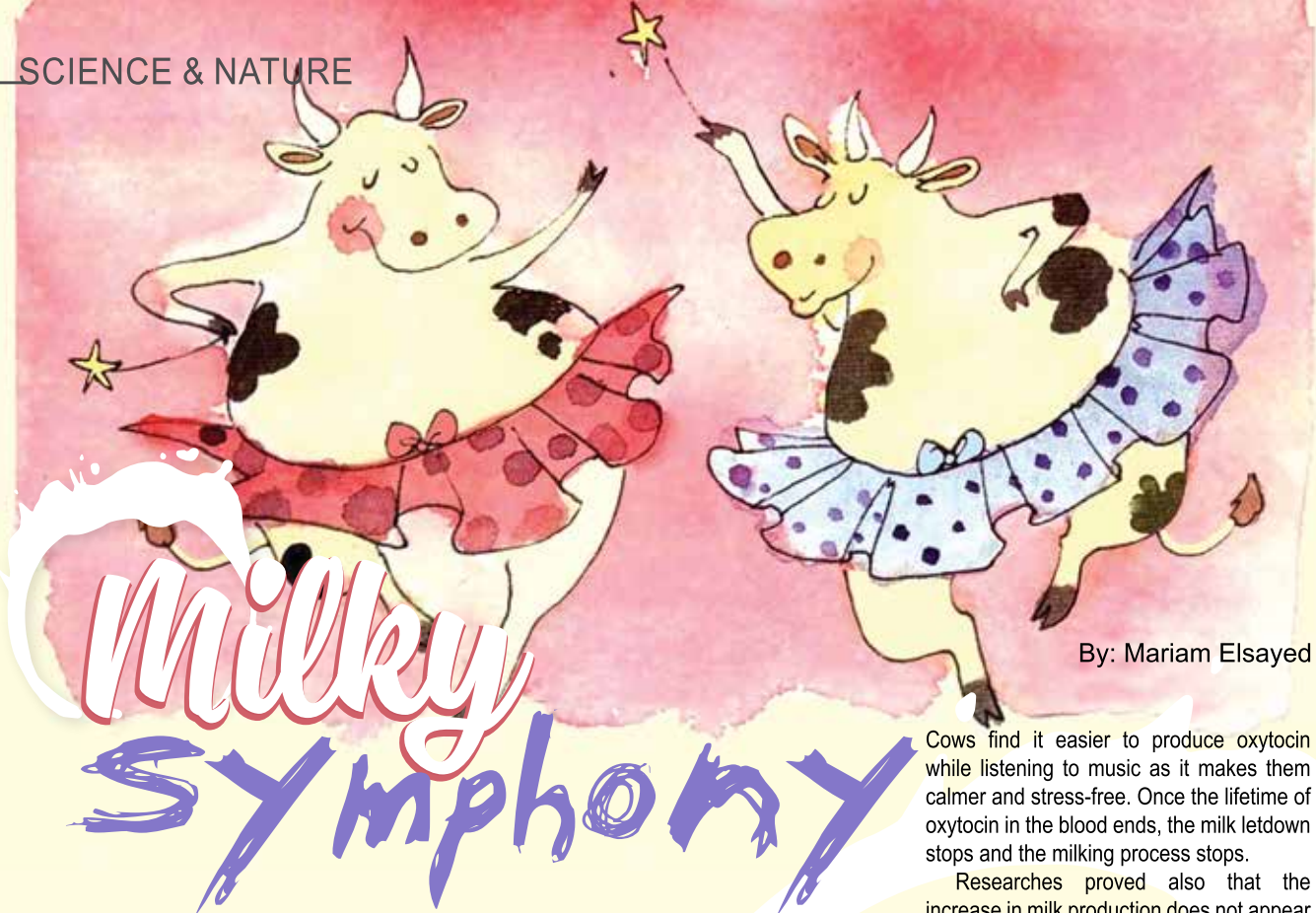
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By: Mariam Elsayed

# Milky Symphony

The British Columbia Dairy Association put forward an initiative entitled “Music Makes More Milk” in 2012. It explains a noticed increase in milk yield when music is played during cows milking time, but what could be the relation between music and milk production?

