Life-Science #FuturPopArt





Life-Science #FuturPopArt

Artist's note

A Sci-Illustrate exclusive 30 day challenge which led to some of the most inspired work i have made.

As you scroll below, I welcome you to be a part of my creative exploration through the month of June 2018, and join me in revisiting some scientific areas that are close to my heart.





























































DNA on skateboards. I'm telling you! That's gonna be the whole new thing.

01 JUN

I am so excited. Sci-Illustrate has the privilege of joining some amazing designers in what is called the #FuturPopArt challenge. Everyday of this month, I will be releasing a new skateboard design into the world for your viewing pleasure.

Why am I doing this? I say, why not?

This plays right into my current obsession with putting science-inspired art on every-day objects!

- 1. There is a systemic shortage of skateboards with science on them.
- 2. From a design standpoint, it seems to be surprisingly difficult adapting art to the narrow framework of a skateboard. I might just polish up my skills in the process.

 4. It is fun.

What should you do?

Sit back, relax and enjoy the ride.

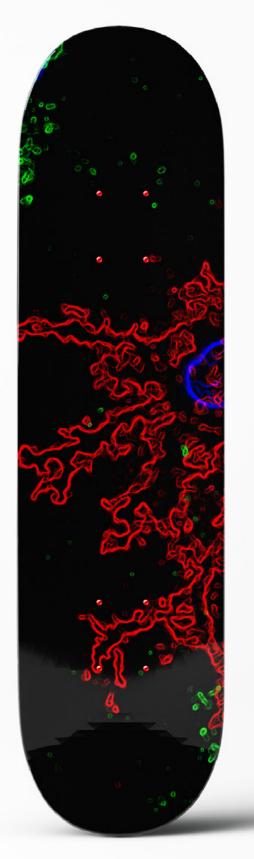


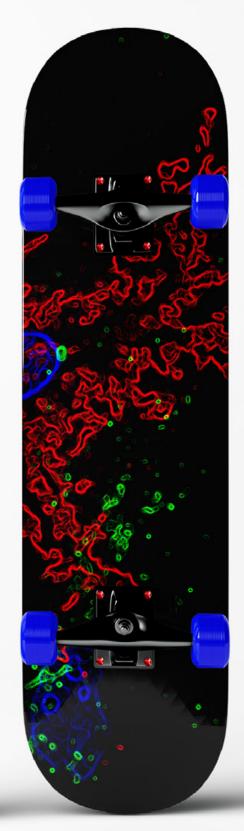
Microglia

Microglial cells are downright amazing. Thank you Prof Dheen for initiating me into glial biology and neuroscience!

Microglia have evolved to intimately co-exist with neurons, assist them during neuronal development, while ensuring their maintenance and protection. We are still exploring the diverse functions of these cells and all they are capable of. Not to mention, the various therapeutic strategies we can develop with them in mind.

Anyway, before I start pouring my heart out about my love for microglia, this is the end of this post.





What do you see?

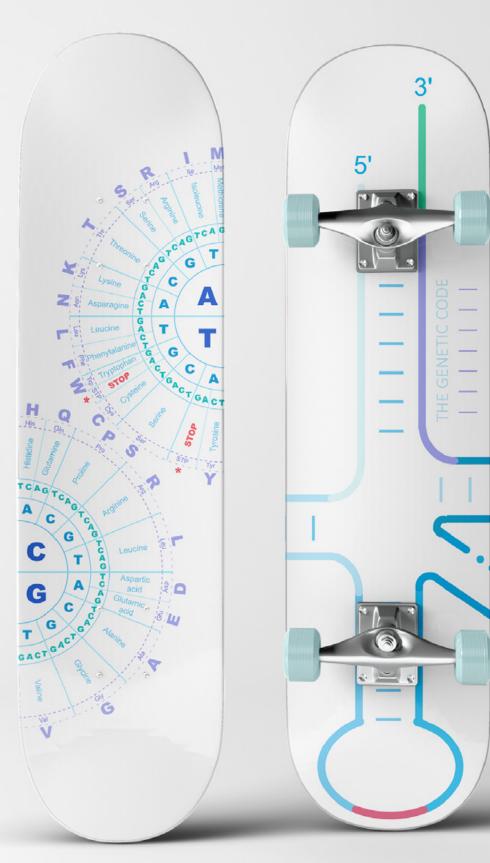
This picture is all about the language of life. Genetic information carried through molecules that define who we are.





