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 $[\gamma^{32}P]$ 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.

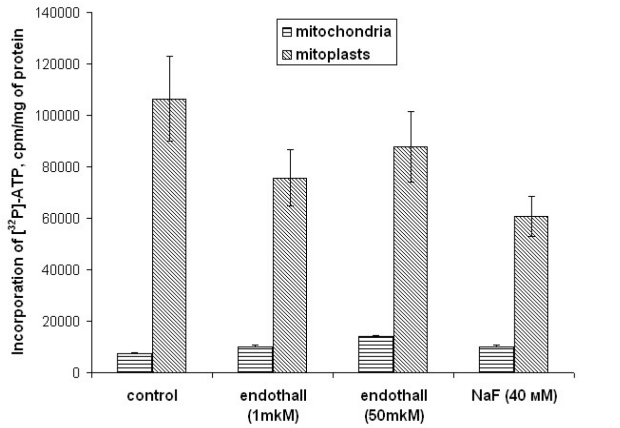

Figure 1. The total activity of protein phosphorylation in maize mitochondria and mitoplasts.

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.

This work was supported by the Russian Foundation for Basic Research (08-04-01426-a) and the Integration Project of the Siberian Branch of the Russian Academy of Sciences No. 6.

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

Table 1. Biological Abstracts authored by Barbara McClintock between 1927 and 1956.

1) McClintock, B. 1927. [Abstract #] 2047. KISSER, J. On Kernschwarz and its serviceability for botanical purposes (Uber Kernschwarz und seine Anwendungsmoglichkeit fur botanische Zwecke). Zeitschr. Wiss. Mikrosk. 43(1):116-119, 1926. Biological Abstracts, vol. 1.

2) McClintock, B. 1927. [Abstract #] 2052. NODA, KOI. The chromosomes of *R*[*umex*] *scutatus* (Uber die Chromosomen von *Rumex scutatus*). Jpn. J. Bot. 3(1):21-24, 1926. Biological Abstracts, vol. 1.

3) McClintock, B. 1928. [Abstract #] 106. SCHWEMMLE, J. The hybrid *Oenothera berteriana* X *Onagra* (*muricata*) and its cytology (Der Bastard *Oenothera berteriana* X *Onagra* (*muricata*) und seine Zytologie). Jahrb. Wiss. Bot. 66 (4):579-595, 1927. Biological Abstracts, vol. 2.

4) McClintock, B. 1928. [Abstract #] 8915. LAIBACH, F. Artificial abortions in plants with respect to their importance for hybrid and hereditary investigation (Kunstliche Fruhgeburten bei Pflanzen in ihrer Bedeutung fur die Bastard- und Vererbungsforschung). Naturwissenschaften 15(34):696-700, 1927. Biological Abstracts, vol. 2.

5) McClintock, B. 1933. [Abstract #] 17720. IMAI, YOSHITAKA; TABUCHI, KIYOO. The relative loci of some genes in the variegated chromosome of *Pharbitis nil*. Zeitschr. Indukt. Abstamm. U. Vererbungsl. 58 (1):166-168, 1931. Biological Abstracts, vol. 7

6) McClintock, B. 1934. [Abstract #] 64. FUKUSHIMA, EIJI. Formation of diploid and tetraploid gametes in Brassica. Jpn. J. Bot. 5(3): 273-283, 1931. Biological Abstracts, vol. 8.

7) McClintock, B. 1934. [Abstract #] 5174. KOZHUCHOW, Z. A. Uber die Natur der Extrachromosomen bei *Zea mays* L. Zeitschr. Wiss. Biol. Abt. E Planta 19(1):91-116, 1933. Biological Abstracts, vol. 8.

8) McClintock, B. 1934. [Abstract #] 7687. McCLINTOCK, BARBARA; HILL, HENRY E. The cytological identification of the chromosome associated with the R-G linkage group in *Zea mays*. Genetics 16(2):175-190, 1931. Biological Abstracts, vol. 8. [Biol. Ab. 8(4, April):840, Cytology, Plant 1934].

9) McClintock, B. 1934. [Abstract #] 12787. McCLINTOCK, BARBARA. The order of the genes *C*, *Sh* and *Wx* in *Zea mays* with reference to a cytologically known point in the chromosome. Proc. Natl. Acad. Sci. U.S.A. 17(8):485-491. [2 fig], 1931. Biological Abstracts, vol. 8. [Biol. Ab. 8(6, June/July), p. 1376, Cytology, Plant, 1934].

10) McClintock, B. 1936. [Abstract #] 20257. CHIZAKI, YOSHIWO. Another new haploid plant in *Triticum monococcum* L. Bot. Mag. [Tokyo]. 48 (573):621-628, 1934. Biological Abstracts, vol. 10.

11) McClintock, B. 1941. [Abstract #] 14129. McCLINTOCK, BARBARA. The stability of broken ends of chromosomes in *Zea mays*. Genetics 26 (2):234-282, [1 fig], 1934. Biological Abstracts, vol. 15. [Vol. 15 (August-Dec), p. 1264, Cytology, Plant, 1941].