For us, humans, we always hear music as a tool that helps relieve stress and makes us feel better in hard times. Music helps several people focus and relax, and the same thing can happen to cows while listening to music; they feel less stressed and more comfortable. Music does not only help in cow relaxation during milking time, but it can also distract cows’ attention from stressful surrounding environment.

Stress on cows can lead to metabolic changes, which appear obviously on their health, feeding behavior, and milk production. During milking, sources of stress affecting cows include bad handling, which makes the cow feel uncomfortable, especially in the presence of humans. Bad housing conditions also stress cows and may lead to different types of diseases, leading to increased stress.

Stress is a normal body response, which helps overcome hard and unfavorable conditions. It allows the nervous system to release certain hormones in the blood stream to overcome muscle tension, which is the body’s method of guarding itself against injury and pain. “Cortisol” is one of the main hormones released under stress, allowing the body to provide more energy to the muscles,

which leaves the body with a small amount of energy that may be less than needed. Stress can also affect the immune system, which in turn leads to an increased risk of sickness.

Scientists measured the amount of cortisol in cows’ bodies during a stressful condition and while listening to music. They noticed an amazing decline in cortisol level in blood after listening to music and in milk as well. They also found that, when stress-free cows listen to music, they tend to secrete a hormone known as “oxytocin”, which plays an important role in the final stage of milk production.

The process of milk production requires several steps that start with the filtration of some milk constituents from the bloodstream to the cow’s udder. Other constituents can be formed in the udder itself from certain metabolites, which are also filtrated from the bloodstream. The mammary glands gradually become engorged with milk just as a sponge; milk remains in the cow’s udder until a message or stimuli is sent to the brain. These stimuli may be the sight of milking machine, the labor hand massaging the udder, or the music the cow used to hear.

The stimulus results in the secretion of two main hormones that share in milk production: “prolactin” hormone from the pituitary gland, and “oxytocin” from the hypothalamus in the brain. Oxytocin is responsible for milk letdown process, which is the final stage in milk production.

Cows find it easier to produce oxytocin while listening to music as it makes them calmer and stress-free. Once the lifetime of oxytocin in the blood ends, the milk letdown stops and the milking process stops.

Researches proved also that the increase in milk production does not appear while listening to all types of music; the music beat is more important than the genre. No increase in milk amount was found while playing rap or techno music, as they are fast and loud, and are not considered a relaxing type, so cows do not prefer them. On the other side, soothing and classical music are slow and rhythmic; they showed the desired increase in milk amount for their known effect on body relaxation.

Experiments were carried out on different cows for many days to show the difference in production, with and without playing music, and also to determine the best playlist of music to be heard. It was surprising to find a 3% increase in each cow’s daily production, which means a great increase in the total farm’s income.

Several animals, including cows, are considered creatures of habit. They know the exact time of feeding every day, milking time, and music played every milking time, and they get used to it. Any change in the cow’s habit and normal lifestyle could have a bad effect on it and its milk productivity. If a farmer starts playing music while milking the cows, they should never stop doing it. You may see it overrated, or just a waste of time; however, to farmers, a stress-free dairy cow means wealth.

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When I was surfing the Internet searching for a topic to write about in this issue, a clip popped up displaying a young female elephant called Hong in Thailand painting a picture of an elephant running and holding a flower in its trunk. I searched for more similar videos and articles tackling the super phenomena of paintings done by animals to be sure that the video is for real and not fake. What I found was astonishing; animals can be artists, too!

Giving a chimpanzee, an elephant, or any other animal a paintbrush and canvas is not a natural activity at all. Yet, painting is now considered an activity by which animals can exercise their minds, rather than just using their bodies; thus, enriching their boring captivity environment. The idea was initially introduced to stop animals from reverting to repetitive, compulsive behaviors.

