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# TODAY'S ANALYSIS

## (21 January 2025)

### TOPICS TO BE COVERED

- DARK OXYGEN
- PLANET PARADE
- EXERCISE LA PEROUSE
- MCQs



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## DARK OXYGEN



### Background: The Discovery of Dark Oxygen:

For a long time, scientists believed that **oxygen** could only be produced through **photosynthesis**, which depends on **sunlight**. However, a new discovery has changed this understanding.

- **What Was Found?:**
  - Scientists found that **metal lumps** (called **nodules**) on the **ocean floor** are capable of producing **oxygen** in total **darkness**.

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- This process happens through **electrolysis**, where the metal lumps break down **seawater** into **hydrogen** and **oxygen**.
- **Why It Matters:** This finding challenges the belief that **sunlight** is necessary for **oxygen** to be created and opens up new possibilities for understanding how **oxygen** can exist in dark places, both on **Earth** and on other **planets**.

## THE ROLE OF METAL NODULES IN OXYGEN PRODUCTION

- **What Are Metal Nodules?:**
  - These are naturally occurring lumps of **metal** found on the **ocean floor**, especially in regions like the **Clarion-Clipperton Zone**, located between **Hawaii** and **Mexico**.
  - These nodules are formed when **metals** dissolved in **seawater** collect over millions of years around **debris** such as **shells** and **rocks**.
- **How Do They Work?:**
  - The **metal nodules** create an **electric current** that breaks down **seawater molecules** through a process called **electrolysis**.
  - This results in the production of **hydrogen** and **oxygen** gases—creating **oxygen** in deep, dark parts of the **ocean**, where **sunlight** cannot reach.

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- This process was first observed at a depth of **5 km** (3.1 miles) below the ocean surface.

## SCIENTIFIC REACTIONS & CONTROVERSIES

- The research team published their findings in **Nature Geoscience** in **2024**.
- The discovery sparked a worldwide debate among **scientists**. Many were skeptical, as **oxygen production** in the deep, dark ocean was thought to be impossible without **sunlight**.
- Some **scientists**, like **Michael Clarke** from the **Metals Company** (a **Canadian deep-sea mining company**), questioned the research.
- They suggested that the **oxygen** observed was simply **gas bubbles** created during the sampling process, not actual **oxygen** produced by the **nodules**.
- They also raised concerns about the methods used in the experiments.
- **Prof. Sweetman** and his team defended their findings, arguing that **they had ruled out the possibility of bubbles interfering with their measurements**.
- They are now conducting further experiments to prove that the **nodules** are indeed producing **oxygen**.

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## SIGNIFICANCE FOR LIFE ON EARTH & BEYOND

- The discovery of **oxygen** production in the deep ocean without **sunlight** could change how we think about **life** on **Earth** and elsewhere in the universe.
- The process of **oxygen generation** in the deep ocean suggests that similar processes might exist on other **planets** or **moons**, such as **Europa** (a **moon of Jupiter**) or **Enceladus** (a **moon of Saturn**), where there are **subsurface oceans**. **Life** could potentially exist there, even without **sunlight**.
- If **oxygen** can be produced in these dark, deep environments, it may provide the right conditions for **microbial life** to survive on distant **planets**. **Prof. Sweetman's** team is collaborating with **NASA** to explore whether such processes could support life on other worlds.

## DEEP SEA ECOSYSTEM & SEABED MINING

- The discovery comes at a time when companies are exploring **deep-sea mining** to extract **metal-rich nodules** from the **ocean floor**.
- These **nodules** contain important **metals** like **nickel**, **cobalt**, and **copper**, which are used to make **batteries** for **electric vehicles** and **renewable energy systems**.

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- **Environmental Impact:** There are concerns that **mining** these **metal nodules** could harm delicate ecosystems at the ocean's depths. The **oxygen-producing process** is thought to play a key role in supporting **life** in these ecosystems, and disturbing the **nodules** could have serious **environmental effects**.
- More than **900 marine scientists** from **44 countries** have signed a petition calling for a pause in **deep-sea mining**.
- They argue that more research is needed to understand the potential **environmental risks** before mining can take place.

## RESEARCH PLANS & EXPLORATION

- **New Research Mission:** **Prof. Sweetman** and his team are planning further research trips to study **oxygen production** at even deeper parts of the ocean—at depths greater than **10 km** (6.2 miles)—using specially designed **submersible vehicles**.
- **Collaborations with NASA:** The team is also working with **NASA** experts to investigate whether similar **oxygen-producing processes** might be occurring on **moons** and **planets** in our solar system.
- Their goal is to see if **microbial life** could exist in **subsurface oceans**, such as those beneath the icy crusts of **Europa** or **Enceladus**.

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## PLANET PARADE



### What is a 'Planet Parade'?

- A '**planet parade**' occurs when several **planets** in our **solar system** are visible in the **night sky** at the same time.
- It is not an official term in **astronomy**, but it refers to a rare event when multiple **planets** can be seen aligning or forming an arc across the sky.
- A **radio astronomer** and in-charge of the SciPOP outreach program at the **Inter-University Centre for Astronomy & Astrophysics (IUCAA)**, explains that **planets** move at different speeds across the sky, and sometimes they align, allowing us to see many of them at once.

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- This can occur either in the **morning sky** or the **evening sky**.

## CURRENT PLANET PARADE

- For the past few days, **four planets** — **Venus, Saturn, Jupiter, and Mars** — have been visible to the **naked eye**.
- **Uranus** and **Neptune** are also visible, but require a **telescope** or even a **pair of binoculars** to be seen.
- These 6 **planets** are forming a **breathtaking arc** across the night sky, providing a spectacular viewing experience for **skywatchers**.

