



KYS Department of English

Fourth Quarter Examination

Reading

Scientists studying penguins' feathers have revealed how the birds stay ice free when hopping in and out of below zero waters in the Antarctic. A combination of nano-sized pores and an extra water repelling preening oil the birds secrete is thought to give Antarctic penguins' feathers superhydrophobic properties. Researchers in the US made the discovery using Scanning Electron Microscopy (SEM) to study penguin feathers in extreme detail. Antarctic penguins live in one of Earth's most extreme environments, facing temperatures that drop to -40°C , winds with speeds of 40 metres per second and water that stays around -2.2°C . But even in these sub-zero conditions, the birds manage to prevent ice from coating their feathers.

"They are an amazing species, living in extreme conditions, and great swimmers. Basically, they are living engineering marvels," says research team member Dr Pirouz Kavehpour, professor of Mechanical and Aerospace Engineering at the University of California, Los Angeles (UCLA). Birds' feathers are known to have hydrophobic, or non-wetting, properties. But scientists from UCLA, University of Massachusetts Amherst and SeaWorld, wanted to know what makes Antarctic penguins' feathers extra ice repelling.

"What we learn here is how penguins combine oil and nano-structures on the feathers to produce this effect to perfection," explains Kavehpour. By analysing feathers from different penguin species, the researchers discovered Antarctic species the gentoo penguin (*Pygoscelis papua*) was more superhydrophobic compared with a species found in warmer climes – the Magellanic penguin (*Spheniscus magellanicus*) – whose breeding sites include Argentinian desert.

Gentoo penguins' feathers contained tiny pores which trapped air, making the surface hydrophobic. And they were smothered with a special preening oil, produced by a gland near the base of the tail, with which the birds cover themselves. Together, these properties mean that in the wild, droplets of water on Antarctic penguins' superhydrophobic feathers bead up on the surface like spheres – formations that, according to the team, could provide geometry that delays ice formation, since heat cannot easily flow out of the water if the droplet only has minimal contact with the surface of the feather.

"The shape of the droplet on the surface dictates the delay in freezing," explains Kavehpour. The water droplets roll off the penguin's feathers before they have time to freeze, the researchers propose. Penguins living in the Antarctic are highly evolved to cope with harsh conditions: their short outer feathers overlap to make a thick

protective layer over fluffier feathers which keep them warm. Under their skin, a thick layer of fat keeps them insulated. The flightless birds spend a lot of time in the sea and are extremely agile and graceful swimmers, appearing much more awkward on land.

Kavehpour was inspired to study Antarctic penguins' feathers after watching the birds in a nature documentary: "I saw these birds moving in and out of water, splashing everywhere. Yet there is no single drop of frozen ice sticking to them," he tells BBC Earth. His team now hopes its work could aid design of better man-made surfaces which minimise frost formation.

"I would love to see biomimicking of these surfaces for important applications, for example, de-icing of aircrafts," says Kavehpour. Currently, airlines spend a lot of time and money using chemical de-icers on aeroplanes, as ice can alter the vehicles' aerodynamic properties and can even cause them to crash

1. Penguins stay ice free due to:

- A. A combination of nano-sized pores
- B. An extra water repelling preening oil
- C. A combination of nano-sized pores and an extra water repelling preening oil
- D. A combination of various factors

2. Antarctic penguins experience extreme weather conditions, including:

- A. Low temperature, that can drop to -40
- B. Severe wind, up to 40 metres per second
- C. Below zero water temperature
- D. All of the above

3. In line 5 words engineering marvels mean:

- A. That penguins are very intelligent

- B. That penguins are good swimmers
- C. That penguins are well prepared to living in severe conditions
- D. Both B and C

4. Penguins feather has everything, EXCEPT:

- A. Hydrophobic properties
- B. Extra ice repelling
- C. Soft structures
- D. Oil structures

5. The gentoo penguin:

- A. Is less superhydrophobic compared to the Magellanic penguin
- B. Has feathers that contain tiny pores
- C. Can't swim
- D. Lives in Argentinian desert

Write ONLY ONE WORD from the passage for each answer.

- 6. Formations likecould provide geometry that delays ice formation.
- 7. The delay in freezing is dictated by the of the droplet.

8. Penguins in Antarctic are highly evolved to be able to cope with conditions.
9. Penguins are insulated by a layer of fat.
10. On the land, penguins appear much morethan in the sea.
11. The inspiration came to Kavehpour after watching aabout penguins.
12. Kavehpour would like to seesurfaces which minimise frost formation.

