

# Night sky in spring

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It is said, "No matter how long the winter, spring is sure to follow." And when spring arrives, robins chirp, daffodils bloom, butterflies dance, and the night sky unveil its awesome beauty "at the dead hour of the night, when the world is hushed in sleep and all is still." Spring beckons a new set of stars majestically adorning the heaven as if it is a sublime gallery of arts.

Once again, we will use the Big Dipper (Ursa Major) as the signpost to help us navigate through the myriad of stars and constellations patterned in the sky on a quilt of lights. Starting from the handle of the Dipper, follow the arc of stars outlining the handle away from the bowl until your eyes land on the brilliantly sparkling star Arcturus, the "Guardian of the Bears." This topaz colored red giant, dominating the sky as the fourth brightest star, is at the tail of the kite-shaped constellation Boötes the Herdsman.

Follow the same arc farther to the prominent blue-white colored "gem of a star" Spica in the constellation Virgo the Maiden. With her feet planted on the eastern horizon, Virgo is one of the largest constellations, albeit very nondescript, and Spica is her brightest star. In fact, the brightness of Spica makes it fairly easy to locate the constellation.

West of Boötes is Leo the Lion. The constellation's luminary Regulus the Lion's Heart can be located by using the pointers of the Dipper in reverse. It lies at the base of a group of six stars shaped like a "sickle" or backward question mark that traces the lion's mane. Regulus is regularly occulted by the Moon. To the east of sickle is a right triangle of stars that also belong to Leo. At the eastern point of this triangle is Denebola the Lion's Tail.

Midway between Regulus and Pollux in Gemini is the diminutive group named Cancer the Crab. Centered in this group is a hazy patch of light that binoculars reveal as the Beehive star cluster (nebula) or Praesepe (Latin for "manger"). On the star chart it is labeled as M44. The uppercase M refers to the eighteenth century astronomer Charles Messier who catalogued over one hundred wonders in the sky.

In the direction of Virgo, between



return of her husband Ptolemy III from Assyria. It used to be a star in Leo before; it was later promoted to the rank of a constellation. There are about a dozen beautiful clusters of stars in this constellation. You will need a binocular or telescope to enjoy this wonderland of stars.

Straddled between Arcturus and Vega is Corona Borealis or the Northern Crown. It is home to several binary and two variable stars. Adjacent to the crown is a large region that houses Hercules the Strongman, the fifth biggest constellation in the sky. Right underneath the armpit of Hercules is the northern sky's brightest globular cluster, M13. It is one of nearly 150 known clusters surrounding our galaxy. These riveting beauties become visible in late

spring. Arcturus and Leo, is the constellation Corona Berenices. It is also known as Berenice's Hair, after Queen Berenice II of Egypt who sacrificed her long hair to Aphrodite for the

Return to Ursa Major and locate the second-to-last star in the Dipper's handle. With a binocular, you will see in the middle the most famous binary star Mizar together with its companion Alcor. If the sky is clear and moonless, you will probably see the constellation Canes Venatici, the Hunting Dogs of Boötes, tucked just under the handle of the Big Dipper. The brightest star in this constellation is Cor Caroli, named after the murdered King Charles I of England. Like Mizar, Cor Caroli is a resplendent binary star.

The depth and splendor of the night sky is simply breathtaking. Embellished with thousands of stars, each appearing as a bright pinpoint of light, star gazing is one of the truly remarkable experiences of life. The great 17th century astronomer Kepler remarked: "The treasures hidden in the heavens are so rich that the human mind shall never be lacking in fresh nourishment."

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## BLAZING PUZZLE

### A high energy wonder



Artist's concept of the Hubble Space Telescope viewing ultraviolet light from the jet of the active galactic nucleus of PKS 1424+240.

BLAZARS are the brightest of active galactic nuclei, and many emit very high-energy gamma rays. New observations of the blazar known as PKS 1424+240 show that it is the most distant known source of very high-energy gamma rays, but its emission spectrum now appears highly unusual in light of the new data.

A team led by physicists at the University of California, Santa Cruz, used data from the Hubble Space Telescope to set a lower limit for the blazar's redshift ( $z = 0.6035$ ), which corresponds to a distance of at least 7.4 billion light-years. Over such a great distance, a substantial proportion of the gamma rays should be absorbed by the extragalactic background light, but calculations that account for the expected absorption yield an unexpected emission spectrum for the blazar.

"We're seeing an extraordinarily bright source which does not display the characteristic emission expected from a very high-energy blazar," said Amy Furniss, a graduate student at the Santa Cruz Institute for Particle Physics (SCIPP) at UCSC and first author of a paper describing the new findings. The paper has been accepted for publication in *Astrophysical Journal Letters*.

Source: Science Daily



## OUT OF THE EGG

### Birds linked to dinosaurs?

A small, bird-like North American dinosaur incubated its eggs in a similar way to brooding birds -- bolstering the evolutionary link between birds and dinosaurs, researchers at the University of Calgary and Montana State University study have found.

