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ENLIGHTENING THE NOBLES!



— NATIONAL  
**SPORTS**  
DAY —  
AUG 29<sup>th</sup>



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*Enlightening the nobles !*

# WELCOME !

KNOWBEL is back with a pool of mind-boggling articles filled with rare facts and famous personalities from all over the world brought to you in yet another edition!

Through the journey of reading, don't forget to pause and feel the whiff of brainstorming quizzes and contests that'll create an adrenaline chill within you! Fabulous prizes await the winners with the chance of being featured in our next issue!

We also provide you the golden opportunity to showcase your quirky talents. Spread the message among friends and family members. Just as ripples spread out when a single pebble is dropped into water, your actions can illuminate the darkroom of knowledge!

Flip the page to discover more!  
Magical things happen when you read!  
So, keep calm and read on...  
Thank You!

## SPECIAL THANKS TO

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# WONDERELLA

Never Stop Questioning

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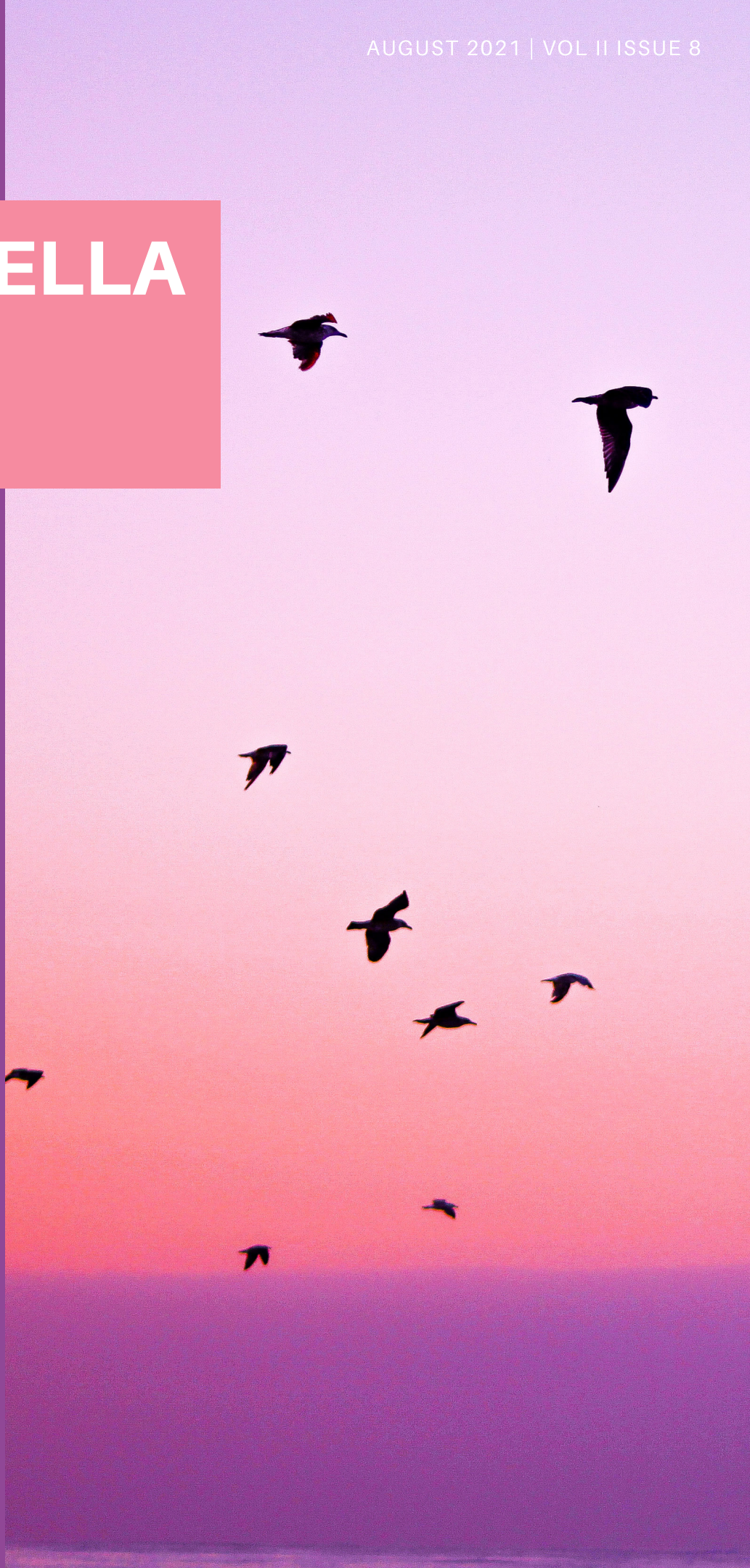
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# INSANE BIOLOGY OF THE OCTOPUS

by Anuradha Meena

Nature is very mysterious, and it's tough to reveal its originality. Some creatures in nature are incredibly remarkable and show bizarre behavior. Cephalopods are one of the most intriguing classes of intelligent and most mobile animals in all invertebrates.

