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Advance in Dating of Interstellar Materials: Grains of Silicon Carbide Older Than Sun Identified

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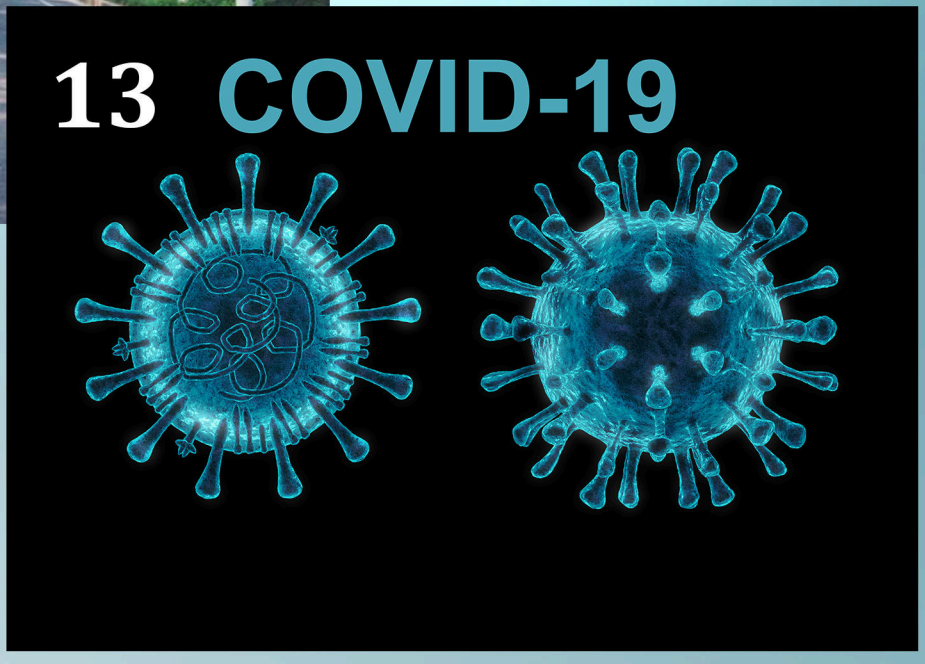
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What Makes Ginkgo *Biloba Live for Thousand* Years

Gingko trees lives for thousands years by evolving compensatory mechanisms to maintain a balance between growth and ageing.

Ginkgo biloba, a deciduous gymnosperm tree native to China is known commonly as health supplement and as herbal medicine.

It is also known for living a very long life.

Some of the Gingko trees in China and Japan are more than thousand year old. Ginkgo is said to be a living fossil. It is the only living species that can live for more than 1000 years defying ageing, the most universal property of living organisms. Hence, Gingko is sometimes referred to be near immortal.

The science behind longevity of such ancient trees has been of immense interest to the longevity research professionals. One such group, after investigating age-related changes in the vascular cambium from 15 to 667 year old Ginkgo biloba trees, has published their findings recently on January 13, 2020 in PNAS.

In plants, reduction in activity of meristem (the undifferentiated cells that give rise to tissue) is associated with ageing. In larger plants like Gingko, the activity of meristem in vascular cambium (main growth tissue in the stems) is the focus.

This group studied the variation in properties of vascular cambium in mature and old Gingko trees at the cytological, physiological, and molecular levels. They found that the old trees had evolved compensatory mechanisms to maintain a balance between growth and ageing.

The mechanisms involved continued cell division in the vascular cambium, high expression of resistance-associated genes, and continued synthetic capacity of preformed protective secondary metabolites. This study gives an insight into how such old trees continue growing through these mechanisms.

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Source(s)

Wang Li et al., 2020. Multifeature analyses of vascular cambial cells reveal longevity mechanisms in old Ginkgo biloba trees. PNAS first published January 13, 2020.
DOI: https://doi.org/10.1073/p-nas.1916548117

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Advance in Dating of *Interstellar Materials:* *Grains of Silicon* Carbide Older Than Sun Identified

Scientists have improved the dating techniques of interstellar materials and identified oldest known grains of silicon carbide on earth. These stardusts are pre-solar in age, formed prior to birth of sun 4.6 billion years ago.

