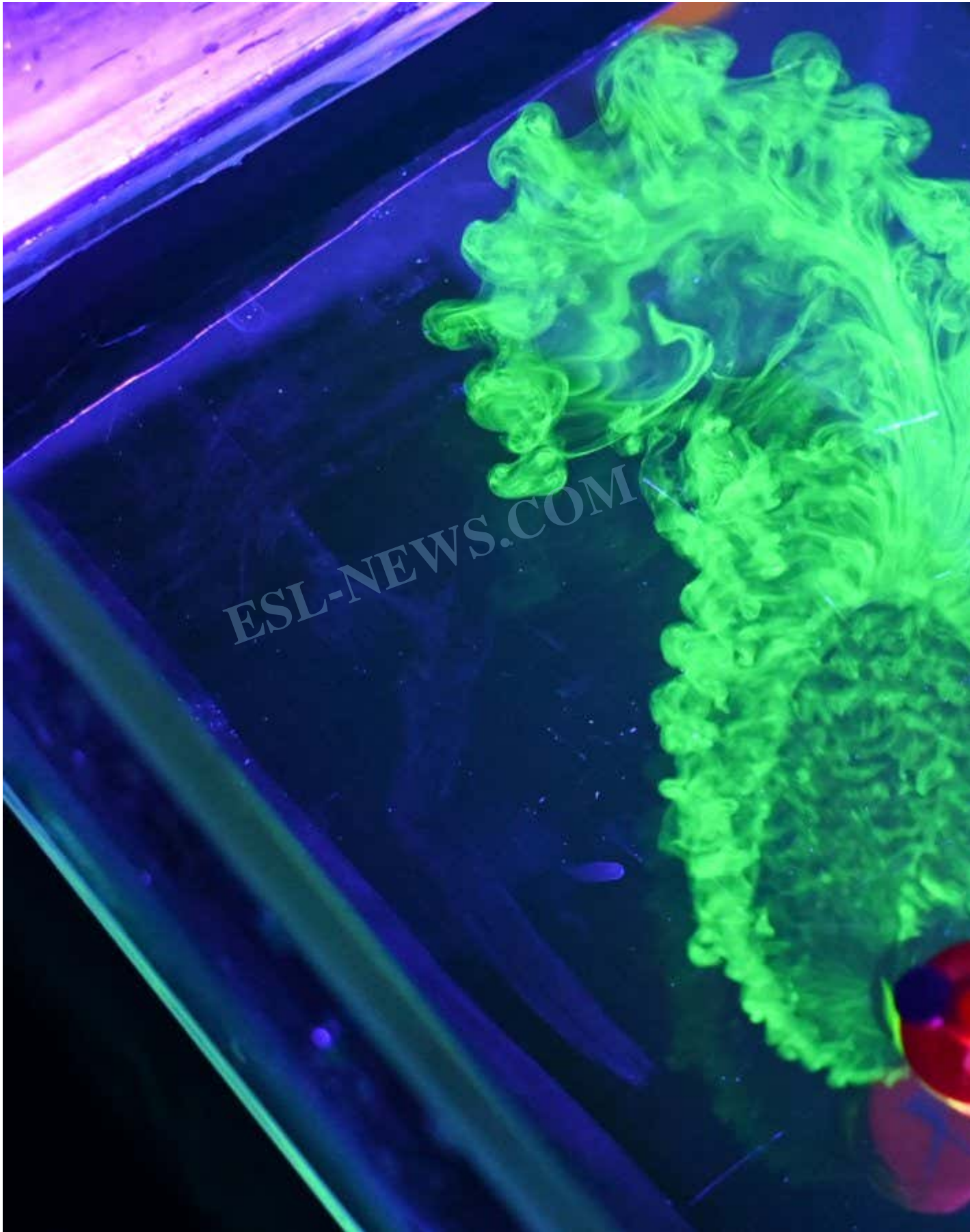




Cheerios-Inspired Robot Innovation Unveiled

Description

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A robot inspired by Cheerios releasing alcohol fuel with a fluorescent dye

Jackson K. Wilt et al. 2024

Scientists have created tiny floating robots inspired by the way beetles and Cheerios behave in fluids. The robots use the Marangoni effect, where a liquid spreads quickly over a surface with different tensions. This effect lets beetles glide across ponds by secreting stenosin and allows soap-powered toy boats to move as well.