If you look closely at some of the early copies of the Declaration or Independence, beyond the flourished signature of John Hancock and the other fifty-five men who signed it, you will also find the name of one woman, Mary Katherine Goddard. It was she, a Baltimore printer, who published the first official copies of the Declaration, the first copies that included the names of its signers and therefore heralded the support of all thirteen colonies.

Line (5)

Mary Goddard first got into printing at the age of twenty-four when her brother opened a printing shop in Providence, Rhode Island, in 1762. When he proceeded to get into trouble with his partners and creditors, it was Mary Goddard and her mother who were left to run the shop. In 1765 they began publishing the Providence Gazette, a weekly newspaper. Similar problems seemed to follow her brother as he opened businesses in Philadelphia and again in Baltimore. Each time Ms. Goddard was brought in to run the newspapers. After starting Baltimore's first newspaper, The Maryland Journal, in 1773, her brother went broke trying to organize a colonial postal service. While he was in debtor's prison, Mary Katherine Goddard's name appeared on the newspaper's masthead for the first time.

(10)

(15)

When the Continental Congress fled there from Philadelphia in 1776, it commissioned Ms. Goddard to print the first official version of the Declaration of Independence in January 1777. After printing the documents, she herself paid the post riders to deliver the Declaration throughout the colonies.

(20)

During the American Revolution, Mary Goddard continued to publish Baltimore's only newspaper, which one historian claimed was "second to none among the colonies." She was also the city's Postmaster from 1775 to 1789 – appointed by Benjamin Franklin – and is considered to be the first woman to hold a federal position.

13. With which of the following subjects is the passage mainly concerned?

(A) The accomplishments of a female publisher

(B) The weaknesses of the newspaper industry

(C) The rights of a female publisher

(D) The publishing system in colonial America

14. Mary Goddard's name appears on the Declaration of Independence because

- (A) she helped write the original document
- (B) she published the document
- (C) she paid to have the document printed
- (D) her brother was in prison

15. The word "heralded" in line 5 is closest in meaning to

- (A) influenced
- (B) announced
- (C) rejected
- (D) ignored

16. According to the passage, Mary Goddard first became involved in publishing when she

- (A) was appointed by Benjamin Franklin
- (B) signed the Declaration of Independence
- (C) took over her brother's printing shop
- (D) moved to Baltimore

17. The word "there" in line 17 refers to

- (A) the colonies

- (B) the print shop
- (C) Baltimore
- (D) Providence

18. It can be inferred from the passage that Mary Goddard was

- (A) an accomplished businesswoman
- (B) extremely wealthy
- (C) a member of the Continental congress
- (D) a famous writer

19. The word "position" in line 24 is closest in meaning to

- (A) job
- (B) election
- (C) document
- (D) location

Galaxies are the major building blocks of the universe. A galaxy is a giant family of many millions of stars, and it is held together by its own gravitational field. Most of the material universe is organized into galaxies of stars, together with gas and dust.

There are three main types of galaxy: spiral, elliptical, and irregular. The Milky

Line (5)

Way is a spiral galaxy: a flattish disc of star with two spiral arms emerging from its central nucleus. About one-quarter of all galaxies have this shape. Spiral galaxies are well supplied with the interstellar gas in which new stars form; as the rotating spiral pattern sweeps around the galaxy it compresses gas and dust, triggering the formation of bright young stars in its arms. The elliptical galaxies have a symmetrical elliptical or

Line (10)

spheroidal shape with no obvious structure. Most of their member stars are very old and since ellipticals are devoid of interstellar gas, no new stars are forming in them.

The biggest and brightest galaxies in the universe are ellipticals with masses of about 10¹³ times that of the Sun; these giants may frequently be sources of strong radio emission, in which case they are called radio galaxies. About two-thirds of all galaxies are elliptical. Irregular galaxies comprise about one-tenth of all galaxies and they come in many subclasses.

Line (15)

Measurement in space is quite different from measurement on Earth. Some terrestrial distances can be expressed as intervals of time: the time to fly from one continent to another or the time it takes to drive to work, for example. By comparison with these familiar yardsticks, the distances to the galaxies are incomprehensibly large, but they too are made more manageable by using a time calibration, in this case, the distance that light travels in one year. On such a scale the nearest giant spiral galaxy, the Andromeda galaxy, is two million light years away. The most distant luminous objects seen by telescopes are probably ten thousand million light years away. Their

Line (20)

light was already halfway here before the Earth even formed. The light from the nearby Virgo galaxy set out when reptiles still dominated the animal world.

