



G E O D E



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University Department of Geology, Ranchi University, Ranchi.

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Perseverance : A Breakthrough in Astrogeology

It is our great opportunity to see the perseverance space craft successfully landed on 18th February (Thursday) 2021. It has proved itself as a giant leap with following features - **PERCY** - the rover installed in perseverance the spacecraft is a car-sized (2m × 2.7m) Mars Rover planned to explore JEZERO Crater on Mars (RED PLANET) as part of NASA's Mars 2020 mission having a life span of ten years. It was manufactured by Jet Propulsion Laboratory and launched on 30th July 2020 at 11.50:00 UTC (12.45 AM IST) through a United Launch Alliance Atlas V 541 rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida, USA. The Mars 2020 mission aims to seek signs of ancient life on Mars by studying the planet's terrain that once held flowing rivers and lakes. This rover is designed for many Firsts:

- Focus on surface based studies of the Martian environment.
- Seeking preserved signs of biosignature in rock samples that formed in ancient Martian environments with conditions that might have been favourable to microbial life.
- Cache rock and soil samples and the Flight Testing.
- Spacecraft will experiment new **EDL** (Entry, Decent and Landing) and **TRN** (Terrain Relative Navigation) technology for the first time.
- The PERCY is the heaviest (1000 Kg) rover powered with Plutonium energy on the Martian Surface.
- Ladden with Robotic arm of 7 feet drilling machine and 25 cameras system including Mastcam-Z to record sensitive videos, audios and pictures.

INGENUITY - the Mars Helicopter is a technology demonstration of the robotic rotor craft planned to

test/scout targets of interest on Mars and help plan the best driving routes for future Mars Mission rovers. It is the first ever helicopter attempting to fly on another planet is a unique marvel of engineering. Ingenuity features four specially made carbon-fibre blades arranged into two rotors that spin in opposite directions at around 2400 rpm many times faster than a passenger helicopter on Earth. It has innovative Solar cells batteries and other components. It is the first Aircraft with controlled flight on another planet. Mars' thin atmosphere makes it difficult to achieve enough lift because of its 99% lesser density than the earth and hence Ingenuity was designed lighter. Ingenuity is a befitting name for the robot which has resulted from extreme creativity efforts.

JEZERO - the crater on the Red Planet Mars is located at 18.38°N, 77.58°E in the Syrtis major quadrangle. The diameter of the crater is about 49.0 Km thought once to have been flooded with water, the crater contains a fan-delta deposit rich in clays and Carbonates/Hydrous Sulphates etc. The landing site of Mars Mission 2020 hosts a fossilized ancient crater lake, the only location on Mars where clear orbital detection of clays and carbonates are found in the close proximity to landing site. It offers geologically rich terrain with landforms dating upto 3.6 billion yrs and may revolutionize our knowledge of Mars and its ability to harbour life.

The field of Astrogeology (Planetary Science) is bound to gain much more momentum with this marvellous space experiments.

----- **Chief Editors' Desk**

- **Honours and Achievements:**

1. An MoU with Atomic Minerals Directorate for Exploration and Research (AMDER), Department of Atomic Energy (DAE), Government of India has been signed on 23th Feb 2021 at University Department of Geology, Ranchi University in the august presence of Vice-Chancellor, Registrar and Dean Student Welfare, Ranchi University, Ranchi.

2. Ms. N. P. Tirkey, Assistant Professor, University Department of Geology, Ranchi University has given a synopsis seminar on 20th Feb. 2021 for Ph.D. registration under the Supervision of Dr. Bacha Ram Jha.

3. The 34th Convocation ceremony has been celebrated on 01st March 2021. The honorable Vice-chancellor has awarded Ph.D./M.Sc. degree to the following students of this Department:

- Dr. Chanchal Lakra and Dr. Sanjog Kumar Choudhary have received their Ph.D. degree.
- Mr. Siddharth Sarkar (2018-2020) has received a Gold medal and M.Sc. degree certificate.

- **Field/Research Visit:**

- Ms. Alisha Priyal Minz (Research Scholar) has visited the Gurabandha Block, East Singhbhum, Jharkhand from 24th Feb - 28th Feb 2021.

