



# KNOW BEL

ENLIGHTENING THE NOBLES!



VOLUME II : FEBRUARY 2021 . ISSUE NO. 2

*Equipped with his five senses, man explores the universe around him and calls the adventure 'Science'.*

*-Edwin P. Hubble*



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<http://knowbel.wordpress.com>



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*Enlightening the nobles !*

# WELCOME !

Here comes the latest edition of your favourite magazine, KNOWBEL. Dive into the world of fascinating articles, inspiring personalities, mind-blowing quizzes, adorable comics and a lot more. All it takes is the flip of a page.

We firmly believe that everyone must have access to information and hence, strive to include the choicest of material for you to dwell upon. Besides, we provide a wonderful platform for you to showcase your amazing talent.

You can send us your creative work at [knowbel.science@gmail.com](mailto:knowbel.science@gmail.com).

Moreover, don't forget to participate in the quizzes and contests we host because who knows, you may be the next star to win some exciting prizes and a feature in our next issue. Do share this with your friends and family. A candle loses nothing by lighting up another one.

Happy reading!

*Stay home & Stay safe !*

## SPECIAL THANKS TO

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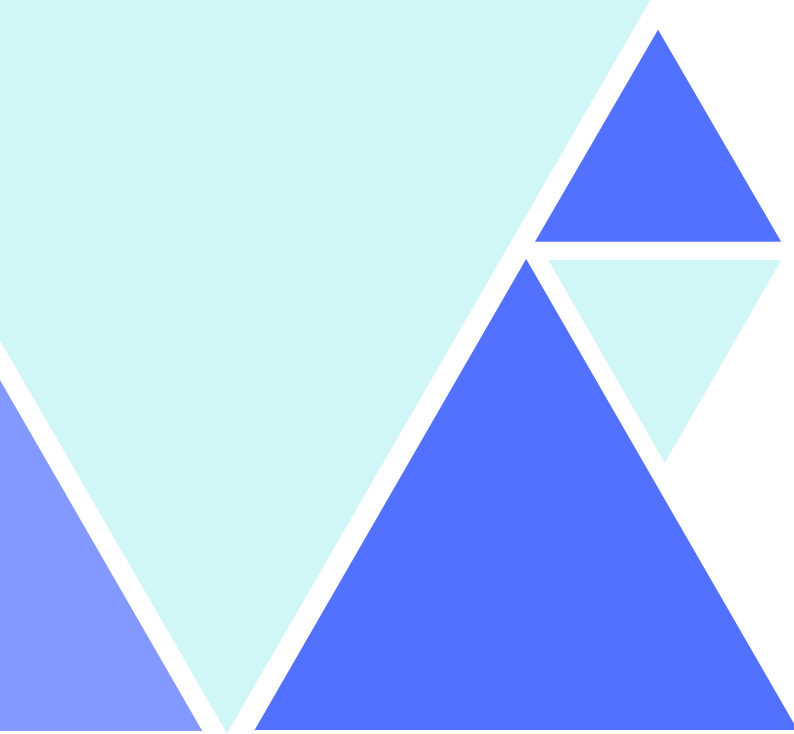
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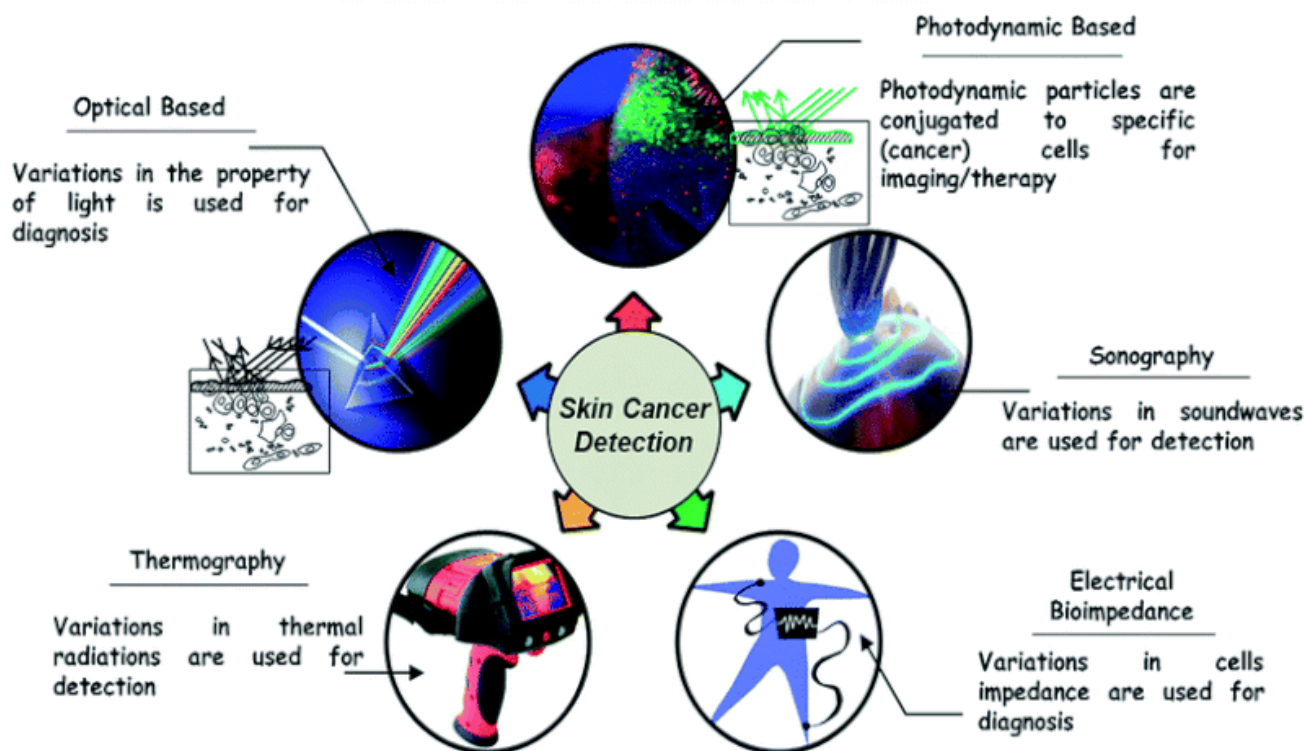
# Wonderella



