Underground cave system on the moon discovered by NASA's Lunar Reconnaissance Orbiter (I PO) I NASA

HRITHIK KIRAN BAGADE

HEN Neil Armstrong first stepped on the Moon, from Apollo 11's lunar module, on July 20, 1969, his iconic words - "That's one small step for a man, one giant leap for mankind" - were more than a catchiphrase for posterity. They reflected the futuristic fascination that drew the human species to the Moon and beyond, for the purpose of adventure, science, exploration, and at present hypothetic ally-speaking. hypothetically-speaking,

hypothetically-speaking, 'colonisation'.

The Moon, being the Earth's nearest celestial object, has par-ticularly evoked immense inter-est for its sheer majesty, and also as a gateway to further future cosmic odysseys. Accordingly, astrophysicists and the pundits of sci-fi have charted a theoreti-cal roadmap for colonisation of the Moon. The idea is that in the future, humans may live and future, humans may live and work on the moon for weeks or even months. It is a process or concept employed by some pro-

Caves have been found under the Moon's surface, indicating a probable shelter for future researchers, while NASA is already planning a 'Gateway'. Today, human lunar habitation is not just theory, but a serious area for scientific study

ls for robotic or human exposais for roboto or numan ex-ploitation and settlement endeav-ours on Earth's natural satellite. Energy and power will make it possible to travel to and live on the lunar surface. Humans must choose the appropriate energy source and technological means to produce that power. Solar energy is abundant on the moon, and ways must be found to effec-

ergy is abundant on the moon, and ways must be found to effectively harness it.

While a range of proposals for missions of lunar colonisation, exploitation or permanent exploration have been raised, current projects for establishing a permanent crewed presence on the Moon are not for colonisation, but to focus on building moonbases for exploration and to a lesser extent for harnessing lunar resources. In reality, current ly, global space agencies, including India's ISRO, are looking at studying specific regions of the lunar surface, so as to understand the scientific potential that the Moon may unlock, as we dive the Moon may unlock, as we dive

the Moon may unlock, as we dive deeper into space.

When we talk about looking at a suitable perennial energy re-source to run extended lunar missions, in the form of crewed stations, one must also take into account the topography and en-vironment of the Moon. The account the topography and environment of the Moon. The
Moon is not one smooth white/
grey ball of rock. It's surface is
composed of Anorthosite, which
is a calcium-rich white rock, almost entirely made up of plagicolase feldspar, a common, lightweight, light-coloured mineral
on Earth. It is an igneous rock,
which means it cooled and solidified from hot melted material.
Also, the Moon's environment
is not nearly as easy to live in as
Earth's. Apart from the toxic lunar dust, the sparse atmosphere
provides no protection from meteorites or radiation. The temperature fluctuations on the
Moon are also intense, ranging
from -284 to 127 degrees Celsius.
This again leads to the question

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of how can the Moon be made of how can the Moon be made more survivable, begging the need for shelters. In addition to protecting inhabitants from meteorites, radiation and toxic lunar dust, a sealed shelter would all own them to breathe. While the pursued purpose of monbases is mostly for space exploration, exploiting and commercialising the Moon, it also theoretically advocates for a lunar and cis-lunar infrastructure, economy and setinfrastructure, economy and set-tled society. Hence, conditions ought to be appropriated.

Discovery of a cave

In this direction, just this week. In this direction, just this week, a team of international scientists, under the lead of the University of Trento, Italy, have made a breakthrough. They published a paper in Nature Astronomy demonstrating the existence of a tunnel in the lunar subsurface. It seems to be an empty lawa up to the country of for human habitation on the Moon. "These caves have been theorised for over 50 years, but it is the first time ever that we have demonstrated their existence," explains Lorenzo Bruzzone, professor at the University of Trento.

How was this demonstration.

How was this demonstration achieved? Bruzzone explains: "In 2010, as part of the ongoing LRO MASA mission, the Miniature Radio-Frequency (Mini-RF) instrument acquired data that included a pit in Mare Tranquilitatis. Years later we have reanalysed this data with complex signal processing techniques we have recently developed, and have discovered radar reflections from the area of the pit that are best explained by an underground cave conduit. This discovery provides the first direct evidence of an accessible lawa tube under the surface of the Moon." "Thanks to the analysis of the data we were able to create a model of a portion of the conduit," continues Leonardo Carrer, reachieved? Bruzzone explair

DOCUMENTS LOST

l, Smt. Rathnamma

Apollo 11's Buzz Aldrin with the US flag on the Moon | NASA

archer at University of Trento searcher at University of Trento. This study has scientific implications for the development of missions to the Moon, where the environment is hostile to human life. The aforesaid conditions drive the need to find safe sites for the construction of infrastructure that can support sustained exploration. Caves such as this one offer a solution to that problem, the scientists conclude.

ms one other a southern to the southern the scientists conclude.