- **GLOBAL NEWS:**

- **Scientists Discover Martian Mineral (Jarosite) Found Locked in Deep Ice Cores of Antarctica:**

Jarosite has been found in the ice cores that were extracted from Antarctica by a team of international researchers recently. A paper was published in the Nature Communications then that described in detail about it. Jarosite is a family of iron-hydroxy sulphate minerals generally



Representative image: Ice shelves in Antarctica. (Jeremy Harbeck/NASA)

occurring in acidic, sulfate-rich environments. These are also found in mining and ore processing wastes. As per the research, the end-member jarosite consists of potassium and has the chemical formula of $KFe_3(SO_4)_2(OH)_6$. The extensive element substitution process occurs in the crystal structure for potassium, iron, and sulfur. Jarosite group minerals also include ammoniojarosite, argentojarosite, natrojarosite, and plumbojarosite, in which ammonium, silver, sodium, and lead, respectively, substitute for potassium. Environments in which jarosite group minerals commonly form as secondary minerals include the oxidized zones (gossans) of sulfide ore deposits, areas of acid mine drainage, and acidic soils. As per a study, this mineral is rarely found on Earth but is quite abundant on Mars as there is a large amount of dust on the red soil. Jarosite is also formed as a by-product of purification and refining of zinc. Significance of the discovery: On our planet mixing of sulfuric acid with groundwater results in the formation of jarosite. Although, the right balance of these situations is necessary for its formation to occur. In case, the ratio changes this same mineral transform into goethite. The space scientists were perplexed to find jarosite on Mars as it lacked the required conditions. Now the mineral has been found submerged in the icy core of Antarctica. There has been another theory suggesting that jarosite may have been formed from the dust trapped in ice deposits on Mars.

These conditions are similar to those discovered in Antarctica. A team of scientists embarked on its mission with the main objective to study minerals in deep ice cores. This would have helped them to understand the ice age cycles. It was led by the researchers of the University of Milano-Bicocca in Italy. While the team was investigating a 5,315-foot deep ice core or TALDICE based in Talos Dome of East Antarctica, they stumbled upon a unique and different mineral that was rarely found on Earth. The team then studied this yellow-brown substance-using various techniques like X-ray absorption testing and electron microscopy to confirm that it is indeed jarosite.

-Courtesy: Jagran Josh

- **Dinosaur Fossil of a Titanosaur Discovered in Argentina May Belong to the Largest Land Animal Ever:**



The dig team uncovering fossils of the 98 million-year-old titanosaurs in Neuquén Province, Argentina. (Photo: Alejandro Otero and José Luis Carballido/CONICET)

The region of Patagonia is known for its beautiful vistas; but among paleontologists, the region is also known for its fossils. Rich deposits of bones have revealed the presence of giant dinosaurs who once walked the river deltas of the region. A recent paper published in Cretaceous Research has announced an exciting new find from the Neuquén Province in Argentina, which lies in the northwest part of Patagonia. Years of careful excavation have revealed vertebrae and pelvic bones belonging to a mysterious, giant sauropod- a type of dinosaur with a long neck, long tail, and four legs. The researchers plan to continue digging for the rest of the

skeleton, but they are already suggesting this may be the largest animal that ever walked on Earth. The newly announced fossils were discovered in a rock formation called the Candeleros Formation which formed from sediment in a river flood plain during the Upper Cretaceous period about 98 million years ago. The fossil was discovered in 2012, and excavations began in 2015. According to a statement made by Dr. Jose Luis Carballido (one of the authors of the recent paper), “the specimen is terrific, because it is practically articulated and we have more than half of the tail, many hip bones and, obviously, the specimen is still [in] the rock, so we are going to have a few more years of excavations.” So far, the team has uncovered 24 vertebrae from the beast's tail as well as parts of the pelvic and pectoral girdles. Although excavations are not complete, the bones which have been excavated suggest an enormous dinosaur. According to Dr. Alejandro Otero- the bones are “between 10 and 20% bigger” than the corresponding fossils of the largest dinosaurs previously documented. It is not yet clear if the new fossil is a member of a known species or a yet-undefined new one. However, it is clearly a type of titanosaur. A titanosaur is a type of sauropod which has been discovered in fossil beds around the world; the largest known individuals have been found in Patagonia. A type known as the Patagotitan weighed in at 77 tons, while the Argentinosaurus reached 110 tons and up to 40 meters (131 feet) in length. While paleontologists will need to excavate a femur or humerus bone from the new fossil to estimate its weight, the ancient dinosaur seems to have towered over the other inhabitants of the region. More exciting discoveries can be expected as the fossil continues to emerge from the earth.

