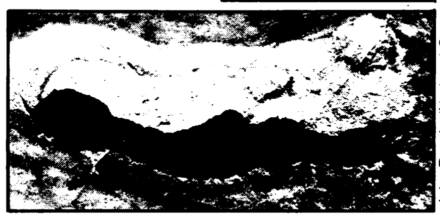
Happy trail for three hominids

It is hard to speculate how creatures might have spent their free time 3.6 million years ago, but the latest evidence suggests they were rather enthralled with their new-found ability to walk upright and took great pleasure in their constitutionals. In a footnote to her discovery last year of a fossilized trail of footprints (SN: 3/31/79, p. 196), Mary D. Leakey has depicted an intriguing scenario of a three-person "family" of sorts holding hands and playfully marching through damp volcanic dust during Pliocene times in the Laetolil region of northern Tanzania.

Leakey's original find of two side-by-side trails suggested that two individuals — an adult and child — had participated in the stroll; the discovery "demonstrate[d] once and for all that... man's direct ancestor walked fully upright with a bipedal, freestriding gait," Leakey said at the time. Now, the uncovering of "better preserved" footprints along the same trail provides a "more accurate interpretation" of that prehistoric walk, she said at a National Geographic press conference.

The prints reveal that a third individual, an adult, walked directly behind the first adult, placing its feet in the first creature's footprints, while the younger being on the left matched the leader stride-for-stride. This leads Leakey to believe "that you've got a social group there of a male, female and juvenile," which the proximity and pattern of footsteps indicate were holding hands. Although Leakey says that "quite honestly, I can't think of why they should" walk that way, she does note that observations of ape behavior suggest that matching steps and holding hands may be a form of recreation.

It is unlikely the walking formation had any higher purpose because these particular hominids were probably not very bright. Although their bipedalism had freed their hands for the first time, the lack of evidence of tool use by the creatures suggests that their brains were not yet developed enough to conceptualize tools, according to Leakey. □



Child's footprints (top at left) and three-toed horse prints (veering right) flank trail of two adults whose footprints overlap (bottom).

John Reader/National Geographic Society

Ape-talk: Two ways to Skinner bird

The flap over whether or not apes really can use symbols to communicate with one another has reached new heights with the entry into the picture of two Carneaux pigeons — Jack and Jill. In what could be interpreted as a compliment to pigeons, but is more likely a slap at primate intelligence, famed Harvard behaviorist B. F. Skinner reports that his two birds have rather easily duplicated what was billed as a major accomplishment for apes: symbolic communication.

Recent reports have disputed the findings of several researchers who claimed to have taught apes (in one case a gorilla) to communicate with humans and each other. Among the most significant such work was that of a Yerkes Primate Research Center group, headed by psychologist E. Sue Savage-Rumbaugh. The group reported that chimpanzees Sherman and Austin had "achieved the first instance of ... symbolic communication between non-human primates" (SN: 8/19/78, p. 117).

Now, Skinner reports — with tongue reportedly gravitating toward cheek — "the first instance of such symbolic communication between nonprimates." Employing a system of symbol-coded keys similar to that used by the Yerkes group in its experiments, Skinner and colleagues Robert Epstein and Robert P. Lanza report in the Feb. 1 SCIENCE that pigeons "are able to transmit information to one another by using symbols." At the culmination of their training, Jack was able to ask Jill about a hidden color; Jill would check the color behind a curtain and peck the answer on a coded key to Jack, who depressed a "thank you" key that rewarded Jill with food; Jack then pressed an appropriate, color-matched key on his console and received his food.

This all suggests, says Skinner, that any ape "learning" may be nothing more than a result of classical conditioning response that is achievable even in the lowly bird brain. Duane M. Rumbaugh, a co-investigator along with Sarah Boyson on the Yerkes team, vigorously disputed Skinner's conclusions and labeled the Harvard study "misleading" and "not responsible." While the pigeons may have "simulated some of the more simplistic things" performed by Sherman and Austin, Rumbaugh suggests that the birds pecked certain keys only because of the keys' fixed locations and not because they recognized the symbols or colors. In the chimp experiments, the keys were shifted to ensure the animals were responding to the coding rather than location, Rumbaugh told SCIENCE NEWS. □

Closing stubborn antibiotic rings

The most widely used antibiotics — beta-lactam antibiotics — may be tough when fighting bacterial infection, but the compounds seem to prefer the kid glove treatment during their synthesis, a Notre Dame research team has discovered.

Marvin J. Miller and co-workers report they have developed an efficient and versatile process of synthesizing beta-lactam antibiotics — the most famous of which is penicillin — by using very mild conditions during a difficult step of the synthesis. The difficult step involves the core of beta-lactam antibiotics — a hard-to-produce four-member ring composed of three carbons and a nitrogen atom. Forming the final bond of the ringed compound involves some chemical diplomacy because the bond angles are smaller and more strained than in open-chain systems. So, to close the beta-lactam ring with a nitrogen-carbon bond, researchers traditionally have had to protect the necessary functional groups attached to the four-member ring or leave these peripheral groups off until the ring is closed. Now, Miller and his colleagues have performed the ring closure, with functional groups intact, under very mild conditions — near physiological pH, for example.

Easing the burden of the ring-closing step of antibiotic synthesis could revolutionize the development of new antibiotics. While beta-lactam antibiotics have been available for years through a natural fermentation process, the bacterial targets of the antibiotics have evolved enzymes capable of destroying the antibiotics. So, researchers have been searching for unusual derivatives of the natural antibiotics that are effective medicinal agents. Interestingly, Miller's proposed method of synthesizing these derivatives is the first real mimic of the way nature produces these compounds.

"Beta-lactam synthesis has perhaps been the source of more research effort than any other synthetic challenge in organic chemistry," says Miller, whose ring-closing method is described in the Feb. 1 JOURNAL OF ORGANIC CHEMISTRY. "The private pharmaceutical companies have poured billions of dollars into research and development in a constant search for derivatives of beta-lactam antibiotics."

And several major pharmaceutical companies — Eli Lilly and Co., for example — have shown interest in Miller's method of beta-lactam antibiotic synthesis and are exploring patent possibilities.

"It may be several years before antibiotics are commercially produced by this method, if at all," Miller warns, "but the main concern at this point is that a major breakthrough has been made which may significantly help man fight bacterial infection in the years ahead." □