## Talent is not restricted to chimpanzees and horses; dogs can paint too.

A study was performed to determine if painting helps in reducing elephants' stress levels. No clear evidence suggested a link between elephant painting and a reduction in their stress levels; however, higher stress levels and more anti-social behaviors were observed on days when they did not paint.

Back in the 1950s, a chimpanzee named Congo was able to create patterns of lines; he never managed to produce a recognizable pictorial image though. Congo had a creative ability and he himself made all the decisions about where each mark should go. By time, he balanced his patterns making them more complicated, proving that he has the first germ of artistic creativity within his brain.

Another example of animal artists is Metro Meteor, the race horse. After suffering from serious knee injuries while

on the racetrack, the artist Ron Krajewski adopted him. The vets told the artist that Metro had only two years left to live, so he wanted to make him as happy as possible. Ron noticed that Metro enjoyed bobbing his head up and down, so he thought that the horse might like to paint with a paintbrush in his mouth.

Metro loved painting and became the best-selling artist at Gallery 30 in Gettysburg, Pennsylvania, gaining enough money to pay for a pioneering treatment for his knee injury. It worked, and Metro is now able to spend a long and contented life at the easel. He has also donated over USD 45,000 from

the proceeds of his work to a charity that helps racehorses find good homes.

Talent is not restricted to chimpanzees and horses; dogs can paint too. Dagger, a black Labrador, was adopted by artist Yvonne Dagger, who welcomed the dog in her studio, where he watched her while she painted. Previously, Dagger learnt how to observe and master human skills; when Yvonne once gave him a paintbrush, he set to work creating his own art. He continued painting, selling more than 150 paintings and raising over USD 10,000 for charities.

In addition to painting, Dagger was also trained to be a certified therapy dog

for Therapy Dogs International (TDI) in Mount Olive, New Jersey—a nonprofit organization dedicated to regulating, testing, and registration of therapy dogs and their volunteer handlers for the purpose of visiting nursing homes, hospitals, other institutions and wherever else therapy dogs are needed. Now, Dagger inspires, influences, and comforts people all over the world.

In modern zoos, many elephants paint as part of "enrichment activities", they paint detailed pictures of trees, leaves, and flowers, as well as colorful abstracts. Occasionally, the keeper replaces the empty brush with a loaded one, and this is the only form of human intervention in the elephant's painting process.

Nowadays, animal paintings have become an important source of income in most zoos; artworks are sold in zoo gift shops and online, where prices vary and the revenue can be significant. In 2017, for example, paintings by brush-wielding seals at the Virginia Aquarium generated USD 15,000 in less than two years. For a nonprofit organization, every thousand dollars count, and art by animals can be an important source of income indeed.

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# A Healing Medium

By: Jailane Salem

Being human is not an easy task; we experience highs and lows, and everything in between. We all go through difficult times, when we feel we cannot cope or are overwhelmed with negative emotions; these rough times can sometimes give our mental equilibrium a beating. Often times, what causes us to worry and fret are things beyond our control; past negative experiences, toxic relationships, feelings of loss and grief, and wondering at the meaning of it all can gnaw at one's well-being.

We learn that when we fall and break a limb to go seek medical attention; but what do we do when it is our mental state that is broken? How does one go about remedying that? We are not always equipped with the know-how to take care of our mental wellbeing, and it is not something that is often talked about openly. When our brains are not functioning as they should and our emotional state is in shambles, we are more inclined to remain quiet about it in fear of the stigma that comes with addressing those issues.

There is no shame in being open about mental illness; there are many avenues to treat mental illness and states of mental and emotional turmoil. One such avenue is therapy, which can sometimes lead the way to recovery. Many people suffer from the likes of depression and anxiety, and they are not always of the clinical variety. They can be induced by the environment one lives in and the pressures of daily life.

Modern life has slowly and steadily chipped away at our wellbeing. We are always on the go, always trying to prove ourselves, always trying to play all the

parts society expects of us. We have become experts at functioning under high stress, but then it gets overwhelming; before you know it, you break down and fold. Overworked, overstressed, overconsumed, it takes a toll on the human psyche; for those who feel they are out of balance emotionally and mentally, therapy can be a saviour.