-Courtesy: My Modern Met

- **NATIONAL GEOLOGICAL NEWS**

- **Potash mining to open a new chapter for Rajasthan:**



Pic Credit: The Times of India

After oil, gas and silver, Rajasthan is now set to open a new chapter with potash, chief minister Ashok Gehlot said while chairing a virtual meeting organized for signing an agreement with state PSU Rajasthan State Mines and Mineral Ltd (RSMML) and Mines Exploration Corporation Ltd (MECL), under Union ministry of mines. The agreement will allow MECL to undertake a pre-feasibility study of potash mines in Hanumangarh where preliminary estimates of two blocks done by Geological Survey of India has found reserves of 220 million tonne. Addressing the meeting, which was also attended by Union coal and mines minister Prahlad Joshi and heavy industries and public enterprises minister Arjun Ram Meghwal, Gehlot said that he had announced exploration of potash in the state as the country fully depends on imports for its requirements. “Rajasthan is the only state where potash has been found by GSI. The exploration by MECL with new technologies will positively find the mineral and we will be able to achieve the dream,” said Gehlot. He also drew attention to his recent meeting with Vedanta Resources chairman Anil Agarwal where the focus was on exploration of minerals in the state. “We want to explore the minerals in all of Rajasthan and MECL can also play a role,” added Gehlot. Joshi in his speech said that GSI in its early estimate has found availability of 2500 million tonne potash in

the whole basin and there is a direction in Rajasthan to estimate the reserves and start mining. He also highlighted the reforms measures undertaken at the Centre for growth of the mining sector. Drawing attentions to benefits, Union minister Meghwal said that mining of potash will create opportunities for several ancillary industries that will generate employment and livelihood opportunities for large number of people. Potash is used for mainly making fertilizer and the country does not produce the commodity. Ajitabh Sharma, principal, secretary, mines and petroleum, said, “This has set example in the country for harnessing the deep-seated mineral deposits to attain self-sufficiency. There are around 25 minerals on which Indian import dependent. This sort of studies will pave the way for reducing import dependency for other mineral also.” Most of the Potash deposits of Rajasthan are identified in Nagore-Ganganagar basin of Rajasthan covering part of Sriganganagar, Hanumangarh and Bikaner districts.

-Courtesy: Time of India

- **Spike in uranium in Agri borewells around Andhra's Kadapa basin:**



APPCB member secretary Vivek Yadav confirmed receipt of MECON's hydrogeological investigation report

A study by a state-owned metallurgical and engineering consultant has found a spike in uranium, sodium and other salts of uranium ore body in the agriculture borewells of villages in Kadapa basin of Andhra Pradesh that houses

• **STATE GEOLOGICAL NEWS:**

- **Tata Steel installs 4km piped conveyor at coal mines in Jharkhand, India:**



The Long Pipe Conveyor installed by Tata Steel at West Bokaro. (Credit: Tata Steel.)

Tata Steel, one of India's privately-owned steel companies, has announced the installation of a new 4km Long Pipe Conveyor (LPC) at its opencast coal mines at West Bokaro Division in the state of Jharkhand. The LPC system will bring coal and by-products from the washeries to the Chainpur railway siding. It is driven by controlled start transmission drives and includes a steel cord belt with fire resistant properties. Tata Steel claims that the new pipe conveyor will have zero spillage and also be noiseless. The maintenance staff and all necessary equipment will be borne by two maintenance trolleys atop the conveyor. The installation of the new conveyor will replace the over 60 years old mono cable and bi-cable ropeway system, driving productivity at its mines. Tata Steel CEO and managing director T.V. Narendran said: "Implementation of best-in-class technologies and sustainable practices are critical success factors for mining operations. The Long Pipe Conveyor would improve the productivity and help in reducing the environmental footprint in coal logistics, significantly." The company

further said that the single unit has the capacity to handle both coal and by-product grades and can carry loads of up to 1,200 tonnes per hour, making it cheaper and safer than road and ropeway transport. The enclosed structure is also expected to result in zero material degradation along the way. Last November, the company announced plans for a CO₂ project capture for its blast furnaces in IJmuiden, Netherlands. The captured CO₂ is planned to be transported for storage in empty gas fields under the North Sea.

