Average branch numbers were collected in a generation mean analysis study planted in February 2008 with parent P1 = Hi27 and parent P2 = *fl v4* (branched). Branch numbers were as follows: P1=11.1, P2=20.9, F1=16.0, F2=16.1, B1=13.1 and B2=16.5. However, seeds were classified as normal or floury before planting, and the data were as follows: F2, 16.6 floury vs. 15.5 normal; B1, 15.3 floury vs. 11.0 normal; B2, 17.3 floury vs. 15.8 normal. A GMA analysis revealed no significant non-additive effects. F2 segregation could generally be interpreted as a 1:2:1 affected by the linkage of floury and the branching locus.

It is inferred that the branched tassel trait is governed by a single locus that we've designated *Brta* ("branched tassel"). We chose to symbolize branched allele as the capitalized *Brta* with normal as *brta*. The locus is on chromosome 2 and suspected to be somewhere between *v4* and *fl*. No other NILs we have on this chromosome show branched, including *sk1* (2-57) and *gs2* (2-50). Inheritance is simple and dominance absent. The brt phenotype bears no resemblance to described loci *ub* (unbranched) and *td* (thick tassel dwarf), nor does it lead to seed-bearing flowers in the tassel as in the highly branched ramosa mutants. Several genes greatly reduce or eliminate tassel branching (*ad1*, *baf1*, *lg1*) but none are in this region. The relevant NILs are now designated (*fl Brta v4*)^Hi27 and (*fl Brta v4*)*y*^Hi27.

Double-cob (*dbcb*) on chromosome 1

--Brewbaker, JL

Conversions of Hi27 to the variegated-pericarp allele *P-vv* were initiated in 1967 using Maize Coop Stock 63-2656-2/2655-5, a stock showing variation at the following loci: *A1, A2, C, et, lg2, R* and *P*. In a somewhat sophomoric way, we began a series of 10 backcrosses to Hi27 together with an extensive series of selfs and sibs aimed at preserving only the *P-vv* (with its *Ac* insertion). The "pure line" *P-vv* inbred has always been uniquely semi-dwarf, narrow-leaved, poor in seed set and irregular in expressivity of variegations.

In 2001, in the 23rd cycle of breeding *P-vv*, we observed four sister lines with a trait we named double-cob (Figure 1). The mutant cobs normally split at the tip into two or three arms, and were not highly competent at filling seed. However, the trait proved to be considerably more stable than *P-vv* and to be inherited as a simple recessive. The linkage of the two loci is inferred from many of these segregations, but mapping has not been done. The double-cob trait has been carried through more backcrosses to Hi27 (which is *P-ww*) and a series of selfs to produce three sub-lines--(*dbcb P-ww)* ^Hi27*, (dbcb P-vv)* ^Hi27 and *(dbcb P-rw)* ^Hi27. All of these NILs are otherwise identical to recurrent parent Hi27 (Brewbaker, Crop Sci. 37:637, 1997) in maturity, color (e.g., bronze tassel), disease resistance, tassel and kernel type, etc. None of the 14 other chromsome 1 mutants among our NILs show the double cobs.

Figure 1. Phenotype of Hi27 near-isogenic line (*dbcb P-ww*)^Hi27.

Floppy tassel (*Flta*) on chromosome 9

--Brewbaker, JL; Yu, H

Tassels of Hi27 and most modern inbreds are relatively erect in appearance (see accompanying article on branched tassels). In contrast, a tassel with lax branches that we characterize as "floppy" is rather common among tropical maize varieties. Breeders of popcorn and of waxy Asian maize ("glutinous" or "sticky" corn) also find such "floppy" tassels to be the norm, as we do also in our breeding of popcorns.

The floppy tassel trait (Figure 1) segregated monogenically in our conversions of inbred Hi27 to the gene *wx* (chrom. 9S-47.9). The mutant originated from MGC stock 70-1000-3/999-3 (*wx-a*), and had 6 backcrosses through 24 generations of breeding to Hi27. Floppy tassel was also observed in our digenic NIL with

Figure 1. Floppy tassel of *wx*^Hi27 near-isogenic line.

genes *bz C* (chrom. 9S-22.5, 16.2) that originated from MGC stock 68-1238-5/1238-4 and had seven backcrosses to the parent.

Branch angle averaged 50.1 degrees in the *wx* and *bz C* NILs (based on branches at center of the tassel). In contrast, the recurrent Hi27 parent had an average branch angle to the central spike of 31.7 degrees. The floppy trait was not accompanied by longer tassel branches, but it did increase the apparent spread or diameter of the tassel. The branched-tassel mutants described in the accompanying article had a much lower branch angle (15 to 20°), as did our Hi27 NILs such as *ra2* and *lg1* (6°).

