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What It Took to Create

*this body was crafted with care.
a small zygote, invisible to the eye,
divides rapidly in a blood lined chamber.
inside it, spools lay scattered,
carrying the inheritance of ancestors,
their lives coming together randomly,
the distilled essence of you.
cells pick their lot,
switching genes on and off,
painting the canvas,
with varied tones.
it took a miracle to make you.
creation is no easy task.
nature and nurture in tandem,
choreographing a life.
so when i whisper that you are poetry,
i am saying,
that you are letters chosen,
words forged,
so specifically at random,
to bestow meaning,
to breathe vibrance into an otherwise
blank slate.*

– Shreya Venkatesan, B '19
Art by Nikitha Srinivas, B '17



A Missing Page From the Annals of History

Imagine this: a scientist goes to the US as a physician, dedicating his life to medical research despite the hardships faced by Indians in the US. While there, he discovers indispensable antibiotics, isolating two vitamins in search for cures and synthesises a chemotherapeutic drug so potent and invaluable, it's still in use today. To top it all off, he discovers the function of a molecule so commonplace, it doesn't even feel remarkable to talk about it. Now imagine him not receiving even the most basic recognition, let alone a Nobel Prize. Imagine him not being recognised by his own countrymen, let alone scientists across the world. How preposterous!

While it might seem preposterous to you and me, the man himself didn't seem to mind much. Those who intimately knew him fondly remember not only his scientific brilliance, but also his modesty and self-effacement. He even shared credit with many a friend or colleague, helping them get a promotion or a job. Funnily enough, as a child he was driven by a desire to achieve fame and wealth.

Let's see how many of you know these molecules.

- **Chlortetracycline**—trade name Aureomycin, the first of tetracycline antibiotics;
- **Polymyxin**—an antibiotic against gram-negative bacteria, now used as a last resort treatment;
- **Vitamin B₁₂**—an answer to pernicious anaemia, first isolated from pig liver;
- **Folic acid**—otherwise known as vitamin B₉, obtained in pure crystalline form by the 'folic acid boys';
- **Aminopterin**—an analogue of folic acid which competes with folic acid for the folate binding site on dihydrofolate reductase; identified to have induced remission in children with acute lymphoblastic leukaemia (methotrexate, a derivative of aminopterin, has since been the drug of choice for childhood leukaemia and many adult tumours);
- **Diethylcarbamazine**—trade name Hetrazan, used in the treatment of filariasis; and finally,

- **Adenosine triphosphate**—energy supplier for nearly every biochemical process (along with this discovery came the classic method for estimation of the amount of phosphorous in body fluids and tissues).

