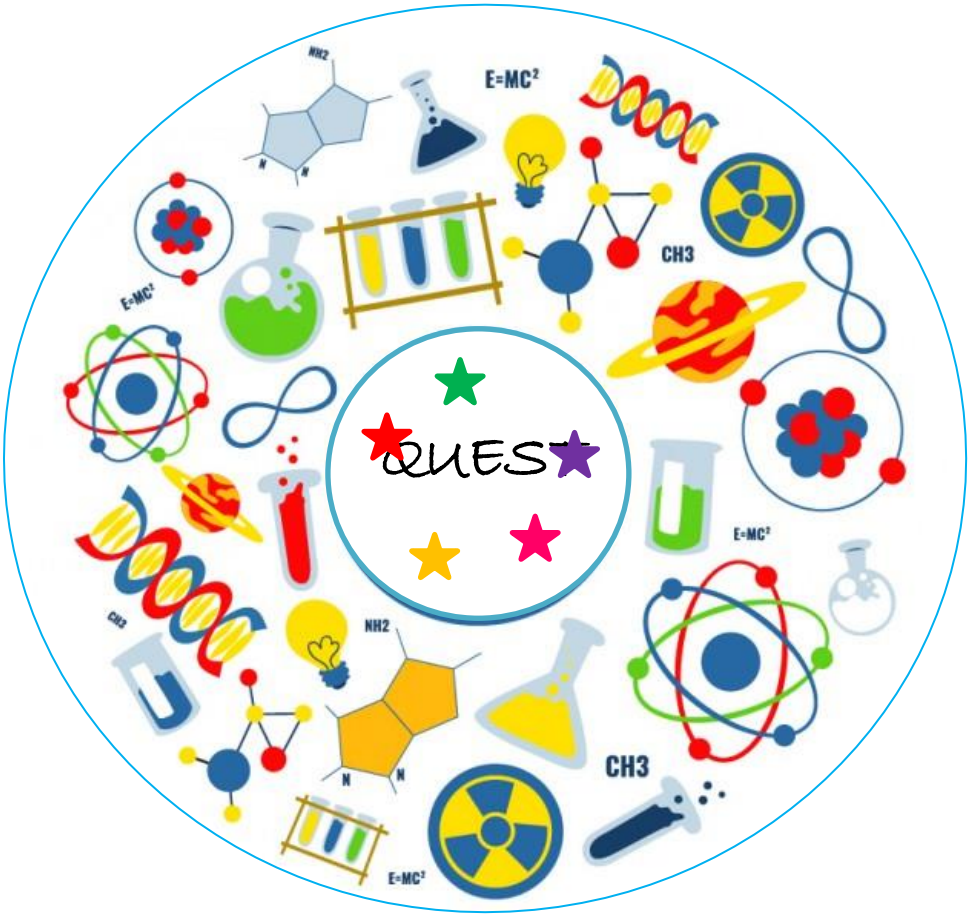
GYAN BHARATI SCHOOL

MONTHLY SCIENCE AND MATHEMATICS MAGAZINE

QUEST



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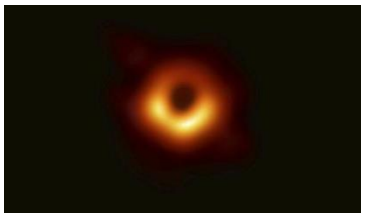
HOW CAN A BLACK HOLE BE IMAGED?



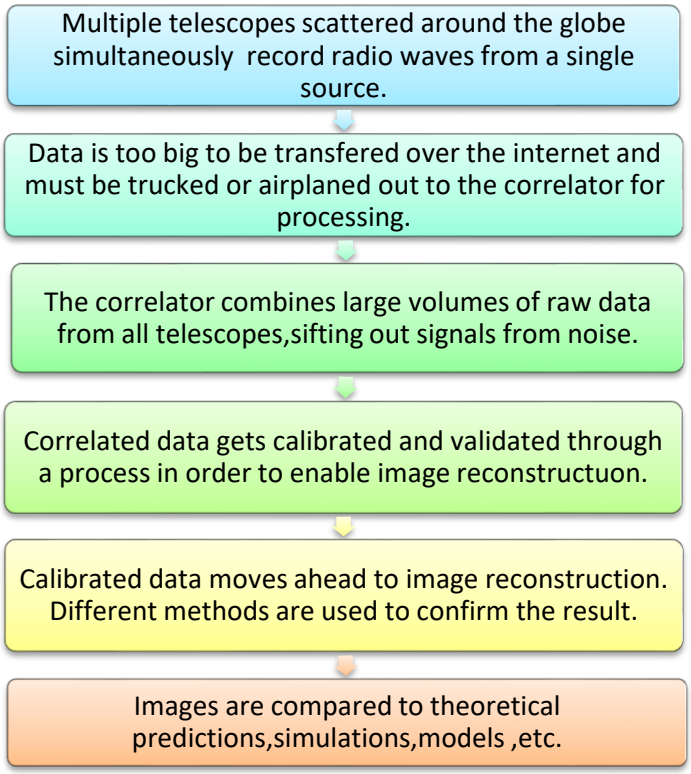
This is the first ever image of a black hole, named **Powehi**, captured by the **Event Horizon Telescope (EHT)**, a network of eight radio telescopes from across Earth. This is the first direct visual evidence that a black hole exists.

