The largest flying creature

The fossilized remains of what may be the largest flying creature that ever lived—a true monster of the skies believed to have spanned a prodigious 15.5 meters, wider than most executive jets—have been unearthed in the Big Bend National Park in western Texas.

The bones, which date from the Late Cretaceous period about 63 to 70 million years ago, were actually discovered in the summer of 1971, but they were so huge that University of Texas graduate student Douglas Lawson assumed he had stumbled onto the remains of a land animal. Previously known pterosaurs, or flying reptiles, reached wingspans of little more than nine meters. Several paleontologists, however, confirmed that the huge bones (the radius, equivalent to a lower-arm bone, was 67 centimeters long), hollow and light in weight despite their size, were those of a flying creature.

Since then, Lawson has found two more pterosaurs in the same region, both of them smaller but belonging, as does the monster, to what he believes to be an entirely new genus. The latter find, discovered last spring, showed a complete wing, as well as a femur and some cervicals, and may turn out to be a complete skelton, although it is not of the imposing size of the original example. Next week, Lawson, now working on his doctorate at the University of California at Berkeley, will return to the Big Bend to dig it out of its hillside, aided by Wann Langston Jr., director of the University of Texas Memorial Museum. Even if it is only half complete, the skeleton should make possible a more reliable estimation of the size of the giant, whose remains include only a humerus and partial radius, proximal carpal, distal carpal, metacarpal, first phalanx and second phalanx.

There are several ways of estimating wingspan from such remnants. Comparing the length of the humerus with wingspan in a better-known genus such as *Pterodactylus antiquus* and simply enlarging the numbers, Lawson says, yields a wingspan for the monster of only 11 meters. But, he points out, as with most flying creatures, as pterosaurs grew larger and heavier, they needed a proportionately greater increase in wingspan to keep them aloft. It is such an expansion of measurements from the smaller Big Bend specimens that suggests 15.5 meters. In fact, he says, beyond individual growth patterns, this effect seems to be still greater among large types of pterosaur. If that is true, the wings of the Big Bend behemoth could have stretched a mind-boggling 21 meters—almost 69 feet.

British Museum

Prehistoric predators, ponderous pterosaurs scan the Late Cretaceous sky.

The intermediate find, unearthed in the spring of 1972, included enough wing parts to suggest only a six-meter wingspan. However, it included enough mandibular structure to suggest jaws a full meter in length, although, reports Lawson in the March 14 SCIENCE, apparently without teeth.

Despite the lack of teeth, Lawson believes—and this may turn out to be the most controversial aspect of the new genus—that the newly discovered pterosaurs may have been carrion-eaters. Most pterosaurs are thought to have subsisted on fish, living on shore and flying out to prey on the teeming denizens of the primordial oceans. All three Big Bend specimens, however, were found at least 400 kilometers from the nearest Late Cretaceous seacoast. The monster itself was found in what would have been a stream bed, and not far from an ancient flood plain, but neither environment, says Lawson, would have provided sufficient bounty for such a titan. Nor, he believes, were there enough insects, the other supposed diet for some pterosaurs.

Whatever they ate, all three specimens were found in nonmarine sediments, a rarity for pterosaur remains, and, Lawson says, unique in North America, suggesting that future pterosaur-hunters may now have wider ranges to explore. The monster may also indicate a need for reexamining pterosaur classifications, since previously found wing structures thought to indicate a given genus may instead have evolved in response to sheer size. □

Sex differences in reading words

Females may perceive words differently, and thus read differently than males, three British psychologists conclude in NATURE (253:438). In three tests with college-aged students, Max Coltheart, Elaine Hull and Diana Slater investigated whether females and males read phonetically (by sounding words out) or visually (recognition by spelling), and if the difference is sex-related.

To study tasks that are purely visual or purely verbal, the team asked 75 British undergraduates to mentally tabulate the number of letters from A to Z containing the sound "ee" to test use of verbal aid. Writing or speaking during the test was prohibited; speed in answering was encouraged. A similar task to test visual aids in reading required the group of respondents to mentally count the number of letters

containing a curve in their upper-case form. Although females were faster on the verbal test and males faster on the visual tasks, the differences, the team says, were not statistically significant (a difference of 0.9 seconds or less in both tests). But the women made fewer mistakes on the verbal test (number of "ee" sounds) while the men scored better on the visual task (letters with curves). The team says these results imply that women more often than men read words by the way they sound.

In selecting their experiments, the team purposely avoided the possibility of visual imagery or tasks that appear visual but could be successfully performed verbally. Since sex differences in psychometric investigations (measuring mental speed) are usually so small, earlier research of a similar nature, the team says, might have been ignored. Also, differences might not be attributed to sex by researchers who may be looking for some other determining factor.

In a follow-up experiment patterned after one designed by D. W. J. Corcoran of the British Medical Research Council, subjects were asked to scan six enlarged pages of a novel, crossing out the letter "e." As expected, females had more difficulty in recognizing and marking out unpronounced "e" 's, as in "late," than did males, confirming the team's theory that females rely more strongly on verbal analysis, while males on visual analysis.