Researchers at Harvard University printed round plastic pucks with air chambers and alcohol fuel tanks inside. The alcohol leaks out gradually, propelling the robots across water. The scientists found that stronger alcohol leads to better propulsion, with vodka being the most effective.

The robots can move at speeds of 6 centimeters per second and can be combined to create larger devices that can move in different patterns. By understanding the Cheerios effect, where objects cluster due to surface tension, researchers hope to apply this technology in education and environmental or industrial processes.

These 3D-printed robots could be used to distribute substances in water or deposit materials over time in various applications. The potential for this technology is vast and could revolutionize how we interact with our environment.

Topics:

Vocabulary List:

1. **Marangoni** /,mɛrəŋ'gəʊni/ (noun): A phenomenon where surface tension gradients cause fluid movement.
2. **Propelling** /prə'pɛlɪŋ/ (verb): Driving or pushing something forward.
3. **Fluorescent** /flɔ:'rɛsənt/ (adjective): Emitting light as a result of being exposed to radiation.
4. **Secreting** /sɪ'kri:tɪŋ/ (verb): Producing and releasing a substance from a cell or gland.
5. **Tensions** /'tɛnʃənz/ (noun): States of strain or stress on a surface or medium.
6. **Revolutionize** /,rɛvə'lʊ:ʃənəɪz/ (verb): To bring about a dramatic change in something.

Comprehension Questions

Multiple Choice



1. What is the main inspiration behind the tiny floating robots mentioned in the text?

Option: Beetles and Cheerios behavior in fluids

Option: Fish swimming patterns

Option: Bird flight mechanics

Option: Ant colony movements

2. What effect do the robots use to move across water?

Option: Bernoulli effect

Option: Marangoni effect

Option: Venturi effect

Option: Piezoelectric effect

3. What type of fuel is found inside the round plastic pucks of the robots?

Option: Petrol

Option: Water

Option: Alcohol

Option: Diesel

4. What kind of alcohol was found to be the most effective for propelling the robots?

Option: Rum

Option: Whiskey

Option: Vodka

Option: Gin

5. What is the speed at which the robots can move?

Option: 2 centimeters per second

Option: 4 centimeters per second

Option: 6 centimeters per second

Option: 8 centimeters per second

6. What could researchers potentially apply the technology of these robots to?

Option: Space exploration

Option: Artificial intelligence

Option: Education and environmental processes

Option: Virtual reality gaming

True-False



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7. The Marangoni effect allows beetles to glide across ponds.
 8. The robots can only move individually and cannot be combined to form larger devices.
 9. The Cheerios effect mentioned in the text refers to objects clustering due to gravitational forces.
 10. The technology of the 3D-printed robots has limited potential and applications.
 11. Vodka was found to be the least effective alcohol for propelling the robots.
 12. The way beetles and Cheerios behave in fluids was not a source of inspiration for the floating robots.

Gap-Fill

13. The robots can move at speeds of _____ centimeters per second.
14. Researchers at Harvard University printed round plastic pucks with air chambers and alcohol fuel tanks inside, and found that stronger alcohol leads to better propulsion, with Vodka being the most effective. These robots could be used to distribute substances in water or deposit materials over time in various applications. The potential for this technology is _____ and could revolutionize how we interact with our environment.
15. The technology of these 3D-printed robots may be applied in _____ and environmental or industrial processes.
16. The robots use the _____ effect to move across water, where a liquid spreads quickly over a surface with different tensions.
17. The main inspiration behind the tiny floating robots mentioned in the text is how _____ behave in fluids.
18. Researchers hope to apply the technology of these robots in _____ and



environmental or industrial processes.