Black holes are among the many mysteries of the Universe. The fuzzy doughnut-shaped ring of gas and dust traces the outline of a supermassive black hole, at the heart of the **Messier 87** galaxy, 55 million light years from Earth. The stunning image looked like an uneven gold ring, heavier at the lower end than the upper.

Analysis revealed that what was within the dark inner circle was rotating clockwise. This could either be the black hole itself or matter that was falling into it. The mass of this black hole was calculated to be 6.5 billion times the mass of the Sun and its diameter is 100 billion kilometers.

If immersed in a bright region, like a disc of glowing gas, we expect a black hole to create a dark region similar to a shadow - something predicted by Einstein's general relativity that we've never seen before.

STEPS INVOLVED IN CAPTURING IMAGE OF A BLACK HOLE



INTERESTING FACTS

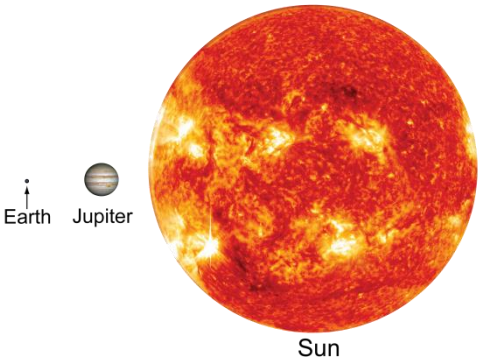
1) Glass is actually a liquid, rather than a solid. Glass actually flows extremely slowly. In old windows, bottom of the pane is noticeably thicker than the top. Glass is made by cooling, very quickly, a molten substance. Because this cooling happens so quickly, it doesn't crystallize. Rather, the chemical bonds in the molecular structure of the substance essentially tighten up, as they lack the thermal energy to move freely. Glass flows at a speed that would take it millions of years to do what water can do in a moment.

2) When Helium is cooled to almost absolute zero (-460°F or -273°C, the lowest temperature possible), it becomes a liquid with surprising properties: it flows against gravity and will start running up and over the rim of a glass container.

3) An ice cube takes up about 9 percent more volume than the water used to make it.

4) If you drilled a tunnel straight through the Earth and jumped in, it would take you exactly 42 minutes and 12 seconds to get to the other side.

5) If the Sun were the size of a beach ball then Jupiter would be the size of a golf ball and the Earth would be as small as a pea.



QUIZ

Q1. Table salt gets moist during the rainy season because:
A. Sodium chloride is hygroscopic
B. Sodium chloride is deliquescent
C. Sodium chloride contains some quantity of sodium iodide
D. Sodium chloride contains hygroscopic impurities like magnesium chloride

Q2.When ice cubes are pressed over each other they unite to form one cube because:
A. Vander Waal's force
B. Dipole movement
C. Hydrogen bond formation
D. Covalent attraction

Q3. Fathom is the unit of
A. Sound B. Depth
C. Frequency D. Distance

Q4. In which of the following activities silicon carbide isused?

A. Making cement and glass
B. Disinfecting water of ponds
C. Cutting very hard substances
D. Making casts for statues

Q5. Reading of a barometer going down is an indication of
A. Snow
B. Storm
C. Intense heat
D. Rainfall

Q6. Who among the following is considered as the 'father of modern genetics'?
A. Gregor Mendel
B. W. Bateson
C.T.H. Morgan
D. Aristotle

ANSWERS

1. **(D) Sodium chloride contains hygroscopic impurities like magnesium chloride**
2. **(C) Hydrogen bond formation**
3. **(B) Depth**
4. **(C) Cutting very hard substances**
5. **(D) Rainfall**
6. **(A) Gregor Mendel**

Mathematics in Nature

1. SNOWFLAKES,

Snowflakes exhibit six-fold radial symmetry, with elaborate, identical patterns on each arm.Snowflakes form because water molecules naturally arrange when they solidify. It's complicated but, basically, when they crystallise, water molecules form weak hydrogen bonds with each other. These bonds align in an order which maximises attractive forces and reduces repulsive ones. This is what causes the snowflake's distinct hexagonal shape.

Though, no two snowflakes are alike, so how can a snowflake be completely symmetrical within itself, but not match the shape of any other snowflake?

Well, when each snowflake falls from the sky, it experiences unique atmospheric conditions, like wind and humidity, and these affect how the crystals on the flake form. Each arm of the flake goes through the same conditions, so consequently crystallises in the same way. Each arm is an exact copy of the other.

2. SUNFLOWERS,

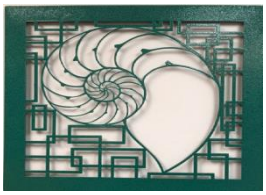
Sunflowers boast radial symmetry and a type of numerical symmetry known as the Fibonacci sequence, which is a sequence where each number is determined by adding together the two numbers that preceded it. For example: 1, 2, 3, 5, 8, 13, 21, 24, 55, and so forth. This is not uncommon; many plants produce leaves, petals and seeds in the Fibonacci sequence. It's actually the reason it's so hard to find four-leaf clovers.