Every language needs a cipher for us to decode it. Years of research lead us to find the cipher to the language of life, which we call the Genetic Code.

Today's post highlights this key which guides the "translation machinery" in our cells to read genetic information and convert it into proteins- the multifunctional units which eventually come together to make a life form.



The heart wants what it wants

I have always had a soft corner and deep seeded fascination for early hand-drawn anatomical sketches. The elegance, the attention to detail, and just the distilled artistic skill that might have gone into making these drawings blows my mind. For this post, I wanted to juxtaposition the essence of anatomy with a dash of pop culture. Hope you enjoy this one!

Anatomy drawing credit:

Wellcome Library, London. Wellcome Images images@wellcome.ac.uk http://wellcomeimages.org Anatomical illustrations showing muscles of the lower arm and hands 1681 A compleat treatise of the muscles: John Browne Published: 1681.



We all come from fishes

Let's add a bit of colour to this skateboard collection, shall we?

This board is dedicated to the zebrafish (Danio rerio).

Yes, it's just a tiny freshwater fish, but over the years, it has grown to be a very important and widely used model organism in scientific research. It has even been to space!

Research with D. rerio has aided discovery in fields of developmental biology, oncology, toxicology, genetics, neurobiology, environmental sciences, stem cell research, regenerative medicine, muscular dystrophies and evolutionary theory to name a few.

Just another example of how being small cannot stop you from making your impact on this world.

#FuturPopArt Day 06



DAILY DESIGN INITIATIVE ----

sci illustrate

07 JUN

This fly wants it given to him. He got them 8 Nobel prizes. Genetics, physiology, neurodegenerative disorders, he has done it all.

Now, after all this while, after contributing so much towards scientific progress, he just wants to put his shades on, get a drink and get down to the beat.

The drosophila melanogaster.

#FuturPopArt Day 07



DAILY DESIGN INITIATIVE ====

This tiny guy inspires one hell of a skateboard!

Ranitomeya imitator is a species of poison dart frogs that are found in eastern Peru. They are mildly toxic compared to the other frog types in the family and produce Pumiliotoxin which can interfere with muscle contraction (by affecting calcium channels), causing partial paralysis, difficulty moving, hyperactivity, or even death.

But they sure are beautiful.

This post is for Jonathan Kolby who has one of the most inspiring lines of work and feels deeply about wildlife conservation. Thank you for the content you put out, it helps all of us get back in touch with nature and reminds us of its value! Karla Oliveira, here you go

#Futurpopart Day 08



Bday special

It's My B-day!!



As with many things, the beauty lies in the details.

The beauty lies in that one red dot among many greens. Especially, when the red dot shows why you have a certain disease or why your cells behave the way they do.

This post goes out to the Microarray technology, referring to the DNA microarray that revolutionised gene expression studies in our industry. Spearheaded by Affymetrix (now under thermo scientific) with its famous quartz chips (GeneChip arrays) this was the well-remembered initiation of life science into Big Data.

As of now, Thermo scientific, Illumina, GE Healthcare, Applied Biosystems, Beckman Coulter, Eppendorf Biochip Systems, and Agilent, are all advancing innovations in DNA microarray technology.

