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By Jonathan Scheff

Tunicate classification

The paper:

F. Delsuc et al., "Tunicates and not cephalochordates are the closest living relatives of vertebrates," *Nature*, 439:965-8, 2006. (Cited in 116 papers)

Left: David Hall / Photo Researchers, Inc

The finding:

Using a data set of 146 nuclear genes, including tunicate data from the *Oikopleura dioica* genome project, Frédéric Delsuc and his colleagues from the University of Montreal and the University of Bergen, Norway, applied new data and techniques to reclassify tunicates (urochordates, also known as sea squirts) as the closest living relatives to vertebrates - and not cephalochordates, as previously believed.

The evidence:

Before the Delsuc paper, researchers had found neural crest cells, a necessary component of vertebrate embryonic development, in urochordates but not in cephalochordates (*Nature*, 431:696-9, 2004). "This was a problem because tunicates weren't the closest to vertebrates," says Ronald Jenner at the UK's University of Bath. Now, he says, "everybody is reinterpreting their data sets."

The error:

The study used genomic data from only one echinoderm, the sea urchin. This limited sample incorrectly grouped cephalochordates with echinoderms instead of other chordates, says Max Telford at University College London, who corrected the assignment in a later paper (*Nature*, 444:85-8, 2006). Delsuc agrees with the change.

The next step:

Billie Swalla of the University of Washington notes that "tunicates have had lots of losses in their genomes and they have really long branches," which can confound phylogenetic analyses. "I think there's still work that needs to be done on it," Swalla says. Indeed, Delsuc is continuing to analyze phylogenies with the availability of the full cephalochordate genome, and Telford is looking at mitochondrial or ribosomal genes.

Changing understanding of vertebrates' closest relatives:

	Before 2006	Delsuc	Telford
Closest	Cephalochordata	Urochordata	Urochordata
2nd Closest	Urochordata	Cephalochordata	Cephalochordata
3rd Closest	Echinodermata	Echinodermata	Hemichordata