Why do sunflowers and other plants abide by mathematical rules?

In simple terms, sunflowers can pack in the maximum number of seeds if each seed is separated by an irrational-numbered angle.The most irrational number is known as the golden ratio, or Phi.

Coincidentally, dividing any Fibonacci number by the preceding number in the sequence will garner a number very close to Phi. So, with any plant following the Fibonacci sequence, there will be an angle corresponding to Phi (or 'the golden angle') between each seed, leaf, petal, or branch.

3.NAUTILUS SHELL,

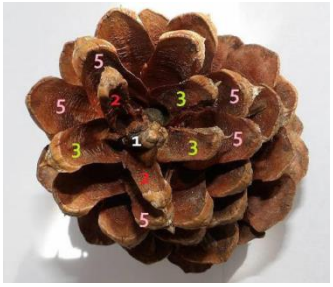


A nautilus is a cephalopod mollusk with a spiral shell and numerous short tentacles around its mouth. nautilus, A nautilus shell is grown in a Fibonacci spiral. The spiral occurs as the shell grows outwards and tries to maintain its proportional shape.

The nautilus's growth pattern allows it to maintain its shape throughout its entire life. Not every nautilus shell makes a Fibonacci spiral, though they all adhere to some type of logarithmic spiral. Nautilus aren't consciously aware of the way their shells grow; they are simply benefiting from an advanced evolutionary design.

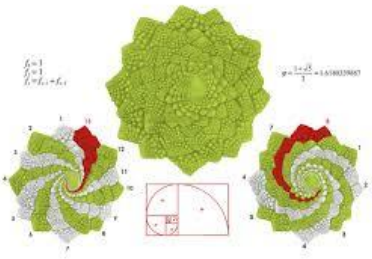
4. PINECONES,

Pinecones have seed pods that arrange in a spiral pattern. They consist of a pair of spirals, each one twisting upwards in opposing directions.The number of steps will almost always match a pair of consecutive Fibonacci numbers. For example, a three–to–five cone meets at the back after three steps along the left spiral and five steps along the right.



This spiralling Fibonacci pattern also occurs in pineapples and artichokes.

5. ROMANESCO BROCCOLI,



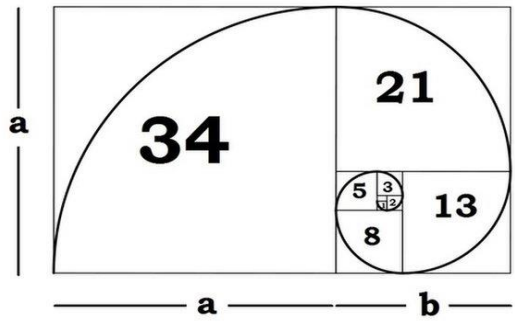
Romanesco broccoli has an unusual appearance. However, it's actually one of many instances of fractal symmetry in nature.In geometric terms, fractals are complex patterns where each individual component has the same pattern as the whole object. In the case of romanseco broccoli, each floret is a miniaturised version of the whole spiral. This means the entire veggie is

head's logarithmic
one big spiral composed of smaller, cone-like mini-spirals.

WHAT IS THE GOLDEN RATIO?

The Golden ratio is a special number found by dividing a line into two parts so that the longer part divided by the smaller part is also equal to the whole length divided by the longer part. It is often symbolized using phi, after the 21st letter of the Greek alphabet. In an equation form, it looks like this:

a/b = (a+b)/a = 1.6180339887498948420 …



As with pi (the ratio of the circumference of a circle to its diameter), the digits go on and on, theoretically into infinity. Phi is usually rounded off to 1.618. This number has been discovered and rediscovered many times, which is why it has so many names — the Golden mean, the Golden section, divine proportion, etc. Historically, the number can be seen in the architecture of many ancient creations, like the Great Pyramids and the Parthenon. In the Great Pyramid of Giza, the length of each side of the base is 756 feet with a height of 481 feet. The ratio of the base to the height is roughly 1.5717, which is close to the Golden ratio.

The Pyramids of Giza, built between 2589 and 2504 BC..

Around 1200, mathematician Leonardo Fibonacci discovered the unique properties of the Fibonacci sequence. This sequence ties directly into the Golden ratio because if you take any two successive Fibonacci numbers, their ratio is very close to the Golden ratio. As the numbers get higher, the ratio becomes even closer to 1.618. For example, the ratio of 3 to 5 is 1.666. But the ratio of 13 to 21 is 1.625. Getting even higher, the ratio of 144 to 233 is 1.618. These numbers are all successive numbers in the Fibonacci sequence.

These numbers can be applied to the proportions of a rectangle, called the Golden rectangle. This is known as one of the most visually satisfying of all geometric forms – hence, the appearance of the Golden ratio in art. The Golden rectangle is also related to the Golden spiral, which is created by making adjacent squares of Fibonacci dimensions.
