February, 2002
Genetics 453

Evolutionary Genetics

Chromosome Rearrangements

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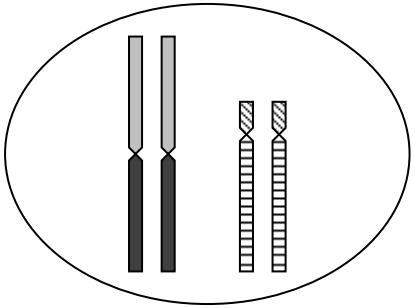
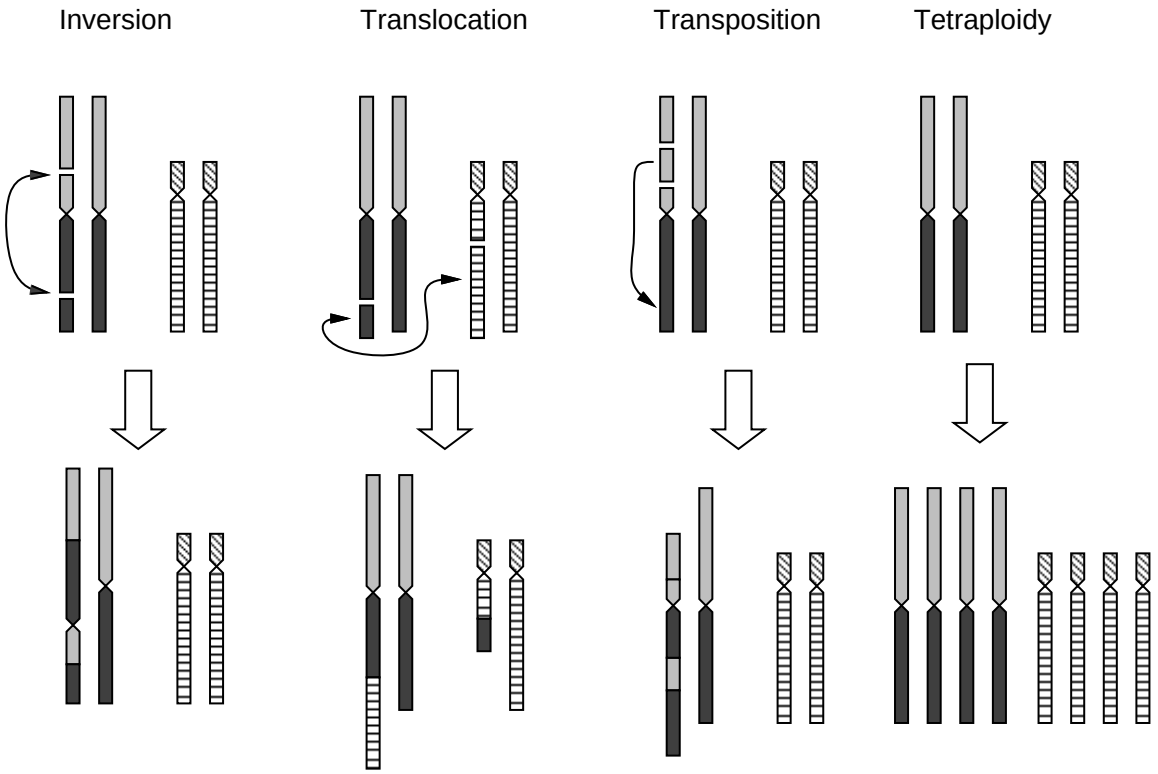
Chromosome Rearrangements





Additional question: when these occur they are rare in a population: how do they spread?

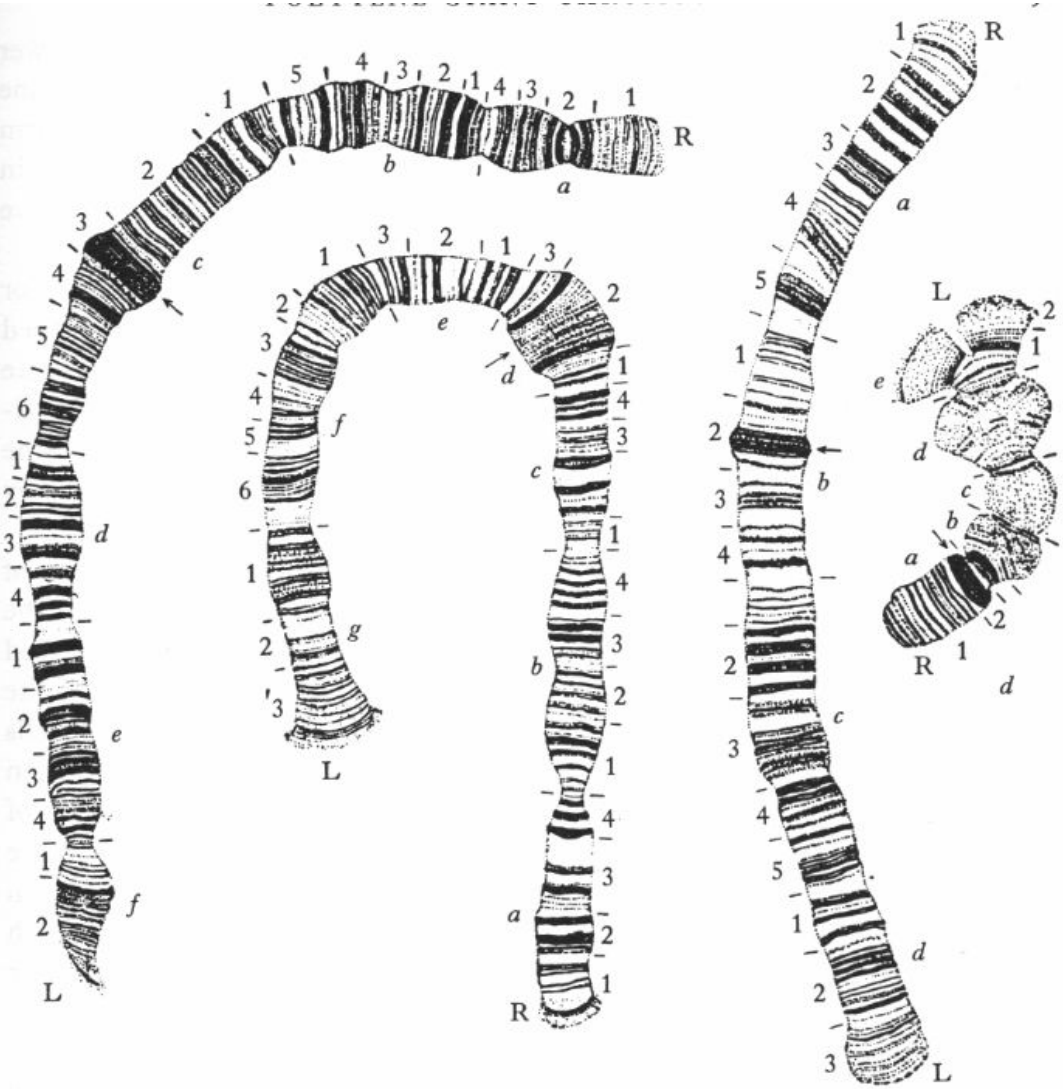
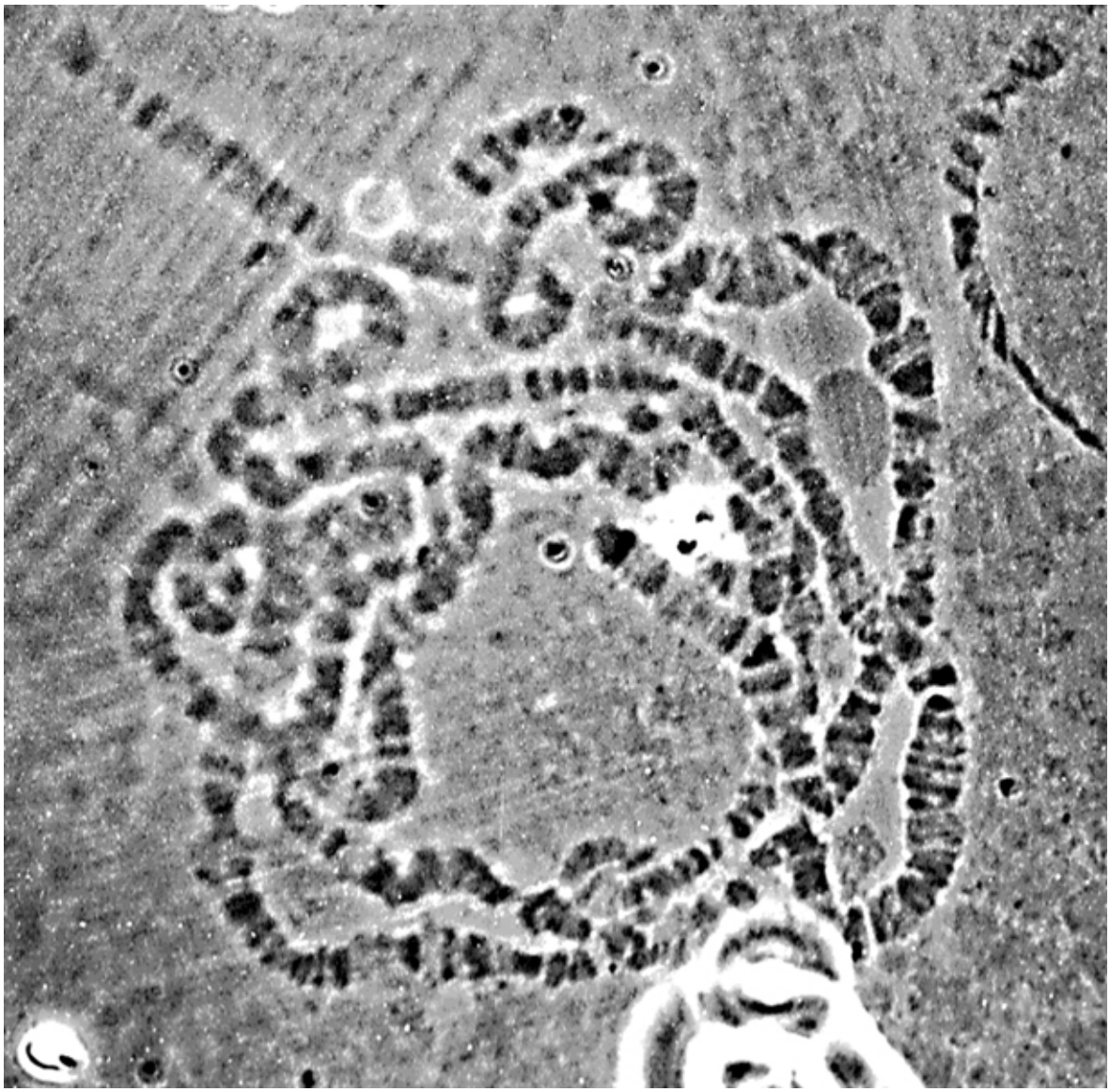