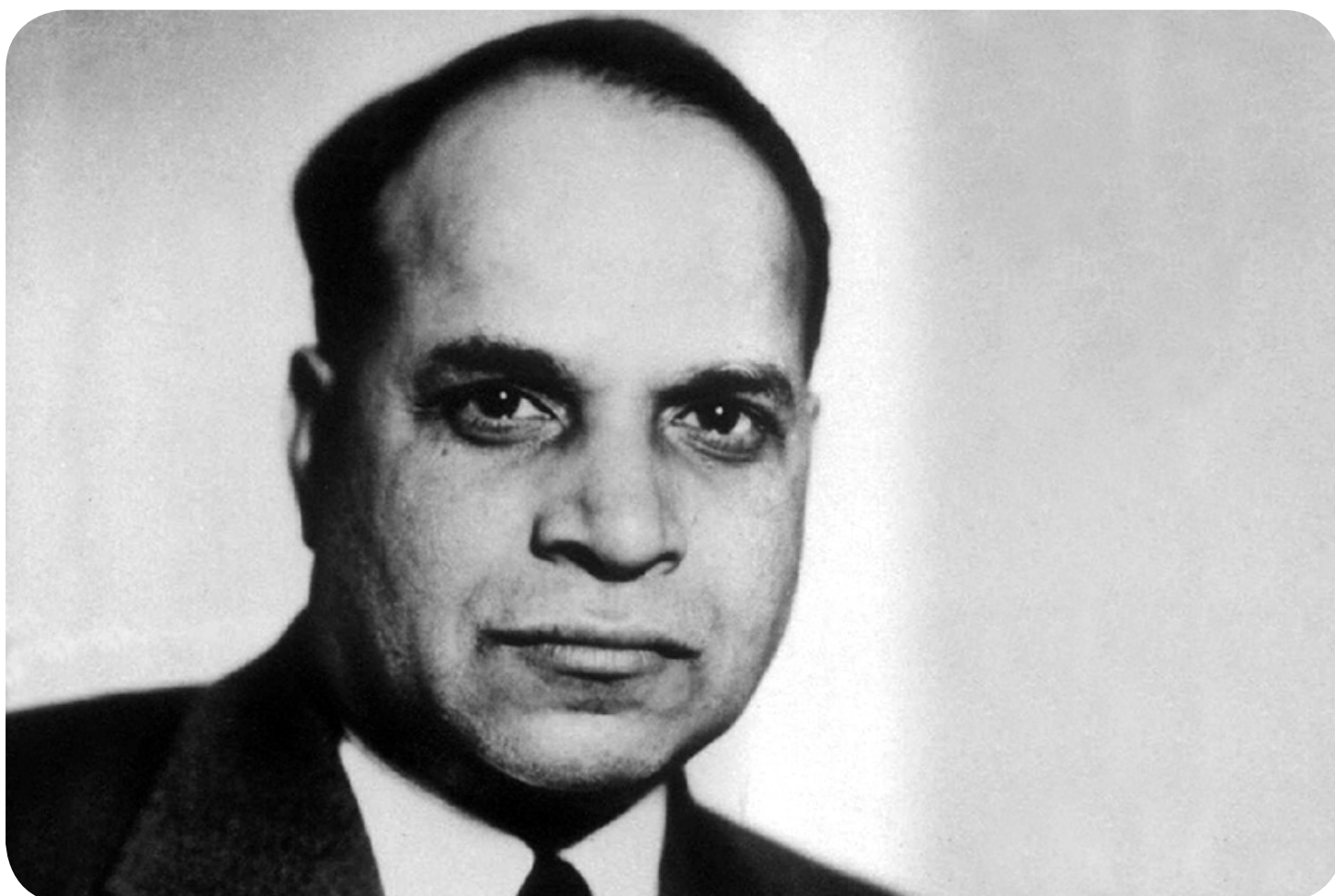
It's not easy, is it, to imagine someone who played such a vital role, and even led the team, in discovering these molecules to not have received a Nobel prize, to not have his name recognised beside the giants in the field of physiology and medicine and to not have his name known by commoners, at least in his own country, whose citizenship he retained till death despite having lived for over twenty-five years abroad, in the US?

A man of integrity, he strictly retained his Indian identity, but was liberal and kind-hearted. He remained a Hindu and a pure vegetarian, but supported church charities and their education programmes, especially those with universal elements in their beliefs. He neither sold his discoveries nor sought patents. He refused interviews, awards and recognition. He was, unsurprisingly, a subject of jealousy of other workers like Fiske, who kept some of his contributions from seeing the light of day, only to rediscover those molecules years later.

Those who did recognise his priceless contributions commemorated him in their own way—a portrait of him in the Karolinska Institute, Stockholm, the institute which awards the Nobel prize in physiology and medicine; a plaque at the research laboratory in American Cyanamid along with the inauguration of library in his honour; a fungal genus named after him; a stamp released in his honour by India Post in 1995 (his birth centenary), and a bust in the National Institute of Nutrition's campus in Hyderabad.

Born in near poverty, he achieved greatness with his imagination, self-confidence, and humility. He was a true example of a jewel from the dirt. His name is Yellapragada Subbarow.

— Yashas R., B '16



Lucky Image of Jupiter

Astronomers have produced remarkable new images of Jupiter, tracing the glowing regions of warmth that lurk beneath the gas giant's cloud tops. The image was captured in infrared by the Gemini North Telescope in Hawaii and is one of the sharpest observations of the planet ever made from the ground. To achieve the resolution, scientists used a technique called "lucky imaging." The achievement described as 'lucky imaging' is no accident.

These images are part of a multi-year joint observation program with the Hubble Space Telescope in support of NASA's Juno mission. The Gemini images, when combined with the Juno and Hubble observations, reveal that some of the largest storm systems and the lightning strikes they create, are formed in and around large convective cells over deep clouds of ice and water. The new observations also confirm that dark spots in the famous Great Red Spot are gaps in the cloud cover and not due to cloud color variations.

What is lucky imaging?

Similar to the twinkling of stars in the night sky, images taken with ground-based telescopes are subject to the blurring effect due to turbulence in Earth's atmosphere. Lucky image is a type of speckle imaging used in astrophotography that scrubs out the blurring effect of looking through Earth's turbulent atmosphere.