*The Journey continues*

**NEVER STOP QUESTIONING !**

## Principles and Mechanisms



Vigjes, CC BY-SA 4.0, via Wikimedia Commons

## 01 - PHOTODYNAMIC THERAPY: CURING WITH LIGHT!

Photodynamic therapy is a photo-therapy involving light and photosensitizing drugs. PDT has three main components: a photosensitizer, a light source, and tissue oxygen. Visible light is used for the application of PDT. The main sources of light in PDT are Laser light, light-emitting diodes (LEDs), and lamps. Light supplies sufficient energy to stimulate the photosensitive drug. Porphyrin, chlorine, and dyes are the main class of photosensitizers that are used in PDT therapy. When photosensitive drugs (photosensitizers) are exposed to light, they get activated for a specific period. The excited photosensitizers interact with molecular triplet oxygen (present in the air and tissue) to produce singlet oxygen, hydroxyl radicals, and superoxide ions. These oxygen free radicals can be generated in two types. Type I can be generated through electron abstraction from the substrate molecule, and type II can be generated by transferring electrons from the singlet oxygen. In the end, these reactive oxygen molecules are used to kill the target cells. PDT is mainly used to kill cancerous and precancerous cells. It can be used to treat skin and eye problems.

### RIVETING READS IN THIS ISSUE:

- 02 - SPEEDING WITH QUANTUM COMPUTERS
- 03 - THE NEUROBIOLOGY OF THIRST: THE BRAIN MECHANISMS THAT CONTROL HYDRATION
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- 05 - MAGNETIC WAVES EXPLAIN MYSTERY OF SUN'S PUZZLING OUTER LAYER
- 06 - VACCINE UPDATES



### References -

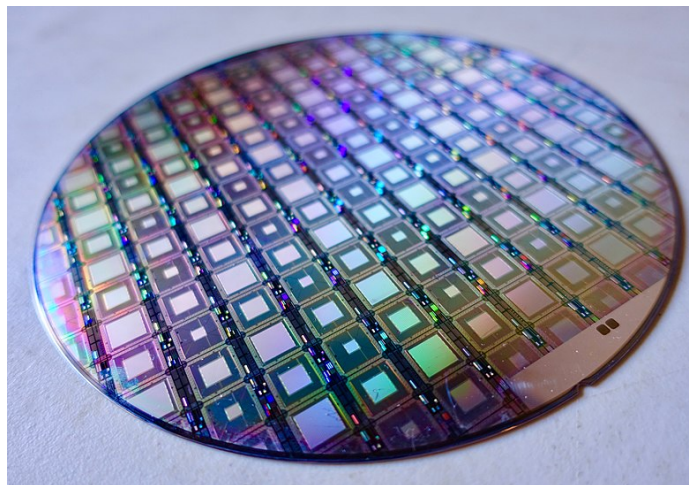
- [https://en.wikipedia.org/wiki/Photodynamic\\_therapy](https://en.wikipedia.org/wiki/Photodynamic_therapy)

## 02 - SPEEDING WITH QUANTUM COMPUTERS

Advancements in electrical engineering have greatly improved classical computers and designed ever-smaller transistors and circuits, and pack them more closely together. Eventually, this downsizing of the circuit approaches to the atomic level, and it is tough to control each component without impacting neighboring ones. But quantum computing made this possible. Quantum engineering bridges quantum science and conventional engineering.

