Fields for Flight: Effects of Magnetic Fields on Butterfly Navigation

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The goal of this project was to investigate whether Painted Lady Butterflies (Vanessa cardui) migrate using an internal compass, if the internal compass can detect strong or unnatural magnetic fields, and if butterflies raised as larvae around strong magnetic fields can detect the field as adults. I tested the larval stage by exposing them to magnets oriented in an east-west direction, with two different field strengths based on the distance from the magnets (1.0 gauss and 2.5 gauss). I had 5 different groups of insects; a control group placed away from the magnets, two groups placed near a north-south magnetic field at two different distances (20cm, 1.0 gauss; 10cm, 2.5 gauss), and two groups placed near an east-west field at two different distances (20cm, 1.0 gauss; 10cm, 2.5 gauss). Insects were scored for movement by placing them onto a numbered/lettered grid, and counting the number of times them moved or flew in a cardinal direction (N, S, E, W). My data revealed that a few larvae groups did respond to magnetic fields, but the majority of larva groups did not, leading me to believe that larvae are not particularly sensitive to changes in magnetic field direction or strength. All five groups adult groups oriented to Earth's magnetic field (with statistical significance) regardless of what they had been exposed to as larvae. This supports my hypothesis that adults would respond to and move in relation to cardinal directions after exposure to a magnetic field. The insects also seemed to respond to light during testing, leading me to believe that other factors such as sunlight direction, intensity, or day length in addition to sensitivity to magnetic fields may contribute to their abilities to migrate long distances.

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