They live in very diverse habitats, ranging from the deep sea to kelp forests to coral reefs to every ocean in the world. Their body size varies from absolute tiny to massive sizes. Some of the species are venomous. Their appearance changes every moment, from spiky to soft smooth. Hence, they are as diverse as their habitat. Cephalopods' most amazing fun fact is that more than 500 million neurons are not in their brains but in their arms, which help them smell and taste, even think.

For a long time, scientists have been mulling over how the Octopus became so biologically complicated. How intelligent are these creatures? Survival of these soft-bodied creatures seems unlikely in a sea full of dangerous, hungry, large predators. But this vulnerability and selective pressure make them remarkably unique.

To protect themselves from predators, octopuses change their skin color very quickly. They change the 3D texture of the skin so that it perfectly matches the surrounding seaweed and coral. In the blink of an eye, they almost wholly blended with their surroundings. But if the Octopus needs to produce colors other than black, red, and yellow, they use iridophores structures present on their skin. It is a special kind of protein called reflectin that reflects specific wavelengths of light.

Octopuses use a special kind of structure called papillae to change the texture of their skin by creating ridges and bumps on the skin. This helps the Octopus to match its surroundings. It also prevents predation by giving them a less identifiable edge. Because many vertebrate predators detect their prey by looking at the edges and breaks in the background, the shell-free, soft-bodied Octopus has been able to survive in an ocean full of predators with all these tools for a long time. But, this doesn't mean that their survival has been hinged on these camouflage properties all alone. The way they are controlled is perhaps an even more effective survival tool. They make decisions at a rapid pace, as fast as the quickest blink. Octopus's camouflage reaction times are up to 200 milliseconds.

The presence of the photoreceptor gene on the Octopus's skin provides a unique property that is sensitive to light. Even when their skin is detached from the body, it responds to light and changes the shape of its chromatophores. Octopus not only sees with its eyes but also with its skin too. Another transformation occurred when the octopus body continuously evolved its color-changing defense mechanisms: developing a large brain and nervous system.

Reference: [https://youtu.be/mFP\\_AjJeP-M](https://youtu.be/mFP_AjJeP-M)



# DO PLANTS COMMUNICATE?

by Anuradha Meena

It certainly doesn't seem that plants can talk with neighboring plants and trees. But they do.

Though plants don't have complex sensory or nervous systems like animals, they can still communicate with each other. Plants look pretty passive, basking in the sun and responding instinctively to inputs like light and water.

But it sounds vague when we say plants communicate with each other through their roots. Just like animals, a plant secretes chemical signals in response to the external changing environments. Not only do they secrete the signal, but they also share these signals with the neighboring plant to protect them from attack. When these plant leaves get damaged by hungry insects or an invading lawn-mower, they release plumes of volatile chemicals.