The meteorite, Murchison CM2 fell to earth 50 years ago in 1969 in Murchison, Australia.

The scientists had identified microscopic silicon carbide grains in this meteorite way back in 1987. These Silicon carbide (SiC) (commonly known as carborundum) grains in this meteorite were identified as interstellar in origin but their age could not be ascertained due to technological limitations. Applying astronomical methods for direct dating was impossible nor standard dating methods based on the decay of long-lived radioactive element could be applied.

However, with advances in scanning electron microscopy and 'noble gas mass spectrometry', it has become possible now to date age of silicon carbide grains based on neon (Ne) isotopes produced by exposure of the meteorites to galactic cosmic rays in the grains. The cosmic rays can penetrate the meteorites to reach the SiC grains to leave its marks in terms of formation of new elements such as neon. The longer the exposure to galactic cosmic rays, the higher the concentration of new elements in the SiC grains of the meteorites.

In this study, published on January 13, 2020, the scientists, using the above method, determined cosmic rays exposure ages of 40 silicon carbide grains extracted from the Murchison meteorite.

Based on cosmogenic Neon-21 isotopes in the grains, they found that the grains predates the birth of sun. Few of the grains were in the age range of 7 billion years.

The age range was from 3.9 ± 1.6 Ma (meaning "Mega annum", abbreviation for one-million years) to ~3 ± 2 Ga (meaning "Giga annum", abbreviation for one-billion years) before the start of the Solar System around 4.6 Ga ago.

This meant SiC grains in the Murchison meteorite CM2 are the oldest physical object on the earth pre-dating birth of sun.

The scientists further concluded that currently, ''Neon-21 exposure age dating'' is only viable technique to ascertain age of pre-solar grains in the meteorite.

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{You may read the original research paper by clicking the DOI link given below in the list of cited source(s)}

Source(s)

1. Heck PR et al., 2020: Lifetimes of interstellar dust from cosmic ray exposure ages of presolar silicon carbide. PNAS first published January 13, 2020.
DOI: https://doi.org/10.1073/pnas.1904573117

2. Eugster et al.,-----: Irradiation Records, Cosmic-Ray Exposure Ages, and Transfer Times of Meteorites. Available online at https://www.lpi.usra.edu/books/MESSII/9004.pdf. Accessed on 14 January 2020.

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Xenobots: The First *Living, Programmable* Creature

Researchers have adapted living cells and created novel living machines. Called xenobots, these are not a new species of animals but pure artefacts, designed to serve human needs in future.

If biotechnology and genetic engineering were disciplines promising immense potential of human betterment, then here are 'xenobots', a step forward, a product of interplay of science of computing and developmental biology which are both novel in science and have tremendous possible applications including in medicine and environment sciences.

The new creature, xenobots, were first deigned on a super computer at Universality of Vermont then assembled and tested by biologists at Tufts University.

Computing scientists first created thousands of possible candidate designs for the new life forms using evolutionary set of rules or algorithm. Driven by rules of biophysics, successful designs or simulated creatures were refined further and the most promising designs were selected for testing.

Then the biologists took over in transferring the in silico design to life form. They used the egg cells from the embryos of frog Xenopus laevis (Xenobots, the living robots derives its name from this species of frog) and harvested the stem cells. These harvested stem cells were separated and skin cells and heart muscle cells were cut and joined in close approximation to the designs arrived at earlier.

These assembled, reconfigured life forms were functional - skin cells formed some sort of architecture while the muscle cells could effect coherent locomotion. During the later tests, xenobots were found to have evolved to perform locomotion, object manipulation, object transport, and collective behaviour. Further, the manufactured xenoots could self maintain and self repair as well in the event of damage and laceration.

These computer designed creatures could be used in intelligent drug delivery. They could also help in cleaning up toxic wastes. But, more than

any application, it is feat in science.