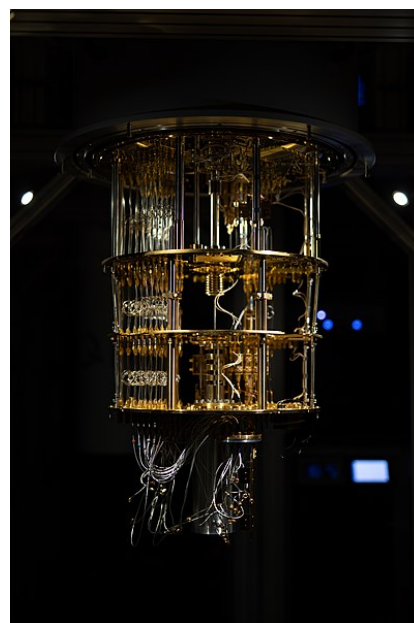
A Quantum computer is a computing device that uses unique quantum mechanical phenomena of superposition and entanglement of the quantum particle to process data and information. Classical computers store information in bits; quantum computers store information in qubits (called quantum bits). Each qubit can hold a value of 0, 1, or a simultaneous combination of the two states. The superconducting quantum computer uses a semiconductor to flow a pair of electrons through a resistance-free circuit. The system harmonically oscillates between two energy states, corresponding to 0 and 1.

Quantum computers can solve problems in minutes that would take millennia with classical computers. Even the working and processing speed of quantum computers have outperformed the world's best supercomputers. Incredible unique quantum mechanical phenomena of superposition and entanglement made them solve problems at breakneck speed. Quantum computers have immense potential to change the world. Many evidence has proved that quantum computers can be a great tool in cryptography, digital security, and simulating complex molecular structures. It is expected, quantum computers could turbocharge many areas of research and industry. Hence, science and engineering are both required to make quantum computing a reality of the 21st century.



Steve Jurvetson from Menlo Park, USA, CC BY 2.0, via Wikimedia Commons

### A Wafer of the Latest D-Wave Quantum Computers



Ragsxl, CC BY-SA 4.0, via Wikimedia Commons

### IQM Quantum Computer Espoo Finland



#### References -

- <https://scitechdaily.com/>



### 03 - THE NEUROBIOLOGY OF THIRST: THE BRAIN MECHANISMS THAT CONTROL HYDRATION

Water is essential for sustaining life on the earth. A lot of archeological evidence shows that the first life form originated from the sea. This means that nearly all the species depend on the balanced ratio of salt and water. An organism's survival requires a balance between salt and water content (for humans, it is ~145mM, called body-fluid homeostasis or salt homeostasis).

When the body gets dehydrated, our brain sends signals to the entire body and makes us crave a glass of water. Thirst is mainly controlled by "water neurons" in the brain's subfornical organ (SFO). When the body is dehydrated, the peptide hormone's plasma levels rise—this level rise detected by the "receptors" of water neurons to simulate water intake. Under sodium-depleted conditions, these water neurons' activity is controlled by the cholecystokinin (CCK) in the SFO. The CCK produces excitatory neurons, which activate the GABAergic interneurons that suppress water neurons and inhibit thirst.

Hence, water neurons are controlled by the two distinct subpopulations of the CCK. One part of it gets activated under the Nadepleted condition, and another gets activated during the dehydrating state. The unique functioning of CCK hormones opens up many possibilities. The most amazing one is the probability of negative feedback control of drinking based on water sensing signals from the oropharynx or gastrointestinal tract.



Krsnarao2006, CC BY-SA 4.0, via Wikimedia Commons



#### References -

- <https://scitechdaily.com/>



## 04 - CREATURES WITH A THIRD EYE!

The parietal eye is commonly known as the third eye, median eye, or pineal accessory apparatus. The parietal eye is a part of the epithalamus. It arises as an anterior evagination of the pineal organ, mostly covered with the skin and usually not visible readily. It is located at the top of the head and very small compared to the central pair of eyes. It is photoreceptive and uses a biochemical method to detect light from the vertebrate eye's cone cell.

It is present in tuatara, most lizards, frogs, salamanders, certain bony fish, sharks, and lampreys. In the oldest fossil record of vertebrates, a socket was found in their skull, which gives evidence of a functional parietal eye in them. This socket is present as a foramen between the parietal bones. The parietal bone is a part of the skull lying between the eyes in amphibians and reptiles.

The parietal eye of amphibians and reptiles present near the eyes and vanishes in the birds and mammals. In ancient times, humans had a third eye on the back of their head for a physical and spiritual purpose. As humans evolved with time, the third eye atrophied and sunk into the pineal gland, and it is present far away from the principal eyes. Hence humans do not have a third eye.



