March 2025

K12Skills

Monthly
Newsletter
Issue 1

New Horizons

AI in Healthcare
by Aasrith Jangala

Artificial intelligence (AI) is making a huge impact on healthcare, changing the way doctors diagnose, treat, and manage patient care. By analyzing massive amounts of data, spotting patterns, and learning from new information, AI is streamlining medical procedures and improving patient outcomes. In today's age, there are many scopes where AI is transforming the healthcare industry, particularly in diagnostics, personalized medicine, and hospital efficiency. Machine learning algorithms can analyze medical images—like X-rays and MRIs—faster and often more accurately than human doctors. Studies have shown that AI can detect lung cancer with higher precision than traditional methods, which means patients can get diagnosed earlier and start treatment sooner. AI is delivering profound impacts in the healthcare industry, especially its applications in personalized treatments, operational efficiency, and the simultaneous adversities that may arise from its utilization.

An area where AI excels is in the field of personalized medicine. By analyzing a patient's genetic information, lifestyle, and medical history, AI assists doctors in creating customized treatment plans tailored to each and every individual. This means medications and therapies are adapted to the individual's needs, increasing effectiveness while reducing the chances of side effects. For example, AI can predict how a patient will respond to a specific drug, allowing doctors to make enhanced prescribing decisions and manage conditions more effectively. Even though these processes can result in complications, AI can effortlessly generate solutions to specific issues that patients receive.

Beyond diagnosis and treatment, AI is also transforming the day-to-day operations of hospitals. Tasks like scheduling appointments, managing patient flow, and processing insurance claims can be automated, reducing administrative burdens on healthcare staff. This not only saves time but also improves patient experiences by cutting down wait times and ensuring resources are allocated efficiently. Furthermore, predictive analytics can even help hospitals anticipate patient admissions, leading to better planning and smoother operations.

Despite its advantages, AI in healthcare comes with numerous challenges when implemented in the healthcare field. One major concern is the risk of errors in the systems of AI, which can potentially generate a wrong diagnosis or recommend the wrong treatment. There's also the issue of job displacement, as automation takes over tasks traditionally handled by healthcare workers. Data privacy is another major possible conflict with AI systems. With AI processing sensitive patient information, the risk of breaches could happen at any time, leading to deteriorated trust and foundation in medical institutes. Finally, there's algorithmic bias—if AI is trained on incomplete or biased data, it could lead to unequal treatment across different patient populations.

THIS IMAGE IS ALSO AI GENERATED

While AI is already beginning to transform healthcare, making diagnostics more precise, treatments more personalized, and hospitals more efficient, with great power comes great responsibility. As we continue to integrate AI into medicine, it's important to balance innovation with ethical considerations, such as errors, workforce displacement, data privacy, and even algorithmic bias, ensuring that technology enhances patient care while maintaining trust and fairness. The future of healthcare will depend on how well we navigate these challenges —and the potential of the discoveries and advancements is truly exciting.

INFORMATION RETRIEVED FROM:HARVARD MEDICAL NEWS, MCKINSEY & COMPANY, HEALTHCARE ITNEWS
FORESEE MEDIC, AMA JOURNAL OF ETHICS

# The Top Cardiac Diseases/Conditions and How to Avoid Them by Anagha S.

Cardiology has come a long way with recent advancements in technology such as the inventions of medical devices like a stethoscope (a device that listens to the heartbeat), the sphygmomanometer (a device that measures blood pressure), and many other equipment. We have, as technology has progressed, been able to see inside the heart for the first time with cardiac MRIs. With all these technological breakthroughs, we are able to understand, on a much deeper level than before, the inner workings of heart diseases and conditions, which are the leading cause of death in the U.S. There are many types of heart diseases, but they all have one common factor - they are almost always fatal. In 2022 alone, 702,880 people died from heart disease: the equivalent of 1 in every 5 deaths. This shows how widespread heart disease is. This article aims to educate you about the general term heart disease and then the top 2 most common types of heart diseases - Coronary Artery/Heart Disease (CAD/CHD) and heart attack along with a few tips about how you can keep yourself healthy. We'll first learn about the general term.

