Lecture, February 1, 1954

Changes in state of Ac -- the effects; Breakage-fusion-bridge cycles in endosperm; Transposition of Ds (Begin).

I. In previous two talks, discussed the disappearance of Ac from a known location and its appearance at a new location -- transposition of Ac as explanation given.

Also discussed the origin of changed action of Ac:

1. Double dose action of single Ac
2. Increase in action of that previously present but not doubled.
3. Decrease in dosage action -- one dose produces an earlier timed break at Ds than that produced by Ac it replaced.

II. The changes in state: Besides (1), (2), and (3) above, have other differences arising. These related to action of a single Ac or an Ac in double dose: Control of the time of Ds breaks can be very precise.

III. The relation of changes at Ac to those at Ds: A high rate of coincidence. If a break occurs at Ds, then a change at Ac is quite likely to be detected.

IV. The nature of the patterns produced by doses of Ac and various states of Ac: Begin Jan. 28 outline:

Add: <u>Stabilized Ac action:</u>

C sh bz wx ds ac female x I Sh Bz Wx Ds Ac-stabilized.

Photos: 6 and 7

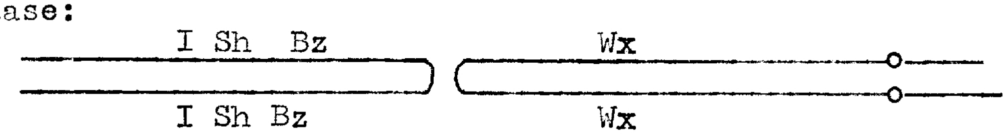
V. The transposition of Ds.

1. How such transpositions detected: Those occurring from one position to another in the short arm of chromosome 9 easily found in the tests with Ds.

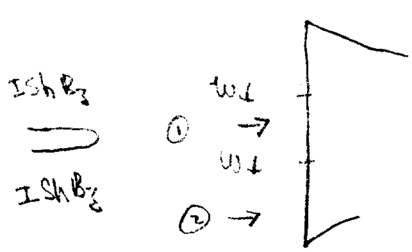
2. If Ds moved from standard location to position between Bz and Wx:

a). The breaks: I Sh Bz Ds Wx 66

b). Ds break: produces a dicentric chromatid and acentric fragment: Prophase:



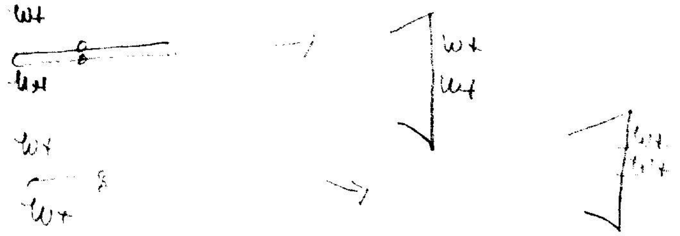
c). The following anaphase:

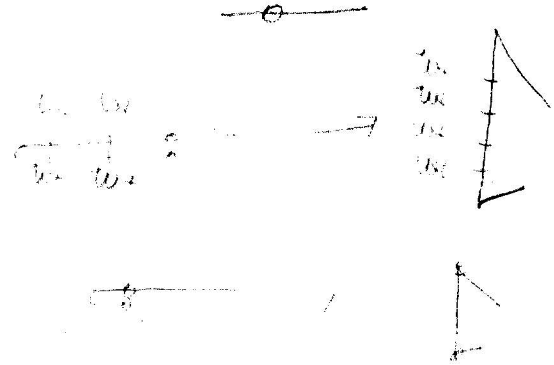


The telophases

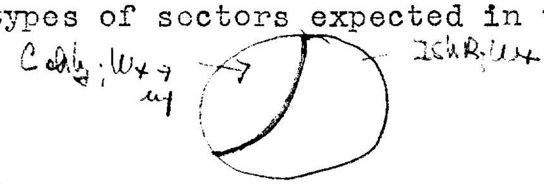
Break at (1) — Break at (2)

Next prophase and anaphase



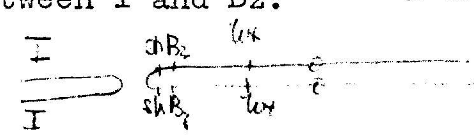


The types of sectors expected in the C sh bz areas: Wx with wx spots.