Armystud77, CC BY-SA 4.0, via Wikimedia Commons

Adult Iguana parietal eye



### References -

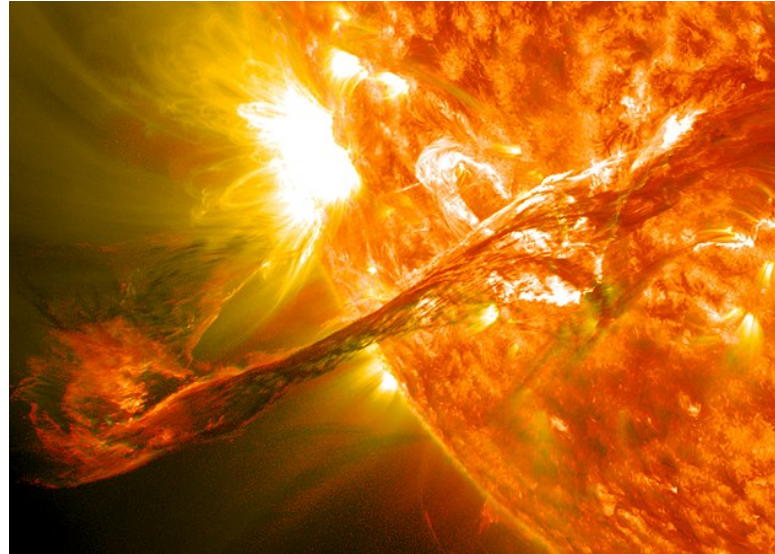
- <https://en.wikipedia.org/>

## 05 - MAGNETIC WAVES EXPLAIN MYSTERY OF SUN'S PUZZLING OUTER LAYER

Different layers of the Sun are physically interlinked with each other. Matter in the corona (outer atmosphere of the Sun) originates from the Sun's innermost layer (called the photosphere). Then the corona and photosphere of the Sun must have similar composition of elements. But, surprisingly, this is not the case? The chemical composition of the Sun's layer varies from the inner to the outer layer. One can explain this as magnetic waves in the middle layer of the Sun (called chromosphere) exerts a force that separates the Sun's plasma into different layers with varying chemical compositions. The magnetic force pushes ions towards the corona of the Sun and leaves neutral particles behind.

The existence of the magnetic waves in the Sun's chromosphere results in varying chemical composition from extremely hot outer layers to the inner layer. The magnetic wave in the middle layer of the Sun is because of the vibration of highly ionized particles. The difference in chemical composition between the Sun layers, such as the inner layer, the photosphere, and the corona, is seen in the Sun and other universe stars.

Hence, just by observing the Sun, we can also understand the composition of other universe stars. Invaluable research that has been done on the Sun will definitely provide a strong foundation for future research on the universe.



NASA Goddard Space Flight Center, CC BY 2.0, via  
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### References -

- [https://www.youtube.com/watch?v=nz\\_5doGrVoA](https://www.youtube.com/watch?v=nz_5doGrVoA)

## 06 - VACCINE UPDATES

In India, the vaccination process has been started. Vaccination is a simple, safe, and effective way to protect the body against harmful disease-causing pathogens. Vaccines train the body's immune system and create a memory in them.

When the pathogen attacks the body, memory gets activated and destroys disease-causing pathogens. Exponential market demand captivated the researcher's attention to manufacturing the COVID-19 vaccine as soon as possible. Presently, 68 Covid19 vaccines are in human clinical trials, out of which 20 have reached phase three testing, eight have got emergency approval. They can be used in an emergency in groups at high risk of infection, morbidity, and mortality. And one can use two for full use to vaccinate the public. COVID-19 virus is similar to SARS-CoV-1 and MERS viruses, and significant research work has already been done on these two viruses. A preliminary study of researchers speeds up the development process of the Covid-19 vaccine.

Otherwise, Vaccines take several years of research work for development. Variant viruses need not always come from foreign shores, but they can also emerge within. New variants of coronavirus have arisen independently in the UK, South Africa, and Brazil that have spread in more than 50 countries, including India. It can multiply and transmit at a 30% - 70% faster rate. The critical mutation is found in the spike protein, which allows them to better attach to the cell.

