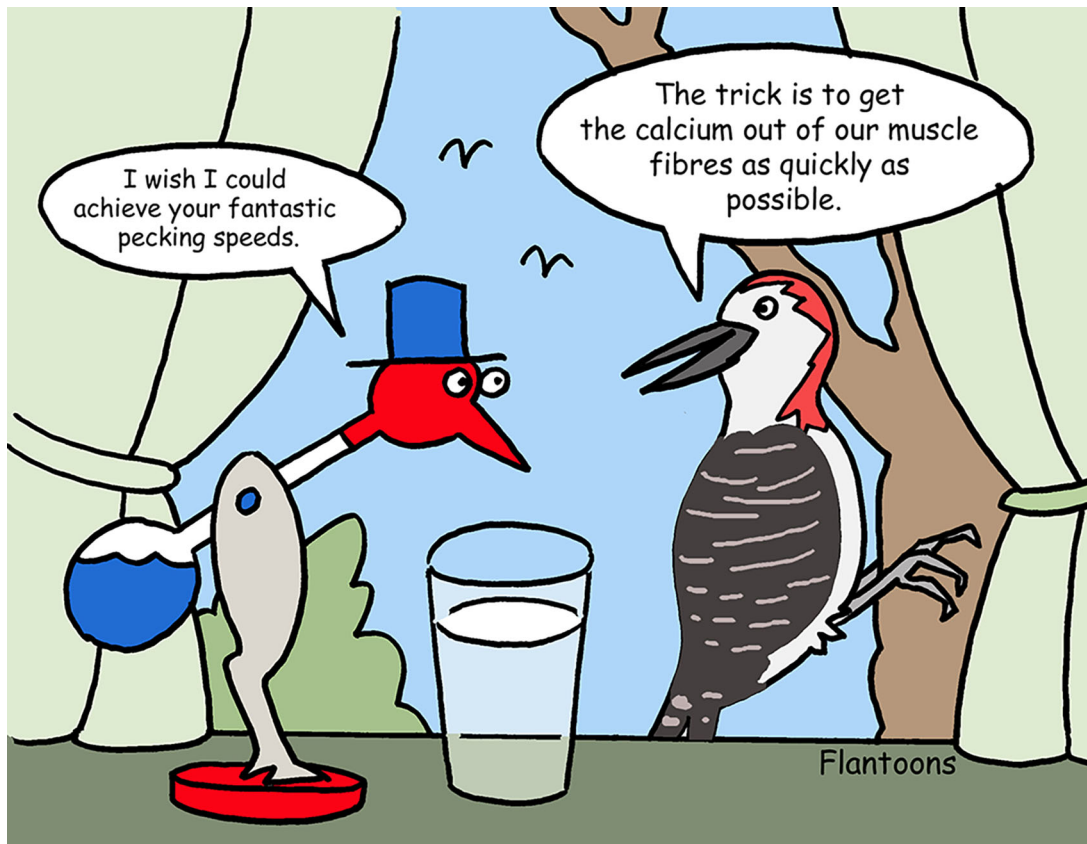


## INSIDE JEB

## Headbanging woodpeckers recycle calcium fast for drum roll



Playing a drum roll is a great way to get attention, and Siddharth Nagarajan certainly did that when he set the current world record in 2017 of 2109 drumbeats in one minute. Now imagine doing something similar with your head. Headbanging woodpeckers drum trees at rates of 16–17 hits  $s^{-1}$ . ‘This means that neck muscles that control this movement must oscillate the head back and forth at roughly 50–60 ms periods’, says Matthew Fuxjager from Wake Forest University, USA. Wondering how these avian percussionists pull off such an impressive feat, Fuxjager and his colleagues Eric Schuppe and John Petersen focused on the mechanisms that allow the neck muscles to relax and contract at break-neck speeds. Muscles contract when nerve signals trigger the release of calcium into muscle fibres, so the trio investigated the

production of messenger RNA (mRNA) for the proteins that return calcium to the sarcoplasmic reticulum storage chambers (causing the muscle to relax) and release it (causing the muscle to contract).

After collecting downy and red-bellied woodpeckers in North Carolina, USA, the trio measured the quantities of three mRNA molecules that code for the three proteins in which they were interested in a muscle in the birds’ necks. ‘We hypothesized that the amount of mRNA for these genes is far greater in the muscles that support rapid display movements’, say Fuxjager. Impressively, the mRNA for two of the three proteins – parvalbumin and the sarcoplasmic reticulum  $Ca^{+}$  ATPase, both of which contribute to rapidly returning calcium to the storage chambers – was significantly higher in the neck muscle. However, the mRNA

for the third protein, the ryanodine receptor – which triggers calcium release into the muscle – was not increased.

‘We think that selection for drumming behaviour drives the evolution of calcium handling machinery to support the emergence of the woodpecker drum’, says Fuxjager. Now wouldn’t it be fun to also find out whether calcium recycling is the secret behind Nagarajan’s lightning-fast fingers?

10.1242/jeb.185793

Schuppe, E. R., Petersen, J. O. and Fuxjager, M. J. (2018). Woodpecker drumming behavior is linked to the elevated expression of genes that encode calcium handling proteins in the neck musculature. *J. Exp. Biol.* **221**, jeb180190.

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