New Phylum Found Residing on Lobsters

Even the most sophisticated lobster lovers probably give little thought to the creatures' lips. If they only knew what they were missing.

On the mouths of Norwegian lobsters lives a tiny invertebrate that fits into none of the animal kingdom's 35 or so broad taxonomic groups called phyla, claim Peter Funch and Reinhardt Møbjerg Kristensen of the University of Copenhagen. They have named the creature *Symbion pandora* and have assigned it to an entirely new phylum, which they call Cycliophora.

Their discovery of "what appears to be a new phylum of metazoans has to be the zoological highlight of the decade," asserts Simon Conway Morris of the University of Cambridge in England in a commentary accompanying the report in the Dec. 14 NATURE.

"I think that there will be a lot of response, both positive and negative" to the report, acknowledges Funch. Scientists often argue over phylum designations.

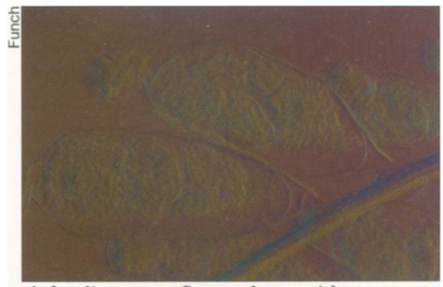
For example, Funch and Kristensen state that the new creature most nearly resembles the phyla Ectoprocta and Entoprocta. Yet scientists fail to agree that Ectoprocta and Entoprocta are closely related, Morris notes.

Tom Fenchel of the Marine Biological Laboratory in Elsinore, Denmark, first observed the creature in the 1960s. Three decades later, using a state-of-the-art electron microscope that can peer deep into cell parts, Funch and Kristensen described the creature's unique body structure and behavior. They find that it reproduces both sexually and asexually and performs some odd stunts in the process. It also has several types of larvae, only some of which feed.

While attached to a lobster, a feeding-stage *S. pandora* uses tiny hairs, called cilia, around its mouth to capture food intended for the lobster. Periodically, its entire feeding apparatus, including the stomach, deteriorates. But *S. pandora* remains stuck to the lobster and grows new feeding structures.

After several cycles, so-called pandora larvae develop inside the feeding-stage animal. Before they emerge, each pandora produces a feeding-stage larva inside itself. When a pandora larva emerges, it settles on the lobster and soon dies. Its feeding-stage larva remains attached to the lobster.

Before the lobster molts, something—perhaps the hormones that tell it to molt—triggers *S. pandora* to produce either a female or a dwarf male, which has only a nervous system, reproductive organs, and cilia for swimming. Then sexual reproduction begins.



Funch

A feeding-stage S. pandora *with a pandora larva in its brooding chamber.*

The dwarf male seeks out an *S. pandora* that is carrying a female and fertilizes her eggs—exactly when remains unclear, Funch says. The fertilized female quickly dies. Yet another type of larva, a chordoid, emerges from the eggs, swims to another lobster, and dies, leaving a few bud cells that develop into a feeding-stage larva.

When their lobster hosts finally molt, all the *S. pandora* disperse and find a new lobster or return to their original one after it finishes molting. — *T. Adler*

San Andreas looms larger in L.A.'s future

When the San Andreas fault eventually unleashes the Big One, it will batter Los Angeles with waves of seismic energy far greater than seismologists had ever imagined, according to a ground-breaking computer simulation—the largest yet attempted for a San Andreas quake.

"We're looking at numbers that are two to three times what had been predicted previously," says seismologist Ralph J. Archuleta of the University of California, Santa Barbara. Archuleta worked with colleague Kim B. Olsen and with Joseph R. Matarese of the Massachusetts Institute of Technology to simulate the effects of a magnitude 7.75 tremor originating north and east of Los Angeles.

Seismologists put the chances of such a quake at one in four by the year 2024.

"When I look at the calculated ground motions, they are just breathtakingly large," says seismologist Paul G. Somerville of Woodward-Clyde, a consulting firm in Pasadena, Calif.

Angeleños shouldn't rush to pack their bags, however. Somerville and other researchers warn against placing too much faith in the computer simulation. Despite its massive size, they say, it suffers from limitations and uncertainties.

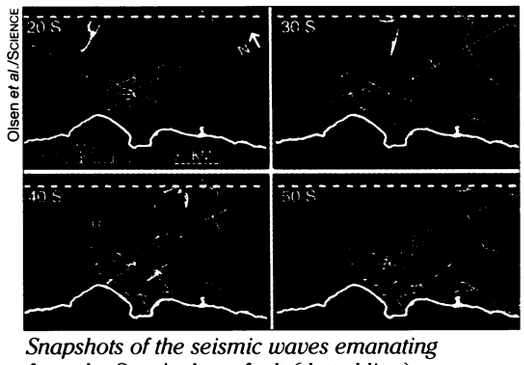
Even Archuleta hesitates to interpret the results. "Is this bad news? I don't know. I don't know if this will be significant or not," admits the seismologist, who discussed the work this week in San Francisco at a meeting of the American Geophysical Union. Archuleta and his coworkers also published their results in the Dec. 8 SCIENCE.

In the simulation, the quake ruptured a 170-kilometer-long stretch of the San Andreas fault from a region near the town of Gorman to the San Bernardino area east of Los Angeles. The virtual vibrations rippled through a three-dimensional representation that included realistic details of the local geology.

Other research groups have conducted simulations with the same algorithm, but Archuleta's team is the first to attempt computations for so big a quake. The simulation took 23 hours on a supercomputer with 512 parallel processors.

"It's a calculation that many have dreamed about for years," says Thomas H. Heaton of the California Institute of Technology in Pasadena.

Despite all this computing power, Archuleta's group had to limit the simulation to keep it manageable. The team looked only at vibrations with periods greater than 2.5 seconds. The rolling motion from these long-period waves threatens tall buildings and long bridges but does not usually harm buildings of a few stories or less, which constitute the majority of structures in Los Angeles.



Olsen *et al.*/SCIENCE

Snapshots of the seismic waves emanating from the San Andreas fault (dotted line). White lines are Los Angeles freeways; red shows strongest shaking.

Not surprisingly, the simulated vibrations were strongest in regions close to the San Andreas fault, including heavily populated San Bernardino. Unexpectedly, however, the computer exercise also showed the ground moving powerfully in parts of Los Angeles some 60 kilometers from the fault.