To further test the theory, 20 subjects, 10 males and 10 females, were told to press a "yes" button the minute they recognized an English word flashed before them. With the aid of an oscilloscope screen controlled by a computer, printed data were produced at the end of each subject's session. Four groups of "words" were shown to the respondents:

—one word from a pair of homonyms (suite/sweet, urn/earn)

—words that look like homonyms but aren't

—nonwords that sound like previously shown homonyms (horl, laks, throo)

—nonwords which are pronounceable but nonexistent (dorl)

Scores from this test indicate that phonetics are used by both sexes in reading, but more by women than by men. Apparently, the sound of the word has more effect on women than on men.

If the same pattern appears in young children, something researchers haven't tested yet, then educational techniques in reading may eventually be altered for sex differences. If relatively pure tests of visual and phonetic processes can be devised which are suitable for use with children before they learn to read, it may be possible to test the origins of those differences as well. □

Young chimps learning sign language

That chimpanzees can be both avid and intelligent at communicating with humans has been shown in many ways. A chimp named Sarah learned to arrange shaped objects on a board into "sentences" at the University of California, while several others at the Yerkes Regional Primate Research Center in Atlanta can construct remarkably complex messages by combining stylized geometric shapes on a keyboard (SN: 6/2/73, p. 360). A comparatively natural method has resulted from the work of Allen and Beatrice Gardner at the University of Nevada, who taught more than 130 sign-language gestures to a chimp named Washoe, inspired by the normal hand-and-arm communication of chimpanzees in the wild (SN: 11/6/71, p. 313).

Since then, the Gardners have made two significant changes in their teaching method, resulting in a substantial improvement in the chimps' language acquisition. More important, however, as they report in the Feb. 28 SCIENCE, "more valid comparison can now be made between the acquisition of language by children and by chimpanzees."

One change was to use deaf persons, persons with deaf parents and other "fluent signers" as teacher-participants. The other was to begin exposing the chimps to the language—Ameslan, the American Sign Language of the deaf—within a day or two of birth, unlike Washoe, who began at age 11 months.

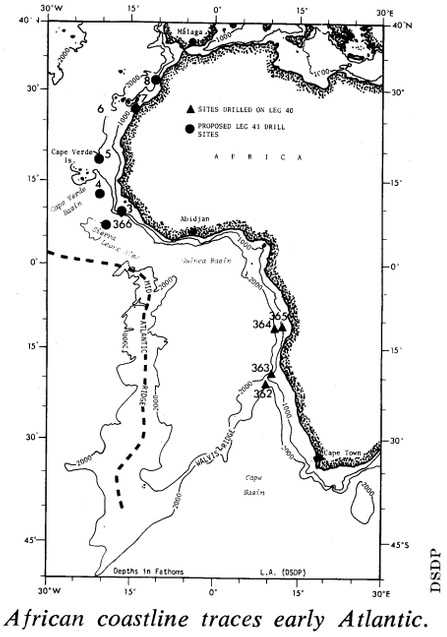
The results were striking. The two young chimps had four-sign vocabularies by 13 and 15 weeks respectively, and at six months had mastered 15 and 13 signs, "drink," "tickle," and "what-we-play-now?" Washoe, after six months' training, was using only two. □

Early Atlantic: A narrow salt trap

In the great rending that separated Africa and South America as the primordial supercontinents began shifting into their present formations, the land was not alone in feeling the change. Leg 40 of the globe-spanning Deep Sea Drilling Project, recently completed off the southeast coast of Africa, has revealed that the waters destined to become the South Atlantic endured their own transformations: now lake-fresh, now brackish, now rich with life-giving oxygen, now suffocating and still. During one period, in fact, according to co-chief scientists William Ryan of Lamont-Doherty Geological Observatory and Hans Bolli of the Geologisches Institut in Switzerland, the young waters may have dried up completely.

The South Atlantic began as nothing more than a narrow crack, gradually widening as it split northward through the land. Tiny fossilized plants and animals found in the sediments of African coastal basins have told Leg 40 researchers aboard the ship Glomar Challenger that at first the waters in the crack were fresh, provided by deep lakes much like those found today in the East African rift valley.

But as the crack widened and deepened, some of its component lakes reaching a depth of more than 1.5 miles, the water began to change. First it grew saline, helped along by thousands upon thousands of tons of sediment pouring into the gap from both sides. Despite the sediments, however, the growing trench was still a deep one —so deep, Ryan and Bolli believe, that there was simply not enough circulation to let the waters freshen themselves



African coastline traces early Atlantic.

with new oxygen from the air above. As a result they became brackish—a huge, stagnant finger of near-dead water that suffered through its northward creepings for more than 20 million years.

Presently, when the split had traveled about a third of the way toward its ultimate continental schism, the water reached a then-young transverse formation now known as the Walvis Ridge. The waters pushed across the ridge, but only slowly, so that for several million years they evaporated more quickly north of the ridge than they could be replaced by the inflow. The sign of that dead time remains to this day, the