Heart Disease is a general term that includes many types of heart issues. The term also applies to cardiovascular disease, which spans heart and blood vessel conditions. There are many causes, but major ones include health conditions, lifestyle, and genetic factors. Overall, heart disease is the leading cause of death for men, women, and people of most racial and ethnic groups. Every 33 seconds, one person dies from cardiovascular disease. In addition to its toll on human life, heart disease is also costly in an economic sense. Heart disease cost about $252.2 billion from 2019 to 2020, including the cost of healthcare services, medicines, and lost productivity due to death. (Source 2, Source 3). This statistic was from a time when inflation wasn't a thing. The annual costs concerning heart disease must be much higher due to the rise in inflation rates.

Now, let's learn about the first type of heart disease which is Coronary Artery/Heart Disease (CAD/CHD). CAD is a disease in which there is a narrowing or blockage of the coronary arteries (blood vessels that carry blood and oxygen to the heart) (Source 4). It is the most common type, killing 371,506 people in 2022 (Source 1), which shows how widespread this is. CAD isn't limited to one race or ethnicity, it can affect all. Coronary artery disease is usually caused by atherosclerosis (a buildup of fatty material and plaque inside the coronary arteries). Some symptoms are chest pain, shortness of breath during exercise, and heart attacks. The risks are higher if you have a family history of coronary artery disease before age 50, older age, smoking tobacco, high blood pressure, high cholesterol, diabetes, lack of exercise, and obesity (Source 4). If we exercise daily, have a healthy diet, and have regular check-ups with our doctor, we can keep ourselves in good health.

Following CAD on the top 2 list is the heart attack, which occurs when the blood flow that brings oxygen to the heart is reduced or cut off. Some possible causes of a heart attack are the build-up of plaque in coronary arteries (atherosclerosis), blocking of blood flow to the heart, as well as spasms. Some symptoms are angina, pressure/squeezing/fullness, arm/jaw/back pain, and shortness of breath. In the United States, every 40 seconds someone has a heart attack, which again isn't restricted to one particular nationality. Every year, about 805,000 people in the United States have a heart attack. Of these, 605,000 are a first heart attack, and 200,000 happen to be people who have already had a heart attack. About 1 in 5 heart attacks are silent—the damage is done, but the person is not aware of it (Source 3). This shows how many people aren't aware of what has happened inside their bodies, yet we have a tool that can identify silent heart attacks. I am talking about MRIs, which have been touched on earlier. MRIs use radio waves to map out what your heart and its surrounding blood vessels look like. If you did have a silent heart attack, the MRI would be able to easily identify it.

A heart condition is a serious problem that, as established earlier, many people aren't aware of It is also responsible for hundreds of thousands of deaths each year. Although heart attacks and most other heart conditions are unpreventable, you do have a hand in making sure your heart is perfectly fine. Having a healthy diet and lifestyle can go a long way. Something as simple as exercising or going outside for 30 minutes per day can greatly reduce the chances of getting heart problems.

INFORMATION RETRIEVED FROM: CDC.ORG AND CANCER.ORG
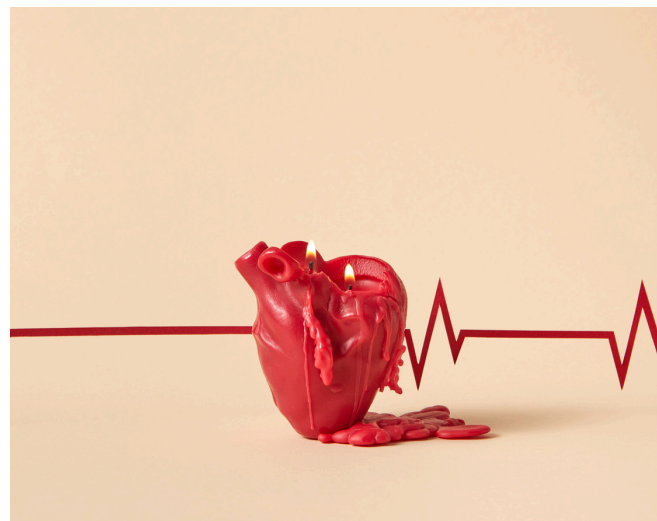
What exactly defines human consciousness?