Breathing on the Moon is out of question. The Moon technically does have an atmosphere, but the gases are so spread out that they do not support breathing.

Experiments on the International Space Station have shown how recycling air systems could be adapted for the Moon. This could look like planting oxygenemitting plants in lunar greenhouses, and then sending the purified air through sealed habitation pods. This would be an entirely new way of life that humans would need to adapt to. Also, producing and storing food to survive long periods in an alien world is key.

How can food be cultivated 384,400 km from our planet, at a place lacking requisite air, soil, or water? Lunar soil does not contain reactive nitrogen, a mineral that is necessary for plant growth. In a 2019 study researchers were able to harvest tomatoes, peas.

radishes, cress, and rye from simradisnes, cress, and rye from simulated lunar soil. Also, greenhouses can simulate Earth-like soil conditions. The said research is able to depict a plausible way how fresh food can be harvested on the lunar surface. Another issue is about watering the crops. While the discovery of detectable molecular water on the near side. molecular water on the near side of the Moon in October 2020 sugof the Moon in October 2020 sug-gests that water may be more widespread, and not limited to the far side and colder regions, it is still to be seen how easily it can be accessed. If this lumar water is clean and easily attainable, it would be much quicker and eco-nomical than shuttling water from Barth. In addition, NASA is currently able to grow food on the scurrently able to grow food on the space station. This promising de-velopment could be replicated in other microgravity environ-ments, such as the Moon.

First lunar station

The future is now NASA and its The future is now NASA and its partners are already developing the foundational systems needed for long-term exploration of the Moon, with the Artemis campaign. 'Following the Artemis III mission that will land the first people near the Moon's South Pole, astronauts on Artemis IV will live and work in humanity's live human was casting. Control with the control of will live and work in humanity's first lunar space station, Gate-way, which will enable new opway, which will enable new op-portunities for science and prep-aration for human missions to Mars. The mission will bring to-gether an intricate choreography of multiple launches and space-craft dockings in lunar orbit, and will feature the debut of NASAS larger, more powerful version of its SLS (Space Launch System) rocket and new mobile launcher."

rocket and new minutes as any NASA.

The Moon is even closer to the Earth today than it actually is. It is technically possible to live on the Moon, say scientists, but many small steps for science and sustainability are needed, before that minute loan. that giant leap.

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Note: Corrigendum & addendum, if any will be published online at https://eproc.punjab.gov.in



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RECRUITMENT NOTIFICATION

Managing Director, Belagavi Smart City Limited, Belagavi called

(1) Internal Auditor - 01. (2) Secretarial Auditor - 01. For further details check our official website: www.bscl.in. Last Date for receipt of application is 31-07-2024 at 5.30 PM.

Sd/- Managing Director,
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W/o B.Srinivasulu. Age 48, H.No. 35, W.No. Srirampura Colony Ballari. It's notified information that original Documents that original Documents which received B.Srinivsulu S/o Pedda Eranna by DC office bearing No. A/Dis/Rev/0380/LND/7071 have been lost on 13.07.2024 at 3.00 PM while going at Near Anjaneyya Temple, Mudragi Village, Complain thas diven If Complaint has given. If anybody found please Contact Near Police Station or 9686084980

PUBLIC NOTICE Agreement/ Sale deed/GPA Extent. Acres Guntas 7 02 SL Sy No. limath Allac Hiremath Veerabhadra 62 Adopted Son of Mr. Karaveerayya. is situated at Kadadi Village, Betageri Hobli, Gadag Taluk, in Gadao District, Karnataka

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Notice is hereby given to all users of Railway lines and premises situated on the completed section of the under noted section of the Indian Railway that the 25,000 Volt 50 Hz AC. Overhead Traction wires will be energized on or after the date specified against the section. On and from the same date the Overhead Traction line shall be trated as "TUP" at all times and no unauthorized person shall approach or work in the proximity of the said