Fig. 4.1. The four polytene elements from a salivary gland nucleus of *Chironomus thummi*, showing the banding. Small arrows indicate the approximate positions of the centromeres. The shortest chromosome has its longer arm largely heterochromatic and the other three elements have short heterochromatic regions at the tips. From Bauer (1935).



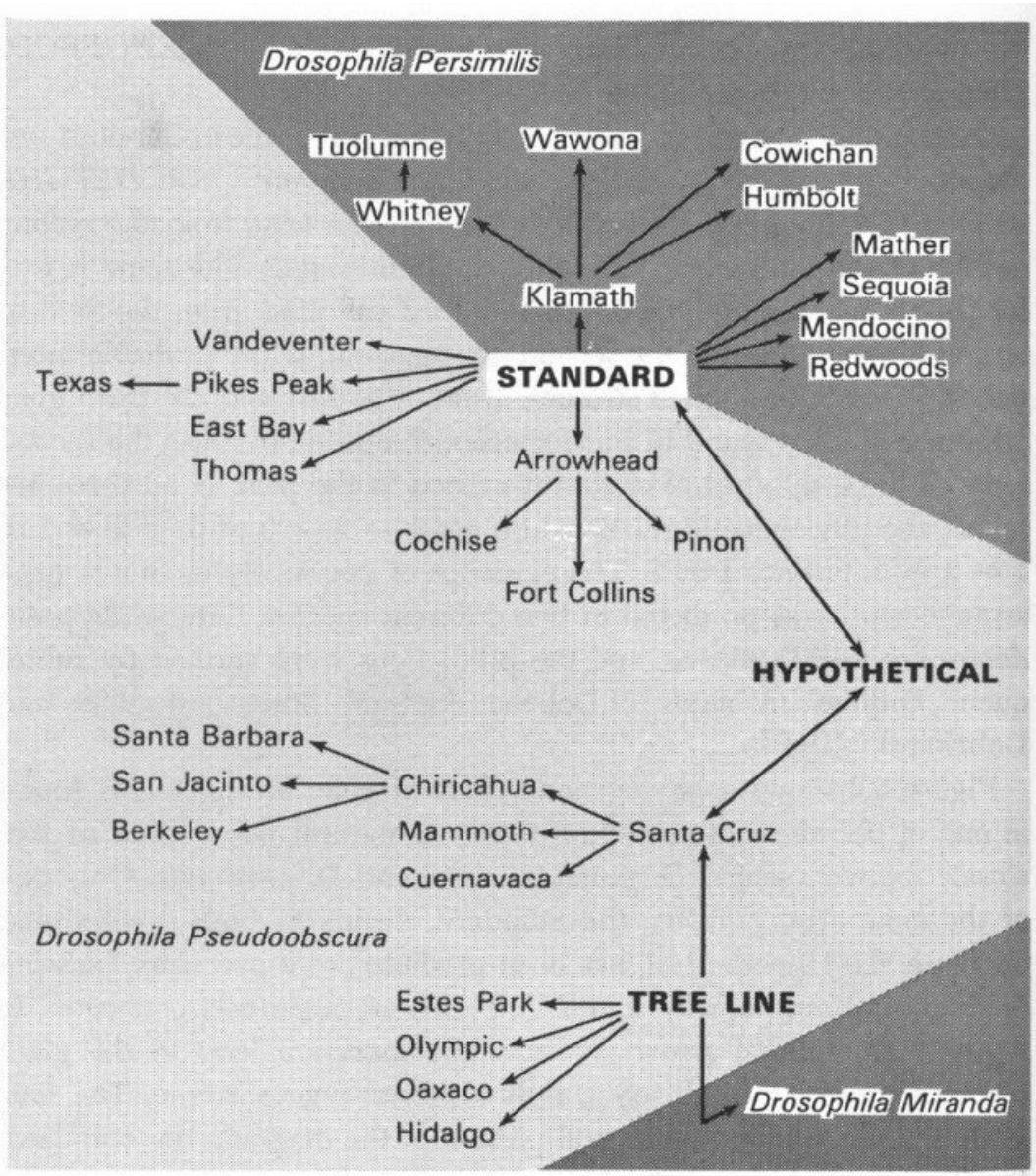
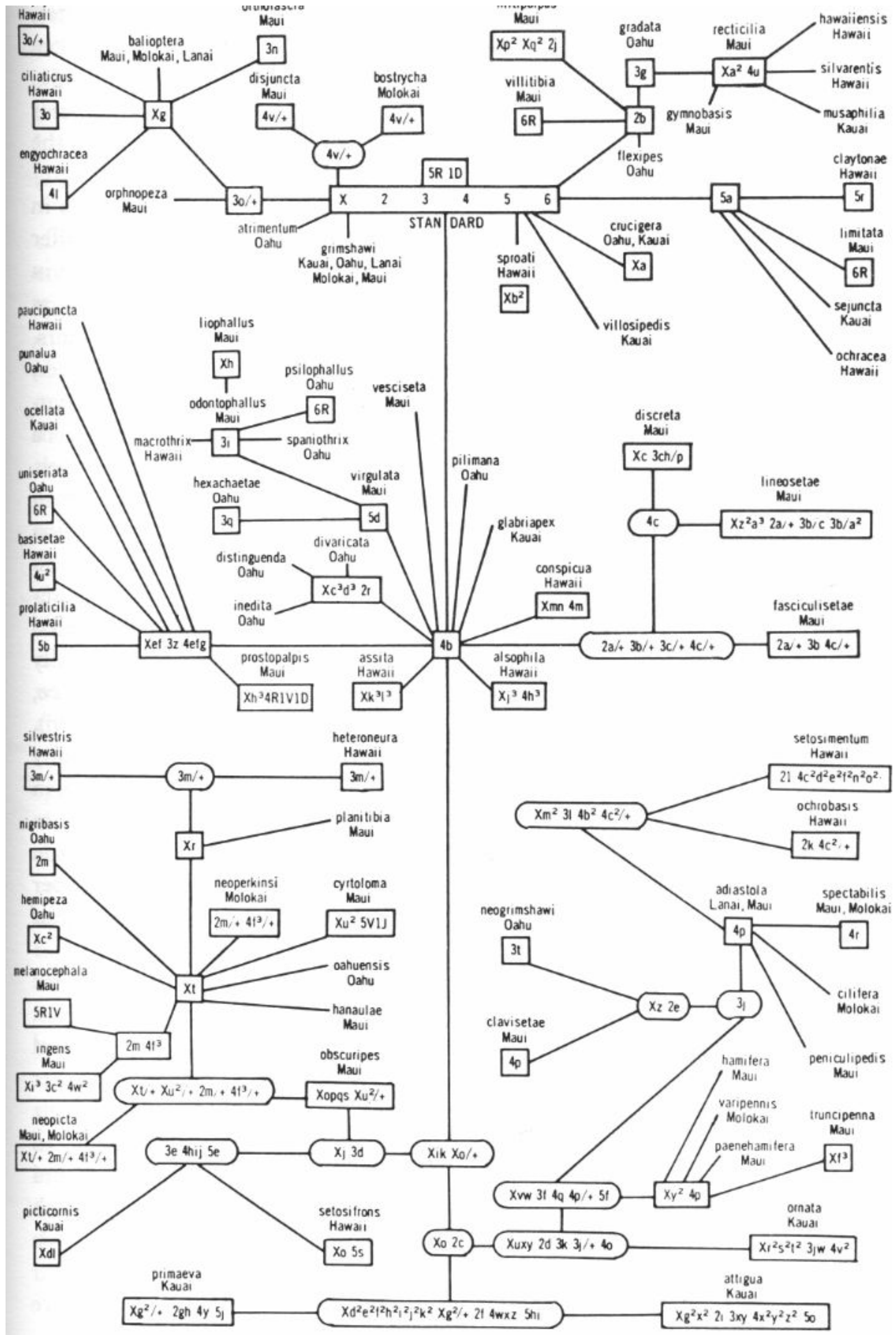


