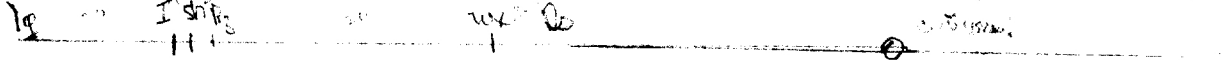
I. Previous discussion:
1. Located factor responsible for chromosome losses 1 to 2 crossover units to right of Wx.
2. The physical location of genetic markers in chromosome 9 short arm:



3. Distance between Wx and centromere -- more than 1/3rd the length of short arm.

4. Previous evidence and that of Longley and Anderson: crossing over between Wx and centromere more than 4% .

5. This suggests that factor responsible for losses is in short arm of chromosome 9, a short distance from Wx locus.

6. Evidence presented indicating that a second factor necessary for losses to occur. This inherited independently of factor in short arm of chromosome 9. Given symbol of Ac.
   a). Ac must be in nucleus for losses to occur.
   b). If Ac absent, no losses, no obvious evidence of presence of factor producing losses.

II. How does factor in short arm of chromosome 9 bring about losses of chromatin in presence of Ac? What occurs at this position in the chromosome?

1. Piece lost is gross. Should be able to see it or see evidence of its loss if sporopytes examined in plants carrying it.
2. This could be done if losses occur in the sporocytes themselves.
3. Evidence for such losses obtained from examination of pollen of plants carrying factor in Wx chromosome:

Begin page 8, section IV of previous talk - outline

Begun Tue. Jan 19 The inheritance behavior and the mode of action of Ac

I. Presence of separate factor, needed for breaks to occur at Ds, suspected from early inheritance studies of Ds.

II. Many studies of inheritance behavior of Ac conducted. Select examples to serve as illustration of methods used.

1. Wish to start this with plant having constitution $\frac{\text{N C Sh wx Ds}}{\text{Re c sh Wx ds}}$ $\frac{\text{Ac}}{\text{ac}}$

   a). Sequence of crosses: On Board.

   b). Gametes produced by $\frac{\text{N C Sh wx Ds}}{\text{Re c sh Wx ds}}$ $\frac{\text{Ac}}{\text{ac}}$ plants:

   (1) N C Sh wx Ds Ac (3) Re c sh Wx Ac

   (2) " ac (4) " ac

2. These plants self-pollinated. Kernels on ear:

C Sh Wx, non-variegated

C Sh Wx with areas of c wx

C Sh wx -- (normal and with homozygous deficient tissue)

c sh Wx

3. The consitutions of the c sh Wx kernels -- or plants derived from them:

F2 ratio | Should be: 1 Ac Ac : 2 Ac ac : 1 ac ac. | To be tested for Ac

4. Must have method for testing for presence of Ac. Development of Ac-tester stocks.

III. Development of Ac tester stocks.

1. The $\frac{\text{N C sh wx Ds}}{\text{Re c sh Wx ds}}$ $\frac{\text{Ac}}{\text{ac}}$ plants used as male parents to $\frac{\text{Re c sh Wx}}{\text{Re c sh Wx}}$ $\frac{\text{ac}}{\text{ac}}$

2. Male gametes:

$\frac{\text{N C Sh wx Ds Ac}}{\text{Re c sh Wx ds ac}}$	$\frac{\text{N C Sh wx Ds ac}}{\text{Re c sh Wx ds ac}}$	$\frac{\text{Re c sh Wx Ac}}{\text{Re c sh Wx ac}}$	$\frac{\text{Re c sh Wx ac}}{\text{Re c sh Wx ac}}$
		To be tested for Ac.	Back-cross ratio
Kernel phenotypes:			
C Sh Wx, areas of c sh	C Sh Wx non-var.	c sh Wx	c sh Wx

3. The C Sh Wx, non-variegated kernels: $\frac{\text{N C Sh wx Ds}}{\text{Re c sh Wx ds}}$ $\frac{\text{ac}}{\text{ac}}$

4. Plants grown from them. These self-pollinated:

C Sh Wx, non-variegated	C Sh wx	c sh Wx
$\frac{\text{N C Sh wx Ds}}{\text{Re c sh Wx ds}}$ $\frac{\text{ac}}{\text{ac}}$	$\frac{\text{N C Sh wx Ds}}{\text{N C Sh wx Ds}}$ $\frac{\text{ac}}{\text{ac}}$	$\frac{\text{Rec sh Wx}}{\text{Re c sh Wx}}$ $\frac{\text{ac}}{\text{ac}}$