#FuturPopArt Day 10

Array my micro

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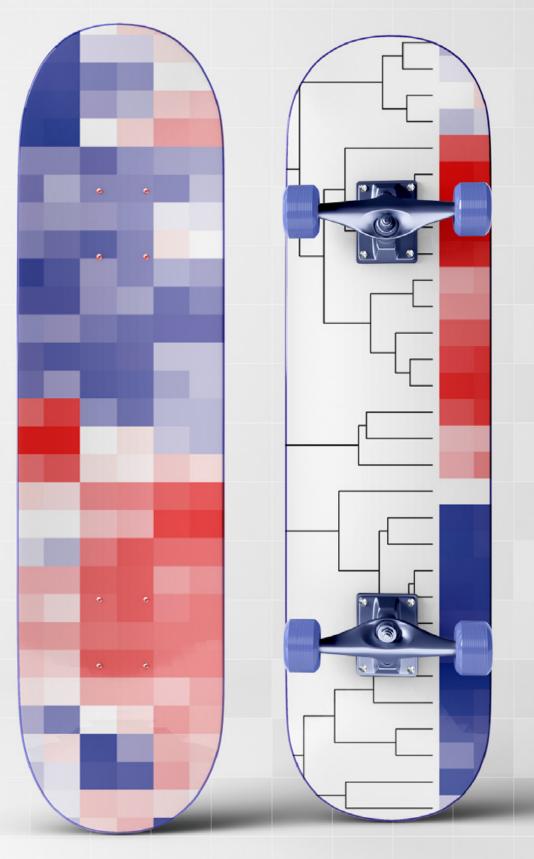
Array my micro

"It was inevitable that the DNA Microarray would be analysed. One day or another, a heatmap would be plotted. And it would result in the most beautifully clustered heatmap you have ever seen."

-Anonymous

A gene expression heatmap allows scientists to visualise cellular gene expression patterns accompanying a certain treatment. It is a widely known analysis and has been essential in gene expression analysis and other areas of genomics.

#FuturPopArt Day 11



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What do my SNPs say?

You know how we all have single nucleotide polymorphisms (SNPs) in our genetic code, single point mutations in DNA that dictate our individual differences?

Yep, this post goes out to this revolutionary field of study: To the many Genome wide association studies (GWAS) that were and are carried out to help find genomic variants associated with a certain disease or trait.

SNPs underlie and highlight the differences in our susceptibility to disease, and how we react to drugs or treatment thereafter. One of the best examples is how a single mutation in APOE gene reduces a person's chances to have Alzheimer's. SNPs (and SNVs) are also the foundation of personalised medicine. @Jyotsna Batra, thank you for introducing me to SNPs, any mention of them is incomplete without you.

I am going to put a plug here, and direct you to this amazing review Jyo and I wrote about in silico tools to analyse variants & find candidate genes in GWAS and Nextgen sequencing studies.

#FuturPopArt Day 12





DAILY DESIGN INITIATIVE -



Today I felt like a bit more art. I often wonder how the visualisation style of proteins was formed.

Here we see a not-so-perfect Beta-sheet, which is common motif in the possible secondary structures of proteins. beta-sheets form hydrogen bonds among each other and can be arranged as parallel or anti-parallel strands.

Anti-parallel beta-sheets are known to be more stable (due to a linear hydrogen bonding) and are usually exposed to an aqueous environment on one side, which bring me to an interesting fact I just learnt: Silk is made up of predominantly beta-sheets, thus attributing to its strength.



This is a Board

Unspoken Beauty

There is something hauntingly beautiful about this one. How the colours, the deep blue, red and olive green intertwine to compliment yet subdue each other. The intertwining also continues onto the alpha-helix, a common protein secondary structure, which is part of the lipid bilayer of cell membranes to keratin in our hair.

The -helix is a cylindrical structure with a hydrogen backbone making the wall, and side-chains of individual amino acids protruding out, free to interact with other parts of the folded protein, or with other proteins altogether.

A right-handed helix is the most common, and there seem to be no practical limits to the length of an alpha-helix. An interesting aspect is the amphipathic alpha helix with polar and hydrophobic faces, knowledge of which can determine protein positioning and inform protein structure prediction.

#FuturPopArt Day 14



Every day, thousands of brave men and women battle with cell culture, and the imminent threats their cultures face which can turn their experiments to dust. But little did Deadpool know their perils.

That unfortunate day in the lab, was the first when Deadpool came face to face with Mycoplasma, and darn it got UGLY.



