

Amazing Fire Ant Architects

Fire ants are famous for their incredible sting. But there's a lot more to them than just their sting. Fire ants are also remarkable builders. Anyone who has seen an ant farm knows that. But they don't just use soil to build things; they also use their bodies! Fire ants are able to quickly assemble a working raft out of their own bodies and sail through dangerous flood waters. They can also build towers and bridges.



Until recently, their secrets have remained hidden from our view.

Now, scientists are able to study fire ant structures up close. They have discovered how the ants link their bodies together to create these remarkably strong yet lightweight structures. Ants use their bodies like the beams in a building. But instead of screwing or nailing those beams together, the ants reach out and touch each other.

"It's like their bodies are covered in Velcro," said David Hu, a mechanical engineer at the Georgia Institute of Technology. Hu co-authored a study on the subject.

It is difficult for researchers to see how the rafts are put together. All of those ant bodies block the view. But researchers at Georgia Tech managed to capture the rafts' complex structure. They used a micro CT scanner, which is used to image the tiny 3-D structures of bones. The researchers wanted to see how the ants' legs link together.

Scientists put 110 live ants in a beaker of water and swirled it around. To save themselves from drowning, the ants would start to form tiny rafts. When the ants formed rafts, the scientists flash-froze the ants. Then the scientists examined the ants under the scanner. They did this four times, for a total of 440 ants. Each ant has six legs, so that's 2,640 legs to look at.

The scientists found that 99 percent of the legs were linked together, while only 26 remained unconnected.

"We were surprised at how effectively they were finding links," Hu said. "We thought oh, maybe half the ants will be linked."

Some ants linked better than others. Most of the ants could have a maximum of five connections, but some larger ants could link with up to 20 legs. These larger ants are like the hub of a wheel. They connect many other ants, which are like the spokes of a wheel.

The ants hold on to each other, but they don't huddle. The ants keep each other at arms' length. This creates big spaces between each connected ant. These spaces make the raft more porous, which makes the raft float more easily. Even though an ant's body is denser than water, their rafts are only one-fifth as dense. So, while a single ant will sink, an ant raft can easily float.

"In some ways they're building a whole new kind of material," Hu said. "The individuals are just ants, but how they're arranged affects its material properties."

Hu said the structure was similar to bone – very porous and light, but still very strong.

Next, researchers want to explore much larger ant clumps and towers, which can include 10,000 to 100,000 ants, Hu said.