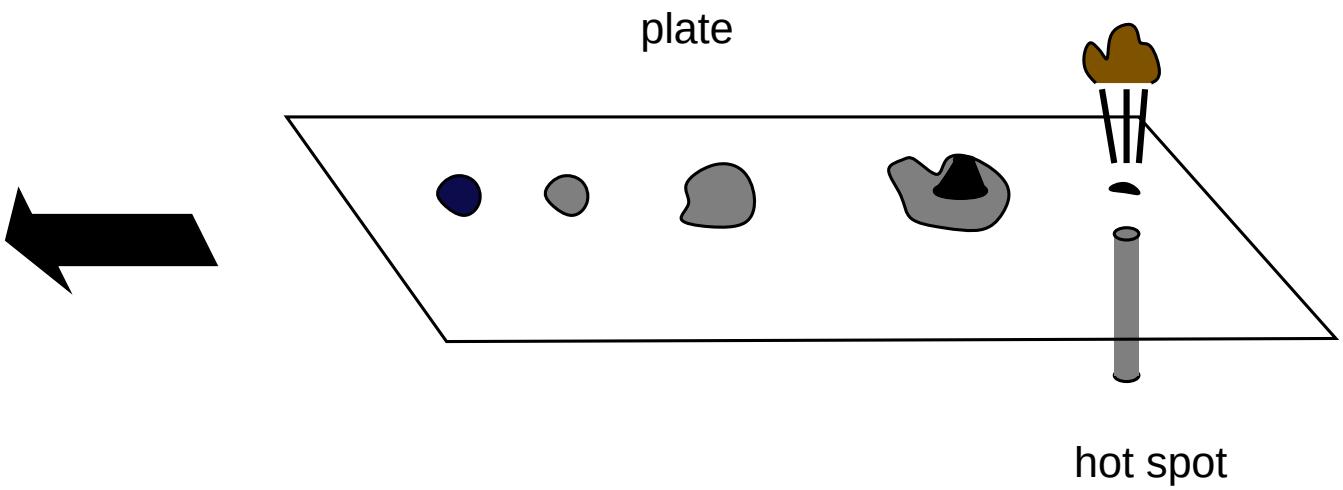
FIGURE 5.2

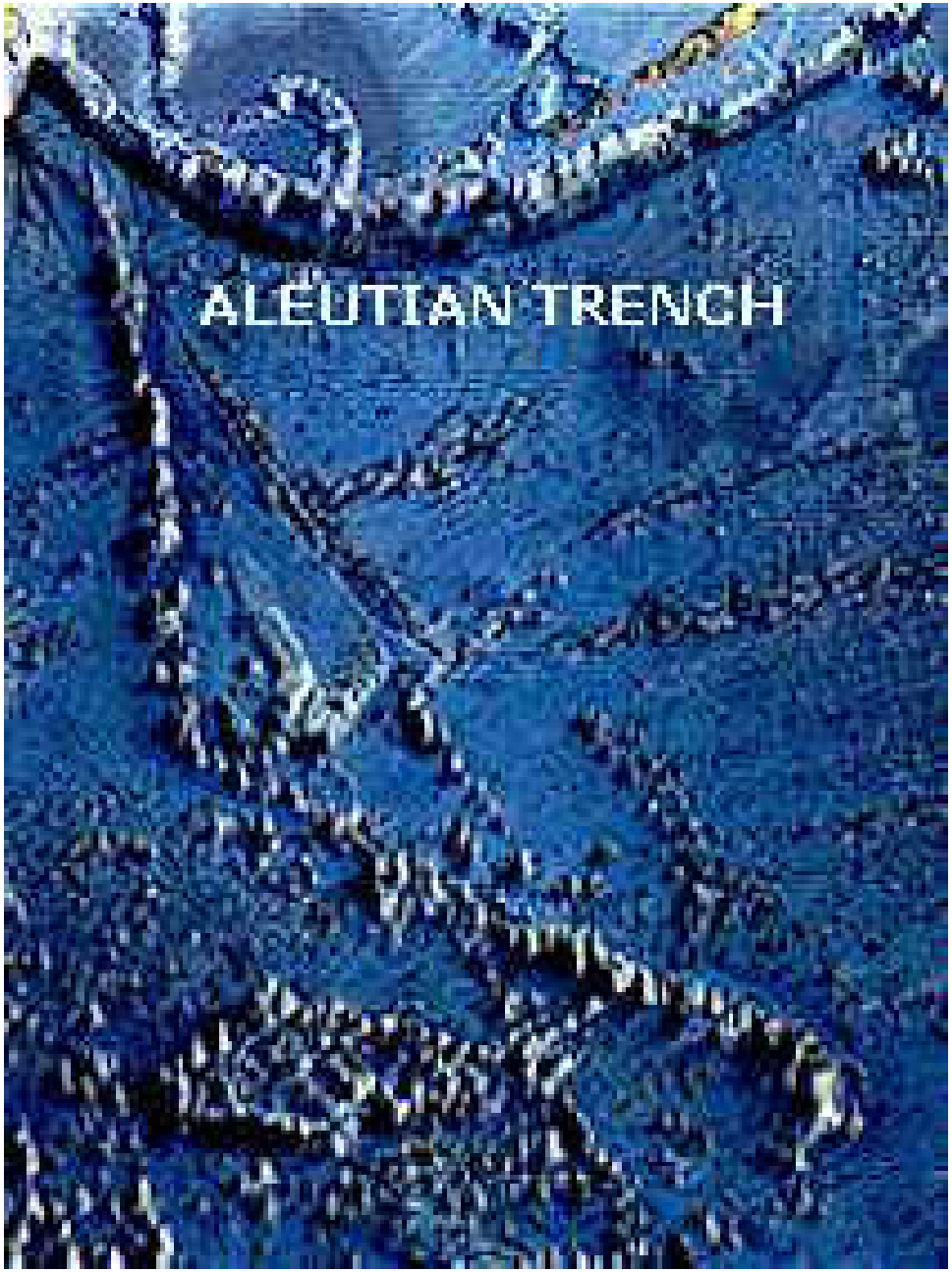
Phylogenetic relationships of the gene arrangements in the third chromosomes of Drosophila pseudoobscura, D. persimilis, and D. miranda.



Hawaii
3o/+
balioptera
Maui, Molokai, Lanai
Maui
3n
ciliaticrus
Hawaii
3o
Xg
disjuncta
Maui
4v/+
bostrycha
Molokai
4v/+
4v/+
engyochracea
Hawaii
4l
orphnopeza
Maui
3o/+
5R 1D
X 2 3 4 5 6
STANDARD
atrimentum
Oahu
grimshawi
Kauai, Oahu, Lanai
Molokai, Maui
Maui
Xp² Xq² 2j
villitibia
Maui
6R
gradata
Oahu
3g
2b
flexipes
Oahu
recticilia
Maui
Xa² 4u
gymnobasis
Maui
hawaiiensis
Hawaii
silvarentis
Hawaii
musaphilia
Kauai
claytonae
Hawaii
5r
5a
limitata
Maui
6R
sejuncta
Kauai
ochracea
Hawaii
crucigera
Oahu, Kauai
Xa
sproati
Hawaii
Xb²
villosipedis
Kauai
paucipuncta
Hawaii
punalua
Oahu
ocellata
Kauai
uniseriata
Oahu
6R
basisetae
Hawaii
4u²
prolaticilia
Hawaii
5b
Xef 3z 4efg
liophallus
Maui
Xh
odontophallus
Maui
psilophallus
Oahu
6R
macrothrix
Hawaii
3i
spaniothrix
Oahu
hexachaetae
Oahu
3q
virgulata
Maui
5d
vesciseta
Maui
pilimana
Oahu
glabriapex
Kauai
distinguenda
Oahu
divaricata
Oahu
Xc³d³ 2r
inedita
Oahu
conspicua
Hawaii
Xmn 4m
prostopalpis
Maui
Xh³4R1V1D
assita
Hawaii
Xk³l³
4b
alsophila
Hawaii
Xj³ 4h³
discreta
Maui
Xc 3ch/p
4c
lineosetae
Maui
Xz²a³ 2a/+ 3b/c 3b/a²
2a/+ 3b/+ 3c/+ 4c/+
fasciculisetae
Maui
2a/+ 3b 4c/+
silvestris
Hawaii
3m/+
3m/+
heteroneura
Hawaii
3m/+
planitibia
Maui
Xr
nigribasis
Oahu
2m
hemipeza
Oahu
Xc²
melanocephala
Maui
5R1V
ingens
Maui
Xi³ 3c² 4w²
2m 4f³
neoperkinsi
Molokai
2m/+ 4f³/+
cyrtoloma
Maui
Xu² 5V1J
oahuensis
Oahu
hanaulae
Maui
Xt
obscuripes
Maui
Xopqs Xu²/+
Xt/+ Xu²/+ 2m/+ 4f³/+
neopicta
Maui, Molokai
Xt/+ 2m/+ 4f³/+
3e 4hij 5e
Xj 3d
Xik Xo/+
picticornis
Kauai
Xdl
setosifrons
Hawaii
Xo 5s
Xo 2c
primaeva
Kauai
Xg²/+ 2gh 4y 5j
Xd²e²f²h²i²j²k² Xg²/+ 2f 4wxz 5hi
attigua
Kauai
Xg²x² 2i 3xy 4x²y²z² 5o
setosimentum
Hawaii
2l 4c²d²e²f²n²o²
Xm² 3l 4b² 4c²/+
ochrobasis
Hawaii
2k 4c²/+
adiastola
Lanai, Maui
4p
spectabilis
Maui, Molokai
4r
neogrimshawi
Oahu
3t
Xz 2e
3j
cilifera
Molokai
clavisetae
Maui
4p
peniculipedis
Maui
hamifera
Maui
varipennis
Molokai
paenehamifera
Maui
truncipenna
Maui
Xf³
Xvw 3f 4q 4p/+ 5f
Xy² 4p
Xuxy 2d 3k 3j/+ 4o
ornata
Kauai
Xr²s²t² 3jw 4v²