Among the many mysteries paleontologists have tried to uncover is how dinosaurs hatched their young. Was it in eggs completely buried in nest materials, like crocodiles? Or was it in eggs in open or non-covered nests, like brooding birds?

Using egg clutches found in Alberta and Montana, researchers Darla Zelenitsky at the University of Calgary and David Varricchio at Montana State University closely examined the shells of fossil eggs from a small meat-eating dinosaur called Troodon.

In a finding published in the spring issue of *Paleobiology*, they concluded that this specific dinosaur species, which was known to lay its eggs almost vertically, would have only buried the egg bottoms in mud.

"Based on our calculations, the eggshells of Troodon were very similar to those of brooding birds, which tells us that this dinosaur did not completely bury its eggs in nesting materials like crocodiles do," says study co-author Zelenitsky, assistant professor of geoscience.

"Both the eggs and the surrounding sediments indicate only partial burial; thus an adult would have directly contacted the exposed parts of the eggs during incubation," says lead author Varricchio, associate professor of paleontology.

Varricchio says while the nesting



Darla Zelenitsky from the University of Calgary collaborated with David Varricchio at Montana State University to closely examined the shells of fossil eggs from a small meat-eating dinosaur called Troodon.

style for Troodon is unusual, "there are similarities with a peculiar nester among birds called the Egyptian Plover that broods its eggs while they're partially buried in sandy substrate of the nest."

Paleontologists have always struggled to answer the question of how dinosaurs incubated their eggs, because of the scarcity of evidence for incubation behaviours.

As dinosaurs' closest living relatives, crocodiles and birds offer some insights.

Scientists know that crocodiles and birds that completely bury their eggs for hatching have eggs with many pores or holes in the eggshell, to allow for respiration.

This is unlike brooding birds which don't bury their eggs; consequently, their eggs have far fewer pores.

The researchers counted and mea-

sured the pores in the shells of Troodon eggs to assess how water vapour would have been conducted through the shell compared with eggs from contemporary crocodiles, mound-nesting birds and brooding birds.

They are optimistic their methods can be applied to other dinosaur species' fossil eggs to show how they may have been incubated.

"For now, this particular study helps substantiate that some bird-like nesting behaviors evolved in meat-eating dinosaurs prior to the origin of birds. It also adds to the growing body of evidence that shows a close evolutionary relationship between birds and dinosaurs," Zelenitsky says.

Source: Science Daily



## FISH TREE

### Mapping of fish genome



Fishes account for over half of vertebrate species, but knowledge about relationships among many types of fishes was essentially unknown -- until now.

FISHES account for over half of vertebrate species, but while groups such as mammals, birds and reptiles have been fairly well understood by scientists for decades, knowledge about relationships among many types of fishes was essentially unknown -- until now.

A team of scientists led by Richard Broughton, associate professor of biology at the University of Oklahoma, published two studies that dramatically increase understanding of fish evolution and their relationships. They integrated extensive genetic and physical information about specimens to create a new "tree of life" for fishes. The vast amount of data generated through large-scale DNA sequencing required supercomputing resources for analysis. The result is the largest and most comprehensive studies of fish phylogeny to date. Broughton notes, "The scope of the project was huge in terms of the number of species examined and the number of genes analyzed, and the new patterns of relationships among fish families result in what may be the broadest revision of fish systematics in history."

While some of the findings provide new support for previously understood fish relationships, others significantly change existing ideas. Many different groupings are proposed in this new tree. For example, tunas and marlins are both fast-swimming marine fishes with large, streamlined bodies, yet they appear on very different branches of the tree.

Tunas appear to be more closely related to the small, sedentary seahorses, whereas marlins are close relatives of flatfishes, which are bottom-dwelling and have distinctive asymmetric heads.

Beyond a better understanding of fishes themselves, the potential implications of this research are wide reaching, said Edward Wiley, curator of ichthyology at the University of Kansas. "Our knowledge about one group can be extended to closely related species, if we understand those relationships," Wiley said. He noted that knowledge of evolutionary relationships among fishes improves scientists' ability to predict how closely related species might react to environmental factors such as climate change. It helps identify and target potential biomedically beneficial substances, and has broader applications related to exploring disease-causing genes and developmental processes shared with humans.