12) McClintock, Barbara. 1946. [Abstract #] 6165. McClintock, Barbara. (Carnegie Inst. Washington, Cold Spring Harbor, N.Y.) Neurospora. I. Preliminary observations of the chromosomes of *Neurospora crassa*. Am. J. Bot. 32(10):671-678, 1945. Biological Abstracts, vol. 20. [Vol. 20 (Jan-July), p. 675, Cytology, Plant, 1946].

13) McClintock, B. 1957. [Abstract #] 6784. McClintock, Barbara. Intranuclear systems controlling gene action and mutation. Brookhaven Symp. Biol. 8:58-74, 1956. Biological Abstracts, vol. 31. [Vol. 31 (Jan-Mar), p. 676, Genetics, Animal, 1957].

awarding winning investigations (Kass, Genetics 164:1251-1260, 2003; Kass, Bonneuil and Coe, Genetics 169:1787-1797; Coe and Kass, PNAS 102(19):6641-6656, 2005). While an instructor in Cornell's Department of Botany (1927-1931), a post-doctoral researcher at Missouri and Caltech (1931-1933) and a researcher in the Department of Plant Breeding (1934-1936) at Cornell University, McClintock was invited to submit summaries of current research in biology for their newly established journal, Biological Abstracts (Table 1). Jacob R. Schramm, Professor of Botany at Cornell University, was editor-in-chief of Botanical Abstracts from 1921-1925 and founder and first editor-in-chief of Biological Abstracts [now BIOSIS] (1924-1937). This is but one of many landmark contributions to American Plant Biology made by Cornellians over the last century (Kass and Cobb, Plant Sci. Bull. 53(3):90-101, 2007; Murphy and Kass, Department of Plant Breeding & Genetics, Cornell University, Ithaca, NY, 2007).

Scientists continue to rely on BIOSIS to gain access to current literature. As a beginning graduate student in the late 1960s, I had used hard copies of Biological Abstracts for my research, and later became familiar with the on-line value of BIOSIS. I used this database to find summaries of the work of McClintock and her contemporaries (e.g., Coe and Kass, 2005; Kass and Chomet, pp. 17-52, in Bennetzen and Hake, The Maize Handbook: Genetics & Genomics, Springer, 2009). Recently, I learned that one may also use this database to find historically recognized papers, summarized by contemporaneous leaders in the field. This was brought to my attention in a note published in Mannifest, the Newsletter of Albert R. Mann Library, Cornell University (Morris-Knower, Mannifest Spring 2007 14(2):3, 2007, http://www.mannlib.cornell.edu/about/news/upload/spring07.pdf). By typing McClintock's name into the "topic" area of BIOSIS Previews one can find a list of abstracts authored by McClintock. The information is not as complete as one would find by examining the original hardbound copies of the journal (i.e., the month of publication and the page on which the abstract appears are not included), yet it provides easy access to the names of authors who summarized research papers, and one can certainly get complete information by seeking out the original source in a library (for example, see Table 1, references 8-9 and 11-13 for the complete source in Biological Abstracts).

It was enlightening to learn of McClintock's contributions to Biological Abstracts and to gain an understanding of the importance of a foreign language requirement for students in the early 20th century. McClintock's comprehension of the German language is reflected by the many papers she read in their original language and summarized for Biological Abstracts. Although most of her publications were encapsulated by others (not listed here), McClintock reviewed five individual investigations for *Biological Abstracts*, the last of which appeared in 1957 (Table 1).

ACKNOWLEDGMENTS: I thank: Linda Stewart and Mary Ochs, Albert R. Mann Library, and Peter Fraissinet, Bailey Hortorium Library, Cornell University, for their guidance using BIOSIS; the Departments of Plant Biology and Plant Breeding and Genetics, Cornell University for logistical support for this study; Ed Coe, University of Missouri-Columbia, for reviewing the manuscript.

KHUDWANI, INDIA
SKUAST-K Rice Research and Regional Station
SHALIMAR, INDIA
S. K. University of Agricultural Sciences and Technology of Kashmir

Evaluation and identification of maize for *turcicum* leaf blight resistance under cold temperate conditions

--Shikari, AB; Zafar, G

In temperate hilly regions, high infestations of *Exserohilum turcicum* (Pass) Leonard and Suggs are encountered, causing *turcicum* leaf blight disease that exceeds economically feasible limits. Disease development is favoured by high relative humidity (75-90%) and moderate temperatures (22-25^{o}C) during the growing season. The valley of Kashmir, which is a hotbed for this disease, lacks varieties of maize resistant to this disease. In spite of the fact that maize is an important food and fodder crop for the region, chemical control for the disease is not practiced. This results in a need to screen for TLB disease resistance in order to develop high-yielding disease resistant varieties of maize. We