People worldwide have questioned this since ancient times, long before the 21st century. While there is no specific answer, many theories have been developed to help explain the who, what, when, where, why, and how humans are given the sharpest double-edged sword of consciousness.

Humans are very diverse creatures. They have evolved and advanced in geographically, economically, and demographically diverse and unique societies, where they developed and taught various ideologies to explain phenomena, experiences, and events that shape their beliefs, personalities, interests, and identities. One such phenomenon that has been explored is the nature of human consciousness. Both philosophical and psychological theories of consciousness have been explored, along with the origins of these theories and their implications across several scientific disciplines and beyond.

Philosophical Theories

Integrated Information Theory (IIT)

Integrated Information Theory (IIT), developed by Giulio Tononi, is a mathematical theory explaining how consciousness arises from the integration of information within a system. It begins with a set of axioms, which are statements accepted without extensive proof. The first axiom is *intrinsic existence*: the idea that we simply accept our consciousness exists. The second is *information*, meaning consciousness is shaped by what we can or cannot perceive. The third is *integration*, meaning we have one unified consciousness. The fourth is *composition*, indicating our consciousness is structured, and we experience different things across space and time. The final axiom is *exclusion*, which states there are boundaries to individual conscious experience. Postulates translate these axioms into mathematical formulas, which AI uses to simulate a conscious "person," sparking controversy over whether AI can be considered "real."

Global Workspace Theory (GWT)

Global Workspace Theory (GWT), developed by Bernard Baars and Stan Franklin, explains how conscious experience arises. Using an analogy of a theatre production, one can understand that the stage is an analogy of the human brain, and the certain scenes that occur at different times, similar to how our consciousness can only hold a limited set of thoughts, sensations, and ideas simultaneously. Likewise, the actors waiting backstage are like the unconscious processes in our brains such as memory retrieval, emotional processing, and sensory analysis. In this way, the thoughts formed by one's consciousness stay in their long-term memory.

Interface Theory of Perception (ITP)

The Interface Theory of Perception (ITP), developed by Donald Hoffman, suggests that our perception of the world is not an accurate reflection of reality, but rather a "user interface" that helps us navigate the environment. Similar to how a computer's graphical interface doesn't reveal how the system works behind the scenes, our perceptions are designed to help us survive, not to see the world as it truly is. According to this theory, our senses only give us a "simplified" version of reality that is evolutionarily advantageous for decision-making, rather than an exact representation of the external world.

Psychological Theories

Neural Correlates of Consciousness (NCC)
The Neural Correlates of Consciousness (NCC) theory, developed by Crick and Koch (1990), states that consciousness is "a neural system with a state which is minimally sufficient (but not necessary) for an experience" (Fink, 2016). Essentially, this theory links neuroscience and psychology, explaining that certain areas of the brain must be active for one to have "conscious" experiences, but that isn't enough by themselves. Other factors, like how these brain areas interact with each other or with the environment, are also important for facilitating consciousness. Studies using neuroimaging techniques (e.g., fMRI, EEG) continue to identify specific brain activities and neural patterns associated with the experience of consciousness/the conscious mind.

Freudian Psychoanalytic Theory

Sigmund Freud, a pioneering figure in clinical psychology, specifically studied the unconscious mind and its influence on human behavior. Freud developed the Iceberg Theory, proposing that the mind is divided into three layers: ego, the conscious mind (what we are aware of); superego, the preconscious (thoughts that can become conscious); and the id, the unconscious (thoughts, memories, and desires outside of conscious awareness). His contributions had real-world effects, including the development of psychological practices that influenced advertising during the early 20th century, particularly in shaping strategies that appeal to unconscious desires.