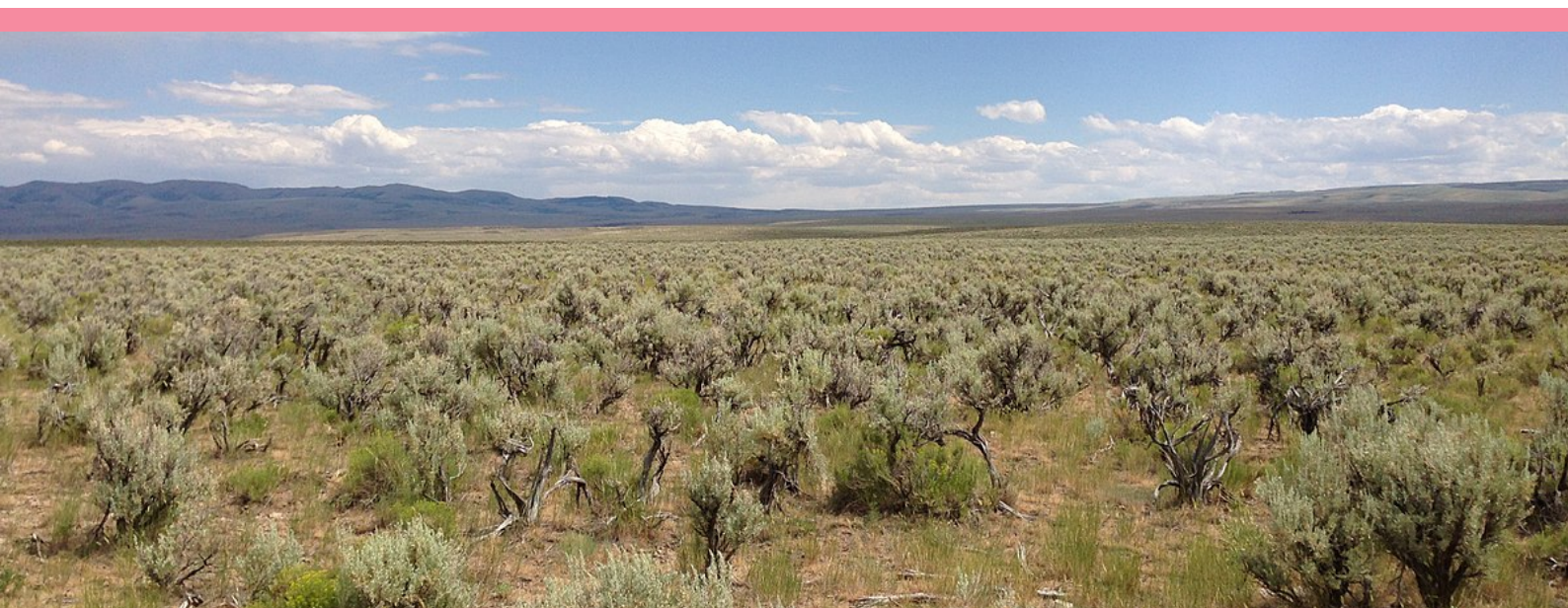
During an experiment, sagebrush leaves were deliberately damaged by insects or scissor-wielding scientists. It has been observed that, throughout the summer, other branches of the same sagebrush plant got less eaten by wandering insects. Hence, this suggests that branching on neighboring bushes beefed up their anti-insects defenses and made the second plant more insect resistant. A plant is most sensitive to the cues emitted by its leaves. Hence, plants communicate more effectively with relatives than with strangers. Similar plants communicate more fluently as they have similar chemical fingerprints. But sometimes, even other species can benefit from it. For example, tomato and tobacco plants can both decipher sagebrush warning signals. These signals transmit via two routes, either through the air or the soil.

A variety of plants can pick up the airborne messages, and accordingly, they adjust their internal chemistry. Like sagebrush and lima beans, these kinds of plants catch the airborne cues generated by other neighboring plants and increase their likelihood of seedling survival. Plants don't solely rely on airborne broadcasts.

Most plants have a symbiotic relationship with fungi (called mycorrhizae), which colonize the plants' roots and help them in absorbing water and other nutrients. These fungal filaments form extensive underground networks that interconnect different plants and trees and create a superhighway for chemical messages. This is known as the wide wood web.

All living beings compete for their survival resources, so why would a plant warn its neighbors from danger or attack? Plants and trees connected with the wide wood web exchange their nutrients and facilitate the signaling molecule to reach out to healthy plants and prompt them to activate their immune system. These early warnings increase the chance of survival. So what is communication? It is an exchange of information, and plants have the unique ability to send, receive, and respond to signals without making a sound and without brains, noises, dictionaries, or the Internet. If we can learn to speak to them in their language, we can protect crops and other valuable species.

Reference: <https://www.youtube.com/watch?v=xOXSqy05EO0>





# REWRITING HISTORY USING CHEMISTRY

by Aditya

Isotopes refer to atoms of the same element (i.e., have the same number of protons) with different masses. Oxygen has three stable isotopes, O-16, O-17, and O-18, all of which have 8 protons but have atomic masses of 16, 17, and 18 amu. O-16 is the most abundant among the 3, comprising 99.76% of all oxygen on Earth. O-17 and O-18 have abundances of 0.04% and 0.2%, respectively. However, these values are average values for the entire planet. Some regions on the Earth's surface are slightly enriched or depleted in O-18 compared to the average value. This variation in the O-18 abundance depends on various factors, including temperature, climate, altitude, terrain, rock composition, etc., and changes with time. Consequently, the bodies of the living organisms, including humans who would consume water, organic material, and inorganic salts (like sulfates and carbonates) from this region at a given point in history, would also reflect that region's O-18 composition then.