Formation of the Hawaiian Islands




ALEUTIAN TRENCH

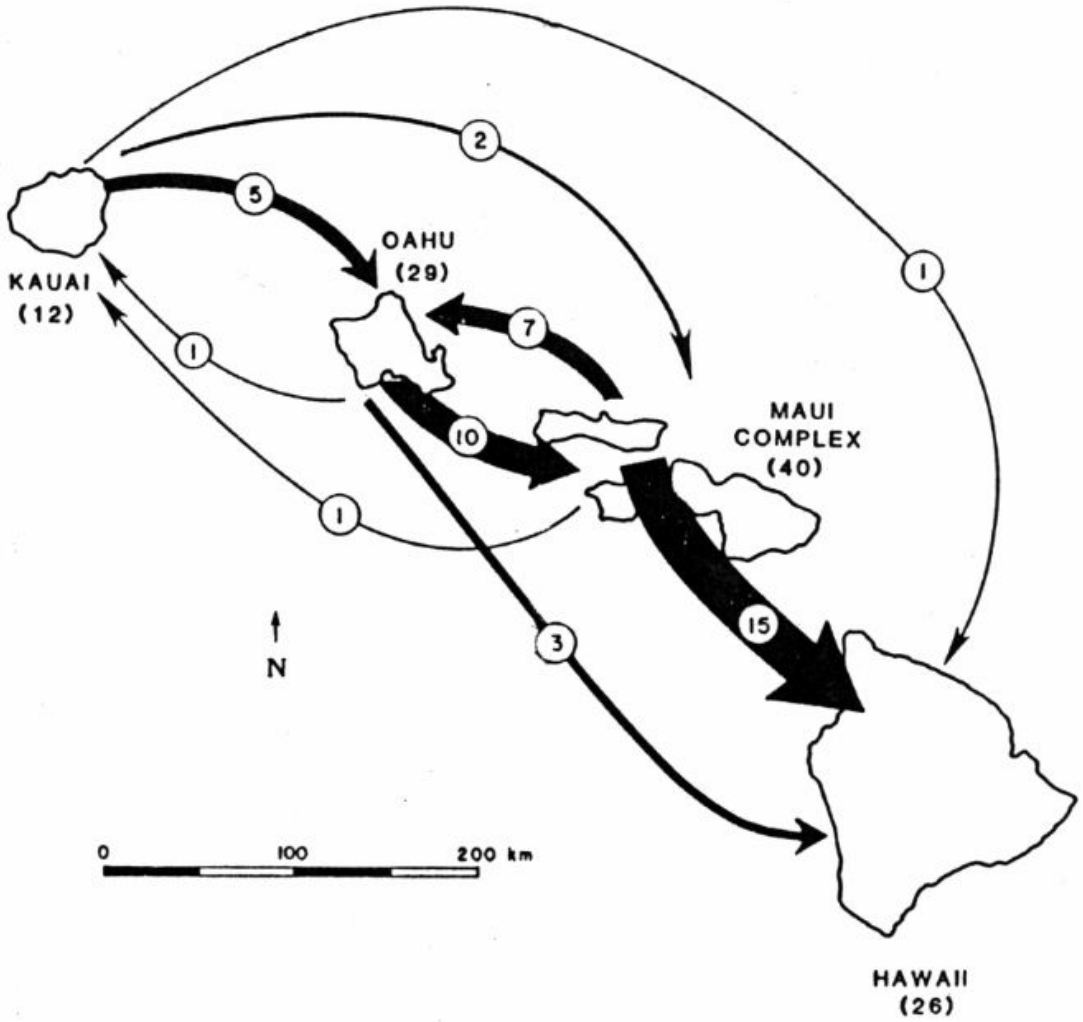
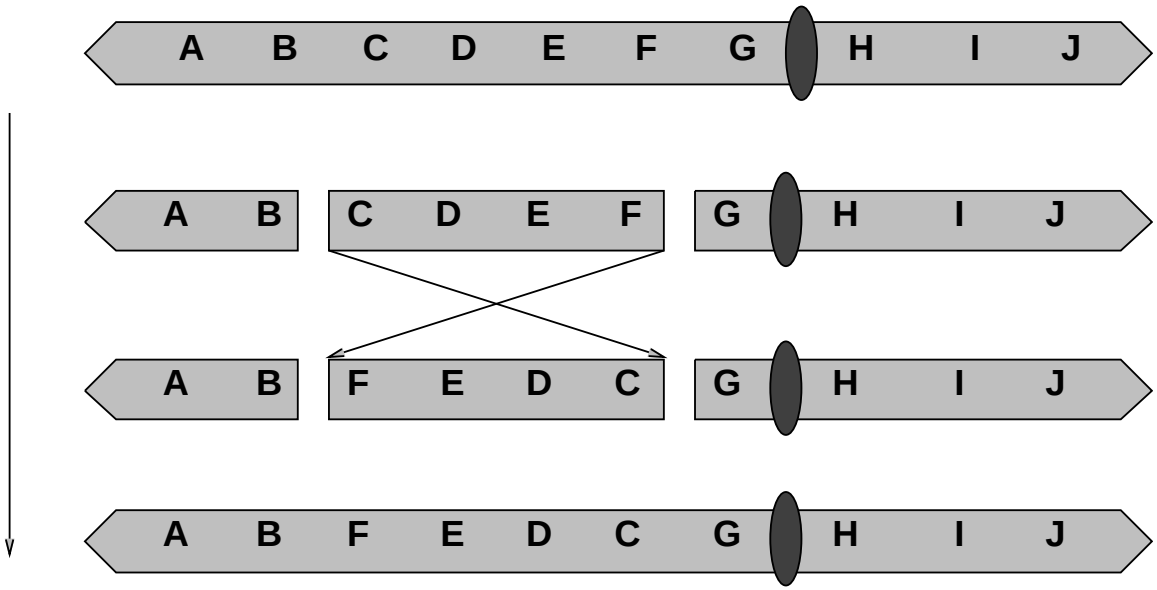
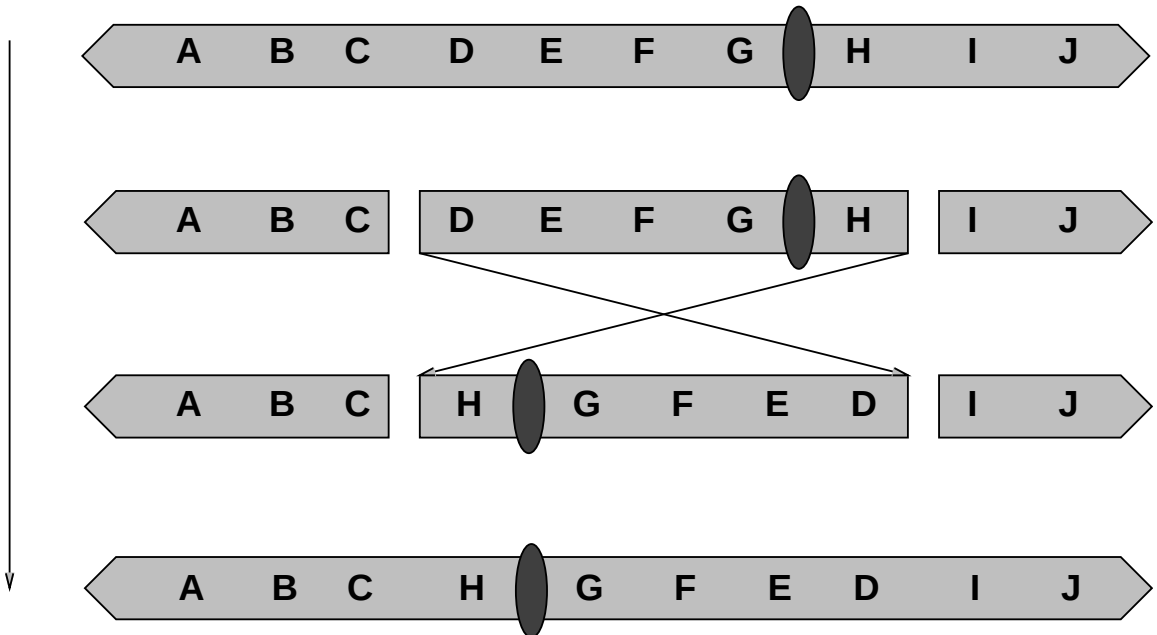


FIGURE 5.—Geographical summary of the proposed founder events invoked to explain the origin of the fauna of each island. The width of the arrows is proportional to the number of proposed founders. The number of species found on each island is given in parentheses.