Cognitive Psychology

Cognitive Psychology, founded by Ulric Neisser and other psychologists, focuses on understanding the mental processes behind perception, thinking, memory, and decision-making. It also seeks to explain human consciousness through cognitive processes (ental activities like thinking, remembering, and problem-solving.). The Information Processing Theory, founded by George Miller, suggests the mind processes information in stages, like a computer. The Working Memory Theory, developed by Alan Baddeley and Graham Hitch, explains how working memory holds and manipulates information for tasks like reasoning. The Cognitive Load Theory, founded by John Sweller, describes how cognitive load affects the ability to process and retain information, emphasizing the importance of reducing unnecessary load in learning.

Human consciousness is an evolving concept, shaped by both simulation theories and the psychology of cognitive functions. Humanity, aware of its own awareness and endlessly curious, will forever question it. Countless theories have been proposed and thoroughly explored by scientists, yet the true answers remain beyond our grasp, as they always have—and perhaps always will.
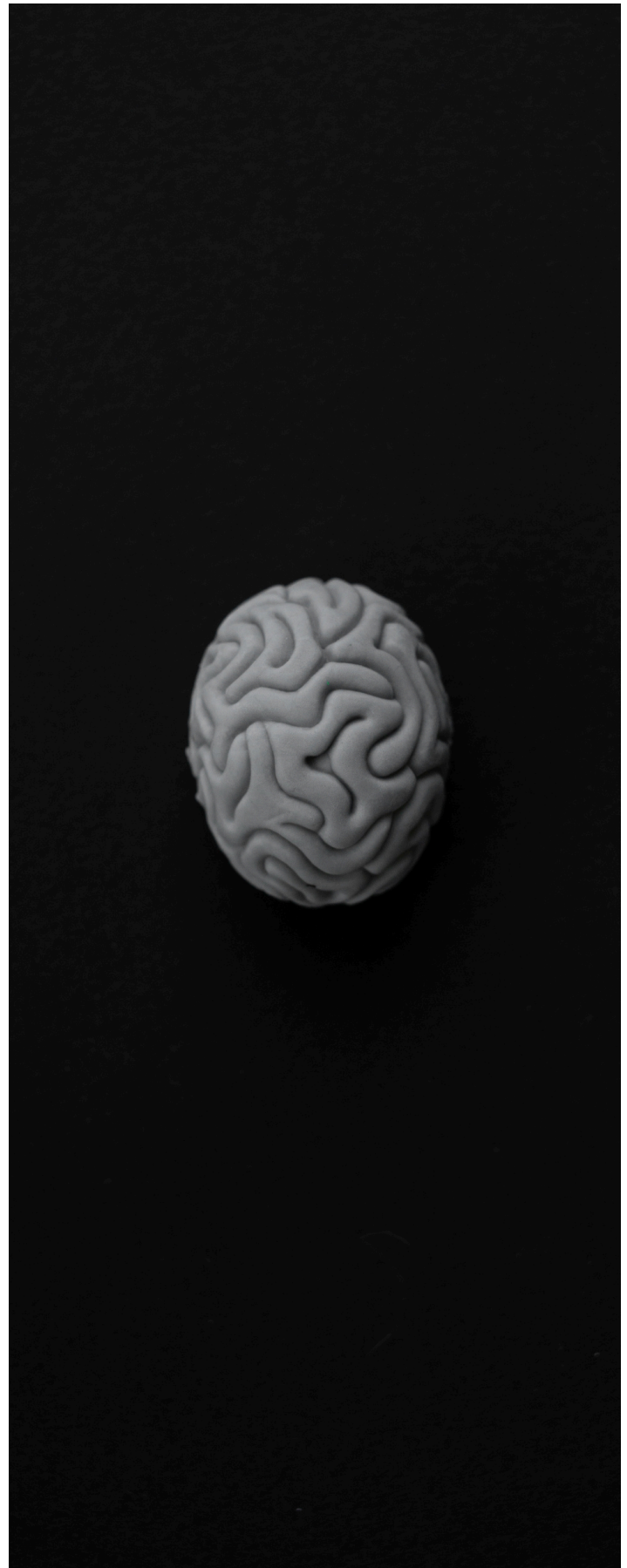
The American Civil War: A Key Event That Shaped The Nation by Devyani Suryawanshi