The enamel in our teeth is one of the few parts of our body which remains preserved for tens and thousands of years after our death. Its formation takes place between the ages of one and eight, during which it would incorporate oxygen from the food and water we intake. As a result, the enamel retains the O-18 composition of where we lived during our childhood and would continue to store it for several millennia after our death. Thus, measuring the ratio of abundances of O-18 to O-16 (called the  $\delta^{18}\text{O}$  value) in the enamel of archaeological human remains gives us a historical record of the O-18 composition (and consequently the location) of the place where that person grew up and comparing it with the place where they finally ended up dying. Therefore this tool has allowed historians, archaeologists, and anthropologists to study migrations undertaken by humans during prehistoric times.

The ancient Greek city of Himera, located in Sicily, Italy, was the site of several battles between Greek forces and Carthage. Contemporary historians like Herodotus wrote that Himera won the first battle in 480 BCE due to support from surrounding Greek provinces. In contrast, the future engagement in 409 BCE was reported to primarily involve fighters from only Himera, leading to the city's fall.

A team of scientists from the US and Italy decided to test this information. They examined the skeletal remains linked to the two battles. By analyzing the  $\delta^{18}\text{O}$  value present in the teeth, the team established probable locations where the soldiers might have lived in their childhood. Along with oxygen, they also performed a similar isotopic analysis based on Samarium. Their results revealed that while the 409 BCE battle did involve just local Himerans, as historians reported, the former battle was fought by many soldiers from outside the Greek world who were likely foreign mercenaries. They concluded their paper by stressing the need to validate ancient Greek historical records as they are the only ones of their time to have survived to this age, and they tend to be biased towards themselves.

Reference: <https://doi.org/10.1371/journal.pone.0248803>



# HOW DO BIRDS SENSE EARTH'S MAGNETIC FIELD?

by Aditya

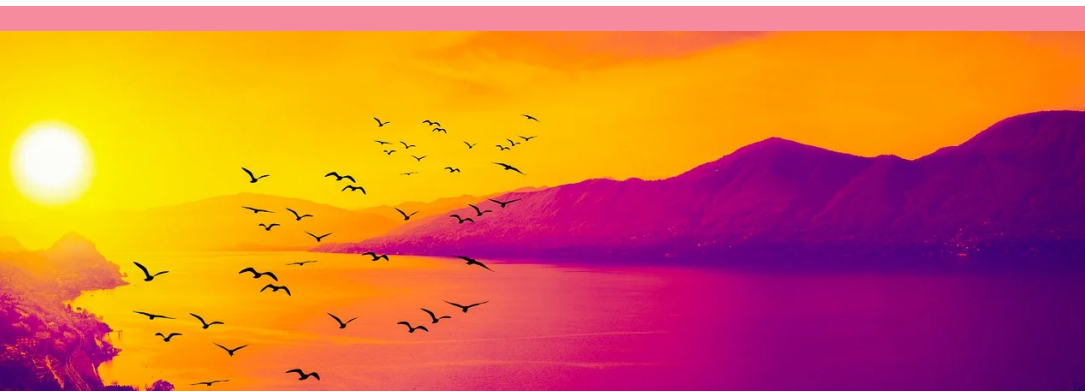
One of the biggest unanswered questions in biology is how migratory birds like the European Robin remember their long routes across the planet. Most biologists by now have come to the consensus that these birds sense the Earth's weak magnetic field (the process is called magneto-reception) and use it as a sort of a compass for navigating through their long and arduous migratory journey. However, the underlying mechanism behind magneto-reception is yet to be fully understood. A large group of scientists from around the globe headed by Dr. Heinrik Mouritsen from the University of Oldenburg may just have arrived at a breakthrough in explaining this fascinating phenomenon.

In the late 1970s, theoretical physicists first proposed a light-dependent mechanism for magneto-reception. They hypothesized that birds might possess specific molecules that may react in the presence of light to produce chemical species called radical pairs (RP). Now, RPs exist in two different states called singlet and triplet states, respectively. Moreover, they keep changing back and forth between these two states over a million times in a second! Usually, RPs don't prefer being in the triplet state and stay longer in the singlet state. However, in the presence of a magnetic field (even a weak one like the Earth's), they prefer the triplet state a little more and exist a bit longer in that state than previously. This subtle change in the longevity of the triplet and singlet states was hypothesized to be the basis behind magneto-reception.