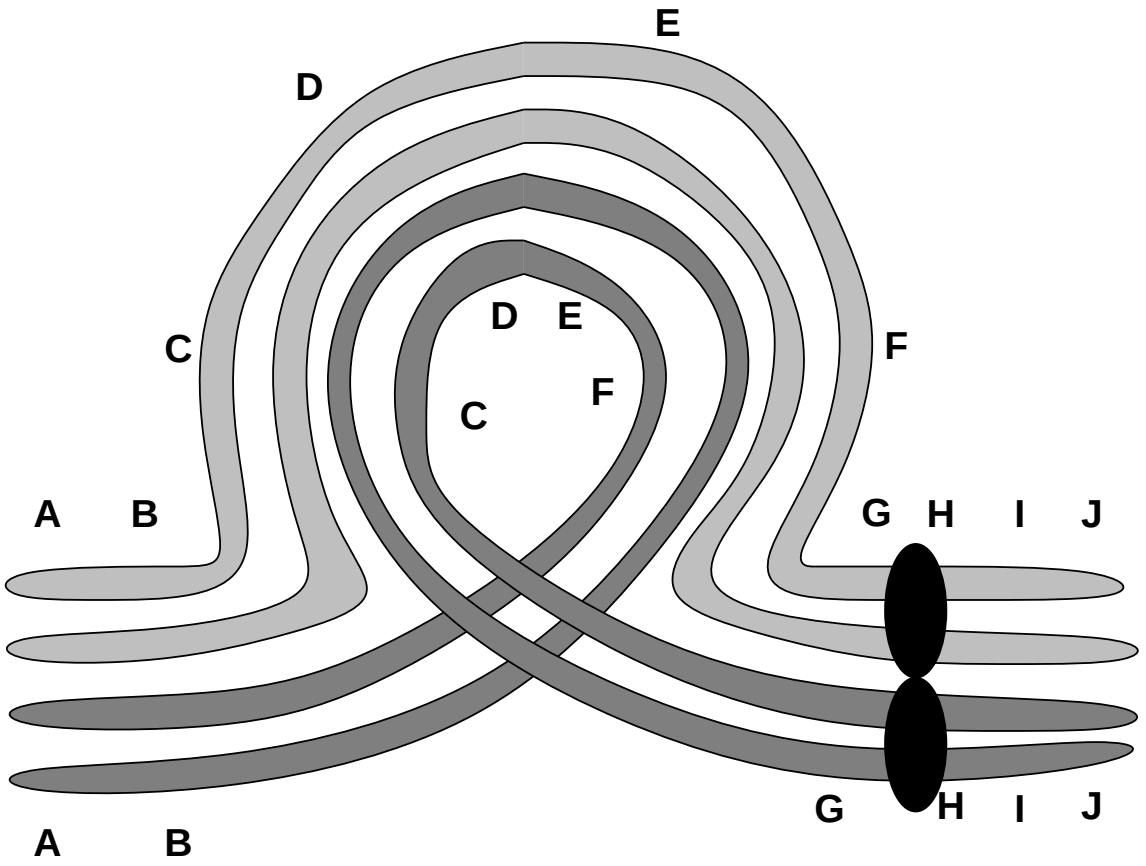
A Paracentric Inversion



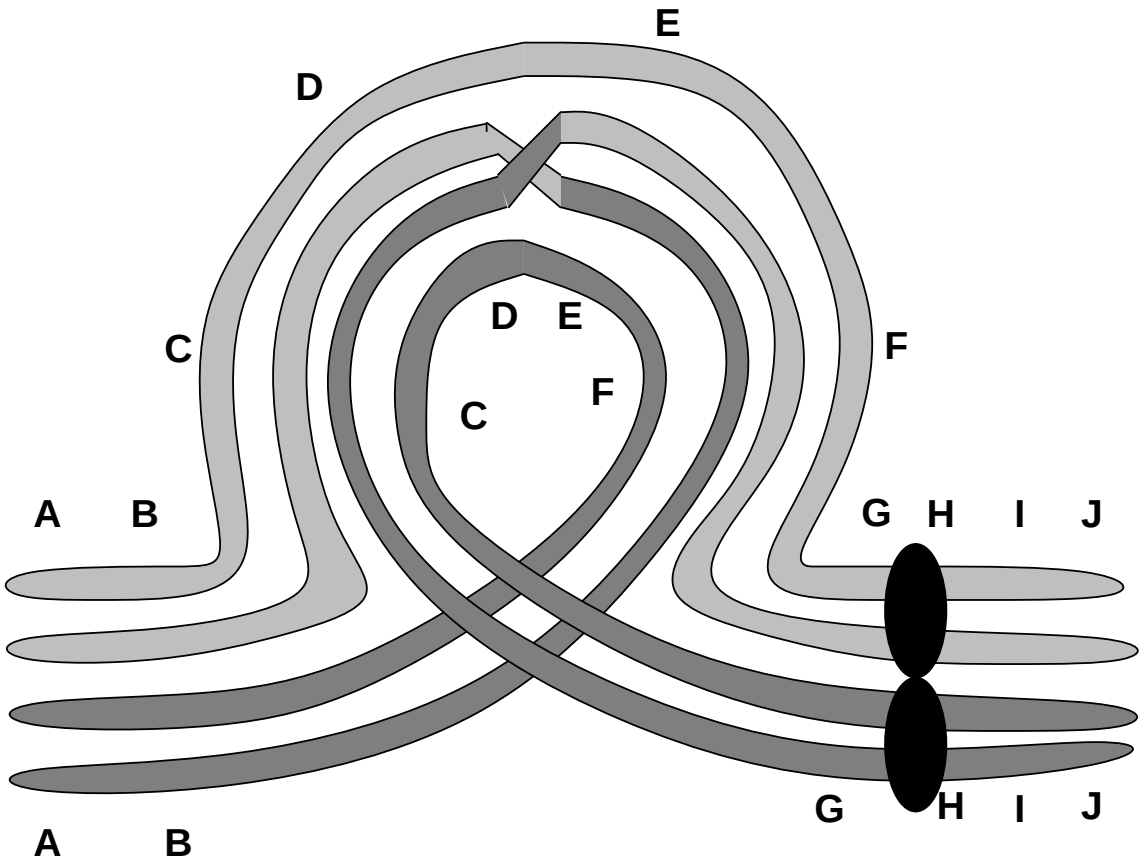
A Pericentric Inversion



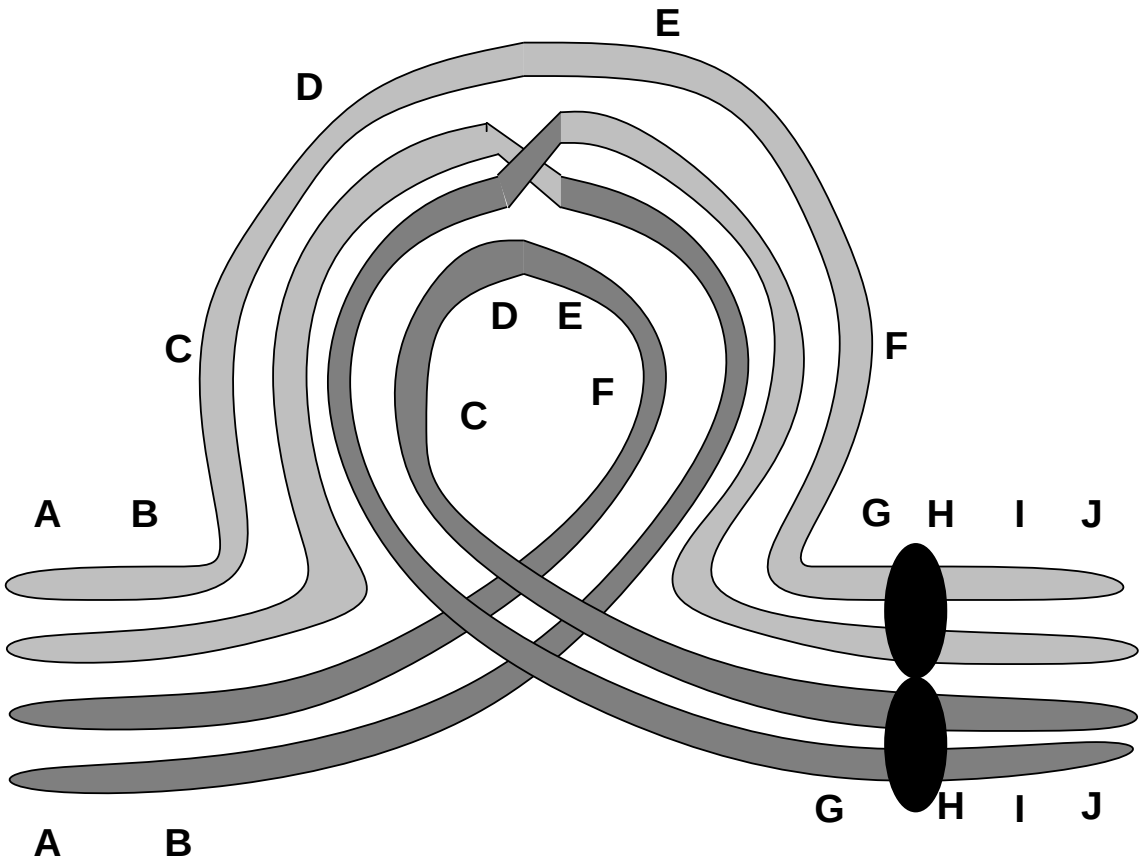
Pairing in a paracentric inversion heterozygote