5. The $\frac{\text{N C Sh wx Ds}}{\text{N C Sh wx Ds}}$ $\frac{\text{ac}}{\text{ac}}$ An Ac-tester stock. How used:

6. Assume Ac/ac constitution of plant with c / c constitution:

Gametes: c, Ac ; 1 c, ac x G Ds, ac gametes:

F ear: 1 C kernel with c areas : 1 C kernel, non-variegated;

Assume Ac/Ac constitution in c/c plant. Gametes: all c, Ac.

Plant crossed by C Ds, ac tester plant: All kernels on ear should be C with c areas.

Assume ac/ac; c/c constitution: all gametes c, ac. Crossed by Ac-tester stock: all kernels:

C Ds / c ds. ac ac. All Colored, non-variegated.

IV. The tests for Ac in plants derived from c sh Wx kernels in backcross ears:

1. Expected ratios of Ac: 1 Ac/ac : 1 ac ac (See diagram of crosses).

2. The test cross:

a). Kernels selected; plants grown from them; crossed by $\frac{\text{C Sh wx Ds}}{\text{C Sh wx Ds}}$ $\frac{\text{ac}}{\text{ac}}$

(1) Results: 180 plants tested:

(2). The ears: 90 with 1 to 1 ratio of C Sh Wx non-var. to C Sh Wx, areas of c sh.

90 with all C Sh Wx, non-variegated kernels.

(3) Counts of Variegated to non-variegated kernels on ears:

Table 4a in Ac account.

V. Tests for Ac constitutions in plants derived from self-pollination of

$\frac{\text{N C Sh wx Ds}}{\text{Re c sh Wx ds}}$ $\frac{\text{Ac}}{\text{ac}}$ The c sh Wx kernels selected.

F2 Expected constitutions:

$$1\ \frac{\text{Re c sh Wx ds}}{\text{Re c sh Wx ds}}\ \frac{\text{Ac}}{\text{Ac}} : 2\ \frac{\text{Re c sh Wx ds}}{\text{Re c sh Wx ds}}\ \frac{\text{Ac}}{\text{ac}} : 1\ \frac{\text{Re c sh Wx ds}}{\text{Re c sh Wx ds}}\ \frac{\text{ac}}{\text{ac}}$$

Crossed by C Sh wx Ds, ac tester plant: Ears expected:

	All kernels C Sh Wx with c sh areas	½ kernels C Sh Wx nln-var. ½ C Sh Wx with c sh areas	All kernels C Sh Wx, non-variegated.
Observed:	61 ears from 61 plants	145 ears from 145 plants	68 ears from plants
	64.2	136.4	64.2

Appearance of ears. (2 note non-var. kernels

VI. The non-variegated kernels on the Ac/Ac plant constitutions:

a). All kernels should be variegated if plants were Ac/Ac

b). Some kernels non-variegated as shown by photograph. Why? Table 5 a, Ac account.

VII. Tests of Ac inheritance in c sh Wx/c sh Wx Ac Ac plants:

1. Besides cross by C Sh wx Ds, ac tester, some plants also crossed by Re c sh Wx, ds , ac tester stocks.

2. Expect all gametes to be Re c sh Wx, Ac. If crossed by C Sh wx Ds ac tester stocks should get all plants with ears in which ratio of varl to non-var. is 1 : 1:

Female gametes	Male gametes:
Re c sh Wx ds, Ac	C Sh wx Ds, ac

All ears should show this ratio

3. Observed ratios. Ears obtained from 96 plants.

On 95 of them: 1 C Sh Wx non-var. kernel to 1 C Sh Wx with c sh area

On 1 ear: All kernels non-variegated. No evidence of Ac

4. Question: What hashappened to Ac? Why is one plant ac/ac in constitution?

VIII. Return to ears produced by c sh Wx, ds, Ac/Ac plants. Photo:

1. What is Ac constitution in the kernels that show no variegation?

2. The tests of these kernels have shown what happens to Ac and why it is absent in some of the kernels and also in some of the plants derived from Ac/Ac plants. Will be discussed next period.