The only known group of biomolecules that might form RPs inside living organisms in the presence of light is a class of proteins called cryptochromes. Subsequently, biologists started searching for cryptochromes inside birds, especially in the bird's eyes, as that would be the only place in the bird's anatomy where light can come in. Sure enough, cryptochromes were found in the photoreceptor nerve cells present in the bird's retina. Moreover, cryptochromes obtained from the eyes of a migratory bird (like the European Robin) were vastly different from those obtained from that of a non-migratory bird (like hens) which further indicated that cryptochromes might play a role in the migratory bird's navigation system.

The next logical step was to verify whether these cryptochromes indeed undergo the hypothesized radical pair mechanism and are magneto-sensitive. As performing experiments on live birds is quite tricky, the researchers first performed a series of in-vitro experiments. For this, they had to artificially synthesize cryptochromes (a formidable challenge due to the complex structure of the protein) followed by performing extremely minute measurements of the magnetic properties of the molecule. This set of experiments involved a large group of scientists. After more than 16 years of hard work, they were finally able to verify the radical pair mechanism and the magneto-sensitive property of cryptochromes.

According to Dr. Eric Warrant of Lund University, explaining the mechanism behind magneto-reception is currently the Holy Grail in sensory biology! This research published just last month reporting the verification of the radical pair hypothesis in cryptochromes may be the crucial step that helps solve the entire puzzle. However, it is essential to realize that these are results of in-vitro experiments only. The actual process happening inside the bird's eye may be markedly different. Hence the future goal for this group of scientists is to verify the hypothesis via in-vivo experiments by measuring the cytochromes present inside the bird's eye. That is a different challenge altogether. For now, we can appreciate their current findings, which combine some of the most diverse fields in science in an attempt to answer one of the most intriguing mysteries of nature.



## References:

- <https://doi.org/10.1038/s41586-021-03618-9>
- <https://www.youtube.com/watch?v=0SPD2r0xV8k&t=1s>
- <https://www.nature.com/articles/d41586-021-01596-6>



# FACTASTIC



Image from Wikimedia Commons

## Olympics Logo

The Olympic Rings are five interlocking rings (colored Blue, Yellow, Black, Green, and Red ). It was created in 1913 by Coubertin. This five-ring represents five continents like the Americas (where North and South America are put together), Europe, Asia, Africa, and Oceania. It is also stated that rings with a white background represent the flags of every nation competing at that year's event.

## Devastating Force

One of the most destructive and deadliest volcanic events recorded began on 20 May 1883 and peaked on Monday, 27 August. Over 70% of the island of Krakatoa and its surrounding Archipelago were destroyed. The explosions were so violent that they were heard 3,110 km away in western Australia and 4,800 km away near Mauritius.

Approximately 36,417 deaths are attributed due to this destruction, and the sound created by it was claimed to be heard in 50 different places all over the world.



Image from piqsels.com



Image from Wikimedia Commons

## All that Glitters is not Gold!

Since 1912, Gold medals awarded to the winners at the Olympic Games are made from 93% sterling silver and only about 1.34% (6 g) gold (was found in the Rio 2016 version), whereas the remaining 6% (approx.) is copper.

## The Flying Fish

Michael Phelps, an American Swimmer, has won more medals than 161 countries in the Olympic games history. He is the most successful and most decorated Olympian of all time, with 28 medals. His record-breaking performances and international titles have earned him the World Swimmer of the year award eight times, and American Swimmer of the Year Award eleven times, and the FINA Swimmer of the Year Award in 2012 and 2016.



Image by ClaraDon from flickr.com





Image from Wikimedia Commons

## Wings of Shuttlecock

One of the finest badminton players produced by India, Prakash Padukone (father of Deepika Padukone), has won the nationals championships for a record nine times. He was awarded the Arjuna Award in 1972 and Padma Shri in 1982 for his achievements. He became the first Indian to win the All England Badminton Championships, and after a victory over Liem Swie, King of Indonesia, he earned the All England Badminton Title in the 1980s.

## Age is just a Number

The youngest Olympic medal winner was Dimitrios Loundras, who was awarded a bronze medal in gymnastics at the age of 10 competed in the 1896 Athens Olympics. On the other hand, the oldest Olympic medal winner was Oscar Swahn of Sweden, who won an Olympic silver medal in the 1912 Olympics in shooting at 72.