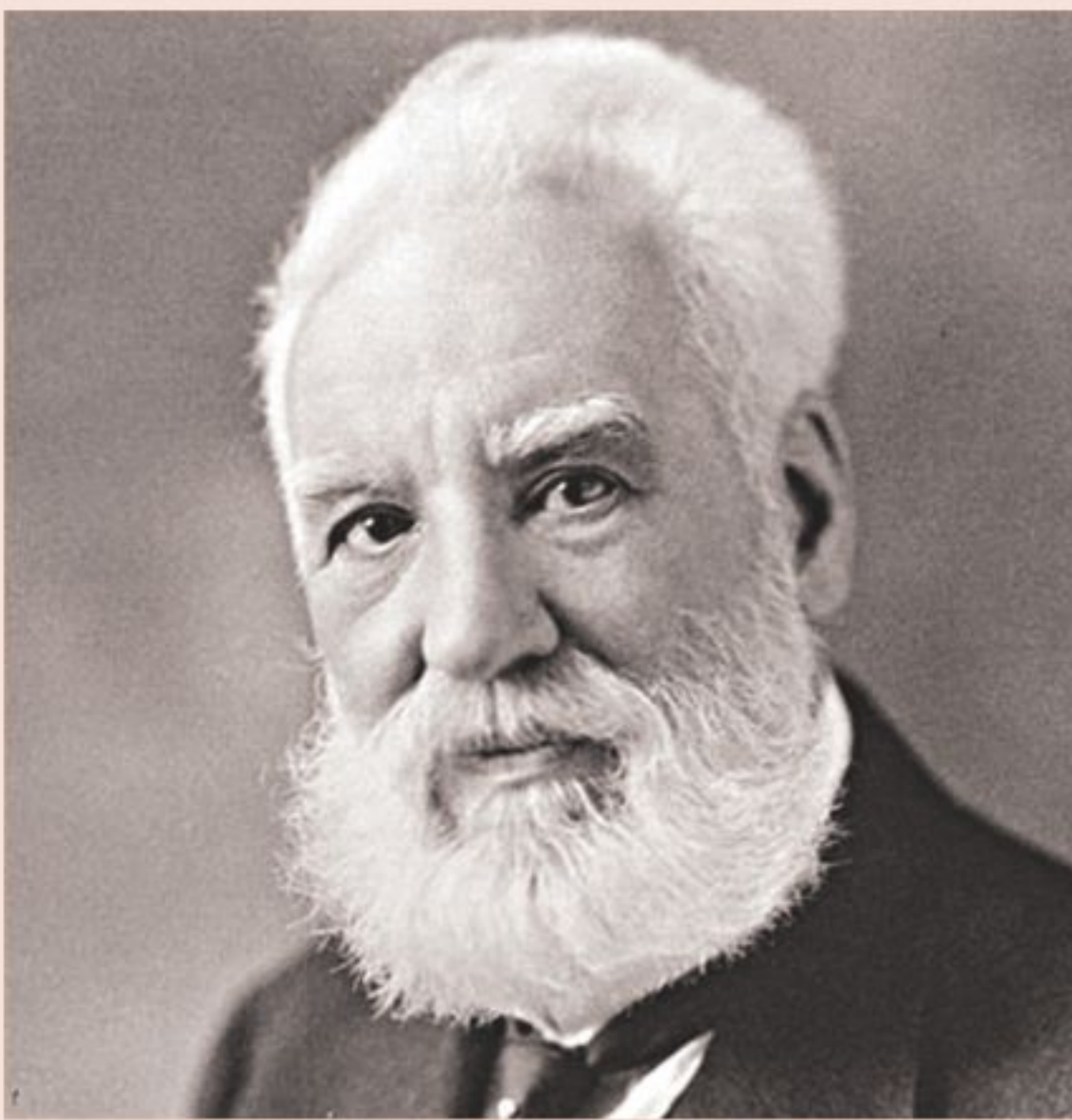
The fish tree is the result of years of work among a collaborative team of scientists as part of the National Science Foundation-funded Euteleost Tree of Life project.

Source: Science Daily



## TELEPHONE MAN

### Discoverer of telephone



Alexander Graham Bell

Alexander Graham Bell is often called the father of the telephone. He was born in Edinburgh, Scotland, moved to Canada in 1870, and later to the USA. He became an expert on the science of speech and his first inventions helped deaf people to hear sounds. During his research, Bell developed a method of transmitting voice messages along a wire. In 1876 he patented the device, which he called the harmonic telegraph. This was the first telephone.

Source: Lony Azad



The Egyptian fruit bat (pictured) uses neurons called place cells to draw mental maps of 3-D spaces.

## WINGED CARTOGRAPHER

### Holy flying fruit bats!

Neurons called place cells help Egyptian fruit bats, *Pteropus aegyptiacus*, navigate three-dimensional spaces, researchers report April 18 in *Science*.

By implanting electrodes in the bats' brains and strapping on lightweight wireless recording devices to their heads, researchers measured neural activity as the animals flew up, down and around a room. Individual place cells perked up when bats zoomed through particular spaces, report Michael Yartsev and Nachum Ulanovsky of the Weizmann Institute of Science in Rehovot, Israel.

Just as spots on a map represent locations, each place cell represented a specific area of the room.

### What is negentropy?

The negentropy, also negative entropy or syntropy or extropy or entaxy, of a living system is the entropy that it exports to keep its own entropy low; it lies at the intersection of entropy and life.

The concept and phrase "negative entropy" were introduced by Erwin Schrödinger in his 1944 popular-science book *What is Life?* Later, Léon Brillouin shortened the phrase



Erwin Schrödinger

to negentropy, to express it in a more "positive" way: a living system imports negentropy and stores it. In 1974, Albert Szent-Györgyi proposed replacing the term negentropy

with syntropy. That term may have originated in the 1940s with the Italian mathematician Luigi Fantappiè, who tried to construct a unified theory of biology and physics.



## DID YOU KNOW?