A key event that shaped the nation was the American Civil War, it was devastating, causing the death of many lives, but there was a benefit. In the beginning, the nation separated, one supported slavery, and the other disagreed with slavery being a practice. It had overall ended inequality between whites and blacks, and treated them equally, before segregation of course. It was going to be the end of our nation, but, in the end, the nation we know today kept growing.

The Civil War was a different war from most others in the nation's history, in which the United States was pitted against other countries. To understand how such a war unfolded, it is important to go back to the beginning.

In the early stages, before the Louisiana Purchase, the 'New World' was the United States, the 13 colonies, with Jamestown being the first permanent colony. The Revolutionary War was between the 13 colonies and Great Britain. The 13 colonies wanted independence from Great Britain and to be their own nation. In the end, the 13 colonies were free and became the early United States.

On November 6th, 1860, Abraham Lincoln was elected as the 13th president of the United States after the Louisiana Purchase was confirmed and explored. Even in his early days, Lincoln was on track to make changes within the trajectory of the country's history. The benefit is that he at least made a few states agree to him and end slavery on their side. The devastating change that caused the death of people's lives was that some states supported slavery resulting in the outbreak of the Civil War.

Some of the larger states in the Union are: New York, Pennsylvania, and Illinois. The larger states in the Confederacy are: Virginia, North Carolina, and Georgia. The border states in between the two are: Kentucky, Missouri, and Maryland.

In this sense, the United States was separated into two parts, the North and the South. The Southern states also known as 'The Confederacy' had supported slavery. The Northern states also known as 'The Union' didn't support slavery. The Confederates had supported it because they wanted agriculture to stay the same, they wanted no change. The Union, however, had built machines and had what they built to do the job while the humans did whatever they had desired to do.

On April 12th, 1861, Confederate troops fired at Fort Sumter in Charleston Harbor, South Carolina, starting the American Civil War. The event that ended the Civil War was the Battle of High Bridge in Cumberland County, Virginia on top of the Appomattox River. After the Confederates were on the bridge, the Union forces blocked every exit so they couldn't escape, causing the surrender of the Confederates. In the end, Confederate General Robert E. Lee surrendered his army to the Union.

The surrender ended the Civil War, leading the two forces to become one nation that was now free of slavery.

INFORMATION RETRIEVED FROM: GALE E.S., BRITANNICA, NEWSELA

Have you ever wondered what color sounds like? People with synesthesia can hear color and see music. Synesthesia is a condition where people may see numbers in colors or even taste words. According to the Merriam-Webster Dictionary, synesthesia is a subjective sensation or image of a sense other than the one being stimulated. This affects perception across all senses as you view the world differently. Although synesthesia may be considered a nuisance, it is truly a superpower that allows people to see and hear the world in new ways. A fascinating aspect of synesthesia is the idea of combining color and sound, showing how artists, musicians, and people with synesthesia experience the world differently.

The science behind this perception-altering condition is actually quite simple. Synesthesia is in fact not a disorder but instead a rare neurological occurrence caused by the abundance of neurological connections in specific areas of the brain. Synesthesia is more common than you may think and there are several types of synesthesia. The more common types include chromesthesia, grapheme-color synesthesia, and lexical-gustatory synesthesia. Chromesthesia is when sound triggers the perception of colors and vice versa. Grapheme-color synesthesia is when letters and numbers appear as specific colors and lexical-gustatory synesthesia is when words or sounds are associated with a taste sensation.