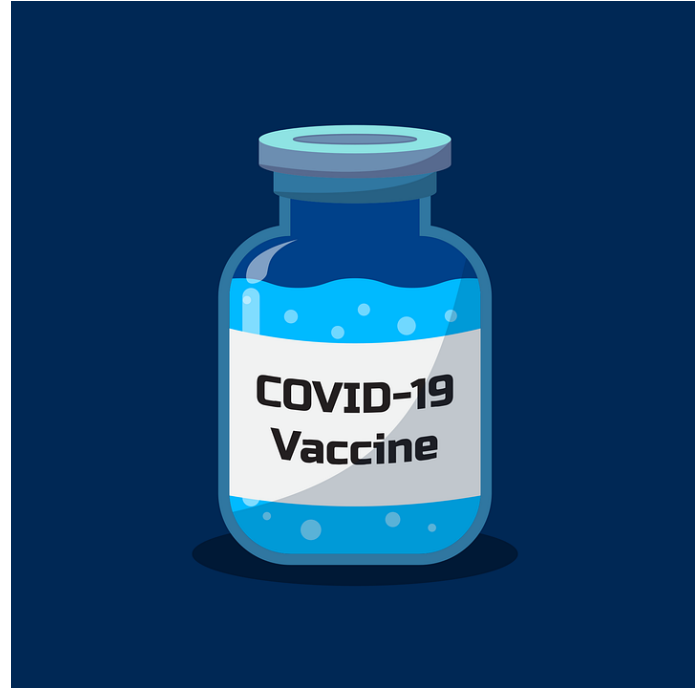


Image by Shafin Al Asad Protic from Pixabay



### References -

- <https://indianexpress.com/>



# FACTASTIC!

*Get ready to guzzle down  
these interesting facts...*



Bombtime, CC BY-SA 3.0, via Wikimedia Commons

## TALKING RAVENS

Ravens are excellent at mimicking human speech and sounds. Some ravens are even better than parrots at mimicking human speech, not to mention sounds from the human world like car engines revving or toilets flushing.

## TASTY CATFISH?

Humans have 9,000 tastebuds, but it is interesting to note that Catfish have over 27,000. These fishes have tastebuds all over their body and can taste without even opening their mouth!



Image by David Mark from Pixabay

## THERE'S GOLD IN YOUR BLOOD

Isn't it surprising to know that blood contains small amounts of gold! The human body has about 0.2 milligrams of gold that is mostly found in the blood.



Rob Lavinsky, iRocks.com – CC-BY-SA-3.0,  
via Wikimedia Commons

## ANCIENT HUMAN SPECIES

There was a time when four distinct human species lived at the same time in Earth's history. Through a study on hominin fossils found in Kenya, Ethiopia, and Chad, scientists have concluded that four distinct human species coexisted at the same time for about 3– 3.5 million years.



TUBS, CC BY-SA 3.0, via Wikimedia Commons



## THE TALKING ACACIA TREES!

Arcadia trees, commonly found in African Savannah, have a unique defense system. When animals like wildebeest start to eat up their leaves, the tree increases tannin production to toxic levels to animals. But more interestingly, the tree emits a cloud of ethylene gas that travels through the air, reaching neighboring trees so they too can begin producing more tannins and begin a positive loop.

Charles J Sharp, CC BY-SA 3.0, via Wikimedia Commons

## METAL CAN WELD ON ITS OWN WHEN TAKEN IN SPACE!

We need heat to fuse and mold metals on Earth, but two pieces of the same kind of metal will combine with only a little pressure in space. The process is referred to as cold welding, which happens in the lack of atmosphere.



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### References:

- <https://www.indiatoday.in/>
- <https://www.thoughtco.com/>
- <https://blog.tentree.com/>
- <https://bestlifeonline.com/>
- <https://bestlifeonline.com/>

Fact Finder

**MRUNAL**

# The Quizopedia ?

-ARE YOU READY FOR THE CHALLENGE?

Is your mind slowly going stale? Did you pride yourself on being the 'Know-it-all' in your class? Well, here's a chance to flex your grey cells and bring them back to tip-top shape. KNOWBEL presents to you 'Quizopedia'. I, Aditya, the quizmaster, have selected 11 of the most sizzling questions for you to crack. Note that these questions have an underlying connection.

Check out the instructions below:

The QR code below will take you to a Google Form, which contains a quiz consisting of 10 questions. You must answer all the questions and try to get them correct. You are free to make wild guesses as there is no negative marking! The names of the winners would be published in the upcoming issue, and the winner of the contest will receive prizes worth Rs. 250.

Answers shall be officially released via mail on [February 25, 2021](#).

The winners would be chosen based upon:

1. Number of Correct Answers
2. Time of Submission

Competition begins on: [February 2, 2021, at midnight](#)

Last Date for Submission: [February 20, 2021](#)



**13th Quizzo winner**

**Kartikeya Raghu**  
Symboisis Secondary  
School



**Scan or click on the QR code below:**



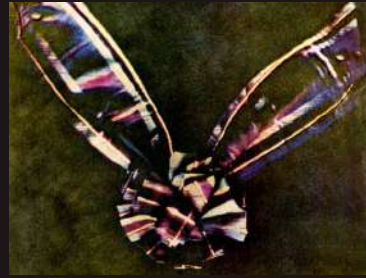
1. \_\_\_\_\_ is the local name for the spoil heap that towers over a town in Germany. It is one of a number of sites where the K+S chemical company dumps sodium chloride, a by-product of potash mining, a major industry in the area. The heap rises over 250 meters above the surrounding land, causing severe impact on the neighboring environment. Fill in the blanks.

- a) Mont Karlo
- b) Kalimanjaro
- c) Natrihaufen



2. This photo of a ribbon taken in 1861 is one of the first 'colored' photographs. Who developed the method to capture this pic?