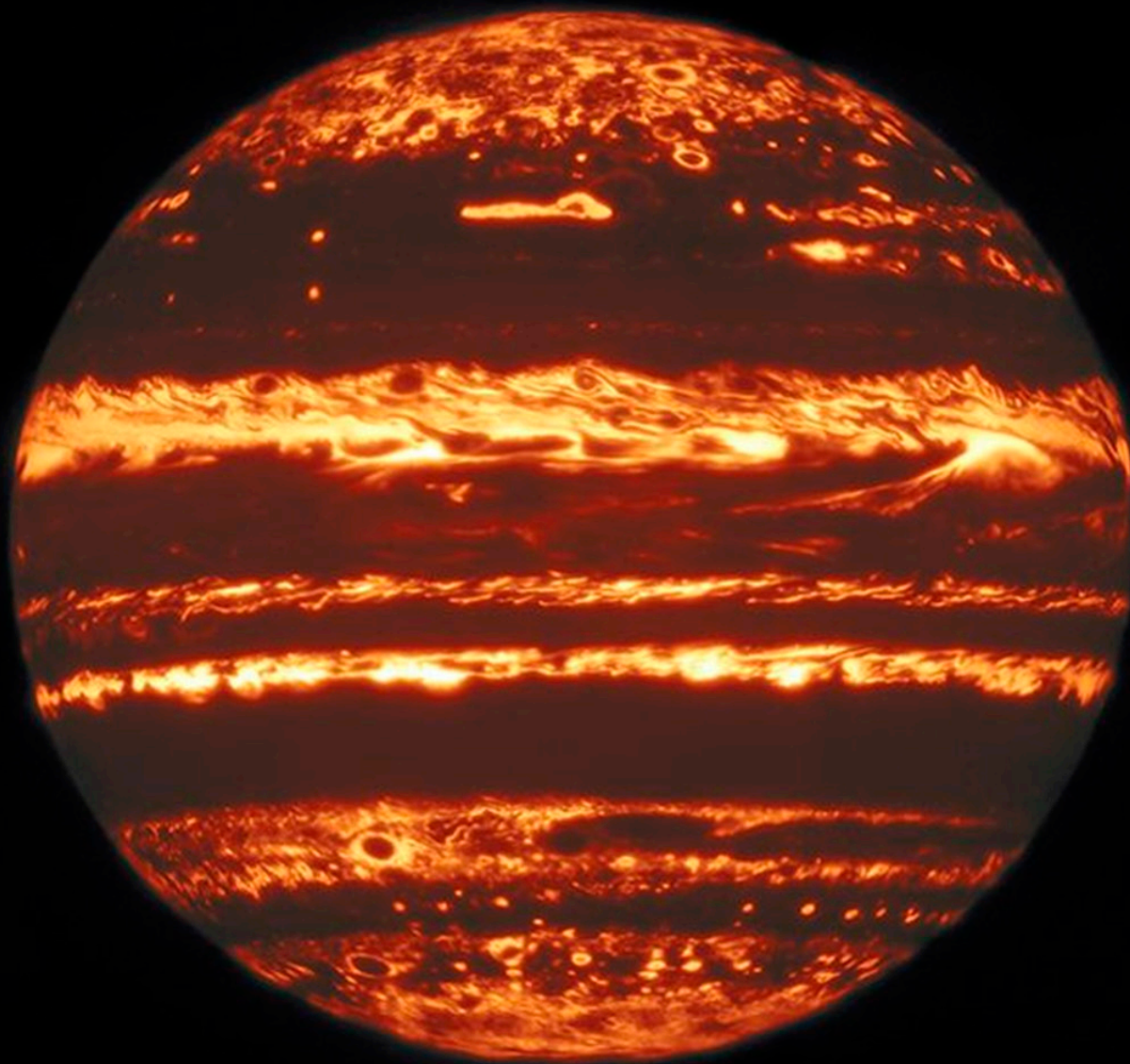
It is achieved by capturing multiple images of the target with short exposures using high-speed cameras, so that the disturbance due to changes in the Earth's atmosphere is minimal. Even with very short exposure, the atmosphere is still seething. However, there are fleeting moments of stillness where your target comes through exceptionally clearly. From the numerous images captured, the sharpest parts of the images are selected and added together by the "shift and add" method to yield pictures with higher pixels and angular resolution than what would be possible with a single long exposure image. This technique serves us, similar to how casting a wide net does in fishing.

