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.

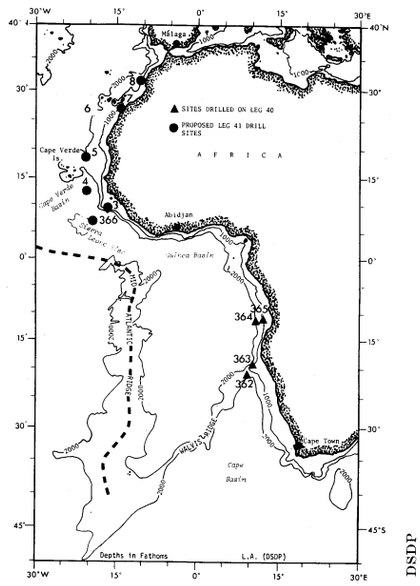
The results were striking. The two young chimps had four-sign vocabularies by 13 and 15 weeks respectively, and at six months had mastered 15 and 13 signs, "drink," "tickle," and "what-we-play-now?" Washoe, after six months' training, was using only two. □

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

Challenger researchers report: a vast layer of evaporite minerals and rock salt, some 8,000 feet thick, stretching from the midpoint of Africa's southwest coastline all the way up to Nigeria—a residue equal to a tenth of all the dissolved salt in the rest of the oceans of the world. Though the influx of water after a while caught up with the evaporation rate, ending the period of salt deposition, continued poor circulation led to another, even longer, period of stagnation. The scientists believe, in fact, that it lasted all the way until the schism was complete, when what is now Brazil had been pulled away from beneath the bulge of Africa.

Besides its historical contributions, Leg 40 of the DSDP may have made a valuable economic one. Core samples from the drilling operations revealed a vast accumulation of extremely thin layers of organically rich sediment, each less than .01 inch thick. "Several of the major producing oil fields in the onshore and shallow offshore areas of West Africa," says a DSDP spokesman, "have tapped their liquid hydrocarbons in sediments of identical age and similar rock type." □

Catalysts may do more harm than good

Environmental Protection Agency Administrator Russell E. Train last week suspended the statutory auto emission standards for the 1977 model year and requested the Congress to further extend a set of interim standards, because of sulfuric acid production by exhaust catalysts needed to meet the standards. "At some point," Train concluded, "catalysts may begin to do more harm by creating sulfuric acid, than good, through additional control of hydrocarbons and carbon monoxide."

The use of add-on catalytic converters has long been criticized as a clumsy way of controlling pollution because of their cost, fragility, inefficiency and the absolute need for unleaded gasoline. The National Academy of Sciences, in particular, has warned that overcommitment to catalyst technology could forestall development of more promising types of engines that would be intrinsically less polluting (SN: 4/28/73, p. 276). Only very recently, however, has firm evidence of an additional health hazard caused by the catalysts come to light, Train said.

In January, when President Ford asked for certain legislative modifications of the Clean Air Act, the question of sulfuric acid generation did not arise, so that the present EPA proposals represent a slackening of even those relaxed standards. The law, for example, would require emission of carbon monoxide to fall to 3.4 grams per mile by 1977. The President had requested enactment of an interim standard of 9.0 grams per mile through 1981. Now EPA says emissions should remain at the present level of 15 grams per mile until 1980, when the 9.0 interim standard would be applied. The hydrocarbon standard remains 1.5 grams per mile until 1980.

The dilemma stems from an apparently inherent trade-off between various types of pollution involved in use of catalysts. As exhaust hydrocarbons and carbon monoxide pass through the catalyst chamber, they are further oxidized to carbon dioxide, water and other relatively harmless products. But sulfur dioxide in the exhaust also become oxidized, forming a sulfate that mixes with the water to produce a fine mist of sulfuric acid. Thus a car with a catalyst may give off 35 times as much sulfuric acid per mile as a noncatalyst car, and if air pumps were added—in order to meet the stricter standards—the sulfuric acid production might double.

Train's decision to let implementation of catalyst technology remain about where it is thus represents a compromise between pushing ahead with the catalysts, incurring unknown risks from sulfuric acid, or backing up, removing or "poisoning" catalysts altogether, and thus doubling or tripling emission of other pollutants. (Train noted that should sulfuric acid suddenly be viewed as an extreme hazard, all the catalytic converters in the United States could be made nonfunctional practically overnight by having people use a couple of tanks of leaded gasoline in their catalyst-equipped cars.)

Predictably, the decision was seen as disastrous by environmentalists and insufficient by industry spokesmen. The National Clean Air Coalition (representing the Sierra Club, Friends of the Earth, the American Public Health Association and others) claimed the suspension condemned city-dwellers to "lives of pollution-aggravated disease." They urged removal of sulfur from gasoline. William D. Eberle, president of the Motor Vehicle Manufacturers Association, urged that all emission-control standards be frozen at present levels through 1981, and said that the EPA proposals would lead to "significant fuel economy penalties."

While Train admits "this is a sobering, in some ways a disappointing occasion," he says the added time should allow manufacturers to introduce new engine technologies that do not require catalysts and that research will establish more definite limits on the presently unknown effect of sulfuric acid pollution. In the meantime, no alternative, such as gas desulfurization, would be adequate, he said. □