Section	Date	Zone
EMD SHED (Rd.3 to RD 11) at Hubballi	18.07.2024	South Western Railway

Proforma 10 - 02 INDIAN RAILWAYS INTRODUCTION OF 25 KV AC TRACTION

"WARNING TO ROAD USERS"

It is notified for information of the public that in connection with introduction of 25 KV AC Electric Traction on and from the dates mentioned against the following sections of Indian Railway, height gauges have been erected at all the level crossings with clear maximum height of 4.78 meter above road level with a view to prevent loads of excessive height from coming into contact or dangerous proximity to "LIVE" traction wires (Contact Wire), which shall be at a height of minimum 5.5 meter above the rail level at level crossings.

Section	Date	Zone	
EMD SHED (Rd.3 to RD 11) at Hubballi	18.07.2024	South Western Railway	

Public are hereby, notified to observe the height specified above for the purpose of loading Vehicles and to see that loads carried in road Vehicles do not infringe the height gauges under

The Dangers of a load of excessive height are as follows:

Danger to the height gauge and consequent obstruction to the Road as well as the

Kailway ine; ii) Danger to the materials or equipment's carried out or the vehicle itself; iii) Danger of fire and risk of life due to contact with or dangerous proximity to the conductors.

General Manager (Electrical) Rail Vikas Nigam Limited, Bangalore Date: 16.07.2024

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SR NO	Name of the Borrower(s) / Guarantor(s)	Description of Secured Asset (Immovable Property)	Demand Notice Date and Amount	Symbolic possession taken date
1	BRANCH - Dharwad Loan No - SEDARWD0229308 BORROWER - SURESH BETAGERI Co-Borrower - SHIVAKKA SURESH	applicant: SURSH BETAGEN, All the piece and parcel of the immovable Schedule the property bearing Grain Parachysish Nov. 64, shashest at, Managand Vallage, & Al- Mossov Grain Parkingsh, Drawdra Elak, Unavand Bolstnik, Novih Dr. Government Raad, South by: Officer in property of Surelsh Bedger, Esat by: Government Raad, Novih by: Officer of Madulapsia Beddlight, Measurement reseasing East to West 39 F. North to South of 60 Ft. bothly to an extent of 2340 SgH. Statest at whith the 5-bb Regions of Delevation and Post Sgh School Sgh Statest and whith the 5-bb Regions of Delevation and Regions of Boston of Sgh Sgh Statest and whith the 5-bb Regions of Delevation and Regions of Boston of Sgh	02.05.2024 & 623753	11-07-2024
2	BRANCH - Dharwad Loan No - SEDARW00246754 BORROWER - GANGAVVA RUDRAPPA KENCHAPPANAVAR CO-BORTOWEY - RUDRAPPA DEVIDRAPPA KENCHAPPANAVAR	Applicant: GANGAWA RUDBAPPA KENCHAPPAANANAR. All the piece and parcel of the immovable The Schedule property Gram Panchayeth Nox 35423, staated at legar Wilege & Gorm Panchayeth, Dehmend Talak & Debirch North by: Property of Trunsis Schadatth, South by: Property of Montpaya Hawakadir, East by: Property of Dundappa Manavalii, Wics by: Government Read. Measurement measuring East to West 50 F & North South 50 April 10 and extend of 50545. Thousand at within the Sub-Registrar of DHAMMAD and Registration Destrict of DHAMMAD.	02.05.2024 & 218034	11-07-2024
3	BRANCH - Dharwad Loan No - SEDARWD0159731 BORROWER - Ningappa Horakeri Co-Borrower - Tippavva Horakeri	Applicant: Miggippa Horakeri, All the piece and parcel of the Immovable Schesule the Properly Bearing PS, No 8 and PNo 9, situated all rigitionals, Willage, rocalising mit Partchapth, Planned Basic, and Olis, North C. Issubhanas Hoddo, South - Road, East F. Jakkinapa Ravippa Rinorkers Property, Never by 1: Roa an Shankingan Rockers Property, Mousternetter, Inscausing East Ower 16 Feet. North In South 100 Feet, Load 1500 Sp. Steet. Shauted at within the Sub-Registrar of Diamental and Registration District of Throats.	03.02.2024 & 232246	11-07-2024
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