The development of adaptive optics has raised the resolution of terrestrial telescopes to that of the Hubble Space Telescope at a fraction of its cost. It's time to capture the universe from your balconies!

— Ravikiran Hegde, B '19

Why infrared??

Near-Infrared Imager (NIRI) allows astronomers to probe deeper into Jupiter's mighty storms since the longer-wavelength infrared light can pass through the thin haze at the top of Jupiter's atmosphere, but is obscured by thick clouds below.



Vizag Gas Leak

This disastrous event, striking in its similarity to the 1984 Bhopal gas tragedy, unfolded in the outskirts of Visakhapatnam (Vizag) on May 7, before dawn. Vizag was not inclined to welcome such a horrendous amount of styrene gas into its atmosphere because of the ongoing pandemic.

The 4-styrene monomer (C_6H_8), a rather volatile organic compound, must be perpetually kept under a temperature of about $20^{\circ}C$. The LG Polymers chemical plant at Vizag stored 2000 tonnes of styrene. Supervision in places such as these has to be top-notch and should not be compromised in any way, so as to ensure public safety. Since the day the lockdown began, there had been a lack of maintenance at the plant, due to which the pressure inside the storage chamber went through the roof. As a result of this, the temperature spiked and the valve broke open, releasing over 3 tonnes of styrene gas into the atmosphere. The levels of styrene in the air were 2500 times higher than the safety limit.

The spread of the gas in the neighbourhood cost 12 individuals their lives and landed several hundred in hospitals. As soon as the news hit the wire, people were evacuated within a 3 km radius of the chemical plant. People rushed to far-off places in order to continue to live their lives, abandoning all of their possessions. The government of Andhra Pradesh tried frantically to bring the situation under control. “[We] are currently assessing local town residents’ damage situation and are taking maximum necessary measures for the protection of residents and employees together with related organizations,” said the statement. Y. S. Jaganmohan Reddy, Chief Minister of AP, spoke of granting 1 crore Indian rupees in compensation to the families who lost their loved ones in this easily avoidable accident.

Investigations so far suggest it was the result of improper maintenance, unsteady storage of the styrene monomer and a few operational errors.

— Kratika Mazde, B ‘18



An aerial shot of the gas leak

World Turtle Day

Last month, there was mass hatching of olive ridley turtles at the Gahirmatha beaches and Rushikulya rookery (a breeding colony) near Ganjam district in Odisha. The sight of thousands of baby turtles crawling to sea was one to behold!

Some Facts about these turtles:

- The coast of Odisha is the largest mass nesting site for the olive ridleys, followed by the Pacific coasts of Costa Rica in Central America and Mexico in North America.
- The olive ridley turtles (*Lepidochelys olivacea*) are the smallest and most abundant sea turtles found in the world. (Although abundant, they are vulnerable).
- These turtles are omnivores.
- They get their name from their olive coloured carapace.
- Male olive ridleys have longer tails than female olive ridleys.
- This unique mass nesting shown by the ridley turtles has a name—*Arribada*. It is a behaviour shown by olive ridley and Kemp's ridley turtles.
- To reduce accidental killing of these turtles by entanglement in trawl nets, the Odisha government has made it compulsory for trawls to use **Turtle Excluder Devices (TEDs)**, which allows the turtles to escape while retaining the catch.

There were hardly any sightings of turtle nesting the past several years because of human intrusion. Now, nature is trying to heal itself. Due to the global lockdown in the face of the coronavirus pandemic, levels of pollution all over the planet have dropped significantly. Delhi has begun to see clearer skies, more birds and animals are being seen, and there has been a significant improvement of wildlife everywhere around us.

Having seen the effects of lesser human activity on nature, we must take action. Every individual in every home must try to do their part to reduce pollution and take responsibility for their actions.

We should stand as one to heal our planet.

[To read more about the mass nesting:](#)

[To know more about olive-ridleys:](#)

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— Deepthi Damodaran Nambiar
B '19



An olive ridley hatchling

The Watchdogs of Memory

Various scientists have diligently worked on memory, striving to understand the mechanism behind memory in the human brain, be it short-term or long-term. People are able to recall the recent past vividly, but events which took place many years ago often evade them. Sheena Josselyn and Paul Frankland, neuroscientists at the Hospital for Sick Children Research Institute in Toronto, hypothesised that neurogenesis (creation of new neurons, which happens in the hippocampus of the mammalian brain, the region associated with learning and memory) might be the reason for such lapses.