Therapy, counselling, or psychotherapy is when you meet with a therapist in order to work through and resolve unhealthy or problematic feelings, behaviors, or relationship issues. Many of us develop coping mechanisms that can be destructive to our wellbeing and those around us; bad habits and patterns of behaviors can be worked on and improved. Therapy is the key in honing in on issues one might have that perhaps we are unaware of. Since we

are not always in-tune with what causes us to feel emotionally distraught, having another pair of eyes assess the situation, in this case a therapist can open avenues for understanding, and therefore, start the process of healing and self-improvement.

There are many kinds of therapy available; each works differently in order to help patients to ultimately feel better and improve their mental and emotional wellbeing. Art therapy is one of them; it is not really surprising to think that art is used to heal and help, because it has long been known that art moves the emotions. This is why we have stories, paintings, films, plays, and so much more. People have always looked to art to understand life and find joy. Human history cannot be told without the presence of art; it is an integral part of humanity.







Recently, there has been a boom in the availability of coloring books for adults. Many marketed as a form of stress relief and a way to be more mindful; there is truth to that. Art is therapeutic in nature; it helps you access a different part of yourself, and allows you to express yourself in a non-verbal way.

This is in essence what art therapy aims to achieve; it allows individuals to communicate their internal state through art. No words are needed to express oneself; you can instead paint, sculpt, doodle, color, or draw to communicate how you feel and what you think. Art therapists are trained in figuring out what colors, symbols, and textures could mean, and work with people to unravel the meanings within the art they produce. Art therapy helps children, adolescents, and adults explore their emotions, improve self-esteem, manage addictions, relieve stress, improve symptoms of anxiety and depression, and cope with a physical illness or disability.

Sometimes words fall short; we try to express an idea or feeling that we have experienced, but when we come to

Emotions and thoughts are complex and sometimes lie beyond the realm of verbal expression. Enter color, shapes, and design, and they can help fill a gap left behind by words.

not about the artistic skill or talent. Art therapists often use psychological, spiritual, and artistic theories, in conjunction with clinical techniques, to achieve the desired

works where those thoughts and behaviors can be accessed. Art therapy taps into the unconscious, where there is no concept of time; what was relevant 30 years ago might still be as relevant at present. Art therapy attempts to make the unconscious conscious, and thus, enable a fundamental change in thinking.

Art therapy has been found to be beneficial to a wide variety of people. Art reflects our inner lives and allows us to explore another facet of who we are. Humans are complex; through art therapy, one can unravel unconscious issues we have and psychological scars that cause us pain. By identifying the problems and issues we have, we can then move on to treatment and healing. Art is after all cathartic, and is a powerful medium for change and development.



articulate, we simply do not know how to. Emotions and thoughts are complex and sometimes lie beyond the realm of verbal expression. Enter color, shapes, and design, and they can help fill a gap left behind by words. By analysing what they produce in an art therapy session, people with the aid of their therapist, can resolve emotional conflicts, and become more self-aware. They can delve into how the process of creating art makes them feel, as well as what the produced art work itself signifies.

People do not have to be talented in arts in order to reap the benefits of art therapy; art therapy is about the freedom of expression and its significance, and

therapeutic outcome. When patients create art, it can make it easier for them to access their own emotions and thoughts, because the physical piece of art makes it more tangible and easier to talk about their issues.

Although art therapy has focused predominantly on emotions, some therapists also integrate cognitive and behavioral constructs into their intervention. The external representations, unconscious projections, and underlying cognitions and feelings can be made conscious through art therapy. Cognitive Behavioral Therapy (CBT) focuses on observable behavior and conscious thoughts. This approach only

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# BIO-ART

## Science and Art in Harmony

By: Mahmoud Hagra  
 Head, Temporary Exhibitions Unit,  
 Art Exhibitions and Collections Department

Art and science seem like the opposite poles of a magnet; each going an opposite way. In fact, art and science work separately and produce different results; whereas art relies on imagination, science relies on facts. Nevertheless, art and science have been in harmony throughout the ages, contributing to achieve powerful, fascinating, and sometimes strange results. There are several examples in this harmony, such as the spherical Earth, gravity, as well as numerous devices and weapons that depended on artists' imagination and scientists' facts.