Image from Wikimedia Commons

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, Atharva, the quizmaster, have selected 10 of the most sizzling questions for you to crack. Note that these questions have an underlying connection: **Sport**.

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 August 25, 2021.

The winners would be chosen based upon:

1. Number of Correct Answers
2. Time of Submission

Competition begins on: August 2, 2021, at midnight

Last Date for Submission: August 20, 2021



19th Quizzo winner

Shreya Doijad  
IISER, Pune



*Scan or click on the QR code below:*





1. In the spot of lawn tennis what piece of fruit is found at the top of the men's Wimbledon trophy ?

- a) cherry
- c) apple

- b) pineapple
- d) orange



2. Who has become the first Indian fencer to qualify for the Tokyo Olympic Games ?

- a) Reorita Devi
- c) Kabita Devi

- b) Bhavani Devi
- d) KP Gishodini



3. Among these famous cricketers, some are also outstanding and have excelled in other games, who are they ?

A) Cotar Ramaswamy B) MJ Gopalan C) Chuni Goswami D) Kapil Deo

a) Only D)

b) Only A), C) and D)

c) Only A), B) and C)

d) Only A) and B)



4. The lowest score of India's cricket team in a test match was \_\_\_\_?

a) against Australia at Adelaide (2020)

b) against England at Lords (1974)

c) against Australia at Brisbane (1947)

d) against England at Manchester (1952)



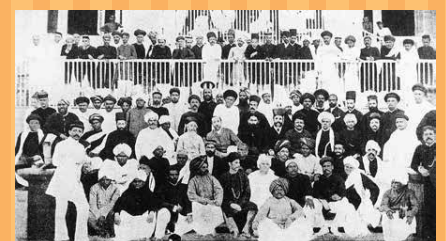
5. At the time of India's independence who among the following was the President of Indian National Congress

a) Mahatma Gandhi

b) Sardar Vallabhbhai Patel

c) J B Kriplani

d) Jawaharlal Nehru



6. Mission Indradhanush aims at \_\_\_\_ ?

- a) reducing child deaths due to pneumonia
- b) elimination of maternal tetanus
- c) reducing the impact of rotavirus
- d) full immunization of children



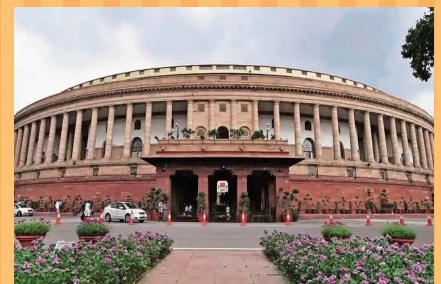
7. In relation to Indian rivers, which of the following is not matched correctly ?

- a) Narmada-Mokshadayani
- b) Padma-Ganga
- c) Bhagirathi-Ganga
- d) Kalindi-Yamuna



8. The 44th Amendment Act of the Parliament eliminated which of the following ?

- a) Right against Exploitation
- b) Right to Constitutional Remedies
- c) Right to Education
- d) Right to Property



9. What is Banshee ?

- a) A character in the film 'The Hitchhiker's guide to the Galaxy'
- b) An unmanned air vehicle (UAV) which is being used as a target for medium range surface- to-air missile
- c) A short film on the degradation of environment in Braj area (Mathura-Vrindavan)
- d) A hybridized horse

10. The term 'Arghatta' refers to what with reference to the economic history of medieval India ?

- a) bonded labour
- b) land grant made to military officers
- c) waterwheel used in the irrigation of land
- d) waste land converted to cultivated land



Image credits: freepik.com



# INSPIRON



Illustration by Ritu

## Milkha Singh

Narrated by Manas Raikar

# The Inspiring Story



Illustration by Ritu

Milkha Singh, popularly known as 'The Flying Sikh,' was an Indian track-and-field sprinter and athlete. He is also known as the first individual sports star of independent India who won several national and international honors. Milkha Singh was born in Govindpura, Muzaffargarh, Punjab in British India, which now lies in Pakistan. Although he had said in his autobiography that he didn't know the exact date of his birth, most official records state that he was born on 20th November 1929. Yet, his passport lists the date as November 1932! Singh was seventh among the eight children of Sampuran Singh and Chawali Kaur. Being born in a family of farmers, Singh spent his childhood in poverty but in a carefree environment.

Running became one of his earliest passions, as he ran to school daily and tried racing against moving trains.