The researchers put mice in a box, shocked their feet with an electric current, and then split them into two groups: one that stayed sedentary and another that ran on a wheel (an activity that boosts neurogenesis). Six weeks later, the mice that stayed sedentary froze upon being put in the same box, but the active ones showed no such signs, having seemingly forgotten that they were shocked. New neurons might make their way into the brain, and change the existing synaptic network of engrams (ensembles of neurons where memories are stored) – making the memories harder to access. This sort of active erasure is beneficial because an excessive number of memories can overload the synaptic circuits. The exact mechanism of the maintenance of memories is unknown, but neuronal circuits may play an important role.

Yan Gu, Lang Wang and their colleagues at the Zhejiang University School of Medicine in China, have unearthed the importance of microglia, the brain's immune cells, which were recently discovered to sculpt the brain during development by pruning excess synapses. They are also the key cells in several neurodevelopmental and neurodegenerative diseases like autism and Alzheimer's. To study

the role of microglia in memory retention, they depleted microglia from the brains of mice with drugs. They then used contextual fear conditioning, placing the mice in a cage and giving them mild electric shocks. Mice became immobilised upon being placed in the cage again because of the memory of this experience. This reaction was found to persist in the microglia-depleted mice, while it reduced after a few weeks in the healthy mice.

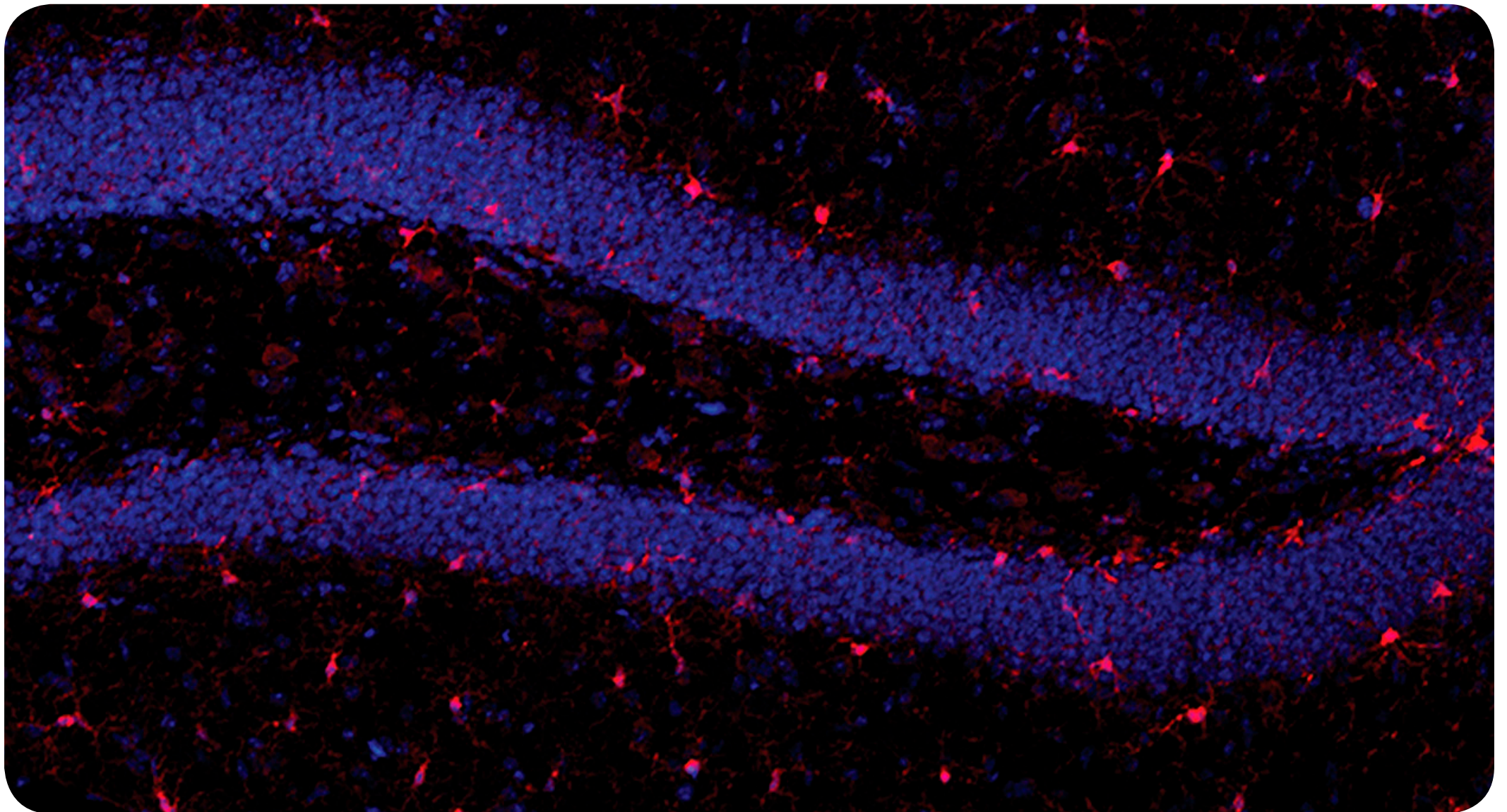
Further tests revealed more about how microglia mediate forgetting. Active neurons in the fear-conditioning process were tagged, and found to be fired more often in the microglia-depleted mice. Forgetting is dependent on the microglia's ability to ingest synapses and also on neural activity. Suppressing the activity of memory-related neurons led to more forgetting, implying that microglia mediates the elimination of less useful memories. By looking at regions in the hippocampus where neurogenesis does and does not occur, Gu and his colleagues were able to show that microglia-mediated loss of memory is more widespread.