Hybrids of our *wx* and *bz C* NILs with parent Hi27 both appeared to be intermediate to the parents, with branch angle averaging 44.8 degrees. Preliminary studies of advanced generations verified monogenic segregations and also inferred lack of dominance at the locus. We've designated the locus *flta* and the floppy allele with the capitalized *Flta*. We suspect the locus to be between loci *C* and *wx* on chromosome 9. None of our other NILs for mutants on chromosome 9 (including *bf, bk2, bm4, dt, sh, yg2*) have floppy tassels, nor does our multiple mutant stock *C sh bz wx*.

A very floppy tassel also characterizes one of the major inbreds in our silage-breeding program, Hi58, which we derived from Kasetsart's Thai inbred Ki14 (Brewbaker and Josue, Crop Sci., 2007). Hybrids of Hi58 are always "semi-floppy", as also are hybrids of our Chinese waxy and Indiana popcorns. Since the waxy gene traces to Chinese origin, where waxy maize is a recognized delicacy, the floppy tassel gene may also have its origin in this germplasm. We've a large breeding program for Hawaii of waxy vegetable maize, and all are floppy-tasseled. We continue to evaluate advanced progenies for linkage involving the floppy tassel mutant and crosses with the vegetable waxy and popcorn types.

IRKUTSK, RUSSIA
Siberian Institute of Plant Physiology and Biochemistry
NOVOSIBIRSK, RUSSIA
Institute of Chemical Biology and Fundamental Medicine

Different types of protein phosphatases in inner and outer membranes of mitochondria

--Subota, IY; Arziev, AS; Nevinsky, GA; Konstantinov, YM

The protein phosphorylation/dephosphorylation of maize mitochondrial proteins in organello was investigated. The goal of this study was to compare the level of protein kinase and protein phosphatase activity between intact mitochondria and mitoplasts (organelles without the outer membrane). The mitochondria were isolated from 3-day-old etiolated maize seedlings (hybrid VIR42MV) by a standard method of differential centrifugation. Protein phosphorylation assays were carried out according to Struglics et al. (FEBS Lett. 475:213-217, 2000) with the use of [γ^{32}P] ATP (specific radioactivity was 6000 Ci/mmol). Considerable differences were found in the level of protein phosphorylation between intact mitochondria and mitoplasts (Figure 1). The incorporation of ^{32}P-label was 7261 ± 461 cpm/mg of protein in the case of intact mitochondria, and 106410 ± 16509 cpm/mg of protein in the case of mitoplasts. Thus, the presence of the outer membrane was associated with an extremely low level of phosphorylation activity of mitochondrial proteins.

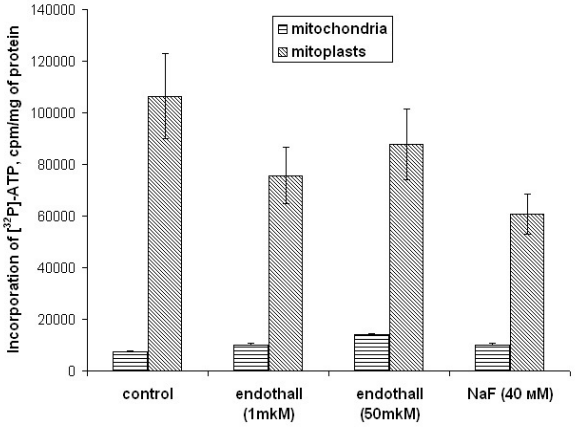

Figure 1. The total activity of protein phosphorylation in maize mitochondria and mitoplasts.

These results could be explained by the presence of different types of protein phosphatases in inner and outer membranes of mitochondria of higher plants. This suggestion was supported by the fact that the effects of inhibitors of protein phosphatases NaF and endothall were different in intact mitochondria and mitoplasts. It was proposed that plant mitochondria possess two types of protein phosphatases. One type is "substrate" phosphatase. The function of substrate phosphatase is to dephosphorylate most of the phosphoproteins. The other type is the phosphatase of protein kinase. Some mitochondrial kinases may exhibit activity only in dephosphorylated form.

The results of our study suggest that the outer membranes of maize mitochondria contain more "substrate" protein phosphatases than the submitochondrial fractions (inner membranes and matrixes). The physiological importance of this phenomenon is not clear.

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ITHACA, NEW YORK
Cornell University

Barbara McClintock's contributions to Biological Abstracts: Another Cornell connection

--Kass, LB

I previously published an annotated list of Barbara McClintock's publications in the MNL (Kass, MNL 73:42-48, 1999). Here I supplement the listing with reviews, written by McClintock, covering the latest literature for the innovative new journal Biological Abstracts during her early career at Cornell University and summaries of her pioneering work completed years later at Cold Spring Harbor, Long Island, New York (Table 1).

McClintock is most noted for her discovery of transposable elements in maize for which she was awarded the Nobel Prize in Physiology or Medicine in 1983. Her early contributions to the cytogenetics of maize are often overshadowed by her Nobel