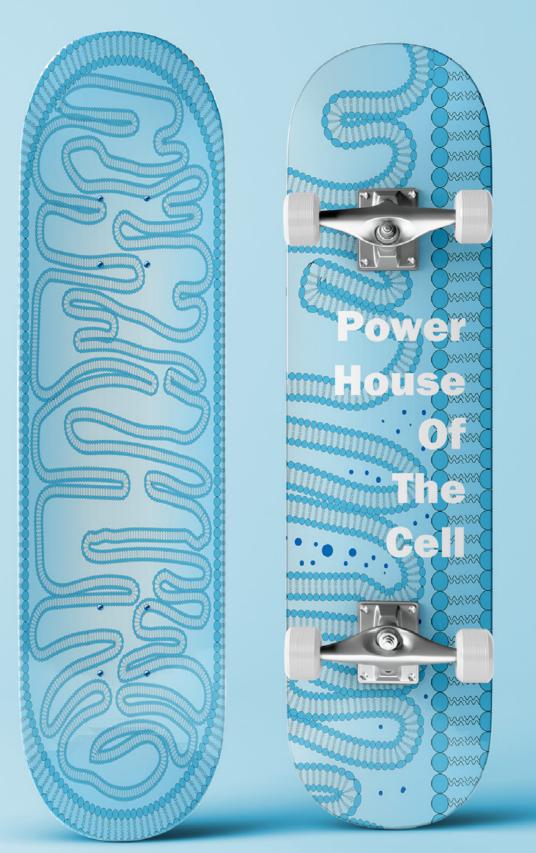


Every activity and body function require energy. Meet Mitochondria: the seat of energy production in our bodies.

Mitochondrion contains an outer and inner membrane, classifying it as a double-layered cell organelle. The inner membrane folds into the mitochondrial compartment, known as the matrix. The folded membrane forms multiple "bristles", known as the cristae, which protrude into the matrix.

On the cristae, lies thecellular machinery that generates energy. This machinery is collectively known as the oxidative phosphorylation complexes. These assist in adenosine triphosphate (ATP) production. The energy currency of the cell - ATP is essential for the proper maintenance of our cellular systems.

#FuturPopArt Day 16



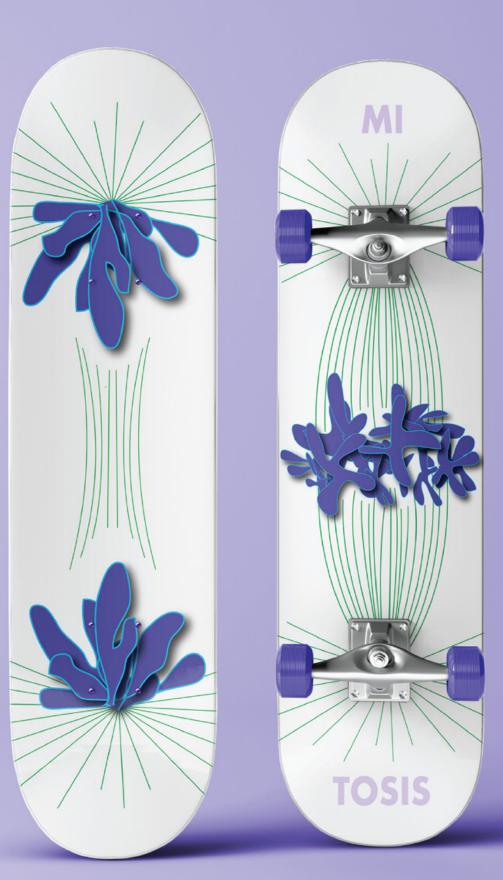
@sci_illustrate

(Almost) every cell becomes two. Replication is the essence of life on earth, and it is incredible how some of the smallest biological events, such as mitosis, lay the foundations for "life" as we know it.

Cell division is an important biological process that multiplies the number of cells in the body. In preparation for a cell to divide, the chromosomes are duplicated so that they can be equally distributed between two daughter cells. The chromosomes are then separated into two nuclei through a multi-staged process known as mitosis.

Mitosis occurs in five sequential stages - prophase, prometaphase, metaphase, anaphase, and telophase. During mitosis, the chromosomes condense and attach to spindle fibers originating from centrosomes. This attachment facilitates the movement of chromosomes, where each chromosome is "pulled" to the opposite sides of the cell.

Following this step, cytokinesis occurs, and the cell is separated into two cells.



