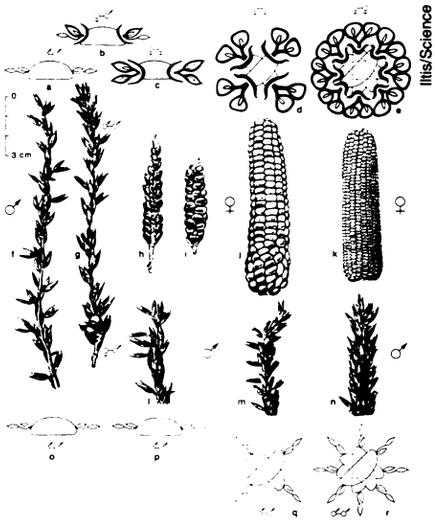
Abrupt sex change in the corn wars

With cataclysmic shifts in structure, size and shape, the male tassels of corn's Mexican ancestor became corn ears about 8,000 years ago. Hugh H. Iltis of the University of Wisconsin in Madison proposes that this explanation should bring to an end the "Corn Wars," a century of vehement arguments among botanists and archaeologists over the origin of modern corn. But some other botanists see no truce on the horizon. They say they find flaws in Iltis's arguments and that there is insufficient evidence to decide among competing models.

Iltis describes his "catastrophic sexual transmutation theory" (CSTT) as an alternative to the view that the ear of corn evolved from the ear of teosinte, a many-branched Central American grass. While modern corn has many rows of large, soft, exposed grains, teosinte's tiny ears have only two single rows of six to twelve hard-shelled kernels.

"It was hard to conceive how such a massive monster as the corn ear could have sprung forth from such a tiny, fragile mouse," Iltis says.



Iltis/Science

Iltis depicts the proposed evolution of corn ear (k) and tassel spike (n) from the teosinte tassel spike (f). The intermediate forms shown are modern corn and teosinte hybrids. Cross-sections are diagramed above and below ears and spikes.

The ears' positions on the stalk suggested to Iltis that the corn ears derive from a teosinte tassel, the male flower cluster. Iltis says in the Nov. 25 SCIENCE, "... in a well-grown, branched teosinte, the position of the maize ear is always occupied by a tassel."

Corn and related teosintes have male and female flowers on the same plant. Each flower has potential for developing characteristics of the opposite sex, Iltis says. Sexual changes have been observed in response to disease, injury and harsh environmental conditions.

Iltis proposes that about 7,500 years ago a wild population of teosinte was subjected to abnormal conditions, perhaps a winter flood or infection with a virus or fungus. The stress produced plants with feminized tassels and free grains, which are desirable for a crop plant. He suggests local farmers noticed the aberration and chose these plants for cultivation, selecting gradually for genes that contribute to feminization even without the original adverse conditions.

"There is no question that the theory is right," Iltis told SCIENCE NEWS. "It resolves all the conflicts."

But a number of other theories still are thriving, says Robert Byrd of the University of Missouri in Columbia. Where Iltis takes teosinte as corn's direct and only ancestor, others say modern corn derives from a hybridization of an early teosinte and a wild corn that has since become extinct.

"I think this CSTT is a classic case of putting the cart before the horse," says Paul C. Mangelsdorf of the University of North Carolina in Chapel Hill. He says that archaeological evidence indicates that corn preceded teosinte, rather than being the descendant of it.

Mangeldorf proposes that primitive corn dates back more than 7,000 years, evolving gradually until it hybridized with teosinte about 4,000 years ago. "From then on it evolved explosively and became a vigorous hybrid," Mangelsdorf says.

Major M. Goodman of North Carolina State University in Raleigh also has doubts about the sexual transmutation theory. "There's little question that the ear of corn is morphologically very similar to the central spike of the tassel," he says. "But how they came to correspond is open to interpretation. There is considerable doubt in many minds that this has occurred in the last 10,000 years [as Iltis suggests]. The archaeological evidence screams 'no.'"

—J. A. Miller

Placebo: Killing pain without opiates

The human brain responds to extreme pain by releasing its own natural opiates, neurochemicals that bind to specific neurons and somehow provide pain relief. Recently this opiate system has been implicated in the pain relief associated with acupuncture, and preliminary evidence has suggested that even placebos—sugar pills prescribed for psychological relief—achieve their analgesic effects by activating this system. New research, however, indicates that the brain's devices for pain control are more complicated: When placebos trick the brain into providing pain relief, they apparently do so by activating a neurochemical system that operates independently of the opiates.

The brain's opiate system has been implicated in the so-called placebo effect because psychological pain relief following surgery has been experimentally reversed by a dose of naloxone, a drug that blocks opiate action. Recently, in order to further test for an interaction between placebo and naloxone, Richard H. Gracely and co-workers at the National Institute of Dental Research in Bethesda, Md., gave hidden doses of naloxone to dental patients two hours after surgery — a time when they would normally be experiencing significant pain. Another group of patients did not receive the opiate blocker.

Half of the subjects in each group were later given a placebo for pain relief, while the others were left untreated; each subject was questioned about pain. As the researchers report in the Nov. 23 NATURE, both the placebo and the naloxone produced independent effects. The placebos provided considerable pain relief not only in subjects untreated with naloxone, but also in those with their natural opiates under blockade. And the hidden naloxone heightened pain sensitivity independent of placebo effect, suggesting that the drug was blocking the opiate action resulting from surgical stress.

The combined action of these two mechanisms is sufficient to explain naloxone's apparent reversal of the placebo effect in earlier studies, the researchers say. But the fact that there was no interaction between these effects indicates that at least one non-opiate system must be influencing pain, they say. Previous research has suggested that at least two other neurotransmitters — serotonin and norepinephrine — and a peptide called substance P may play roles in pain and analgesia, and pain relieving experiences such as hypnotism appear not to involve opiates either. If and how these chemicals are involved remains unclear.

—W. Herbert

Valium, cleft palate untied

Women can use the tranquilizer Valium during pregnancy without increasing the chances that their children will be born with deformities of the mouth, according to a Boston University researcher. The new findings run contrary to results from the mid-1970s that led the Food and Drug Administration to require that a warning label accompany the popular drug. According to epidemiologist Lynn Rosenberg, a study of over 3,000 pregnancies revealed no link between Valium use in the first trimester of pregnancy and the incidence of either cleft palate or cleft lip — the two defects previously tied to the anti-anxiety medication. The results were published in the Nov. 24 NEW ENGLAND JOURNAL OF MEDICINE. □