

## The Cicada - A Marvel of Design

Cicadas get their food by sucking plants. They lay their eggs in the stems of plants or in trees. When the larvae hatch they drop to the ground and burrow into the ground, where they find plant roots as a source of juice to suck up. A close second claim to fame is **the complexity of its life cycle**. They remain underground for many years. Nymphs usually undergo **five molts during the several years** required to reach maturity.

- Among the most fascinating and best-known are **the 17-year cicada and the 13-year cicada**, two of the seven **periodical** species. They are called so because in any one location the development of the individuals is synchronized so that they all emerge as adults at the same time.

It is believed that the second of the five stages of underground development take longer to mature in the periodical species. The great majority of species are nonperiodical, and are often called annual cicadas because some of them are seen every year.

- To produce its moderate buzzing sound, **the grasshopper** either rubs its front wings together or rubs toothlike ridges on the hind legs against its closed wings. But the sonically superior cicada has two special timbals, or drum-like structures, located on either side of the abdomen.

These organs are elastic, with a row of ribs which run along their surface. A large rapidly contracting muscle is attached to each timbal. The rapid contractions cause the ribs to buckle in rapid succession. This produces a series of loud clicks at the typical frequency of 4.3 kilohertz.

- Each click produces **up to 158 decibels** in the insect's abdomen. (People exposed to prolonged sound above 90 decibels can suffer hearing loss). In most species an air sac takes up most of the space in the abdomen, and the sac works as **a resonator to amplify the sound**. A pair of eardrums in the wall of the abdomen connect the sound pulses with the outside world.

The combination of air sac with eardrums **amplifies the sound about twenty times** from what is produced by the timbals alone. The cicada has the remarkable ability to tune the air sac, by extending it, to exactly the 4.3 kilohertz frequency of the timbals, which maximises the volume and purity of the tone.

- So how does the male cicada avoid being deafened by its own song? It has been found that the sensory part of the ear is located in a separate capsule. This is connected to the drum by a small canal, which appears to protect the ear from its own song. The females are capable of hearing much quieter sounds, but seem to find the male's sonic booming attractive.

The cicada's sound organ has been described as "surprisingly complex." The intricate and complicated sound system is made up of a series of interacting parts, all essential for the correct functioning of the complete organ. Each of these parts, on its own, would be of no advantage without the complete system.

- This points to the prior existence of a design, with the final product in mind. On the principle of survival of the fittest, there is **no rational explanation** for the gradual addition of the various parts, and their interconnection, before the entire organ was present to function.

The animal world is filled with such highly complex systems. Their very existence multiplies the evidence that **they are the product of intelligent design** by the God of Creation. In the inspired words of Job: *"But now ask the beasts, and they will teach you; and the birds of the air, and they will tell you... Who among all these does not know that **the hand of the LORD has done this, 10 In whose hand is the life of every living thing, and the breath of all mankind!**" - Job 12:7-10.*

