Agriculture

Humble crop goes high-tech

Every day, about 500 million people dine on the starchy roots of the cassava plant, a tropical vegetable that tolerates acidic, infertile soil.

Cassava is ripe for improvement, however. It lacks protein, and its susceptibility to pests and diseases often costs farmers up to 80 percent of their crop (SN: 10/30/93, p. 277).

Numerous features of the plant make it difficult to improve through traditional breeding methods, so scientists have taken a nontraditional approach and developed techniques for genetically engineering cassava. Reports of these achievements appear in the June NATURE BIOTECHNOLOGY.

Hong-Qing Li and his colleagues at the Swiss Federal Institute of Technology in Zürich have grown cassava plants that express two foreign genes. One, a marker gene, turns blue any cell it has penetrated, revealing to the scientists that their technique has worked. The other gene confers resistance to antibiotics.

The Swiss researchers inserted the two foreign genes into cassava with the help of *Agrobacterium tumefaciens* (SN: 1/17/87, p. 37). This unusual bacterium has the advantage of being able to insert some of its genes into plant cells. The scientists used a transformed version of *A. tumefaciens* in which the transferable genes had been replaced with the foreign marker and antibiotic-resistant genes.

Fauquet

Cassava tubers from Ivory Coast in West Africa.

They then dipped leaves from a cassava embryo into a solution containing the bacteria. Over a few days, the bacteria transferred the foreign genes to cells in the leaves. The team exposed the leaves to an antibiotic, which killed off any remaining normal cells and left only the engineered ones. With the help of growth hormones, the group forced the leaves to form shoots and grow into mature cassava plants.

Christian Schöpke of the Scripps Research Institute in La Jolla, Calif., and his colleagues are also growing new-fangled cassava, but they employ a different technique, biolistics.

This method involves bombarding the plants' embryogenic calli with tiny gene-coated gold bullets. These calli are composed of cells that can become embryos and eventually mature plants. The team used a special liquid culture to grow the cells into plants.

Nigel J. Taylor, also of Scripps, and his colleagues developed this method of growing cassava from embryogenic calli. His group and Schöpke's describe their techniques in the June NATURE BIOTECHNOLOGY.

Like the Swiss team, Schöpke and his coworkers used an antibiotic-resistant gene and a marker gene in their study. In more recent experiments, however, they have also inserted genes to make the plant resistant to the cassava common mosaic virus, found in South America, and to the much more destructive African cassava mosaic virus, says Claude Fauquet of Scripps, a coauthor of the biolistics report.

Biolistics will probably work on a wider variety of cassava genotypes than the *Agrobacterium* method, predicts Fauquet. Using biolistics, researchers can also insert multiple genes into a single plant. They have added 15 foreign genes to rice, for example.

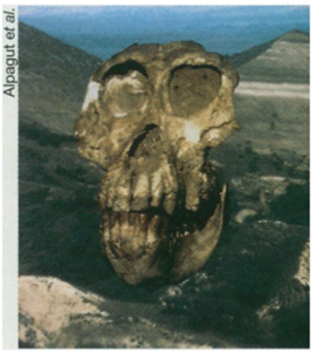
On the other hand, *Agrobacterium* is easier to use and requires no fancy equipment, the researchers note.

Anthropology

New face for ancient ape

Fossil hunters have found precious few remains of apes that lived between 25 million and 5 million years ago, before the emergence of the human evolutionary family. An excavation in central Turkey, however, has yielded the largely complete face of an almost 10-million-year-old ape with a look all its own. The fossil belongs to the species *Ankarapithecus meteai*, according to excavation director Berna Alpagut of Ankara University in Turkey and her coworkers.

No other fossil or living ape possesses the configuration of facial, jaw, and dental features observed on the new find, Alpagut's team reports in the July 25 NATURE. *A. meteai*, until now known only by fragmentary remains, was probably not a direct ancestor of either modern apes or humans, they contend.



Alpagut *et al.*

Ankarapithecus *fossil superimposed on the Turkish landscape near the site of its discovery.*

"This specimen's unique mix of anatomical traits, combined with other fossil evidence, points to a remarkable radiation of ape lineages in Europe and western Asia beginning around 18 million years ago," asserts John Kappelman of the University of Texas in Austin, who participated in the project. "*Ankarapithecus* and a number of other apes probably went extinct between 8 million and 9 million years ago."

In analyses of less complete *Ankarapithecus* fossils, other researchers have drawn direct links between the Turkish ape and the Asian fossil ape *Sivapithecus*, as well as with modern orangutans. But the new fossil's unusual facial layout undermines those proposals, Kappelman argues.

David Pilbeam of Harvard University welcomes the Turkish find but cautions that the evolutionary relationships among ancient apes remain difficult to discern and open to debate. Unlike Kappelman, Pilbeam suspects that *A. meteai* bore a close evolutionary relationship to *Sivapithecus*.

Analysis of several *A. meteai* limb fossils also found by Alpagut's group may help to clarify its evolutionary standing.

An American artifact in Siberia

Prehistoric residents of North America chipped pieces of stone into distinctive "fluted points" as many as 11,200 years ago. Archaeologists now report the discovery of the first fluted point on the Russian side of the Bering Strait, where a land bridge once offered passage from Asia to North America (SN: 7/20/96, p. 41).

The artifact, broken into two pieces, comes from the Siberian site of Uptar, located 1,200 miles from the Bering Strait. Dating of volcanic ash and charcoal at Uptar provides an age estimate of at least 8,300 years for the stone point, although its precise age has not been established.

The find challenges the widespread assumption that the production of fluted points occurred only in North America, asserts Maureen King of the Desert Research Institute in Las Vegas. On a trip to Russia, King noticed the stone implement among artifacts gathered by Sergei Slobodin of the Department of Education in Magadan, a city near Uptar.

If the point dates to more than 11,200 years old, it may represent a precursor of New World fluting techniques, King and Slobodin contend in the Aug. 3 SCIENCE. A younger date would suggest that knowledge about producing these points coexisted in Siberia and North America or moved back and forth from one continent to the other, they hold.

King and Slobodin will conduct further excavations and dating analyses at Uptar later this summer.