The endoplasmic reticulum (ER), the nucleus's neighbour and an important organelle which provides docking sites for ribosomes, aiding them in protein synthesis. Rough ER is made up of a network of membranes known as cisternae that are seen to be studded with ribosomes.

RNA molecules, that are exported from the nucleus, associate with ribosomes, and are translated into polypeptides which form a protein. Proteins can only function when they are correctly folded, and this folding process is governed by endoplasmic reticulum chaperone proteins such as Hsp70.



Work those vesicles

Golgi apparatus is part of the cellular endomembrane system involved in protein packaging. Following protein synthesis at the ER, (described in Day 18), protein molecules are packaged into vesicles and are transported to the Golgi apparatus.

At this stage, the proteins are either destined to be used for cellular activities or are secreted out of the cell through a process known as exocytosis. It is easier to imagine the Golgi apparatus as a post office, where parcels (proteins) are packaged and labeled according to their content and destination.

Then, these parcels (proteins) are delivered to their receivers who either reside within the country (stays inside the cell cytoplasm) or overseas (secreted to the extracellular environment).

#FuturPopArt Day 19



DAILY DESIGN INITIATIVE

Hold me together

20 **JUN**

The cell requires a scaffold to maintain its shape. This scaffold is known as the cytoskeleton, which also plays a role in cellular processes such as cell signalling and cell division.

The cytoskeleton is mainly composed of microfilaments and microtubules. Microfilaments contain actin proteins, which act as tracks for myosin transporting cellular cargo. Microtubules consist of cylindrical components known as tubulins and are involved in intracellular transport of organelles.

Working hand-in-hand, cytoskeletal proteins assist in cell migration and to maintain the structural integrity of the cell.

FuturPopArt #20



The next post is a bit sombre. It is about plants. Yes plants, they were here before us. They live on this planet alongside us, but many a times, we don't see them. We don't see them as an integral part of life on earth, feeding and sustaining our ecosystem so that we may live and breathe.

With the change in climate, many plants are facing the possibility of extinction, and the possible disturbance of several biomes.

Before the vast majority of plants begin to diminish, it is important to come up with initiatives to conserve these plants. Plant conservation helps in maintaining the biodiversity of our earth, which will help in sustaining the existing flora and fauna, which also includes us.

#FuturPopArt 21



We all need them

In 2016, WWF released a "Living Planet Report" which reported a 58% decline of fish, birds, mammals, amphibians, and reptiles between 1970 and 2012.

As urban development progresses, we see more natural habitats being destroyed and this threatens the survival of many animals. This issue is exacerbated by an increase in illegal culling and trading for exotic pets.

This post is dedicated to all those who try to play their small part in making a large difference, to the proponents of wildlife conservation who strike a chord with nature and realize the true wonders that earth has in store for us. Like Jonathan Kolby and many more.

Each animal matters. Earth is our home, it is also theirs.

#FuturPopArt Day 22



Each one matters

@sci_illustrate

Each one matters

Cortical Homunculus

The term "homunculus" has a pretty interesting history worth reading about. But what this post refers to is the new usage of the term to describe an interesting aspect of brain organisation. Yes, you will find the cortical homunculus in various neuroscience and modern medicine textbooks.

Nerve fibres from the spinal cord terminate at various regions of the cerebral cortex in the brain. The homunculus represents a reference neurological map, conveying the proportions of your brain dedicated to motor and sensory processing from different parts of the body. The sizes of the body parts in this representation depends on the number and/or complexity of sensory and motor connections that region of the body has in the brain. The homunculus soon became one of the most famous conceptual maps in neuroscience and stood as a reference for mapping brain structure and function.

#FuturPopArt 23

Mpj29, Side-black, Digital enhancements by Sci-Illustrate, CC BY-SA 4.0 Mpj29 (https://commons.wikimedia.org/wiki/File:Side-black.gif), "Side-black", Digital enhancements by Sci-Illustrate, https://creativecommons.org/licenses/by-sa/4.0/legalcode



Cortical Homunculus

@sci_illustrate

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Feel the flow

7% of the human body weight is made up of blood, the elixir that flows through us and keeps us alive.