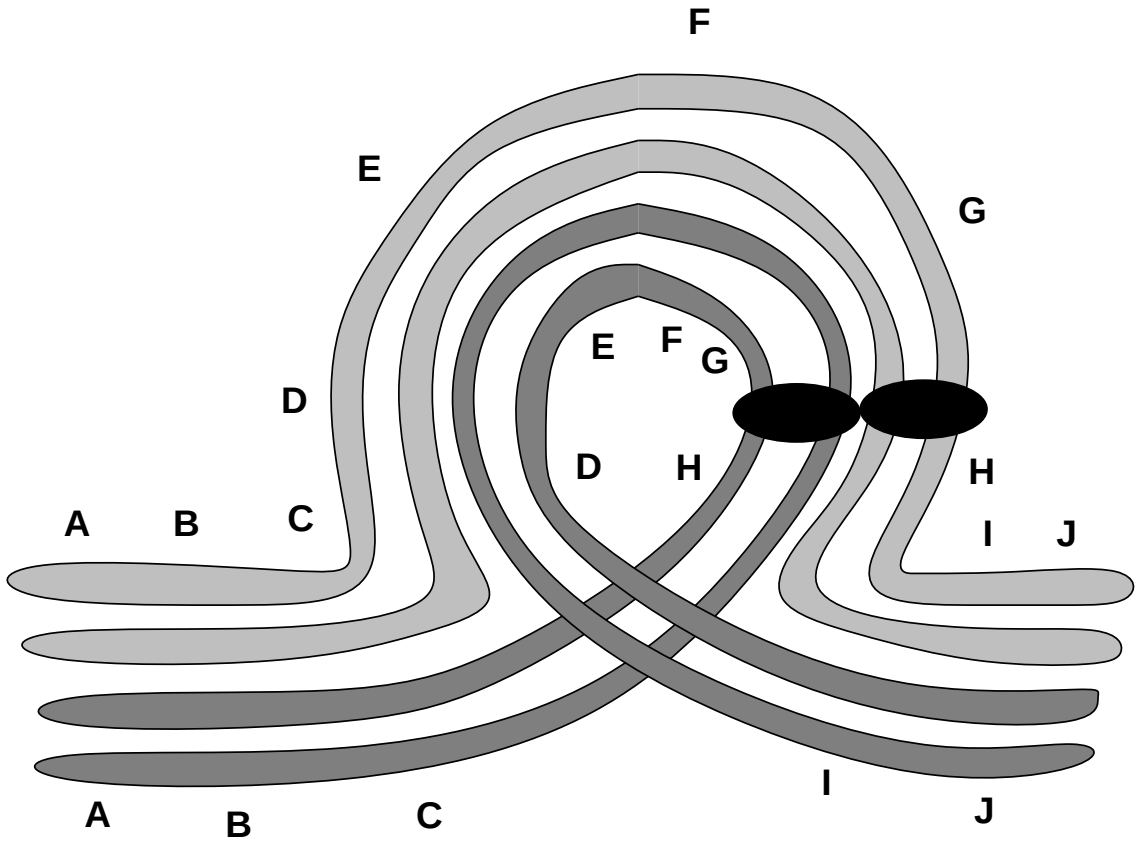
Crossing−over in a paracentric inversion heterozygote



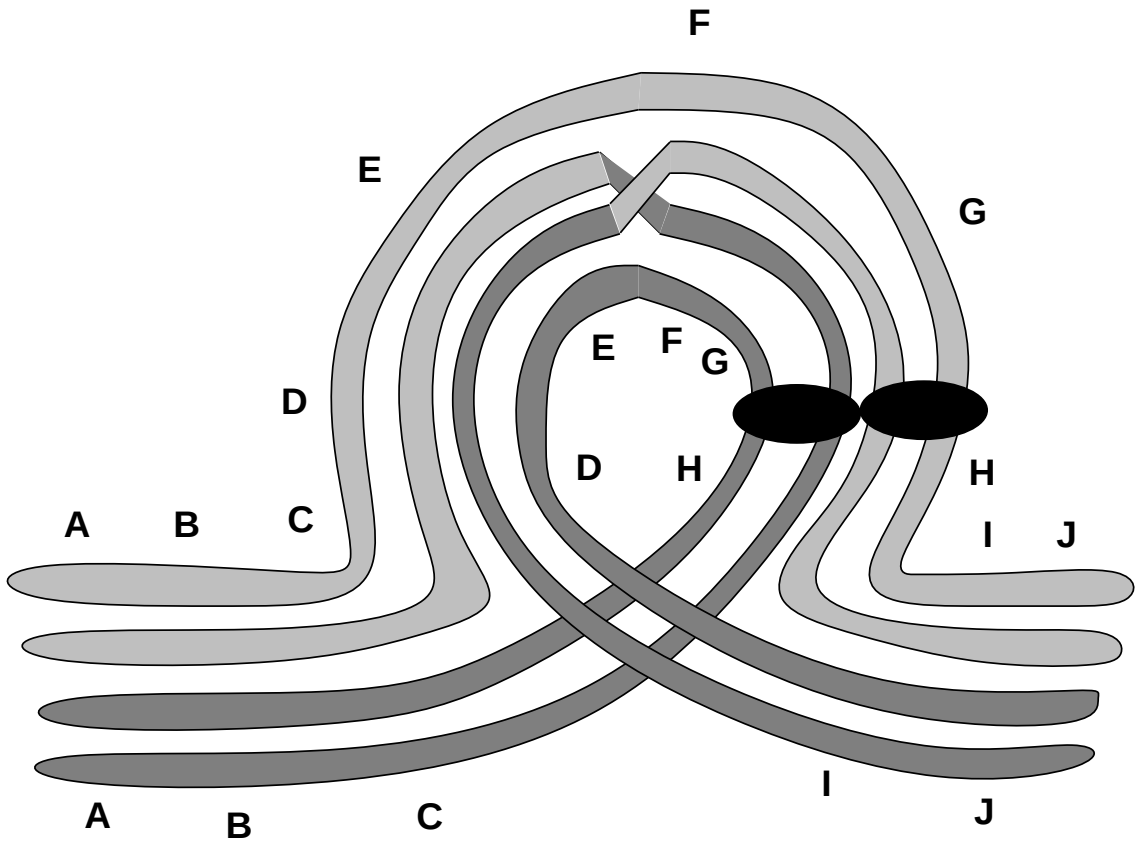
Crossing−over in a paracentric inversion heterozygote



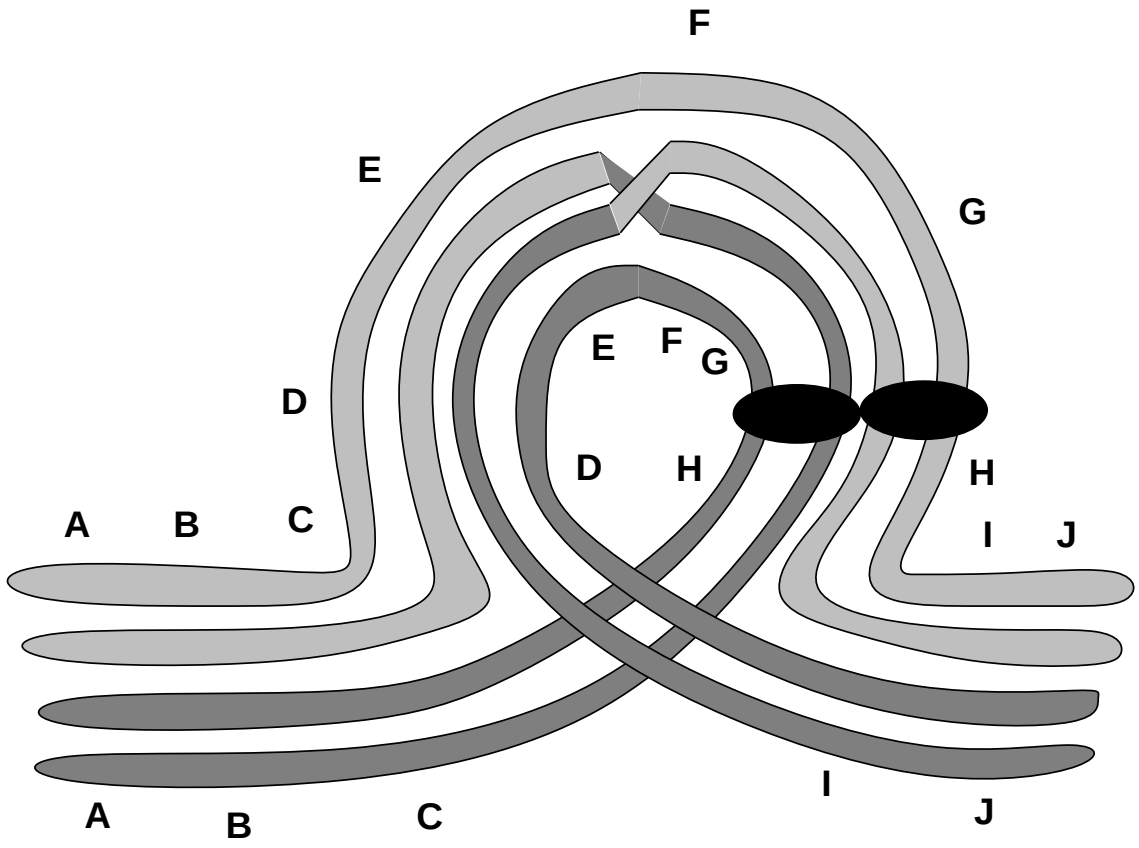
Pairing in a pericentric inversion heterozygote