IX. Review of evidence of Ac inheritance:
1. Statistical ratios in backcross: 1 Ac to 1 ac found.
2. " " " F_2 : 1 AcAc : 2 Ac ac : 1 ac ac found.
3. All Ac/ Ac in self of Ac/Ac plant : Not found. 1 plant in 96 had no Ac
4. All kernels on ears of Ac/Ac plants should show brekas at Ds. This not found. A few kernels with no breaks -- no Ac?

5

X. Must consider pattern of loss produced by dosage of Ac. Expts continuing

1. C Cy as ac ♀ + I Bz Ds Ac ♂." Endosperm:

♀ Cy ac Cy ac ♂ I Bz Ac

b. Ac dose = Ac ac ac
in endosperm. ♂ ♀ ♀

c. The pattern of Ds breaks or loss - irregular. Photo ③ 1 Ac

2. Cy ds Ac ♀ + I Bz Ds ac ♂.
endosperm

♀ Cy Ac Cy Ac ♂ I Bz Ds

b. Ac dose = Ac Ac ac
♀ ♀ ♂

c. Pattern of Ds breaks - late. Photo ④ Ac Ac

3. Cy ds Ac ♀ + I Bz Ds Ac ♂

a) Endosperm ♀ Cy ds Ac Cy ds Ac ♂ I Bz Ds Ac

b) Ac dose = Ac Ac Ac Photo ④. Ac Ac Ac

Photo ⑤ Summary of photos ③ + ④

4. Summary - kernel sections for early loss; late loss; no loss.

a) One dose of Ac = kernel sections for early loss; late loss; no loss.

b) 2 doses = late loss

c) 3 doses = few losses and very late occurring. The endosperm may stop dividing before Ac action takes effect.

d). ? 4 doses, what would be seen ??

XI. The different types of behavior of Ac - changes occurring:

1. Type I. ♀ C Bz Ac × I Bz Ds ac ♂

   or

   C y Ac

   a) Background = heavily spotted.
   Some changes occurring relatively late - small + areas of no loss. Photo ⑥

2. Type II. ♀ C Bz Ac × ♂ I Bz Ds ac

   changes occur in late 2nd division in microspores. in 95% of kernels:

   Photos ⑦, ⑧.

   Sectors occur: No break; moderately coarse; heavily spotted; few spots
   "1 Ac" Ac Ac "Ac Ac Ac"

3. The changes occur at regulated times in development.
   The result appears as if Ac were being segregated during somatic divisions.
   These often occur in conjunction with a break at Ds.

XII. Return to Ac inheritance -

1. Ac Ac ♀ × ac ac ♂ = F1. Some plants do not have Ac
2. Means of Ac Ac ♀ × C ds ac ac ♂. Some kernels do not show presence of Ac
   " " show altered type of action of Ac.
3. In crossing Ac/ac ♀ × ac ac ♂ or reciprocal = fewer kernels with Ac

   Means of Ac ac plants -

   Further examples: ① C ds / C ds, ac ac ♀ × I Ds / I Ds Ac/ac ♂

   15 ears: 1867 I, non-var kernels: 1639 I - C var kernels

(2) cds/cds, ac/ac ♀ × CDs/CDs Ac/ac ♂

10 ears: 1582 C, non var. kernels ; 1429 C→c var.

(3) Cbz ds ac/ac ♀ × I Ds/C Ds Ac/Ac ♂
Cbz ds

4 ears I class: 16 I, non-var : 870 I-Cbz var.
C " : 23 CBz " " : 895 CBz-Cbz var.

Examination of plants derived from aberrant kernels on ear in cross of Re c sh Wx / Re c sh Wx Ac/Ac ♀ × C Sh wx Ds ac ♂.

I. The appearance of ears – Project ear.
1. Majority show 1 kind of pattern
2. Few that show other
a) no variegation
b) Tiny specks of c
c) areas with few c specks
d). Early changes – like 1 Ac.

