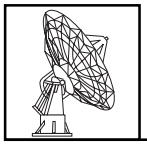
to make quick judgments on motives and trends which lie behind such events, leading to little more than speculative commentary. In many ways we are in new territory. "There is no new thing under the sun" (Eccl. 1:9), and Scriptural examples abound that can be applied to things we see in the earth. However, with regard to our experience, we are living in a world where, so the world claims, 'everything has changed'.

In Joshua 3 we have an example of how to walk through new territory. The people were to follow the ark, but at a distance: "Yet there shall be a space between you and it, about two thousand cubits by measure: come not near unto it, that ye may know the way by which ye must go: for ye have not passed this way heretofore" (Josh. 3:4). By keeping a distance the people would have plenty of warning when the ark turned in a new direction. This should warn us from reacting too quickly to world events. We should maintain an overall view and look at things as it were from a distance.

One way to achieve this overall view is to reserve comment until historical perspective can be seen. However, we also have "a more sure word of prophecy" (2 Pet. 1:19). This enables us to "see afar off" (v. 9). We can therefore, with the eye of faith, project ourselves forward, thinking about "things which be not as though they were" (Rom. 4:17). Our God is able to declare "the end from the beginning" (Isa. 46:10). By taking heed to His Word we can therefore know the end. And, if we can see where the ark is going, we can know the way.



Science

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Science and the Creator

The world's loudest insect

David Burges

MOST OF US are familiar with the noise produced by insects such as grasshoppers and crickets. They are characteristic of warm summer days, although sadly the widespread use of pesticides in the developed world means that such sounds are far less common there than they once were. There is a group of insects, however, which far exceed the powers of grasshoppers to make their presence known. These are small insects known as cicadas (pronounced *si-ka-das*), which inhabit the warmer areas of the world. In the early dusk of late spring the males emerge from underground and fill the air with their piercing song. And one particular species of Australian cicada (*Cyclochila australasiae*) has been found to have the loudest call so far measured. The volume and intensity resemble that of a personal alarm going off, and when tens or hundreds of cicadas are singing together the effect can be deafening.

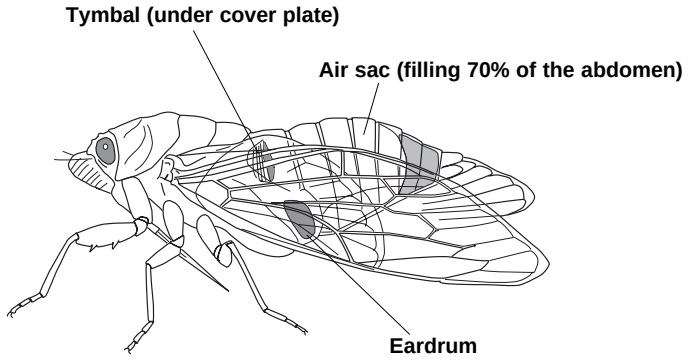
A surprisingly complex instrument

Cicadas are plant-sucking bugs, and their eggs are laid in the stems of plants or in trees. When the larvae hatch they drop to the ground and burrow in search of plant roots to tap. They then remain underground for many years before emerging to moult into winged adults, and then mating. It is then that the males' remarkable sound system comes into use.

Scientists at the Universities of Oxford and Melbourne have been studying, with the aid of tiny probe microphones, the organs which these small creatures, some sixty millimetres (2.3 inches) long, use to produce such a loud sound.[1] Unlike grasshopper species, which rub special structures on the hind legs against their wings to

1. "How cicadas make their noise", Henry C. Bennet-Clark, *Scientific American*, May 1998, pp. 36-9.

produce their call, the cicada is equipped with two remarkable tymbals, or drum-like structures, located on either side of the abdomen. These organs are elastic and have a row of convex ribs which run the length of their surface. A large, fast muscle attached to each tymbal contracts rapidly, causing the ribs to buckle in sequence and produce a series of loud clicks, which merge to form a train of vibrations at a characteristic frequency of 4.3 kilohertz.[2]



Simplified drawing of a male Australian cicada

Each click of the ribs produces a surprisingly high pressure, up to 158 decibels, in the insect's abdomen. In most species the abdomen is filled largely with an air sac, which acts as a resonator to amplify the sound. In the wall of the abdomen is a pair of eardrums that connect the sound pulses with the outside world. The combination of the air sac and the eardrums is to make the sound about twenty times louder than that produced by the tymbals alone! Furthermore, the cicada can extend the air sac in order to tune it to exactly the 4.3 kilohertz frequency of the tymbals, to maximise the loudness and purity of the tone.

We might wonder how the male cicada avoids being deafened by its own song. It appears that, although the sound is radiated from the eardrums, the sensory part of the ear is located in a separate capsule, connected to the drum by a small canal, which probably protects the ear from its own song. As for the females, we can only assume that they respond favourably to the stentorian output of the males, even though experiments show that they are capable of hearing much quieter sounds!

Intelligent design

The author of this study, Dr Bennet-Clark, describes the cicada's sound organ as "surprisingly complex" and a "marvellous sound system". We have noted a number of times before in this series of articles the amazing complexity of many aspects of insect anatomy and behaviour, which poses the utmost difficulty for evolutionary explanations.[3] The cicada's sound system comprises a series of interacting parts, each of which is essential for the correct functioning of the complete instrument and would confer no selective advantage outside of the complete system. It is a fine example of what Michael Behe has termed "irreducible complexity".[4]

The existence of such highly complex systems can only increase our confidence that they are the product of intelligent design by the Master Designer, the God of Creation. In the inspired words of Job: "But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee . . . Who knoweth not in all these that the hand of the LORD hath wrought this? In Whose hand is the soul of every living thing, and the breath of all mankind" (Job 12:7-10).

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2. A hertz is the unit of frequency, representing one cycle per second; one kilohertz is a frequency of 1,000 cycles per second.
3. See, for example, "As the fire burneth a wood", Jul. 2000, p. 286; "The spider . . . is in kings' palaces", Aug. 1999, p. 319; and "Every creeping thing . . .", Apr. 1998, p. 125.
4. Michael J. Behe, *Darwin's Black Box*, Simon and Schuster, 1998, pp. 39-40. Strictly speaking, he applies the term to biochemical systems at the molecular level, but it seems just as appropriate here.