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DOI: https://doi.org/10.1073/pnas.1910837117

2. The University of Vermont News 2020. Team Builds the First Living Robots. Published on 13 January 2020. Available on https://www.uvm.edu/u-vmnews/news/team-builds-first-living-robots. ■

Aminoglycosides *Antibiotics Could Be Used* to Treat Dementia

In a breakthrough research, the scientists have demonstrated that aminoglycosides (gentamicin) antibiotic could be used to treat familial dementia

The antibiotics gentamicin, neomycin, streptomycin etc are commonly used to treat bacterial infections. These are broad spectrum antibiotics belonging to aminoglycosides class and are especially active against gram negative bacteria. They act by binding with bacterial ribosomes and inhibit protein synthesis in susceptible bacteria.

But aminoglycosides are also known to induce mutation suppression in eukaryotes to produce full length protein. This is a lesser known function of this antibiotic which has been used in the past to treat several human diseases such as Duchenne muscular dystrophy (DMD) [2]. Now, there is report that this function may be used in treating dementia as well in near future.

In a paper published on 08 January 2020 in the journal, Human Molecular Genetics, the researchers of University of Kentucky have provided proof of concept that these antibiotics may be used to treat frontotemporal dementia [1]. This is an exciting breakthrough in science that has potential to improve quality of lives of several people with dementia.

Dementia is a group of symptoms involving deterioration in ability to perform usual daily activities and is caused due to deterioration in cognitive function like memory, thinking or behavour. It is a major reason of disability and dependency among elderly people worldwide. It affects carers and families as well. According to an estimate, there are 50 million people with dementia worldwide with 10 million new cases every year. Alzheimer disease is the most common form of dementia. Frontotemporal dementia is the second-most common form. This is early onset in nature and affects frontal and temporal lobes of the brain.

The patients with frontotemporal dementia have

progressive atrophy of frontal and temporal lobes of the brain that leads to gradual deterioration of cognitive functions, language skills and personality and behavioral changes. This is heritable in nature caused by genetic mutations. As a result of these genetic mutations, the brain is unable to form a protein called progranulin. The insufficient production of progranulin in the brain in linked to this form of dementia.

In their study, the University of Kentucky researchers have found that if aminoglycoside antibiotics were added to the neuronal cells with progranulin mutations in an in vitro cell culture, they skip the mutation and form full length protein. The progranulin protein level was recovered up to about 50 to 60%. This finding supports the principle that aminoglycoside (gentamicin and G418) hold the treatment possibility for such patients.

Next step would be to move forward from ''in vitro cell culture model'' to ''animal model''. The mutation suppression by aminoglycosides as a therapeutic strategy to treat frontotemporal dementia has come one step closer.

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{You may read the original research paper by clicking the DOI link given below in the list of cited source(s)}

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1. Kuang L., et al, 2020. Frontotemporal dementia nonsense mutation of progranulin rescued by aminoglycosides. Human Molecular Genetics, ddz280.
DOI: https://doi.org/10.1093/hmg/ddz280

