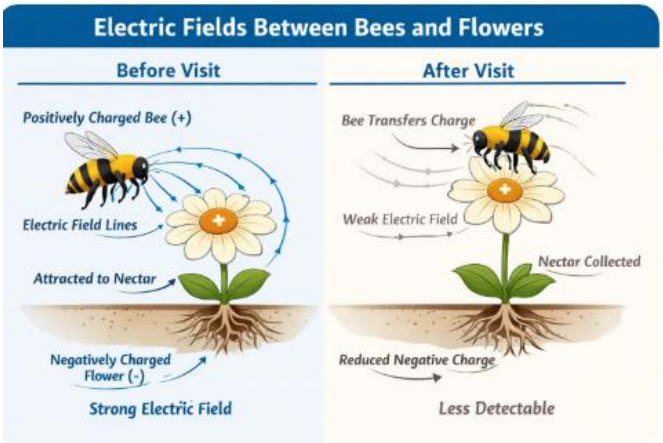
Friday, March 27, 2026

# Electric Fields in Nature: How Bees Detect Flowers

## Test Your Understanding

### *Conceptual and application questions*




## Part A — Understanding the Concepts

1. Explain why bees become positively charged during flight.

2. What is the triboelectric effect?

3. Why do flowers carry a negative charge?

4. Define grounding in the context of plants

5. What is an electric field?

6. Describe how an electric field forms between a bee and a flower.

## Part B — Mechanism and Detection

7. How do bees detect electric fields?

8. What role do mechanosensory hairs play?

9. Why are these electric signals described as “invisible”?

10. Explain how the electric field changes as a bee approaches a flower.

## Part C — Application

11. Predict what would happen if bees were not electrically charged.

12. How would pollination efficiency be affected if flowers did not carry a charge?

13. Why is this system advantageous for bees?

14. Explain how this system helps reduce energy waste for bees.

## Part D — Advanced / IB-Level Thinking

15. A bee lands on a flower and transfers charge. Explain how this affects the electric field.

16. Why does a decrease in negative charge make the flower less detectable?

17. Suggest how environmental conditions (e.g., humidity) might affect this system.

18. Compare this interaction to another example of electrostatic forces in nature or technology.

19. Explain why this system can be described as an “information system.”

20. Evaluate the statement: “Electric fields play a functional role in biological systems.”

# Answer Key

1. Bees lose electrons due to friction with air (triboelectric effect), resulting in a net positive charge.

2. The triboelectric effect is the transfer of charge through friction between materials.

3. Flowers are grounded through their roots, receiving electrons from the Earth, giving them a negative charge.

4. Grounding is the transfer of electrons between an object and the Earth.

5. An electric field is a region around a charged object where forces act on other charges.

6. Oppositely charged bee and flower create an electric field between them.

7. Bees detect electric fields using mechanosensory hairs on their bodies.

8. These hairs bend in response to electric forces, allowing detection.

9. Electric fields cannot be seen directly; they are detected through physical effects.

10. The field strengthens as the distance decreases between the bee and the flower.

11. Bees would not detect flowers as efficiently, reducing foraging success.

12. Pollination efficiency would decrease due to a lack of electrical cues.

13. It allows bees to quickly identify nectar-rich flowers.

14. Bees avoid already visited flowers, conserving energy.

15. Charge transfer reduces the flower's negative charge, weakening the field.

16. A weaker field produces a smaller force on the bee's hairs, reducing detectability.

17. High humidity can dissipate charge, reducing field strength.

18. Examples include static electricity, photocopiers, or electrostatic precipitation.

19. It transmits information about nectar availability without direct contact.

20. Electric fields influence biological interactions and behaviour, supporting the statement.