Answer

Multiple Choice: 1. Beetles and Cheerios behavior in fluids 2. Marangoni effect 3. Alcohol 4. Vodka
5. 6 centimeters per second 6. Education and environmental processes

True-False: 7. True 8. False 9. False 10. False 11. False 12. False

Gap-Fill: 13. 6 14. vast 15. education 16. Marangoni 17. beetles

Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. What small rocky object orbits the sun?

Option: Meteorite

Option: Asteroid

Option: Fireball

Option: Fragment

2. What is the result of an object hitting another object with great force?

Option: Collaboration

Option: Impact

Option: Settlement

Option: Insights

3. What term relates to the application of scientific knowledge for practical purposes?

Option: Fluorescent

Option: Technological

Option: Meteorite

Option: Marangoni

4. What term describes something causing great harm or damage?

Option: Evoke

Option: Destructive

Option: Secreting

Option: Revolutionize

5. What term relates to hot water rising from the Earth's interior?

Option: Tensions



- Option: Hydrothermal
- Option: Marangoni
- Option: Fragment

6. What describes something that is at a higher level than others?

- Option: Forecasted
- Option: Advanced
- Option: Spectacle
- Option: Propelling

7. What involves two or more people working together towards a shared goal?

- Option: Claims
- Option: Enhance
- Option: Collaboration
- Option: Interpret

8. What term means being the only one of its kind?

- Option: Unique
- Option: Abundant
- Option: Deceptively
- Option: Insights

9. What term describes something made or produced by human beings rather than occurring naturally?

- Option: Propelling
- Option: Artificial
- Option: Tensions
- Option: Fragment

10. What term means producing and discharging a substance such as a hormone from a cell or gland?

- Option: Revolutionize
- Option: Secreting
- Option: Marangoni
- Option: Tensions

Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. A _____ is a very bright meteor that may be seen even in daylight.

12. The weatherman _____ heavy rain for tomorrow.

13. The movie's soundtrack managed to _____ strong emotions in the audience.

14. The _____ effect is the mass transfer along an interface between two fluids due to



surface tension gradient.

15. The engine works by _____ the vehicle forward.
16. The new technology aims to _____ the way we communicate with each other.
17. The agreement resulted in a _____ between the two parties.
18. The political debate led to increased _____ among the members of the council.
19. The research study provided valuable _____ into the behavior of the target demographic.
20. The explosion caused the rock to _____ into smaller pieces.

Matching Sentences (Match each definition to the correct word from the vocabulary list.)

21. New technologies and scientific discoveries contribute to societal progress.
22. The study of rocks minerals and Earth's structure falls under this branch of science.
23. Resources that are plentiful and widely available.
24. The process of systematically examining a matter to uncover facts and details.
25. Statements made by individuals asserting that something is true.
26. Emitting light as a result of absorption of radiation from another source.
27. Having an appearance that misleads or gives a false impression.
28. A solid piece of debris from an object such as a comet or asteroid that survives its passage through the Earth's atmosphere.
29. To improve the quality value or attractiveness of something.
30. An event or scene that is visually striking or impressive.



Answer

Multiple Choice: 1. Asteroid 2. Impact 3. Technological 4. Destructive 5. Hydrothermal 6. Advanced
7. Collaboration 8. Unique 9. Artificial 10. Secreting

Gap-Fill: 11. Fireball 12. forecasted 13. evoke 14. Marangoni 15. propelling 16. revolutionize 17. settlement
18. tensions 19. insights 20. fragment

Matching sentence: 1. Advancements 2. Geological 3. Abundant 4. Investigations 5. Claims 6. Fluorescent
7. Deceptively 8. Meteorite 9. Enhance 10. Spectacle

CATEGORY

1. Sci/Tech - LEVEL3

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