This habit helped him flee from the violent mob that attacked his town during the partition of India in 1947. In his autobiography 'The Race of My Life' (2013), he recalls the horrendous experience as he witnessed his family being massacred. He writes about it, "As he fell, Father screamed 'Bhaag, Milkha, Bhaag' - with my father's warning running through my head, I fled for my life."

After he made a run for it, Singh got onto a train to Multan. He reunited with Makhan, his only surviving brother, who helped him cross the border and make it to Delhi. He spent his days at the Old Delhi station as a 15-year-old refugee, living in dire conditions. Singh managed to find his sister, Isher and her family, who had fled from Punjab to Delhi. Feeding an additional mouth was tough for Isher's family, which led to mistreatment and discrimination against Milkha Singh.

Singh, fed up with his miserable life, was planning to become a dacoit. It was his brother Makhan who changed his mind and encouraged him to join the Indian army. The job could offer opportunities to youngsters with no education or prospects. However, Singh was underweight and was thus rejected three times before finally being recruited in 1951. He was introduced to athletics when he was stationed at the Electrical Mechanical Engineering Centre at Secunderabad.

The first contest was a 10km run where 400 recruits competed; Milkha Singh finished in the sixth position and was selected for further training. His reward for the race was a glass of milk daily, which was a big deal for an underweight youth. For the next few years, under the guidance of his coach Havaladar Gurudev Singh, Milkha Singh trained like a beast!

He participated in the Melbourne Olympic Games in 1956 but couldn't make it beyond the initial rounds. Nevertheless, he got the opportunity to meet with the then 400m champion Charles Jenkins, which motivated him to practice harder. It was from 1958 that the fruits of Singh's





Illustration by Ritu

efforts started showing up! In 1958, Milkha Singh set records at the National Games of India, held in Cuttack, Odisha, in 200m and 400m competitions. In addition, he won a gold medal in 200m and 400m categories at the Asian Games held in Tokyo, Japan, the same year. He then became the first athlete from independent India to win a gold medal in the 440 yards (400m) race at the British Empire and Commonwealth Games in 1958.

In 1960, Milkha Singh was invited to Pakistan to compete against Pakistani sprinter Abdul Khaliq. Singh was reluctant at first, owing to his awful memories of the partition. Prime Minister Jawaharlal Nehru persuaded him to participate in the race. Singh successfully competed, ultimately winning the race. The Prime Minister of Pakistan, General Ayub Khan, commented on Singh's performance in the race, leading him to earn his nickname 'The Flying Sikh.'

Shortly after this, Milkha Singh participated in the Rome Olympics of 1960 and managed to make it to the finals. In the 400m race, Singh was leading other players for the first 250m but accidentally slowed down thinking about if he couldn't maintain his pace throughout the race. This proved to be detrimental to his performance because not only did he lose the gold, but he also missed the bronze by one-tenth of a second. Singh regretted the decision and often described it as his worst memory following the death of his family.

Although Singh didn't win any medal, he set a national record of 45.6 seconds which remained unbroken for 38 years! Furthermore, Singh won two more gold medals in the Asian Games in 1962 in Jakarta, Indonesia.

Recognising his success in the 1958 Asian Games, the Indian army promoted Singh from sepoy to a junior commissioned officer. In 1959, the Indian Government awarded Milkha Singh with the Padma Shri, the country's fourth-highest civilian award. Subsequently, he quit his job in the army, became the Director of Sports in the Punjab Ministry of Education, and retired in 1998. He has also donated all of his medals to the nation.

Milkha Singh married Nirmal Saini, the former captain of the Indian Women's Volleyball team, in 1962. Their family consists of three daughters and a son, Jeev Milkha Singh, who is a golfer. Along with his daughter, Sonia Sanwalka, Singh co-wrote his autobiography named 'The Race of My Life' in 2013. The book also led to the creation of a biopic, 'Bhaag Milkha Bhaag.' Singh also ran the 'Milkha Singh Charitable Trust', founded in 2003 to help needy sportspeople.

Milkha Singh passed away on the night of 18th June 2021 due to post-COVID complications. His wife, Nirmal, also succumbed to the COVID infection and passed away on 13th June. May their souls rest in peace.

**[For more info click here](#)**



**POETICA**  
**THE LEGENDARY  
SPORT**

This is famous as football  
Known for grabbing the ball  
Taking it from the opposite mate  
And shooting it into the goal gate

There are fowls in it  
Players growl for it  
Brawl a bit  
But in the end have to withdraw from it.