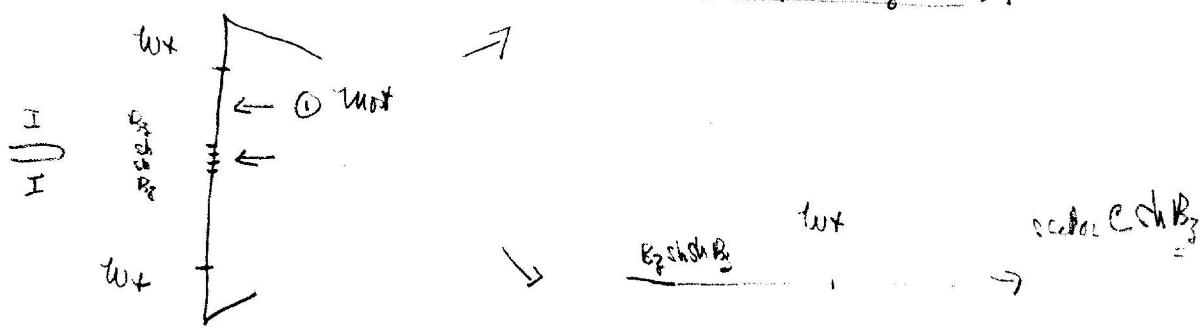


3. If Ds moved to a position between I and Bz: I DsShBz Wx

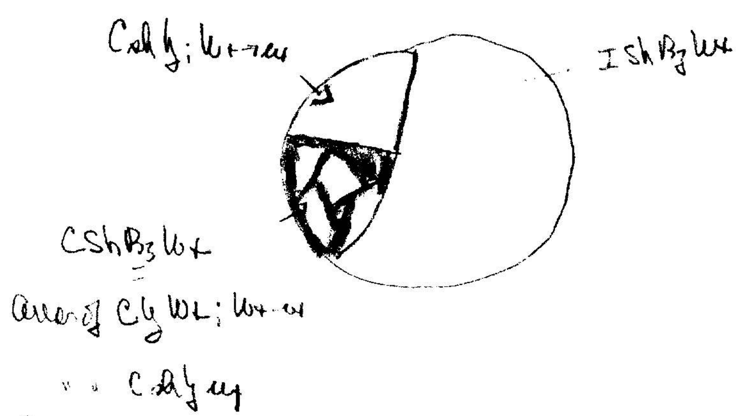
Ds break: Prophase



Anaphase of division following



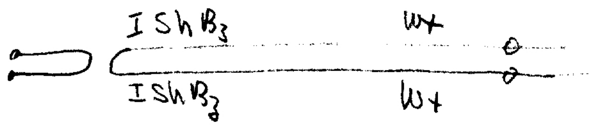
The sectors: Majority will be twins:

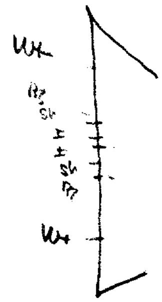


Photos (8) + (9)

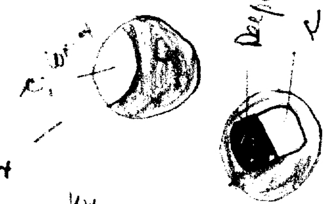
4. If Ds inserted to left of I:

Ds I Sh Bz Wx





Complex pattern but very rarely in pattern (more twin spots)



Deep C (more twin spots)

Confirmed. 2/4/54

→ 5. When C present: c ♀ + C Ds Wx = c areas with Wx-wx

c ♀ + Ds C Wx = Twin areas: Deep C^{Wx} – c Wx with wx areas.