My interest in blood circulation peaked during my doctoral studies when I worked on ischemic stroke. Blood is an important body fluid that transports oxygen and nutrients to the cells. Blood travels in the body using blood vessels such as capillaries, veins, and arteries.

Each blood vessel is made up of several layers, with the endothelium lining the interior surface. The endothelium is made up of single-layered cells known as endothelial cells. These cells form a barrier between the blood and body tissues, regulate blood flow and participate in various inflammatory processes.

The elegance with which blood vessels and our circulatory system have evolved over time is nothing short of mysterious. For those who want to know more, look up the Circle of Willis present in the brain and how it helps circumvent stroke.

#FuturPopArt Day 24



Leafy goodness

25 JUN

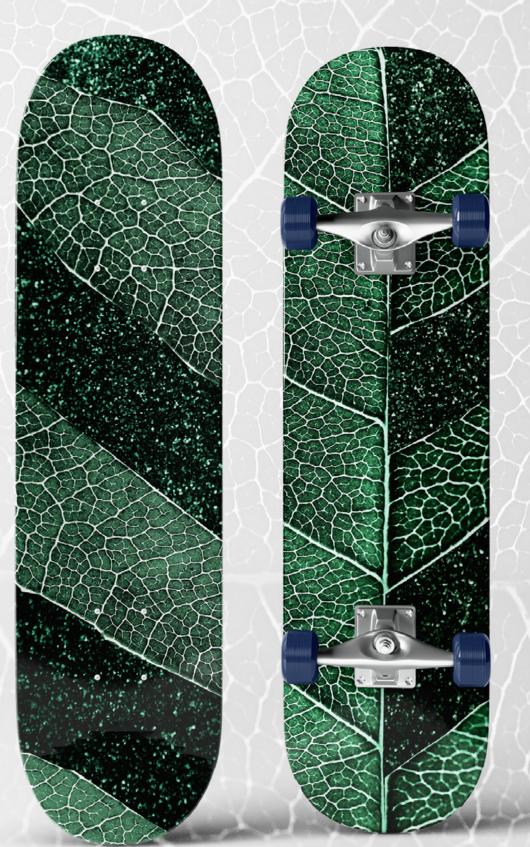
Today's post is an attempt to revisit the everyday beauty we see in biology and the biological systems around us.

All living systems have a vein of commonality flowing through them. Most plant leaves contain a high amount of chlorophyll which is important for their food production. Leaves can come in different shapes and sizes, but they have one thing in common: veins.

Just like human cells, leaves have their own set of veins that facilitate the transport of water, minerals and food to the plant. Generally, there is a large central vein known as a midrib that runs across the length of the leaf.

Besides transporting essential nutrients, the midrib also provides support to the leaf. Broad network of veins branch out from this midrib, creating the beautiful net-like pattern that you see on leaves.

#FuturPopArt Day 25



DAILY DESIGN INITIATIVE

25 #FuturPopArt



Leafy goodness

Fingers crossed

It is difficult to face the prospects of losing a loved one to a disease that is incurable. A few months back, I came by a TED talk by Steffanie Strathdee that really moved me. She came face to face with a multi-drug resistant bacterial infection (a.k.a Superbugs) when her husband was infected, and through her experience and strength of will, facilitated one of the first cases of cure via bacteriophage therapy.

Using the appropriate amount of antibiotics during an infection is helpful. However, the misuse of antibiotics has resulted in the emergence of antibiotic-resistance strains making these bacteria deadly. Phage, the short name of bacteriophage, is a virus that infects and inserts its genetic material into a target bacterium thus capable of eliminating it.

With global players like the Bill & Melinda Gates Foundation and Bill Gates Melinda Gates championing the quick acceleration of this tech into clinics, and EnBiotix, Inc. using Systems biology to streamline the process, I have my hopes up and my fingers crossed. PS: Nothing in this picture is drawn to scale.

#Futurpopart Day26



TRAAK my ions

27 JUN

The movement of ions such as potassium and calcium is facilitated by specific pore-forming proteins on cell membranes known as ion channels. Ion channels control the flow of different ions across cells, which eventually govern membrane potential.