- a) James Clerk Maxwell
- b) Louis Daguerre
- c) Thomas Alva Edison



3. The word 'animalcule' was coined by Anton von Leeuwenhoek to describe organisms in muddy water observed by him under a microscope. What are these 'animalcules' called presently?

- a) Viruses
- b) Protozoa
- c) Cells



4. Select the odd one out?

- a) Varuna
- b) Anubis
- c) Poseidon



5. Interestingly, one of the first scientific papers on the wind patterns of monsoon dates way back to 1686! Who was the author?

- a) Isaac Newton
- b) Robert Boyle
- c) Edmund Hailey





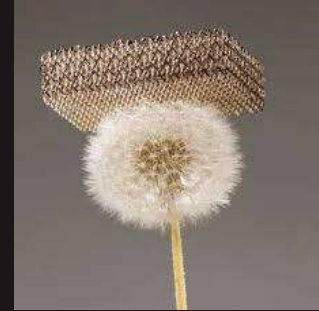
6. Founded in 1889, \_\_\_\_\_ is one of the oldest football clubs in Asia. The club is notable for being the first all-Indian side to win a major championship over the British side in 1911. Fill in the blank.

- a) East Bengal FC
- b) Mohun Bagan FC
- c) Mohammedan FC



7. Micro-lattice is the lightest metallic structure ever made. Composed of a nickel-phosphorus alloy, its density is as low as 0.9 g/cc. Which company made this ?

- a) NASA
- b) SpaceX
- c) Boeing



8. X is a popular type of biscuit. The origin of the name X is unknown, but there are many hypotheses, including derivations from the French word 'or', meaning gold, or from an Ancient Greek root meaning mountain. Others believe that it was named X simply because the name was short and easy to pronounce. Another theory, proposed by writer Stella Parks, is that the name derives from the Latin word for a genus of the laurel family. She observes that the original design of X includes a laurel wreath. Identify X.

- a) Marie
- b) Oreo
- c) Bourbon



9. Which Indian actor after successfully portraying a number of Parsi characters in various films, has been honored by the Bombay Parsi Community by being made an honorary member of the community and has been given the name Nazru Dinshaw?

- a) Nawazuddin Siddiqui
- b) Naseeruddin Shah
- c) nana Patekar



10. Only one organization has been awarded the Nobel Prize three times. Which one?

- a) United Nations High Commissioner for Refugees
- b) The International Committee of the Red Cross
- c) Amnesty International



# < D/CODE >

THERE IS ONLY ONE TRUTH !  
BRING OUT THE SHERLOCK IN YOU.

Are you rooting to challenge your brain in this seemingly endless lockdown? Well, we have just the right thing for you. KNOWBEL presents a revamped version of your favourite D-code. Gear up to send your neurons on a marathon.

To begin, click on the start button below. There are 5 documents, one leading to another with a clue to open it. You have to submit the final answer, a code given in the final document, at the submission link. Remember, don't give up midway because the solution is staring at you in the face.

Conquistadors will be **honoured** with fantastic **prizes** worth **Rs.250** and **certificates**. Besides, you will get a chance to be featured in our next issue.

The answers will be sent to you by **25/02/2021**. The enthralling **competition begins** on **02/02/2021**. **Hints** would be given out after **5 days** from the **start** of the competition on the official **KNOWBEL website**

here : **HINTS**

The final winners will be chosen on the following basis:

- 1) Your answers (obviously!)
- 2) Logic
- 3) Preference for early-bird submissions

**The Deadline for entering your answers is 25/02/2021.**

Now, are you ready to EODCD? 😜

Click on **START** to begin.

<D/code> - 13 :

Priya Batra

IISER Pune

**START**

For clarification, please contact: [knowbel.decode@gmail.com](mailto:knowbel.decode@gmail.com)



# PLOT-TWIST



KNOWBEL



5 year old me



Mom why can't I collect stars with my hand?



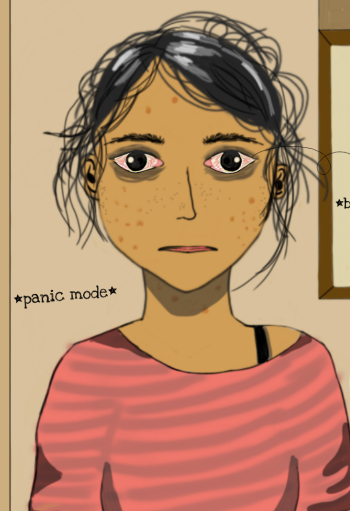
Why can't I ride over rainbow

20 year old me



\*after sleeping 4 hrs in the morning\*  
It's 3 a.m. already! why can't I sleep?!