Dosage of C.

→ Begin here - ... Tables 1 + 2.

VI. Analysis of a case of transposition of Ds from standard location to position to right of I.

1. Cross in which detected: C sh bz wx ds ac female x $\frac{\text{I Sh Bz Wx Ds Ac}}{\text{I Sh Bz wx Ds ac}}$

The kernels on the ear: Table 1

2. The kernel showing Ds to left of I: $\frac{\text{Ds I Sh Bz wx}}{\text{ds C sh bz wx}}$ $\frac{\text{Ac}}{\text{ac}}$

3. Plant from this kernel grown; crossed to a number of tester plants including females, C sh bz, and either Wx or wx, ds, ac.

(a). Types of kernels on resulting ear:

$\frac{\text{Ds I Sh Bz}}{\text{ds C sh bz}}$ $\frac{\text{Ac}}{\text{ac}}$

Table 2.

(b). Same plant to females, c sh Bz wx ds ac: Types of kernels:

Table 3.

4. The variegated kernels from crosses to C sh bz Wx ds ac females selected and plants grown from them.

(a) Crossed to C sh bz wx ds ac females. The types of kernels on ear:

Table 4.

(b) Crossed to c sh Bz wx ds ac females. The types of kernels on ear:

Table 5.

Table 1. Origin of Transposed Ds - 4755C:

1. Cross: C sh bz wx ac ♀ × $\frac{\text{I Sh Bz Wx Ds}}{\text{I Sh Bz wx Ds}}$ $\frac{Ac}{ac}$.

2. Appearance of kernels on ear:

I Wx, non-var. = 102
I wx, non-var = 112 } = 214

I Wx with C bz wx areas = 104 } = 186 ← Breaks to right of Wx.
I wx " C bz areas = 84

→ 5 kernels with odd type of variegation:

Kernel appearance.		Analysis of plant from kernel:
2 with I Wx in which wx areas appeared. Some C bz wx sectors also.	=	2 are triploid: C sh bz wx / I Sh Bz Wx Ds / I Sh Bz wx Ds.
1 I Sh Bz Wx with C sh bz; Wx-wx Breaks between Bz and Wx	=	Transposed Ds: I Sh Bz Ds Wx. (4755 D)
1 I Sh Bz Wx with variegation indicating breaks to left of I	=	no germination of kernel
√√ 1 I Sh Bz wx with variegation indicating breaks to left of I	=	Transposed Ds: Ds I Sh Bz wx (Transposed Ds 4755 C)

To be investigated.

Table 2:

Table 2

(Plant 4755 ♀ - in greenhouse)

$\dfrac{C\ sh\ bz\ (w + or\ wx)\ ds\ ac}{} ♀ \times \dfrac{Ds\ I\ \overset{a\ ①\ ②}{Sh\ Bz}\ wx}{ds\ C\ sh\ bz\ wx}\ \dfrac{Ac}{ac}$ ♂ (5160D-4)

The I classes of kernels:

I Sh non-var: 440 (① non-cross-over with ac; ② cross-over region a) }
③ cross-overs, region ③; no ac. } = 816

I Sh with C Bz-C bz var: 376 (non-cross-overs; with Ac)

I sh (bz) non-var. : 27
49
7 (of var. imp.) → I sh with C bz areas : 22

I Sh (bz) non-var : (with 1st group; had not learned to recognize them at this time)

I Sh bz with C sh bz areas : 7

The C class of kernels:

C sh bz : 793 (no var. can be told -?)