Such research is invaluable in finding therapeutic targets for neural disorders, where these mechanisms go awry. The scientists are continuing to work on how the microglia link synapses to targets, and though there is much left to be discovered, the implications of these findings for the future are immense.

– Shreya Venkatesan, B '19

Sources:

<https://www.the-scientist.com>
<https://www.scientificamerican.com>



Brain cells called microglia (red) snip connections between nerve cells (blue) in the mouse hippocampus, in a process that may influence forgetting

Water Towns

A major turning point in human history was the discovery of water transportation—the first mode of transportation to employ a source of energy that does not come from human or animal power. At around 3500 BC, boats that use sails are believed to have appeared. Important advancements were made in this area as it helped connect more and more distant civilizations and formed the core of the world trade system for several centuries henceforth. It is then no surprise that cities and towns that are nearly entirely dependent on boats and ships for their transport popped up independently around the world. The alluring and all too popular city of Venice serves as a prime example. With a population of 2.7 million and an annual number of tourists nearly ten times its population, Venice is bustling, alive and a cultural treasure box. Being not so popular and a lot smaller (a population of only 2,400), the Dutch town of Giethoorn is in stark contrast to its Italian counterpart. One would imagine that it would be nearly impossible to picture these two together. However, the underlying infrastructure of these places is very similar.

The so-called ‘Venice of the North’ is still only fully accessible via boat. The canals of Giethoorn see around 400 boats a day. To oversee the safety on the waterways, and to respond to any emergencies, Giethoorn also has a fireboat. To be more specific, the residents use punts, which is a local variation of the boat, and is now found all over the world. The residents have built their houses on the islands and use punts to move from one isle to another. Originally established by peat harvesters, peat cutting led to the formation of the lakes, ponds, and islands we find in Giethoorn today. Owing

to the town’s eco-friendly transport systems, there is very little to no pollution in this area (Air Quality Index being 32, which is superb). Giethoorn has recently gained popularity for its simple and almost unreal beauty; gently gliding along small canals past old, but pretty thatched-roof farmhouses.

Most towns like these have died out, and quite understandably so. In the modern world, time is of the essence, and travelling in boats seems to weigh heavily upon one’s clock. However, what the modern world neglects is that we now run on borrowed time. To fuel the rocketing rates of development, we have abused our resources and now stand to face the repercussions of our actions. Creating a stable and sustainable environment for unimpeded development should be our new objective. A step in the right direction could be to implement the model of Giethoorn into our backyard. The backwaters of Kerala already boast thousands of boats and intensive tourism. What we can hope to adopt from our European counterparts is their complete dependence on waterways for transport and their intricate and well laid out infrastructure. This would encourage more efficient use of the available land resource as well as enhance the rigour of the security system the government has in place to counteract illicit trade across the waters. There is much more a small Dutch town like Giethoorn can teach the states of India. As a small peaceful town tucked away in a corner of the world, Giethoorn also possesses a treasure we all seek—blessed silence.

— Adarsh Karekkat, B ‘17



One of Giethoorn’s many waterways under wooden bridges

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