Bio-art is one of these interesting and strange examples; it is a new trend that represents the peak of harmony between plastic arts and biological sciences. It is an artistic practice that involves the use of living tissues, bacterial mediums, genetic sciences, and biological processes as art tools, instead of the brush and colors.

It is a kind of art that cannot be sold or owned; it is changeable, taking a different form everyday. It is affected by light and heat; it starts alive then dies gradually. This kind of art is produced in both laboratories and ateliers; it only requires a clean and sanitized environment to be controlled. While some deal with this art with a focus on colors and color combinations, others utilize different images, shapes, and types of fungi and bacteria to deliver a certain message or idea through the growth and development of these organisms.

The first to draw biological images was the Scottish scientist Alexander Fleming, who was interested in art. He discovered penicillin by accident while drawing a portrait, as a result contributing to saving millions of lives. He used to draw soldiers, mothers feeding their babies, houses, and other images using bacteria. He produced these paintings by coloring some bacteria using natural pigments. He then filled

the glass plates with agar, a gelatin-like medium that stimulates bacterial growth. Then, he used a laboratory tool to cultivate different types. This method was extremely difficult, since he had to find the bacteria and microbes carrying different colors.

Bio-art gained fame by the end of the twentieth century through the works of pioneer artists such as John Davis and Eduardo Kac. Kac became internationally renowned when he utilized bioengineering to make a rabbit glow in the dark. He injected a rabbit's ovum with a green fluorescent substance, a practice that created a stir among some critics and audience. Then, in 2006, he showcased his work "Secret Models of Marvelous Discoveries" in Singapore. The artwork comprised six glass models containing greasy sediments and microorganisms that form changeable shapes. "In the sixties, artists used to bring plants to the exhibition hall. Bio-art, on the other hand, uses, controls, and changes plants to deliver a message".

Heba El Aziz, an Egyptian contemporary plastic artist interested in experimental mediums, especially biological ones, is the most famous artist in the field in the Arab world. She graduated from the Faculty of Art Education, then obtained her PhD in Bio-Art. El Aziz participated in numerous

international art exhibitions and workshops to showcase her endeavors with bio-art. The latest of which was the eighth round of the Artist's Book Biennale 2018, held at the Bibliotheca Alexandrina.

Artist Heba El Aziz makes sanitized cultures for some types of harmless bacteria inside Petri dishes. She has developed her works from a mere projection of bacteria colors under light and heat effects. She uses images of eminent world figures, placing them in mediums suitable for bacterial growth. She then makes bacteria cultures, controls their colors and their growth on the image; as the bacteria develops, it produces different effects.

We do not know for sure where this magnificent advancement in art and its relation with science will lead us; each day is with new and different updates. Some people might agree with new types of art and some might disagree. Viewing them and dealing with them is up to the judgement of the audience.