ignorant



\*panic mode\*

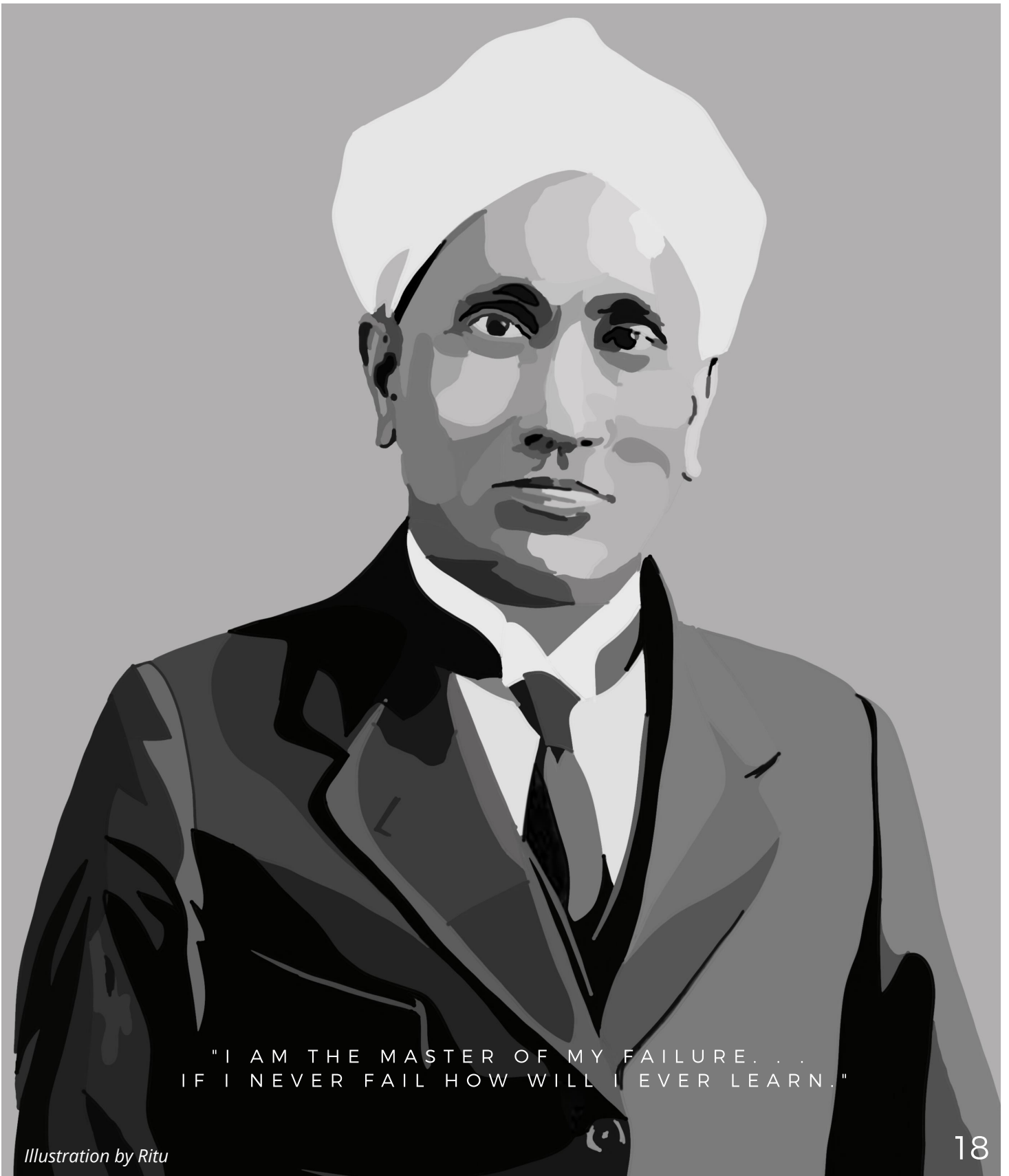
\*bloodshot eyes\*

Did God forget about me?  
Did he abandon me?!

-by Aishwarya Juneja

# INSPIRON

SIR CHANDRASEKHARA VENKATA RAMAN



"I AM THE MASTER OF MY FAILURE. . .  
IF I NEVER FAIL HOW WILL I EVER LEARN."



Illustration by Ritu

Born in Tamil Nadu's Tiruchirapalli to Chandrasekhar Iyer and Parvathi Ammal on November 7, 1888, Chandrasekhara Venkata Raman was a man of exceptional ability. At 11, he completed his matriculation. At 15 years of age, he obtained his B.A. degree as the class topper, winning gold medals for English and Physics.

The brilliant student was barely 17 when he received his M.A. degree in 1907, again at the head of his batch. His college professors allowed him to skip science classes because they recognized he didn't need them!

However, what passed him as a genius in the worthiest sense was that Raman wasn't just a bright student. He was also fiercely curious about the world around him. And it was this dynamic curiosity that led him to scientific discoveries of immense significance.

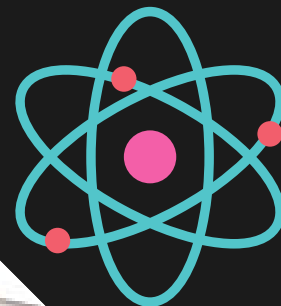
In 1921, Raman worked as a professor at the University of Calcutta and was sent as the university's representative to the International Universities Congress in London.

