Dimensions of Colours

Source: TH

Why in News?

Colour profoundly shapes contemporary human life by enriching the **aesthetic and symbolic aspects** of our surroundings, embracing **cultural diversity** in its interpretation, and deepening our comprehension of the world and our role within it.

What are Colours?

- **About:**
  - Colour is the result of processing **electromagnetic radiation** by the human visual system.
  - **Cone cells** in the **human eye** detect and transmit information about **light wavelengths to the brain,** allowing for the perception of colour.
  - **Humans possess three types of cone cells,** enabling **trichromatic vision,** while some animals, like birds and reptiles, have four cone types (tetrachromats).
    - Human vision is limited to **wavelengths range** from 400 nm to 700 nm **(visible light)** while **honeybees can also 'see' ultraviolet light** and **mosquitoes and some beetles** can access information in **wavelengths of infrared radiation** (Humans sense it as heat).
- **Science of Colours:**
  - **Traditional colour theory,** which emphasises combining **3 primary fixed colours (red, green, and blue)**, to make other colours.
  - **Modern colour theory argues** that all the **colours can be produced by combining any three colours** in different ways.
- **Two Ways of Rendering Colours:**
  - **Additive Colouring:** Mixing light wavelengths to produce different colours, as seen in electronic displays like smartphone screens and TVs, utilising the RGB colour space.
  - **Subtractive Colouring:** Achieving colours by subtracting **specific wavelengths from white light**, commonly done with dyes, pigments, and inks.
- **Properties of Colour:**
  - **Hue:** Degree of similarity or difference to standard colours like red, orange, yellow, etc., influencing the perceived colour.
  - **Brightness:** Related to an object's luminance, reflecting the amount of light emitted or reflected.
  - **Lightness:** Perception of an object's brightness compared to a well-lit white object.
  - **Chromaticity:** Perception of colour quality irrespective of lighting conditions.
- **Significance of Colour:**
  - Colour significantly impacts how humans **perceive and interact with the world around them.**
  - Colour influences various aspects of **human culture,** including art, social hierarchy, philosophy, trade, innovation, symbolism, politics, religion, and responses to phenomena like climate change **(**Green washing**).**
  - Both natural phenomena and **human-made objects like paintings,** gain **aesthetic appeal** and convey symbolic significance through colour.

    - Certain colours convey **universal messages (e.g., red as a stop sign).**
- **Examples of Colour's Impact:**
    - Archaeological evidence suggests **early human societies used** ochre pigment for cultural practices, indicating their intelligence and artistic expression.
    - **Blue** LEDs **revolutionised industries** by completing the RGB colour space, enabling energy-efficient lighting solutions and advancements in consumer electronics.

Why do Patterns and Colours Appear When We Close Our Eyes?

- The appearance of patterns and colors when eyes are closed or in a dark room is an **entoptic phenomenon** called closed eye **visualization or phosphenes.**
- As part of normal cellular function, atoms in the **retina absorb** and **emit tiny particles** of photons, and the optic nerve relays these light signals to the brain.
- Even in the **absence of** photons**,** neurons in the thalamus, visual cortex, and retina are always active and can **activate other visual neurons** and creating patterns and colors.
- Depending on where a **phosphene originates** (retina, thalamus, or visual cortex), it can take on various shapes, patterns, and colors.
- Phosphenes can also be generated by mechanical stimulation, metabolic stimulation like **(low** blood pressure), magnetic or electrical stimulations, and certain drugs like psilocybin.
- When the brain cannot make **sense** of the reconstructed image, it quickly **labels** it as a phosphene.

Read more: Camera Shows How Animals See Motion.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims:

Q. Rainbow is produced when sunlight falls on drops of rain. Which of the following physical phenomena are responsible for this? (2013)

1. Dispersion
2. Refraction
3. Internal reflection

Select the correct answer using the codes given below:

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans:(d)