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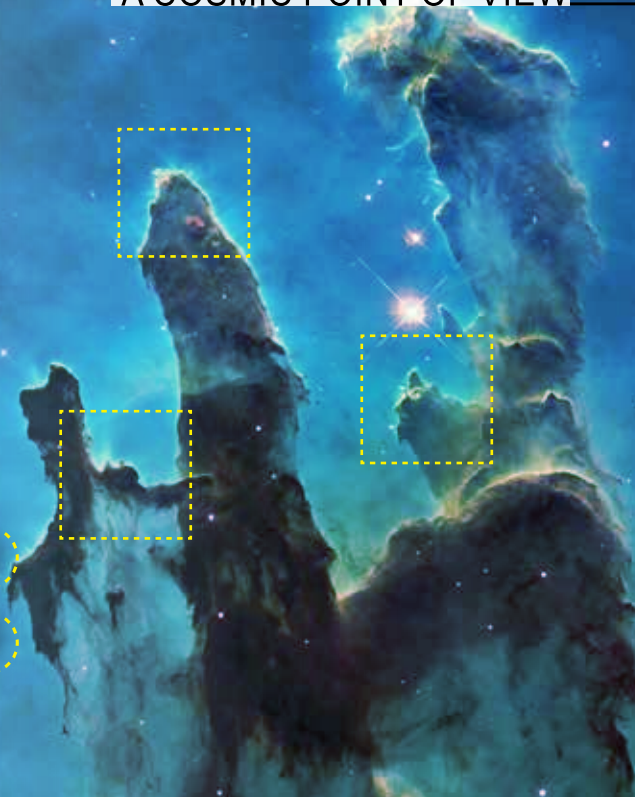


# When Art Meets SCIENCE:

## The Best Astronomical Picture of the 20<sup>th</sup> Century

By: Dr. Omar Fikry

Head, Planetarium Section, Planetarium Science Center



At the end of 1999, before the end of the twentieth century, social networking sites and international cultural authorities, both official and civil, competed in an open poll on the so-called “Best Thing” of the 20<sup>th</sup> century: best film, sports club, invention, political activist, etc. NASA’s website was one of these entities; it asked people to vote for the best astronomical picture captured in the 20<sup>th</sup> century.

The poll was specifically on three pictures captured by the Hubble Space Telescope. NASA made several notes for those willing to participate in the poll; in their forefront, the vote has to be purely based on artistic and aesthetic criteria, followed by the subject and the scientific significance of the picture. The three images were of Earth from space, the Rings of Saturn, and the Eagle Nebula.

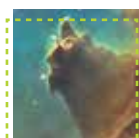
The first picture showed Earth in its striking blue color with its variance of shapes and terrains on a background of dark black space. The image processing demonstrated the beauty and splendor of the Planet, proving with no doubt the spherical shape of Earth. The second picture showed the Rings of Saturn. It looked unbelievably like a painting by a skillful and experienced artist, who is fully aware of beauty standards, color gradings and their compositions. It proved that Saturn and its rings deserve to be named “The Jewel of the Solar System”. The third picture was of the Eagle Nebula; it was

selected as the best astronomical picture of the 20<sup>th</sup> century.

The Eagle Nebula is a huge cloud that is regarded as raw material for star formation. It is formed of a contrast mixture of ionized and non-ionized gases, as well as dense cosmic dust permeating these gases. This picture in particular was included in the poll because it confirms the idea or the theory of stellar evolution: how stars are born, elevate, grow, and even die. The picture proves all these facts; yet, the picture really calls for contemplation and appreciation of beauty with all its aspects. The picture of the Eagle Nebula has a brilliant chromatic composition. I invite the readers to observe this composition, unleash their imagination, and contemplate NASA’s interpretation.

At the top and a little in the center of the picture, you can see the birthplace of a new star behind a pale gelatinous brown spot; a womb-like giving birth to

a newborn star. Below it, on both sides, appears two formations of gases. On the left side, the first gas formation seems like a person rejoicing the birth



of the star, and on the right side, the gas formation seems like a stunned human face anticipating this charming event. All these meanings are there in an astronomical picture, not painted by human hands, but is one amongst thousands of images successfully captured by the Hubble Space Telescope.

These elegant artistic fantasies and meanings have contributed to the success of this picture to be acknowledged as “The Best Picture of the 20<sup>th</sup> Century”.

Those who participated in the poll did not discuss the reasons for gas variations or their different ionization degree, but rather were attracted by the deep technical explanation and the artistic meanings conveyed in the picture. Neither the bright rings of Saturn nor the bright blue color of Earth interceded for their pictures to compete with the the Eagle Nebula picture. At the end, the cosmic art painting in the picture won the competition; with its deep meanings of holding on hope, continuous giving, and birth, even in the world of stars!