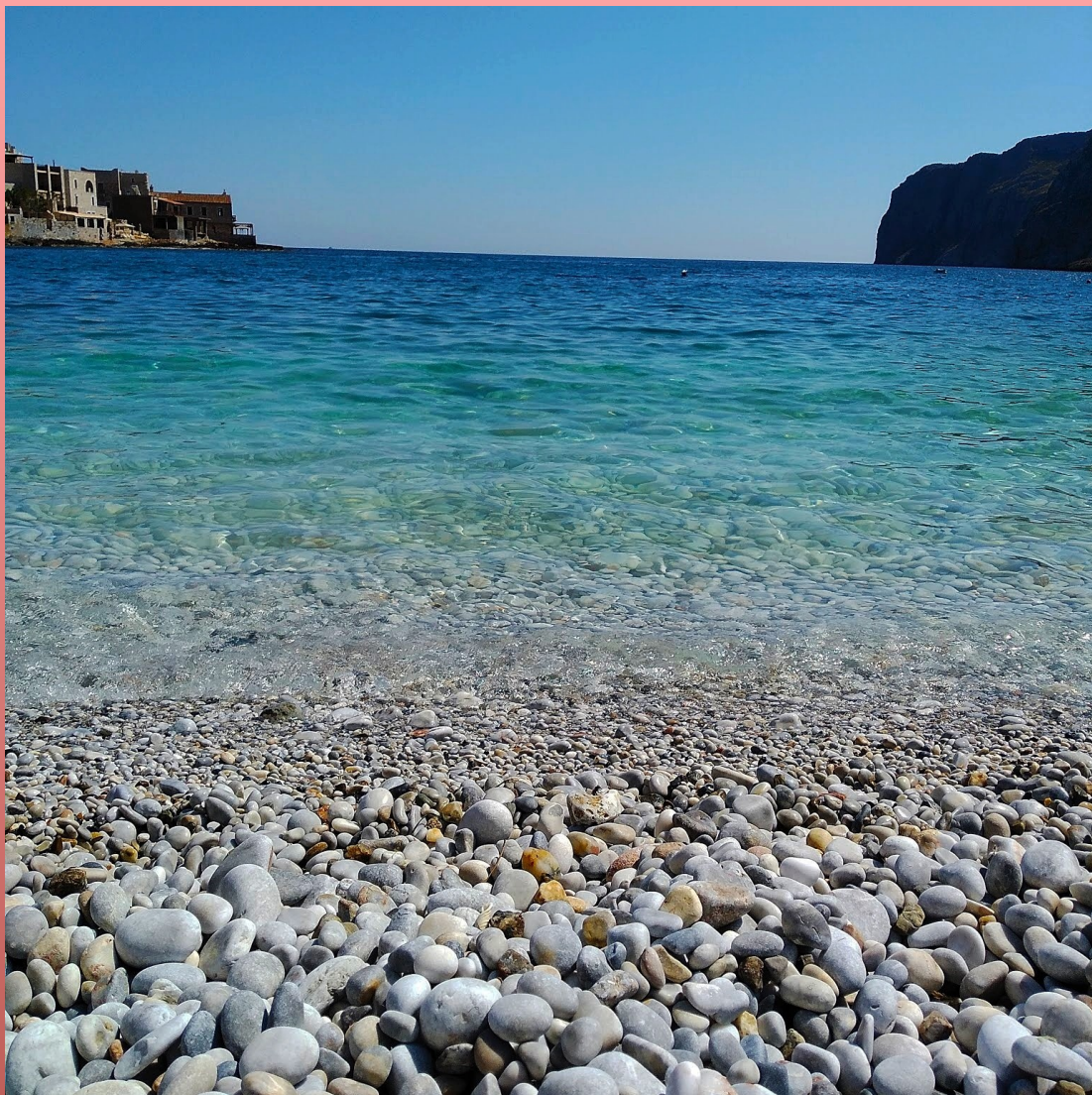
This sport  
Has some GOATs (\*Greatest of all time)  
Like Messi and Ronaldo

It is a sport of fun  
No use of gun  
Only fun and run

But sometimes it is unclear  
When a team loses  
Why do spectators ooze their anger?  
In a way that creates a humongous danger

*By Ansh Gaikwad, Class VIII, APS, Dighi (Pune)*





*~click by Vaibhav Ingale*

*"To find the pearls in life's ocean, you have to venture out far past the shore"*

**Send in the amazing photos clicked by you and we'll be happy to feature them in our magazine and on social media.**



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