-Courtesy: NS Energy

- **JSW wins iron, manganese ore mining lease in Jharkhand:**



(PicCredit: Dailyhunt)

India's JSW Steel has received the mining lease to an iron and manganese ore deposit in Jharkhand state, where it plans to build a 10 million tpy steel plant. The latest round of approvals allows JSW Steel to mine 999.9 ha in the Ankua reserved forest in West Singbhum district, the mines ministry said. The mines allotted to JSW Steel are estimated to have iron ore reserves in excess of 300 million tonnes with iron content of more than 63%.

-Courtesy: Metal Bulletin

"Geology gave us the immensity of time and taught us how little of it our own species has occupied".

-Stephen Jay Gould

Research Scholars of the Department

<p>Name: Shyam Lal Singh DOB: 04.08.1986 Date of Registration: 28.06.2016. Topic: Geological aspects of soil genesis and study of enrichment of soil composition due to generation of biomass through ChakriyaVikas Pranali in parts of Palamu and Latehar Districts, Jharkhand. Supervisor: Dr. P. K. Verma</p>		<p>Name: Rosh Anshu Mala Toppo DOB: 23.06.1991 Date of Registration: 19.01.2019 Topic: Geology of Mica Deposit in Koderma District and Adjoining Areas with Special Reference to Gem Minerals Supervisor: Dr. Bijay Singh</p>	
<p>Name: Anup Kumar Sinha DOB: 11.10.1985 Date of Registration: 26.04.2018 Topic: Petrographic and Chemical Observations of Raham Block Coals of North Karanpura Coalfield, District Chatra, Jharkhand, India: Their Implication to Ascertain Paleoenvironment. Supervisor: Dr. Bacha Ram Jha</p>		<p>Name: Vikram Yadav DOB: 14.10.1994 Date of Registration: 05.09.2020 Topic: Study of The Petrographic Nature and Chemical Properties of The Coal Seams of Dhori Area, East Bokaro Coalfield With Special Reference to Their Depositional Environment and Utilisation Potentiality, District-Bokaro, Jharkhand. Supervisor: Dr. Bacha Ram Jha</p>	
<p>Name: Neha Dadel DOB: 08.07.1988 Date of Registration: 11.08.2018 Topic: Petrographical and Chemical Characteristics Coals from Chalkari Area, East Bokaro Coalfield and Their Implication on Coal Bed Methane Potentiality. With Special Reference to Their Depositional Environment and Utilisation Potentiality, District Bokaro, Jharkhand Supervisor: Dr. Bacha Ram Jha</p>		<p>Name: Alisha Priyal Minz DOB: 09.04.1994 Date of Registration: 05.09.2020 Topic: Geology of Gurabanda Area, District-East Singhbhum With Special Reference to Gemstone Occurrences Supervisor: Dr. Bijay Singh</p>	
<p>Name: Nikita Bhagat DOB: 01.02.1992 Date of Registration: 16.08.2018 Topic: A Study of Geogenic and Anthropogenic causes of water pollution in North Koel Basin and its tributaries in Latehar and Palamu districts. Jharkhand. Supervisor: Dr. P.K Verma</p>		<p>Name: Shashank Kumar DOB: 13.07.1989 Date of Registration: 05.09.2020 Topic: Hydrogeochemical study of Groundwater regime around Baliapur, district Dhanbad Jharkhand with reference to fluoride contamination. Supervisor: Dr. Bijay Singh</p>	
<p>Name: Sapna Xaxa DOB: 10.03.1992 Date of Ph.D. Registration: 13.10.2018 Topic: Nature and Genesis of Auriferous Mineralization at Parasi Area (Tamar Block) District- Ranchi, Jharkhand, India Supervisor: Dr. Bijay Singh</p>		<p>Name: Amrit Kumar Behra DOB: 24.04.1996 Date of Registration: 05.11.2020 Topic: Geohydrological Assessment of Groundwater of the coastal aquifers around Dasarathpur Block, Jajpur District, Orissa Supervisor: Dr. Bijay Singh</p>	