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How thousands of fire ants stay afloat despite piling on top of one another

ANI [Washington](#), Tue, 26 Apr 2011

Washington, Apr 26 (ANI): A [study](#) has found out how thousands of [fire ants](#) stay afloat on water despite piling up one on top of another.

Research has shown that a single ant can walk on water because of the buoyancy of the air bubbles trapped next to its body, and the water's own surface tension.

But for years, biologists have observed fire [ant colonies](#) floating down flood plains and rivers in their native South America without sinking.

Now for the first time a group of engineers has attacked the question of ant flotation from a physics perspective.

Ants float as a group because they can harness the power of nearby air bubbles. Grasping each other's mandibles or front legs with a force 400 times their body weight, the ants are able to trap small pockets of air between them-like a group floatation device.

"The ants are so tightly knit together, that air pockets form between the water and the ants, and water cannot penetrate through any part," Fox News quoted Nathan Mlot, a [graduate student](#) at the Georgia Institute of [Technology](#) in Atlanta and one of the study's authors, as saying.

The bottom layer of ants rests on top of the [water's surface](#), and others pile on above them. Even when they do get submerged, the pockets of air bring them back to the surface quickly-and allow them to breathe. When they get submerged, the ants flex their muscles in unison to form a tighter weave.

To understand exactly how the structure worked, the researchers took a raft of several thousand ants and dropped it in liquid nitrogen, immediately freezing it.

Then they were able to look at the structure on an ant-by-ant level under an electron-scanning microscope.

"We were surprised at just how waterproof the raft was-its ability to repel water and keep afloat," Mlot said.

What if you want to drown the ants? Just add soap to the water, which greatly reduces its surface tension of water and sinks the raft, Mlot said.

"With soap, the ants will drown within a matter of seconds, whereas they can survive for days or even weeks on the raft otherwise," he explained.

To test some of the behavioural dynamics inside the pancake-shaped raft, the researchers painstakingly picked ants one by one from the top of the structure.

Soon, a new one would climb from the bottom to keep the raft the same thickness.

"We know that self-assembly and self-healing are attributes of living organisms, and we have seen that ant rafts develop these on a macro scale," Mlot revealed.

This type of research could eventually help in many fields, from making a better rain jacket to building robots that can think.

When the ants link up their mandibles and legs, they form a highly waterproof weave, which could be the basis for next-generation materials for lifejackets or boats.

In addition, social [insects](#) like ants have long been the inspiration for autonomous robotics that could link up to build a larger structure.

"Ants are like little computers, acting on a few simple rules of engagement," Mlot added.

The study was published in the journal Proceedings of the National Academy of Sciences. (ANI)

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