C Sh Bz non-var: 55

C Sh Bz with C sh bz areas: 0

C sh Bz, non-var: 15

C sh Bz with bz areas: 0

Total = 1735

872 I : 863 C.

Table 3

Table 3

$$c\ sh\ Bz\ wx\ ds\ ac\ ♀ \quad \times \quad \frac{Ds\ I\ Sh\ Bz\ wx}{ds\ C\ sh\ bz\ wx} \quad \frac{Ac}{ac}\ ♂ \quad (5160\underline{\underline{0}}D-4\ ♂)$$

$$c\ sh\ ds\ ac\ ♀ \quad \times \quad \frac{\overset{a \downarrow \ \ 0}{Ds}\ I\ Sh}{ds\ C\ sh} \quad \frac{Ac}{ac}$$

I kernels

I Sh = 317

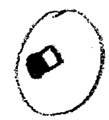
(var. for sh not classified. Too difficult)

I sh = 17

C kernels.

C sh non-var = 299

Desirable



C sh with cases. Twin Deep Color / c. = 18

C.O. Ds to I = 18 Ac (+ 18 ac) = 36

C Sh, non-var = 16

C Sh with cases = 0

Total C = 333

C.O. C to Sh = 16 = 4.8%

C.O. Ds to I = 18 with Ac + 18 no Ac = 36 = 10.9%

Table 4

C sh [illegible] ♀♀ × Ds I sh B z [illegible] / ds C sh [illegible] Wx   Ac / ac ♂♂

I classes				C classes		
Non-crossovers	I Sh Bz Wx	non-var	= 574	C sh [illegible] Wx	non-var.	= 1201
		var. for CBz-Cy Wx	= 448		var. for [illegible] areas	= 69 c.o. [illegible]
Reg 1.	I sh [illegible] Wx	non-var	= 48	C Sh Bz [illegible]	non-var	= 76
		var. for C[illegible] Wx → [illegible] areas	= 42		var.	= 0
Reg. 2	I Sh [illegible] Wx	non-var	= 34	C sh Bz [illegible]	non-var	= 43
		var. for C[illegible] areas, [illegible]	= 22		var	= 0
Reg. 3	I Sh Bz Wx	non-var	= 163	C sh [illegible]		= 311
		var. (leads to [illegible] I)	= 137			
c.o. 1 + 3	I sh bz [illegible]	non-var	= 4	C Sh Bz Wx	non-var	= 7
		var (C bz areas)	= 3		var	= 0
"c.o." 2 + 3	I Sh bz [illegible]			"C sh Bz [illegible]"	non-var	= 2
					var	= 0

1 [illegible]. I sh Wx kernel.

Total C kernels = 1708

c.o. Ds to I = 8.07 %

I to Sh = 5.6 %

Sh to Wx = 20.7 %

Table 5

c sh Bz wx ac ac ♀♀ × $\dfrac{\text{Ds I Sh Bz wx}}{\text{ds C sh bz Wx}}$ $\dfrac{Ac}{ac}$ ♂♂

c sh wx ♀ × $\dfrac{\text{Ds}\ \overset{a}{\text{I}}\ \overset{①}{\text{Sh}}\ \overset{②}{\text{wx}}}{\text{ds C sh Wx}}$ $\dfrac{Ac}{ac}$ ♂

I kernels (colorless)

non-C.O. I Sh wx = 1167
not classified for ds var. Too difficult

C.O. ① I ~~sh~~ Wx
- non-var : 59
- var. = 48

areas of wx

② I Sh Wx
- non-var = 219
- var. = 192

areas of wx

①+② I sh wx = 17*
Can't classify for Ds

C kernels (colored Bz)

C sh Wx
- non-var = 1287
- var. = 68

Breaks to left of C

C Sh wx
- non-var = 96
- var = 0

C sh wx
- non-var = 390
- var. = 3 = C.O. a + ②

breaks to left of C.

C Sh Wx
- non-var = 4
- var. = 0

~~Breaks to~~

C kernels = 1848

C.O. a = 68 + 3 = 71 (Ac) × 2 (ac) = 142 = 7.7%

C.O. ① = 96 + 4 = 100 = 5.4%

C.O. ② = 390 + 3 + 4 = 397 = 21.4%