

*10 Groupings of Tantalizing Questions to Inspire Deep Thought and “Bug” You about
Insects, Spiders, and other Arthropods
Catholic University of America
TPS SPICED Project – Otto Wilson*

1) *Food Factory: Coloring Agents and Protein Sources*

What is the name of a compound derived from insects that is used as a food coloring agent in foods? (it sounds like a proud comment (in reverse) from the owner of a new automobile). What source of protein was recently featured on Shark Tank as the food of the future? What food products do we routinely use that are directly produced or influenced by insects? What is the fascinating story behind BEE Sweet Lemonade?

2) *Insect Architects and Civil Engineers*

How are insects related to Architectural and Civil Engineers? What types of structures can insects design and build? What types of tools and mechanisms are used by insects to change their world and modify their environment? (Leaf Cutter Ant, Origami Spiders -Leaf Curling Spider)

3) *Bubble Engineering (breathing and housing)*

What is the architecture of soap bubbles? How do insects use bubbles to enhance their lives?

4) *Symbiotic Relationships for Food Production (Ant, Termite, Bee)*

Can you think of a very interesting way that Termites, Whales, and Cows are related? Which insect uses agricultural engineering to develop farming techniques to provide food for its colony? Which insect uses chemical engineering to produce food for its colony? Which insect literally eats itself out of house and home?

5) *Energy requirements and navigation: Energy Input and Output*

How do the energy requirements for Bird and Insect powered flight compare with human powered flight? Which insect has recently been crowned the new long distance travel champion, taking the crown from the Monarch Butterfly?

6) *Protection and Security: Kamikaze Chemical Engineers (termite, bombardier beetle, stink bugs)*

Can you think of and describe unique methods and materials that insects use to protect them or their colony?

7) *Insect Navigation*

How do insects navigate? Do they have BPS (Bug Positioning System) instead of GPS? What unique system do some insects use for their BPS? (mnps in bees and other eusocial insects)

8) *Mechanical Engineering: Gears and Inner workings of the Leaf Hopper leg spring Mechanism*

The inner workings of machines and devices can be truly amazing, but nothing can surpass God's Design in Nature! Can you imagine an insect with a working gear mechanism in his legs that help propel it through the air? What insect has recently been discovered to possess such a mechanism?

9) *Materials Engineering in the Insect World*

Insects can even make their own building materials to fabricate their homes. What types of materials can insects make either from their own body chemistry or from modifying surrounding materials to improve their lives?

10) *Biomedical Engineering and Health – Bee Stings*

Insects have some interesting health benefits. Aside from having to be careful not to end up on the wrong side of a dinner invitation as the guest honor (and on the menu), insects are resilient and have many ways to combat disease and infections from their chitin based exoskeleton to their unique breathing and circulatory system to the ability to resist cancer. Fruit flies are even used in developing human cancer models! Can you think of and describe some unique ways that insects improve health and improve medicine and biomedical engineering?

**For answers and more discussion,
contact Dr. Wilson at wilsono@cua.edu**