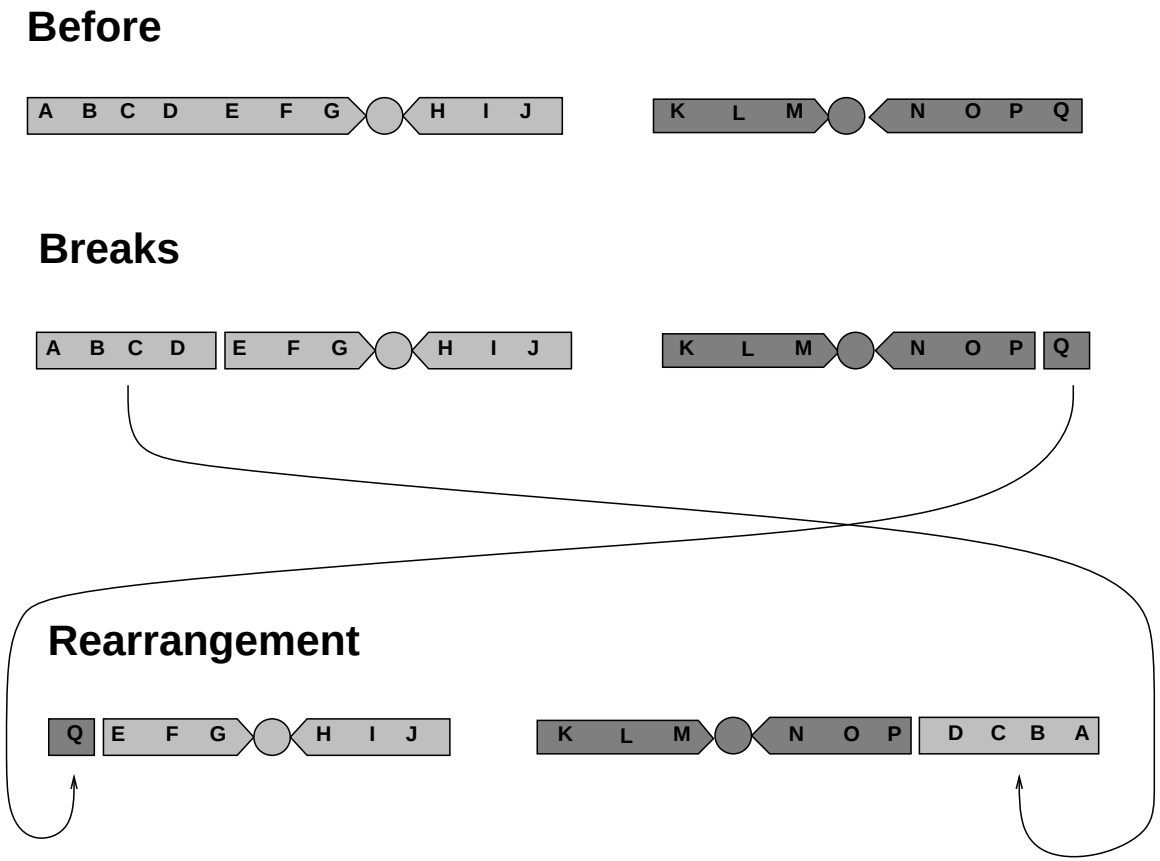
Crossing−over in a pericentric inversion heterozygote



Crossing−over in a pericentric inversion heterozygote

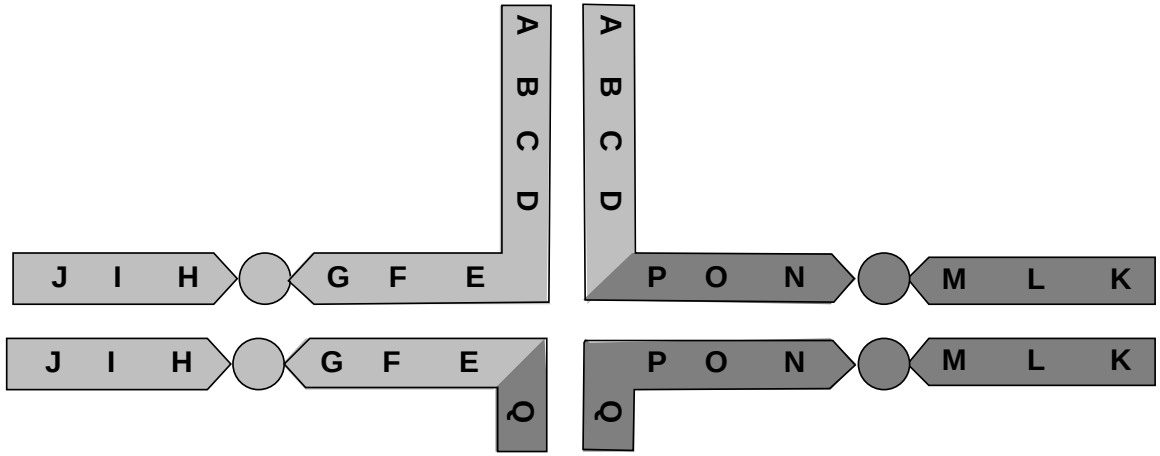


A translocation



A translocation heterozygote

at first division of meiosis metaphase



A pair of translocated chromosomes

pairs with a pair of untranslocated chromosomes

Fig. 2.11 Meiotic prophase (diakinesis) in a sporocyte of *Ophioglossum reticulatum*, showing about 630 bivalents. (From Ninan.[174])

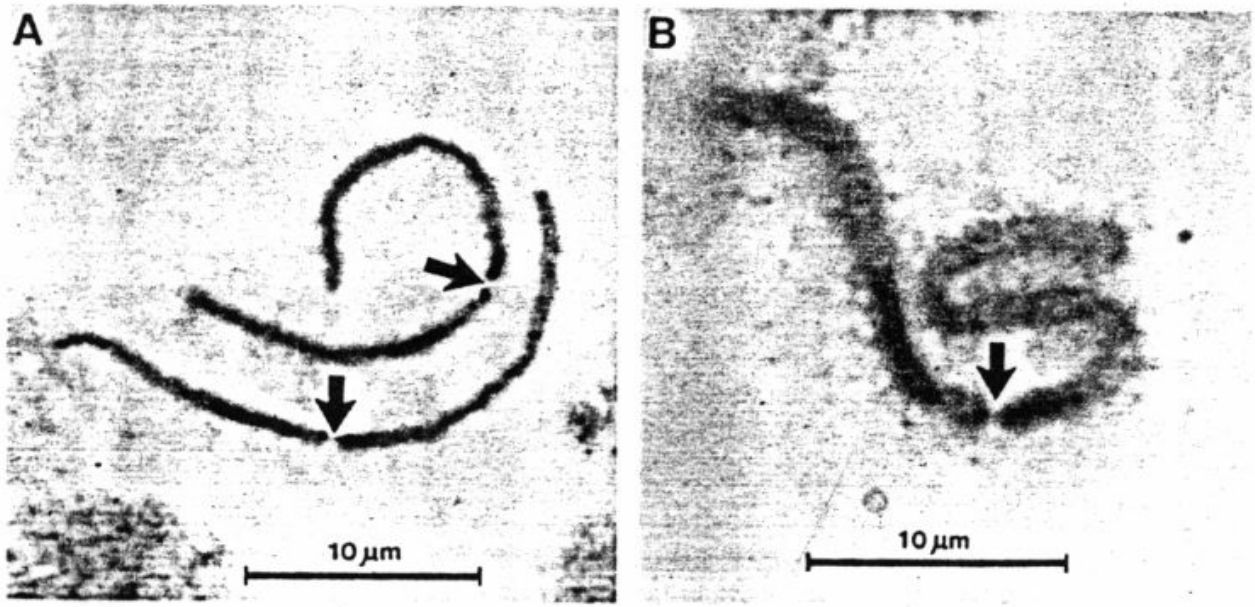
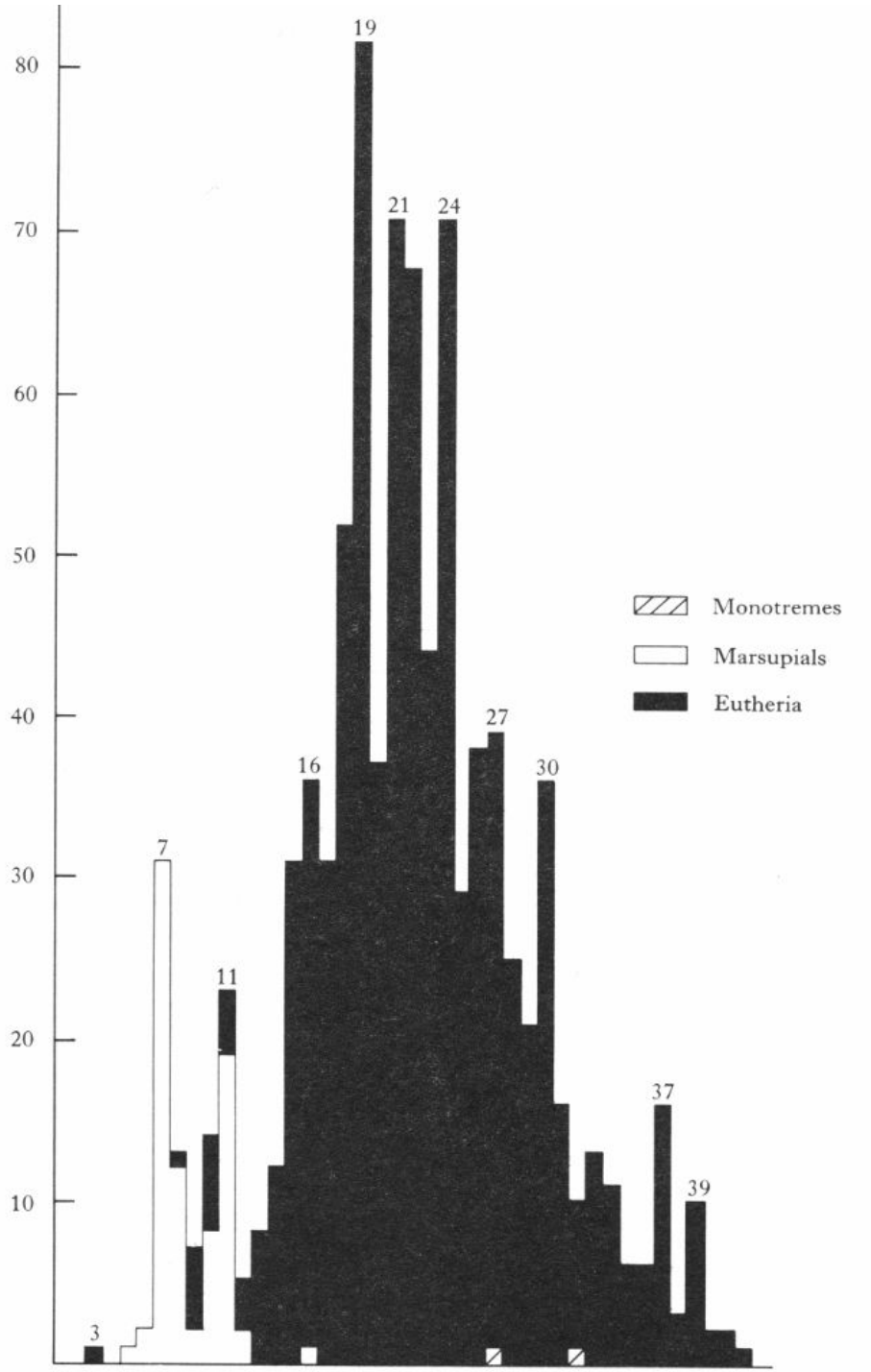


