

EDITORIAL

Insects as Catalysts of Innovation: A Call to Rethink Entomological Frontiers



Insects have long served as elegant models for fundamental research, offering insights that transcend disciplinary boundaries. Their biological simplicity, genetic richness, and adaptability make them ideal subjects for experiments that require minimal infrastructure—an advantage especially vital in resource-constrained settings. The knowledge derived from insect-based studies often finds surprising applications in fields as diverse as robotics, medicine, and space science. Consider the evolution of drone technology, inspired in part by the flight mechanics and sensory systems of insects. Such biomimetic breakthroughs underscore the transformative potential of entomological research. I've previously highlighted this in an editorial referencing

Raghavendra Gadagkar's work, which showcases how simple experiments with insects have led to profound discoveries in basic science—discoveries that ripple outward into real-world innovations. A recent and striking example is the Axiom-4 mission to the International Space Station (ISS), where Indian astronaut Shubhanshu Shukla participated in a groundbreaking experiment involving *Drosophila melanogaster*, the common fruit fly. The mission aimed to study how space radiation affects DNA, using fruit flies as proxies due to their genetic similarity to humans (they share approximately 77% of human genes). While Shukla contributed to the mission, fellow astronaut Tibor Kapu oversaw the experiment, observing how fruit fly DNA responds to the harsh conditions of space. The goal: to develop strategies for protecting human DNA during long-duration space travel to the Moon, Mars, and beyond. This experiment exemplifies the profound utility of insects in addressing challenges that extend far beyond Earth. The implications are staggering—not only for space biology but also for genetics, radiation medicine, and planetary health. And all this, achieved through a humble insect model. So, are these findings not invaluable? Do they not demonstrate that insects can serve humanity in ways that are cost-effective, scalable, and visionary? As entomologists, we must be cognizant of these possibilities. We must provoke ourselves—and the next generation—to think beyond the conventional boundaries of our discipline. Let us embrace out-of-the-box thinking. Let us deploy insect science in bold, unexpected directions. In doing so, we reaffirm that entomology is not just a study of insects—it is a gateway to understanding life, solving global challenges, and even exploring the cosmos.

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