## ARE PLANET PARADES RARE?

- **Planet parades** are not extremely rare. According to **NASA**, these multi-planet viewing **opportunities don't happen every year**, but they are **not a once-in-a-lifetime event either**.
- The last such **planet parade** occurred in **May-June 2024**, when **all the planets** of the solar system were visible in the **morning sky**.
- This **current event** has been ongoing since **December**, and **it's not a one-day phenomenon**.

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- In fact, **Mercury**, the **fifth planet** visible to the naked eye, will appear in the **evening sky** after **February 20**.
- **Alignment of planets** is often talked about, but according to **NASA**, there is nothing special about the way planets appear to align.
- The **alignment** is simply due to the **plane of the solar system**, causing planets to always appear in a sort of line.

## HOW TO VIEW THE PLANETS?

- There are **eight planets** in the solar system: **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Neptune, and Uranus**.
- Of these, **five planets** can be seen with the **naked eye** — **Venus, Mars, Jupiter, Saturn, and Mercury** (which will be visible later). The other two, **Neptune and Uranus**, require a **telescope** or **binoculars** to be seen clearly.
- **Planets** are generally visible a few hours after **sunset**, when the sky is dark enough. **Clear skies** and the **absence of light pollution** are ideal for viewing.
- This is why the best places to observe the planets are areas far from **cities** and **towns**.
- To distinguish between **planets** and **stars**, look for **twinkling**.

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- **Stars** twinkle, while **planets** shine with a constant brightness. Planets are usually also brighter than **stars**.
- There are now many **mobile apps** and **websites** available to help identify the exact locations of celestial bodies in the sky.



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# EXERCISE LA PEROUSE

## Overview of INS Mumbai's Participation

- **INS Mumbai**, an indigenously designed and built guided missile destroyer, is participating in the **5th edition** of the **Multinational Exercise LA PEROUSE**.
  - The first edition of La Pérouse joint exercise, initiated by France in 2019.
- The exercise, which began on **January 16**, will continue till **January 24**.

## PARTICIPANTS

- This exercise will include participation from **naval personnel**, **surface assets**, and **sub-surface assets** from various maritime nations, including:
  - **Royal Australian Navy**
  - **French Navy**
  - **Royal Navy (UK)**
  - **United States Navy**
  - **Indonesian Navy**
  - **Royal Malaysian Navy**
  - **Republic of Singapore Navy**
  - **Royal Canadian Navy**

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## OBJECTIVE OF THE EXERCISE

- The **primary goal** of LA PEROUSE is to develop **Maritime Situational Awareness** by improving cooperation in areas such as:
  - **Maritime surveillance**
  - **Maritime interdiction operations**
  - **Air operations**
- The exercise also focuses on **training, progressive learning, and information sharing** among participating navies.
- It provides an opportunity for these **like-minded navies** to strengthen **planning, coordination, and information exchange**, enhancing their **tactical interoperability**.

## TYPES OF EXERCISES

- **LA PEROUSE** will feature **complex and advanced multi-domain exercises**, including:
  - **Surface warfare**
  - **Anti-air warfare**
  - **Air-defense**

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- **Cross-deck landings**
- **Tactical maneuvers**
- Additionally, **constabulary missions** like **VBSS (Visit, Board, Search, and Seizure)** operations will be conducted to enhance operational readiness in maritime security tasks.

### **Significance of Indian Navy's Participation**

- The participation of the **Indian Navy** in the exercise demonstrates the high levels of **synergy, coordination, and interoperability** between the **Indian Navy** and other **like-minded navies**.
- It also highlights their commitment to a **rules-based international order** in the **maritime domain**.

### **Alignment with India's Vision of SAGAR**

- This exercise aligns with **India's vision of SAGAR (Security and Growth for All in the Region)**, which focuses on enhancing **maritime cooperation and collaboration**.
- It emphasizes the importance of ensuring a **safer and secure Indo-Pacific region**, promoting peace and stability in the region through greater **cooperation** among navies.

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## MCQs

1. Which of these is a possibility of outcomes of discovery of dark oxygen?

1. Possibility of extraterrestrial life.
2. Microbial proliferation.

- (A) Only 1  
(B) Only 2  
(C) Both 1 & 2  
(D) neither 1 nor 2

**Ans. (C)**

2. Consider the following statements wrt Dark Oxygen & mark the correct one:

1. Dark Oxygen is produced by some varieties of plants in absence of light.
2. Discovery of Dark Oxygen has posed questions about the generation of Oxygen by plants in presence of sunlight.

- (A) Only 1  
(B) Only 2  
(C) Both 1 & 2  
(D) Neither 1 nor 2

**Ans. (B)**

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3. Consider the following statements wrt Planet parade and mark the correct one:
1. A planet parade occurs when several planets in our solar system are visible in the night sky at the same time.
  2. It is an official term in astronomy.

- (A) Only 1  
(B) Only 2  
(C) Both 1 & 2  
(D) Neither 1 nor 2



**Ans. (A)**

4. Consider the following statements and mark the correct one:
1. Planet parade is an annual phenomenon.
  2. Planet Parade is a one day phenomenon.
- (A) Only 1  
(B) Only 2  
(C) Both 1 & 2  
(D) Neither 1 nor 2

**Ans. (D)**

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5. Which of these countries' Navy is not participating in the La Perouse naval exercise?

- (A) Australia
- (B) UK
- (C) Germany
- (D) Indonesia

**Ans. (C)**



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