Line (25)

20. The word "major" in line 1 is closest in meaning to

- (A) intense
- (B) principal
- (C) huge
- (D) unique

21. What does the second paragraph mainly discuss?

- (A) The Milky Way
- (B) Major categories of galaxies
- (C) How elliptical galaxies are formed
- (D) Differences between irregular and spiral galaxies

22. The word "which" in line 7 refers to

- (A) dust
- (B) gas
- (C) pattern
- (D) galaxy

23. According to the passage, new stars are formed in spiral galaxies due to

- (A) an explosion of gas
- (B) the compression of gas and dust
- (C) the combining of old stars
- (D) strong radio emissions

24. The word "symmetrical" in line 9 is closest in meaning to

- (A) proportionally balanced
- (B) commonly seen
- (C) typically large
- (D) steadily growing

25. The word "obvious" in line 10 is closest in meaning to

- (A) discovered
- (B) apparent
- (C) understood
- (D) simplistic

26. According to the passage, which of the following is NOT true of elliptical galaxies?

- (A) They are the largest galaxies.
- (B) They mostly contain old stars.
- (C) They contain a high amount of interstellar gas.
- (D) They have a spherical shape.

27. Which of the following characteristics of radio galaxies is mentioned in the passage?

- (A) They are a type of elliptical galaxy.
- (B) They are usually too small to be seen with a telescope.
- (C) They are closely related to irregular galaxies.
- (D) They are not as bright as spiral galaxies.

28. What percentage of galaxies is irregular?

- (A) 10%
- (B) 25%
- (C) 50%

(D) 75% 48.

29. The word "they" in line 21 refers to

- (A) intervals
- (B) yardsticks
- (C) distances
- (D) galaxies

30. Why does the author mention the Virgo galaxy and the Andromeda galaxy in the third paragraph?

- (A) To describe the effect that distance has on visibility
- (B) To compare the ages of two relatively young galaxies
- (C) To emphasize the vast distances of the galaxies from Earth
- (D) To explain why certain galaxies cannot be seen by a telescope

31. The word "dominated" in line 26 is closest in meaning to

- (A) threatened
- (B) replaced
- (C) were developing in
- (D) were prevalent in

An old proverb states, "Beware of oak, it draws the stroke." This saying is handy during thunderstorm season. In general, trees with deep roots that tap into groundwater attract more lightning than do trees with shallow, drier roots. Oaks are around 50 times more likely to be struck than beeches. Spruces are nearly as safe as beeches. Pines are not as safe as these two, but are still much safer than oaks.

32. What is the author's main point? ____

- (A) Old proverbs often contain important truths. ____
- (B) Trees with shallow roots are more likely to avoid lightning than those with deep roots. ____
- (C) The deeper a tree's roots, the safer it is during a thunderstorm.

Alternative history is generally classified as a type of science fiction, but it also bears some relation to historical fiction. This type of writing describes an imaginary world that is identical to ours up to a certain point in

history, but at that point, the two worlds diverge; some important historical event takes place in one world but not in the other, and they go in different directions. Alternative histories might describe worlds in which the Roman Empire had never fallen, in which the Spanish Armada had been victorious, or in which the South had won the Civil War. Or they may suppose that some technology had been introduced earlier in the world's history than actually happened. For example: What if computers had been invented in Victorian times? Many readers find these stories interesting because of the way they stimulate the imagination and get them thinking about the phenomenon of cause and effect in history.

33. What is the main idea of this passage? ____

- (A) Alternative histories describe worlds in which history has taken another course. ____
- (B) Alternative histories are a type of historical novel. ____
- (C) Science fiction writers have accurately predicted certain actual scientific developments.

Almost every form of transportation has given someone the idea for a new type of toy. After the Montgolfier brothers flew the first balloon, toy balloons became popular playthings. In the nineteenth century, soon after railroads and steamships were developed, every child had to have model trains and steamboats. The same held true for automobiles and airplanes in the early twentieth century. Toy rockets and missiles became popular at the beginning of the space age, and by the 1980's, there were many different versions of space-shuttle toys.

34. The main idea of this passage is that ____

- (A) inventors have been inspired by toys to build new forms of transportation ____
- (B) toy automobiles and airplanes were very popular in the early 1900's ____
- (C) toy design has followed developments in transportation