

Ants

Why are ants so strong that every one of them can easily carry more than its body weight a long distance while a man cannot? The answer is simple if you know where to look: arithmetic.

Start with a man and scale him upward (enlarge him) by 2X. Twice as tall and twice as wide both left to right and front to back. All linear measurements are now twice as big. His volume is now 8X as big and he weighs 8X as much.

How much stronger is he? Increasing a muscle's length adds nothing to its strength, only to the distance over which that strength can operate. A muscle's strength is proportional to its cross-sectional area. When distances scale up by 2X volumes scale up by 8X, but areas only scale up by 4X. This difference is all important. 8X the weight with only 4X the strength means that *relative to his weight* the man is only half as strong as before.

Now take the original man and scale him downward (shrink him) by 2X. His weight is now $\frac{1}{8}$ his original weight while he is $\frac{1}{4}$ as strong. $\frac{1}{4}$ is twice as big as $\frac{1}{8}$, so relative to his new, lighter weight he is now twice as strong as before.

Shrink him by 500X (to ant size) and relative to his new, lighter weight he is now 500X as strong. Of course he can lift relatively heavy objects!

Anyone who looks for the explanation anywhere but arithmetic is barking up the wrong tree.