New creatures from the Cambrian

At the turn of the century paleontologist Charles Walcott stumbled upon a remarkable fossil find in the shale layers of Mt. Burgess in British Columbia. The well-preserved remains of more than 100 species of arthropods (invertebrates such as insects, scorpions and millipedes), sponges and other creatures, embedded in the Burgess shale since the Middle Cambrian 530 million years ago, provided scientists with a distinctly rare glimpse of life near its very beginnings.

Bill Robertson/Royal Ontario Museum

Newly found "Santa Claws," a few inches long, may be the ancestor of scorpions.

Now a new assemblage of Middle Cambrian fossils has been unearthed, giving paleontologists another peek at early life. The fossils were found on Mt. Stephen, 5 kilometers to the south of Walcott's site, in rocks that are slightly older than the Burgess shale. According to Desmond H. Collins, a curator at the Royal Ontario Museum in Toronto, Canada, who reported the find at the recent meeting of the Geological Society of America in Orlando, Fla., the Mt. Stephen assemblage is one of the largest and most significant discoveries since Walcott's find.

Included in the new assemblage of more than 1,000 specimens are the first representatives of modern chaetognaths (arrowworms) and ctenophores (jellyfish). Collins's group also found the largest Cambrian animal known, *Anomalocaris nathorsti* — a half-meter-long monster with a circular mouth, radiating teeth and claws in the front. In addition, there are a few animal forms of unknown affinities, including a leggy creature that Collins describes as looking most like an inch-long cameo of a stegosaurus (a dinosaur with a small head and club tail). "It's like nothing I've ever seen," he says.

But the real prize of the Mt. Stephen assemblage is an arthropod Collins has dubbed "Santa Claws" because of the five pairs of claws attached to its head (and because Collins thought of the fossil as a gift). Santa Claws has two unusual flaps on its side and a beaverlike tail, both of which Collins suspects helped to steer the fearsome creature. Collins also believes that Santa Claws is the earliest ancestor of sea scorpions, which thrived during the Ordovician period after the Cambrian and which later gave rise to scorpions, the first land animals.

The Mt. Stephen assemblage, as well as another recent discovery of many similar fossils of older and younger ages made in Utah by Richard A. Robison of the University of Kansas in Lawrence, shows that by the middle of the Cambrian virtually every invertebrate group was represented and well developed. Morever, by providing views of life several million years before the animals in the Burgess shale died, the two recent finds indicate that the Middle Cambrian animals were not evolving very rapidly. This suggests to Collins that Cambrian fauna had been evolutionarily stable for some time — which may imply that early evolution occurred either faster or even earlier than paleontologists commonly suppose. —*S. Weisburd*

Striking up a synthetic sound

A keyboard isn't the only way to coax a musical sound out of a computer-controlled synthesizer. Max V. Mathews and his collaborators at AT&T Bell Laboratories in Murray Hill, N.J., have invented a sensor that responds to the beat of a soft drumstick. The sensor tells the computer where, when and how hard the sensor is hit. The synthesizer responds with the appropriate musical note.

The sensor, a very light, rigid sandwich of wood and Styrofoam, has the shape of an equilateral triangle. Each time the sensor is struck, it sends four pieces of information to the computer — a "trigger" pulse, the two coordinates of the strike point and the force of the blow. The computer uses this information to shape synthesizer notes. The blow force usually controls the loudness, while the two coordinates may set the pitch and the sound's decay time.

One novel way of playing the sensor is in the form of a "conductor program." The sequence of pitches to be played is stored in the computer's memory. Each stroke causes the next pitch in the sequence to be played. In this mode, the two coordinates control the type of sound and its decay time. As a result, the player no longer has to worry about getting the notes right, and can concentrate instead on dynamics and tempo.

"In this particular style of music and lots of other music," says Mathews, "the performer has very little choice in what pitch he plays. If he changes the pitch from what the composer wrote down, that's considered to be a mistake." On the other hand, the performer has much more freedom to choose an appropriate rhythm, loudness, speed and timbre.

"Most of the music is not in the raw notes but in the interpretation of the notes," says Mathews. "If the musician doesn't really have a choice, don't make him make the choice. There is plenty left for the performer to do in bringing the music out of the raw score." A suitable sensor allows a musician to modify in interesting ways what's coming from the memory of the computer. A drumlike sensor can be played faster than a keyboard, and, says Mathews, "people like hitting things."

Mathews demonstrated his percussive sensor last week at an Acoustical Society of America meeting in Nashville, Tenn. "This is a simple, rugged, inexpensive sensor that's easy to manufacture," says Mathews.

The Mathews sensor works best with a synthesizer like the Synclavier II manufactured by New England Digital Corp. This electronic instrument responds almost instantly to signals sent in by a computer.

Mathews and W.A. Burnette have developed a special computer language, a form of RTSKED, for the Synclavier. It allows precise control of the timing of computer-controlled events to generate complex musical sounds, which can then be triggered by signals from a keyboard or some other sensor. "Yet [the language]," says Burnette, "is still easy for musicians and composers to use." —*I. Peterson*

Stroke surgery nix

A surgical technique that purportedly reduces the risk of stroke is of no value, according to a group of researchers.

The procedure, called extracranial-intracranial arterial (EC/IC) bypass, sounds like a logical solution: Since many strokes are caused by a narrowing and eventual closing down of arteries feeding the brain, why not find another route to serve the brain tissue?

In 1967 a European surgeon devised a procedure in which an artery on the scalp is attached to an artery on the brain, to bypass a partial or total blockage. Each year in the United States this operation is done on 3,000 to 5,000 people who have had, or are at high risk of, stroke. It costs about $15,000.

In the new study, researchers led by H.J.M. Barnett of University Hospital in London, Ontario, looked at 1,377 people who had recently had strokes or had signs of impending strokes. They randomly assigned 714 to get standard medical care and 663 to get EC/IC bypasses. The group that had the surgery subsequently had a slightly higher rate of stroke and death than the control group, according to the study, which appeared in the Nov. 7 NEW ENGLAND JOURNAL OF MEDICINE.

"The study has answered an important question," says Michael D. Walker of the National Institute of Neurological and Communicative Disorders and Stroke in Bethesda, Md., which funded the study. "But it has raised another: *Why* doesn't the procedure work?" □