On his first overseas trip, he spent his time excitedly writing papers about the Whispering gallery in St. Paul's cathedral and meeting luminaries he had looked up to since his days as a pupil (JJ Thompson and John Rutherford).

“

*Ask the  
right  
questions,  
and nature  
will open  
the doors to  
her secrets*

”



AshLin, CC BY-SA 3.0, via Wikimedia Commons

“

*Treat me  
right and  
you will see  
the light...  
Treat me  
wrong and  
you will be  
gone!!*

”

While coming back from England abroad, Raman faced a question that left him perturbed. "A glass of water does not possess any color of its own. However, the same water in the deep sea develops a magnificent blue color. Why is it so?" he asked himself as he gazed at the azure waters of the Mediterranean Sea.

The scientist recalled observing a pale blue opalescence in the icebergs and the vast lakes he had seen during his trips to the northern latitudes.

On sifting through his books, Raman found out that the prevailing explanation was that the sea looked blue because it reflected the sky's color. Unconvinced, he promptly began carrying out elementary experiments onboard the ship using the simple instruments he had with him.

He found that the sea looks blue for the same reason the sky looks blue — the water made blue light scatter more than other colors in the morning. Excited by this understanding, Raman wrote to *Nature* (a premier science journal) as soon as he arrived in India.

Interestingly, one can glimpse his dedication and enthusiasm from his letter to *Nature*. It bears the address not of his home or laboratory, but of the harbor where his ship had docked!





<http://www.bibl.u-szeged.hu/sztegy/photo/213.jpg>, CC BY-SA 3.0, via Wikimedia Commons

Raman remained engrossed with the 'scattering question' (as he called it) in the years that followed. Along with his pupils at Kolkata's Indian Association for Cultivation of Science, he began conducting a series of systematic and straightforward experiments to observe how light behaved while passing through different substances.

One should note that India in the mid-1920s was firmly in the clasps of British colonial rule, making it a place hostile for scientific research, especially by Indians. Undeterred by these obstacles, the tenacious scientist persevered, and his hard work finally paid off when, on February 28, 1928, one experiment gave a startlingly obvious result.

After his student KS Krishnan announced the observance of a greenish glow in glycerine, Raman conducted further investigations to confirm "induced secondary radiation" — the light of only one color was being passed through the liquid. Still, the light that was emerging had traces of another color.

This meant that the liquid molecules were changing the color of some light passing through them. This phenomenon (called the Raman Effect) created a sensation worldwide and earned its Indian discoverer a litany of rare honors.

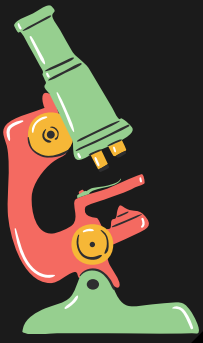
In 1929, Raman was established as a Knight of the British Empire and honored with the distinguished Hughes Medal by the Royal Society of London. And in 1930, he came to be the first Asian to be awarded a Nobel prize in any science field.

“

*Success can  
come to you  
by courageous  
Devotion to  
the task lying  
in front of  
you.*

”





“  
*I strongly believe  
that fundamental  
science cannot be  
driven by  
instructional,  
industrial and  
government or  
military pressures*  
”



Kvr.lohith, CC BY-SA 4.0, via Wikimedia Commons

During his address at the banquet following the Nobel Prize ceremony, a visibly moved Raman referred to the congratulatory telegraph he had received from his "dearest friend who is now in jail." Much to the British ambassador's discomfort, this "friend" was none other than Mahatma Gandhi!

Over time, the Raman Effect has proved immensely useful in multiple areas of science. The colors produced by a substance when light passes through it are almost like a fingerprint used in chemistry, biology, medicine, etc., to find out what made a substance.

They used this principle in the Raman Scanner, a device used by the police to determine if people are carrying illegal substances!

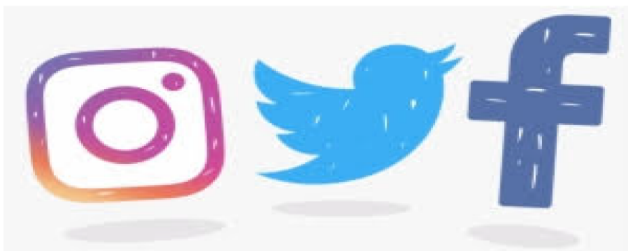
When India is trying to instill a scientific temper and spirit of innovation in its students, One ought to remember that while not all of us can be as brilliant as Raman, we can be just as curious about the world as he was.





click by Vaibhav Ingale

*A chance to portray your photographic skills!  
Send us the amazing photos clicked by you  
and we'll be happy to feature them on our social media &  
in the magazine as well*



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