There are many types of ion channels including mechanosensitive channels which are activated through physical force. These channels are mediated through lipid deformation and they respond to changes in the tension or curvature of the membrane.

In case of the TRAAK ion channel featured in this post; in a non-conductive conformation where the membrane tension is low, lipid chains can access the cavity of this ion channel and block ion conduction. When membrane tension increases, a "flap" known as TM4 seals the cavity of this ion channel and prevents entry of the lipid chains. This permits movement of ions, giving rise to a conductive ion channel.

#Futurpopart Day27



DAILY DESIGN INITIATIVE -

27 #FuturPopArt

TRAAK my ions

@sci_illustrate

Privilege can come in many forms. One of them is the ability to see colour. To know what colour is, to differentiate hues, palettes and to have the ability to experience and appreciate the beauty in nature to the fullest.

Approximately 1 in 12 men (8%) and 1 in 200 women in the world are affected by various forms of Colour (colour) blindness (colour vision deficiency, or CVD).

When light hits the surface of an item, it emits a specific wavelength which is captured by colour-detecting molecules in our eyes, also known as cone cells. Depending on the wavelength of the light, our brain is able to perceive and translate it into specific colours.

Colour blindness, most often, is a genetic condition caused by a difference in how the light-sensitive cells found in the retina of the eye perceive and distinguish certain colours. Most common is the inability to differentiate between Red-green, followed by blue-yellow and rarer is monochromacy where vision is greyscale. What I show here with this post is a simple contrast between what you might see and what might be seen instead. Makes one stop and wonder, how different the world might seem through these eyes. Just the experiences, memories and the simple moments of deciphering traffic lights (with its red-green signage).





Now and then, after decades of hard work and ingenuity, scientists break through the glass ceiling, and find a promising cure to a disease.

One such strategy is the use of the Chimeric Antigen Receptor T-Cell therapy, an approach which stems from the blossoming field of Immunotherapy to treat Cancer.

According to the World Health Organisation, 8.8 million people worldwide died from cancer in 2015. Cancer cells evolve various processes to evade the immune system. This revolutionary approach allows us to engineer immune cells (in this case T-Cells) to overcome this and selectively detect those cancer cells, thus harnessing the body's own immune system to treat the disease.

New advances in the field of immunotherapy are giving hope to millions, that one day Cancer may be a disease of the past.



Did you get it?

PS: Mendelian inheritance (first identified by Gregor Mendel – The farther of modern genetics) is the event at which genes are passed down from the parents to their children. These genes are expressed to give rise to specific traits, and the level of expression can depend on many factors including epigenetics modifications. Epigenetics is an extra layer of gene regulation, that regulates the information read from the genome by modulating genomic architecture (How DNA is folded).

But this final post is dedicated to our dear freshly sterilised eppys, that all researchers grow to love during their time in the lab.

(IM DONE!!! IM DONE :D We will celebrate on Monday! For now, I'm going to go to bed and finally catch some sleep!)





Sci-Illustrate

Sci-Illustrate was conceived with a vision to encapsulate the intrigue, passion and pride we feel as scientists towards scientific research and medical innovation;

to make compelling visuals which tell scientific, medical and pharmaceutical stories the way they deserve to be told.

Catering primarily to the design needs of research, healthcare/medical, biotech and pharmaceutical industry, we believe that design must be informed by science and business strategy to be effective. Sci-illustrate brings to the table such scientific expertise which fast-tracks communication, and helps us facilitate a well-rounded industry-relevant graphic design, animation and production experience for our clients.





Neuroscientist
Founder and Director, Sci-Illustrate

Dr. Radhika Patnala has trained for over a year in Brand Strategy Design Consultancy from <u>Blind.Inc</u>, a creative agency in California and a leader in Brand Strategy & Design.

Before the conception of Sci-Illustrate, Dr. Patnala received her doctorate in Neuroscience as Validictorian from the National University of Singapore, and a Masters in Biotechnology (Research) from The Australian National University. She has over 8 years of bio-medical research experience, with expertise in neuroscience, immunology, epigenetics and cancer biology.

With an eclectic skill-set ranging from graphic design to motion graphics, she puts creative & scientific teams together to assist the life-science research and healthcare community with their design needs.

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