2. Malik V., et al, 2010. Aminoglycoside-induced mutation suppression (stop codon readthrough) as a therapeutic strategy for Duchenne muscular dystrophy. Therapeutic Advances in Neurological Disorders (2010) 3(6) 379389.
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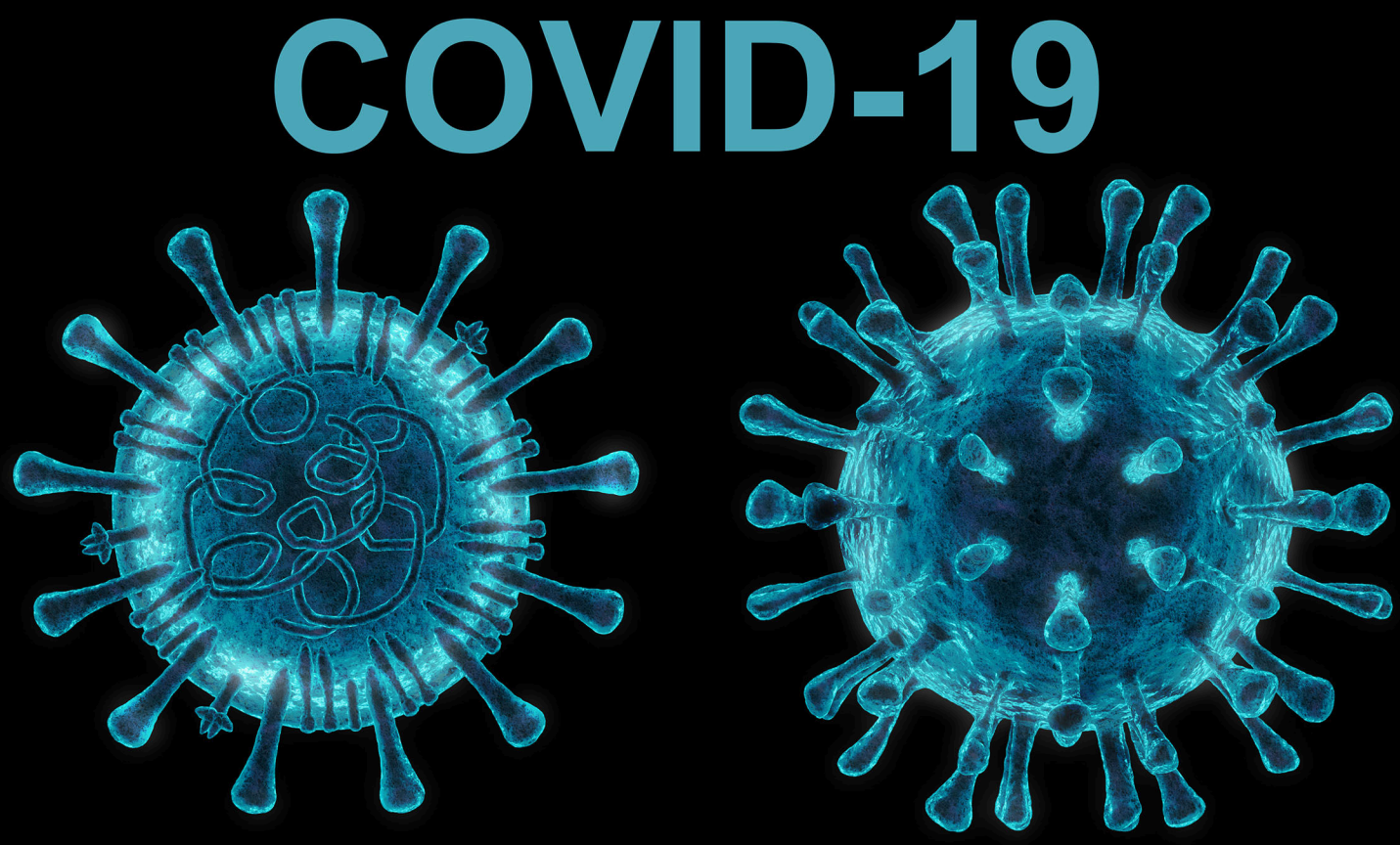
COVID-19: The Novel Coronavirus (2019-nCoV) Given New Name by WHOt

The novel coronavirus (2019-nCoV) has been given new name COVID-19 by the international body WHO which makes no reference to any of the people, places or animals associated with this virus.



The deadly novel coronavirus which has claimed thousands lives so far has been given a new name COVID-19.

The acronym COVID-19 stands for Corona Virus Disease 2019, as this highly infectious disease was first diagnosed last year.

Under international guidelines, the W.H.O. "has to find a name that does not refer to a geographical location, an animal, an individual or group of people, and which is also pronounceable and related to the disease,"

In keeping with this policy to avoid stigmatising, WHO chose the new name COVID-19 which makes no reference to any of the people, places or animals associated with this virus. ■

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