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Giant sperm found in crustacean fossils

'Gargantuan gametes' are oldest on record and have visible nuclei.

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A set of tiny ancient crustaceans has yielded the oldest — and some of the biggest — fossilized sperm cells ever discovered. The specimens, which are at least 16 million years old, were preserved well enough to show some of the structures within the creatures' unusually large gametes, which researchers were able to reconstruct in three dimensions from X-ray data.

Ostracods are a class of crustacean still around today. They are shrimp-like animals typically around 1 millimetre in length, but their sperm cells are disproportionately long — up to 1 centimetre. Renate Matzke-Karasz, a self-described ostrocodologist at Ludwig Maximilian University in Munich, used synchrotron X-rays to reveal the soft tissue inside fossils of freshwater ostracods found in an Australian cave.

Many of the fossilized sperm cells were tangled together, and their lengths were difficult to determine precisely. But the researchers estimate them to be around 1.2 mm long — around 20 times the length of a human sperm cell. The researchers report their results today in *Proceedings of the Royal Society B*[1].

Soft tissue is normally obliterated by the process that turns flesh into rock, but the innards of these ostracods were preserved in excellent detail. By taking multiple X-ray images of the fossils and then stacking them to produce a three-dimensional image, the researchers were able to image some of the sperm cells down to their nuclei, as well as the reproductive systems and muscles of the ancient animals (see 'Supersize sperm from the past').

"When we found the sperm inside it was really thrilling," says Matzke-Karasz. "When we found the nuclei we were just flattened." The results suggest that the X-ray imaging method could be used more widely in palaeontology, says Matzke-Karasz.

Researchers had previously described ostracod sperm from fossils found in Romania[2], but those dated back to less than 15,000 years ago. The fossils described in Matzke-Karasz's paper are estimated to be between 16 million and 23 million years old. This, Matzke-Karasz says, proves that giant sperm have persisted in these animals for a substantial period of time.

Ostracods do not hold the record for largest sperm cells — that distinction belongs to some species of fruitfly, which have sperm up to several centimetres long. Exactly why ostracods have such elongated gametes is unclear, says Matzke-Karasz, and she is now working to gain a better understanding of reproduction in living ostracods to tease out an answer.

Scott Pitnick, who studies reproductive biology at Syracuse University in New York says that sperm evolves very quickly and is of great interest to evolutionary biologists. But although researchers can study sperm from thousands of extant species, they often can only infer what has happened in the past. “Seeing is believing,” he says of the latest paper. “For evolutionary biologists, there’s nothing like a good fossil to have it laid out in front of your eyes.”

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References

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2. Iepure, S., Namiotko, T., Valdecasas, A. G. & Magyari, E. K. *Naturwissenschaften* **99**, 587–590 (2012).