# Towards a Better Educator

By: Rania Farouk  
Marketing Specialist, Planetarium Science Center

“Towards a Better Educator” is a project that is the outcome of the joint and fruitful collaboration between Bibliotheca Alexandrina (BA): a cultural, scientific, and academic beacon of knowledge; Sawiris Foundation for Social Development: a pioneering Foundation dedicated to sustainable development; and Star Care Egypt Organization, which was founded by Mercedes-Benz partners to promote community service in the field of children's support and assistance in different fields, including health and education.

The project is also implemented in cooperation with the Egyptian Ministry of Education, which helped in facilitating all procedures and requirements needed by the project to organize workshops for the selected educators by the Ministry during the period of the project, in addition to the Faculty of Education at Assiut University, which hosted the project and provided all the available resources necessary for the success of the initiative.

The project aims to develop the teachers' personal and life skills that complete their teaching skills, in order to improve communication with the students, which will reflect on the entire educational

process. It also aims to activate the role of school libraries and encourage students to use them for research. Moreover, the project trains science teachers to animate scientific activities within science clubs in schools. The ultimate goal is to ensure the continuous transfer of acquired skills and to encourage teachers to plan non-classroom activities that can be implemented with their students in the future.

Over the past two years, the project has trained around 300 elementary and preparatory school teachers, and equipped 60 science clubs in 60 schools in Alexandria and Assiut. A number of scientific and cultural competitions and school visits

were conducted from both Governorates at the BA Children's and Young People's Libraries, the Planetarium Science Center, and the Embassy of Knowledge at Assiut University.

The BA hosted the closing ceremony of the the project on Tuesday, 9 October 2018, in the Bibliotheca Alexandrina Conference Center, Small Theater.





# PLANETARIUM SCIENCE CENTER

"Science for All"

Dear Planetarium Visitors,

Please note that the Planetarium Theater is closed to upgrade the projection system. The technology of the new planetarium is based on full lasers, which means more brightness, clarity, and dazzlingness; a sharper and more accurate vision for more realistic simulation that approaches the reality, for high quality picture and fun viewing experience.

## ALEXploratorium

### Discovery Zone

#### Opening Hours

Sunday, Monday, Wednesday, Thursday:

9:30–16:00

Tuesday: 9:30–12:30

Friday: 14:00–16:00

Saturday: 12:00–16:00

#### Guided Tours Schedule

Sunday, Monday, Wednesday, Thursday:

10:00, 11:00, 12:00, 13:00, 14:00, 15:00

Tuesday: 10:00, 11:00

Friday: 14:00, 15:00

Saturday: 12:00, 13:00, 14:00

**Fees:** EGP 10.- (EGP 5.- for students)

### Listen and Discover

#### Fees:

DVD shows: EGP 4.- (EGP 2.- for students)

3D shows: EGP 10.- (EGP 5.- for students)

12D shows: EGP 20.-

## History of Science Museum

### Opening Hours

Sunday–Thursday: 9:30–16:00

Saturday: 12:00–16:00

### Guided Tours Schedule

Sunday–Thursday:

10:30, 11:30, 12:30, 13:30,

14:30, 15:30

**Fees:** EGP 2.-  
for non-audience  
of the Planetarium

The Bibliotheca Alexandrina Planetarium Science Center (PSC) invites its visitors to spend a day of fun learning, where they can enjoy amazing scientific shows that cover a diverse variety of scientific fields and are suitable for a wide range of groups at the Planetarium Theater.

Visitors can also enjoy tours of the History of Science Museum, which highlights scientific discoveries throughout three eras: Pharaonic Egypt, Hellenistic Alexandria, and the Golden Age of Islam.

Moreover, visitors can enjoy a collection of interactive exhibits that targets children and adults, workshops, DVD and 3D shows at the ALEXploratorium as well as shows at the 12D Theater.

For schedule and fees, please visit the Planetarium Science Center website.



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BAPSC



# Meet the Artist