Believe it or not, quite a few famous musicians and artists have synesthesia. For instance, musician Pharrell Williams has synesthesia and believes it shapes his music and gives it that recognizable and unique energy. Pharrell's experience with synesthesia highlights the intriguing way music can connect with sound and other senses, leading us to wonder why specific melodies evoke certain colors.

Why does music evoke color? Music, with its melodies, rhythms, and emotions, often invokes color in people's minds because it carries a sense of mood which synesthetes, or people with synesthesia, interpret along with colors. For example, enthusiastic music with a quicker beat might bring to mind warmer colors, whereas a sad, soft melody may evoke cool colors. The connection between music and art is that both allow people to feel through creativity. Music allows people to feel emotions such as joy, sadness, and excitement, just as colors can trigger diverse feelings and moods.

This can be seen through the works of Russian artist, Wassily Kandinsky, who was also thought to have synesthesia. It is said that Kandinsky's synesthesia allowed him to explore the connection between colors and sounds and interpret the emotions and vibes of music. He used his synesthesia to his advantage and translated music into art in his abstract paintings.

Similarly, Alexander Scriabin is one of the most prominent examples of synesthetes merging music and art. Scriabin was a Russian composer and renowned pianist who experienced chromesthesia, which allowed him to create new ways to compose masterpieces. His mind associated specific pitches with particular colors, such as the pitch "D" with bright yellow, and "A" with dark green. As a result, he invented an instrument called the clavier à lumières, which translates to the keyboard with lights. With his new instrument, Scriabin composed Prometheus: Poem of Fire, with different colors emitting from the instrument as special keys were played. This all goes to show the true feats that can be achieved when simply viewing music and art from a varied perspective.

Interestingly enough, the neurological condition of Synesthesia encourages people to be more creative by allowing them to experience the world in unique ways. Using the multi-dimensional perceptions synesthesia creates, artists, musicians, and even authors to form exceptional artistic expressions.

Music and art are more connected than we think. Even if you don't experience synesthesia, you can still explore the wonderful and distinct connection between both art forms. As this article comes to a stop I would like to encourage readers to be creative. What color does your favorite song look like?
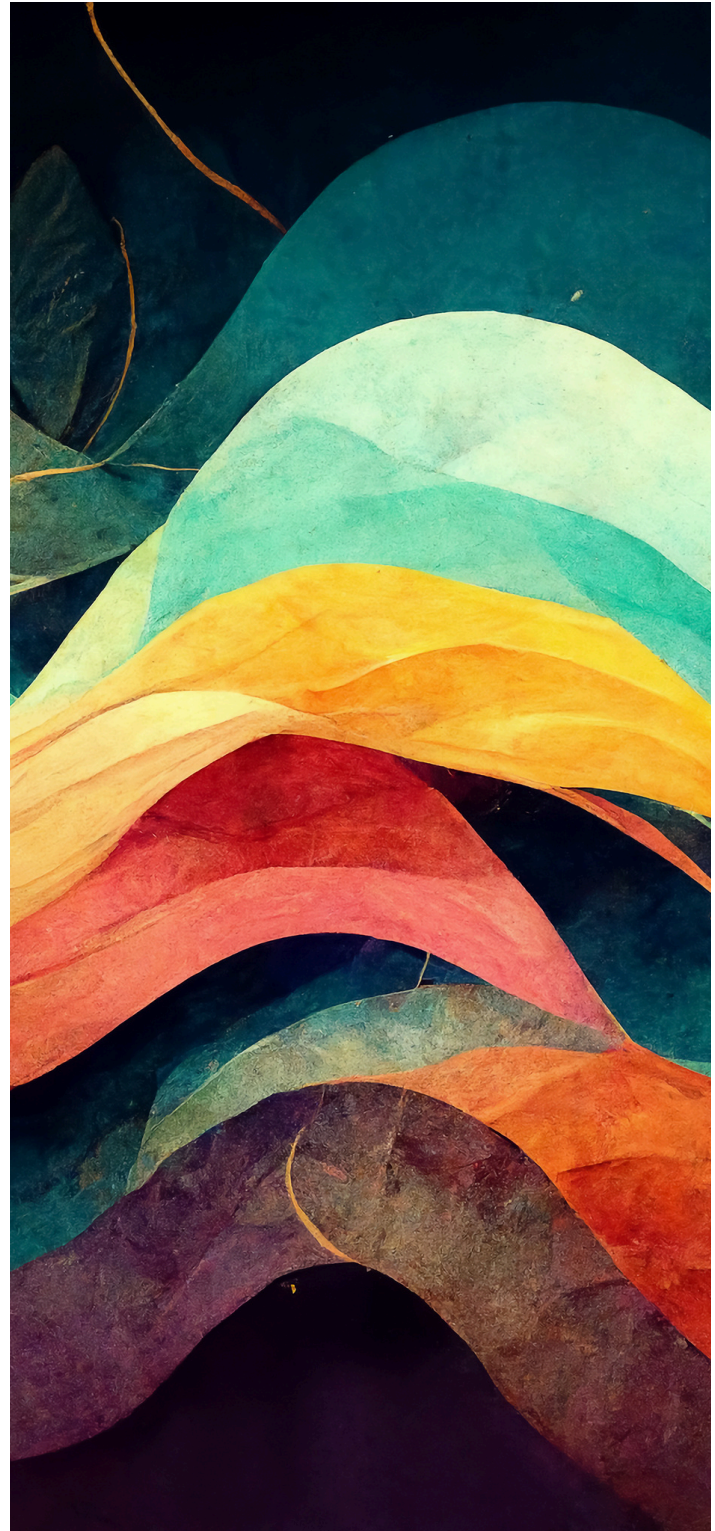
The Science of Color
by Vihaan Rathi