II. The tests:
1. Kernels of all classes removed from ear. Plants grown from them.
Each plant tested in various ways.
2. The constitution of the plants derived from the completely C, non-var. kernels
Supposed to be H C Sh wx Ds / Re c sh Wx ds. What about Ac?

3. Typing test conducted with each plant:

① Self-pollinated: To test for Transmission of 2 chrs. 9.

② Crossed by ♂ ♂ I Dr / C Dr, occ: To again test for Ac in ♀ C class (by I Dr) and in ♂ a class (C Dr). Both for Dr assign.

③ Crossed to ♀ ♀ cds/cds, occ. To test for Ac

④ " " " Cds / cds, Ac/Ac. To test for action of Dr in C shrunk elsewhere.

4. The results - summary in advance of presentation of evidence:

1. Some plants = no Ac present at all.

2. " " = Two Ac factors present; not linked to one another.

a) the endosperm constitution when 2 Ac present in ♀ parent

♀ Ac ; Ac ♀ Ac + Ac occ

Endosperm Ac Ac Ac Ac occ =

Recalling ♀ Recalling ♀ C Shrunk occ

♂.

Appearance of kernels =

3. Some plants = 2 Ac factors. linked

4. " " = 1 Ac ". Behaves in inhibiting recessive unit but gives double-dose action

5 " " = 1 Ac behaves as ♀ dosage action intermediate between 1 + 2 Ac.

On Board

Jan. 21 lecture

♀ × ♂

1). $\dfrac{c\ sh\ wx\ Ds}{c\ sh\ wx\ Ds}$ $\dfrac{ac}{ac}$ × $\dfrac{I\ Sh\ Wx\ Ds}{C\ Sh\ wx\ ds}$ $\dfrac{Ac}{ac}$; Crossing over between wx and Ds gives gametes with C Sh wx Ds

2). F1 ears. Selected few kernels that were C Sh wx with c sh areas, derived from gametes. Plants grown from them. Their constitutions: $\dfrac{C\ Sh\ wx\ Ds}{c\ sh\ wx\ Ds}$ $\dfrac{Ac}{ac}$

3). used as ♂ parents in crosses to ♀♀ $\dfrac{Ac\ c\ sh\ Wx\ ds}{Ac\ c\ sh\ Wx\ ds}$ $\dfrac{ac}{ac}$

4). Many C Sh wx kernels with c sh areas.

Plants derived from these kernels: $\dfrac{I\ C\ Sh\ wx\ Ds}{Ac\ c\ sh\ Wx..}$ $\dfrac{Ac}{ac}$.

On Board

$\frac{M\ C\ Sh\ wx\ Ds}{Rc\ c\ sh\ Wx\ ds}$ $\frac{Ac}{ac}$

Self-pollinated.
Appearance of kernels on ear.

Expected
Constitution of plants derived from kernels in col. class

C Sh Wx non-var

C Sh Wx with c sh areas
C Sh wx

c sh Wx

1	$\frac{Rc\ c\ sh\ Wx\ ds}{Rc\ c\ sh\ Wx\ ds}$	$\frac{Ac}{Ac}$
2	"	$\frac{Ac}{ac}$
1	"	$\frac{ac}{ac}$.

Back crossed to $\frac{Rc\ c\ sh\ Wx\ ds}{Rc\ c\ sh\ Wx\ ds.}$ $\frac{ac}{ac}$

Appearance of kernels on ear.

Genotype of plants from the kernels.

c sh Wx

1	$\frac{Rc\ c\ sh\ Wx\ ds}{Rc\ c\ sh\ Wx\ ds}$	$\frac{Ac}{ac}$
1	"	$\frac{ac}{ac}$

C Sh Wx with areas of c sh — $\frac{M\ C\ Sh\ wx\ Ds}{Rc\ c\ sh\ Wx}$ $\frac{Ac}{ac}$

C Sh Wx; non-var. — $\frac{M\ C\ Sh\ wx\ Ds}{Rc\ c\ sh\ Wx\ ds}$ $\frac{ac}{ac.}$

Self-pollinated

2 C Sh Wx non-var.
1. C Sh wx non-var.
1 c sh Wx

= $\frac{M\ C\ Sh\ wx\ Ds}{M\ C\ Sh\ wx\ Ds}$ $\frac{ac}{ac.}$

[illegible]