Color is everywhere. It is in nature, art, and even technology. But what is it, and how does it impact us? Color is the result of light interacting with objects. It shapes our thoughts, emotions, and behaviors. The science of color influences everything from art to psychology. Light is made up of waves, and each color has a different wavelength. Each color corresponds to a different wavelength. Red light has the longest wavelength, while violet has the shortest. When light passes through the prism, it splits into all the colors of a rainbow, demonstrating how clear white light is actually composed of seven visible colors. This phenomenon explains why sunlight passing through a prism results in the seven colors of a rainbow, showing that light contains a variety of wavelengths that our eyes can perceive as colors.

The way we see these colors has a lot to do with how our eyes work. Our eyes contain special cells called cones that help us see color. Most people have three types of cones, each sensitive to specific wavelengths of light. These three cones are red, blue, and green. They work together allowing us to see a range of colors. When light hits an object, some colors are absorbed and the rest of the colors bounce off. Meanwhile, the light that reflects off enters our eyes, and our brain helps us see the color. This process shows that color depends not just on the object but on how light interacts with it and how our eyes and brain work together to create that light.

Colors mix in two ways: **additive** and **subtractive**. Additive mixing happens with light. This is how things like phone screens work, where red, green, and blue light mix to make other colors. Subtractive mixing happens when you mix paints or pigments. Mixing colors like red, yellow, and blue absorbs some colors and reflects the others. The more colors you mix, the closer you get to black, as more light is absorbed and less is reflected.

Nature is full of color. Flowers have bright colors to attract bees and butterflies, while animals, such as chameleons and zebras, use color for hiding or communicating. In this way, colors are essential for animals to survive in the wild. The science of color shows that what we see is not just about how something looks. It's about how light and how it helps the world around us. Understanding color helps us appreciate the amazing world around us.

INFORMATION RETRIEVED FROM: INFORMATION RETRIEVED FROM NASA AND THE SMITHSONIAN LIBRARIES AND ARCHIVES

Credits

...

Edited, Designed, and Managed by Aarya Karmarkar: Editor-in-Chief

Images without sources are sourced by Canva and used under permission