Fig. 1. Chromosomes from prepupal cerebral ganglia. (A) Worker prometaphase chromosomes. Identical C-banding provides evidence for homology of the two chromosomes. (B) Male prometaphase chromosome. Chromosomes consistently display a large centromeric C-band on the short arm and a smaller centromeric C-band on the long arm. Most of the short-arm C-band is not immediately adjacent to the centromere, though a very small portion of the short-arm C-band is centromeric. Arrows indicate position of centromere.


80
70
60
50
40
30
20
10
19
21
24
27
16
30
7
11
37
39
3
Monotremes
Marsupials
Eutheria

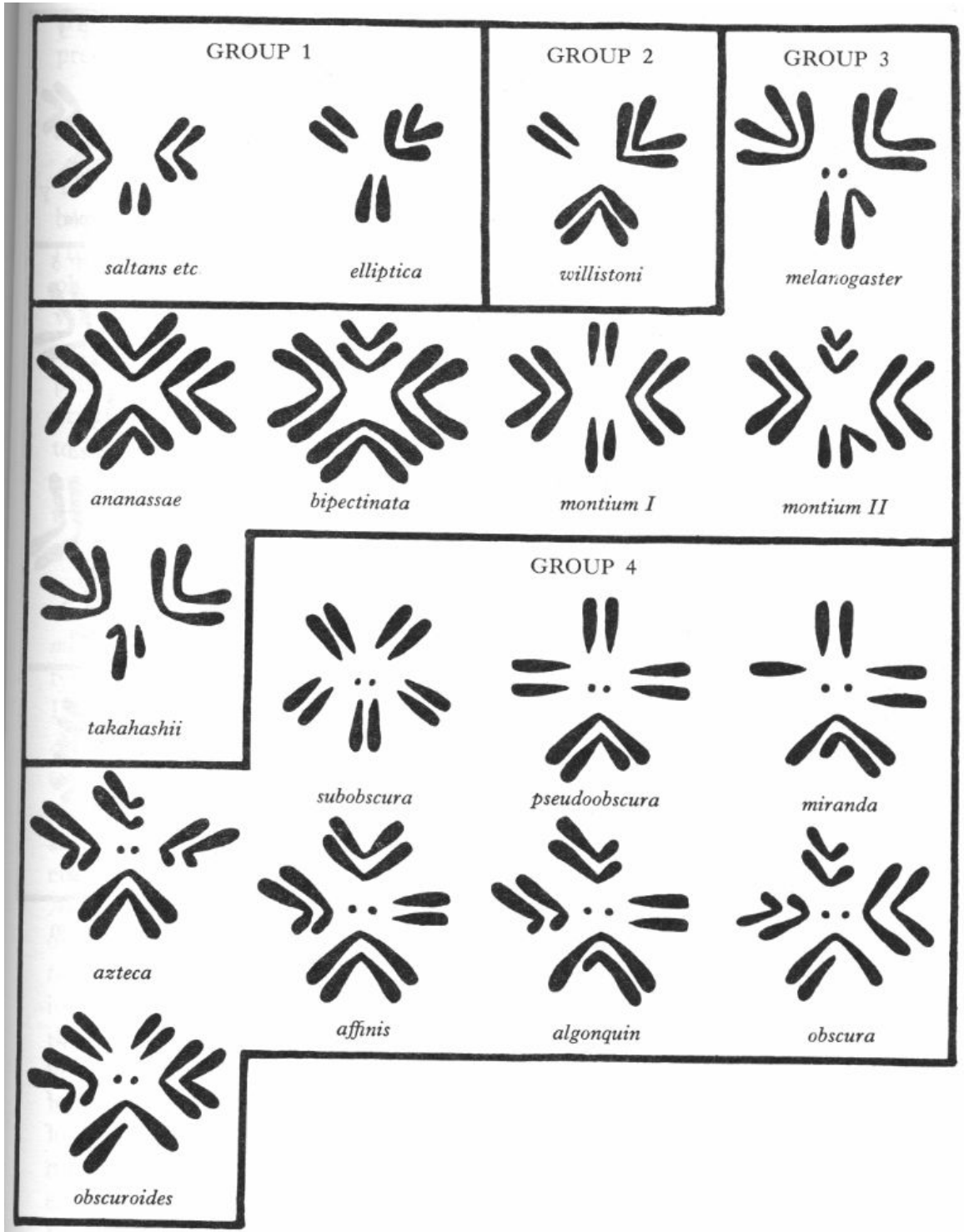


Fig. 11.3. Male karyotypes of some members of the subgenus *Sophophora* of

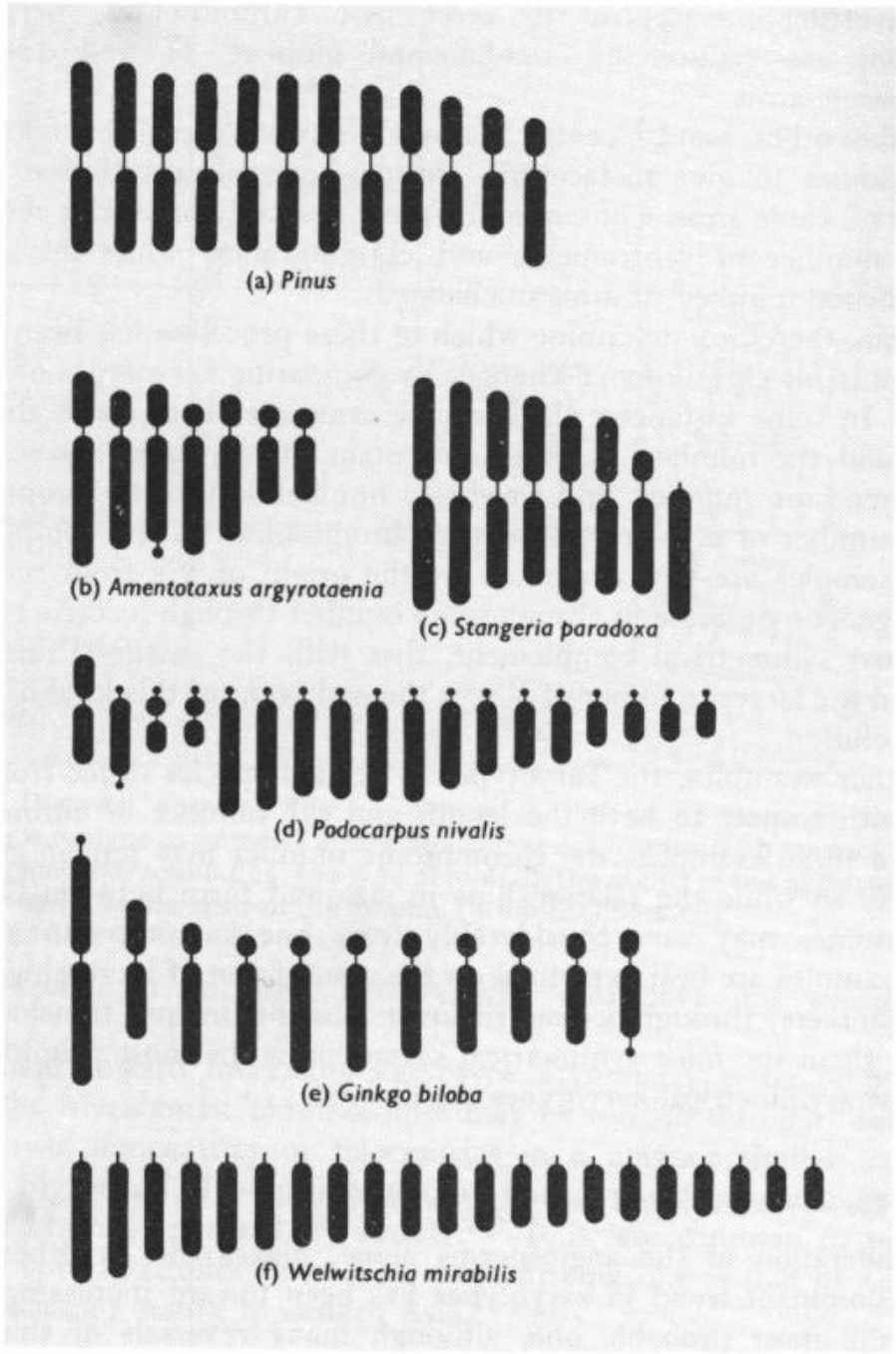
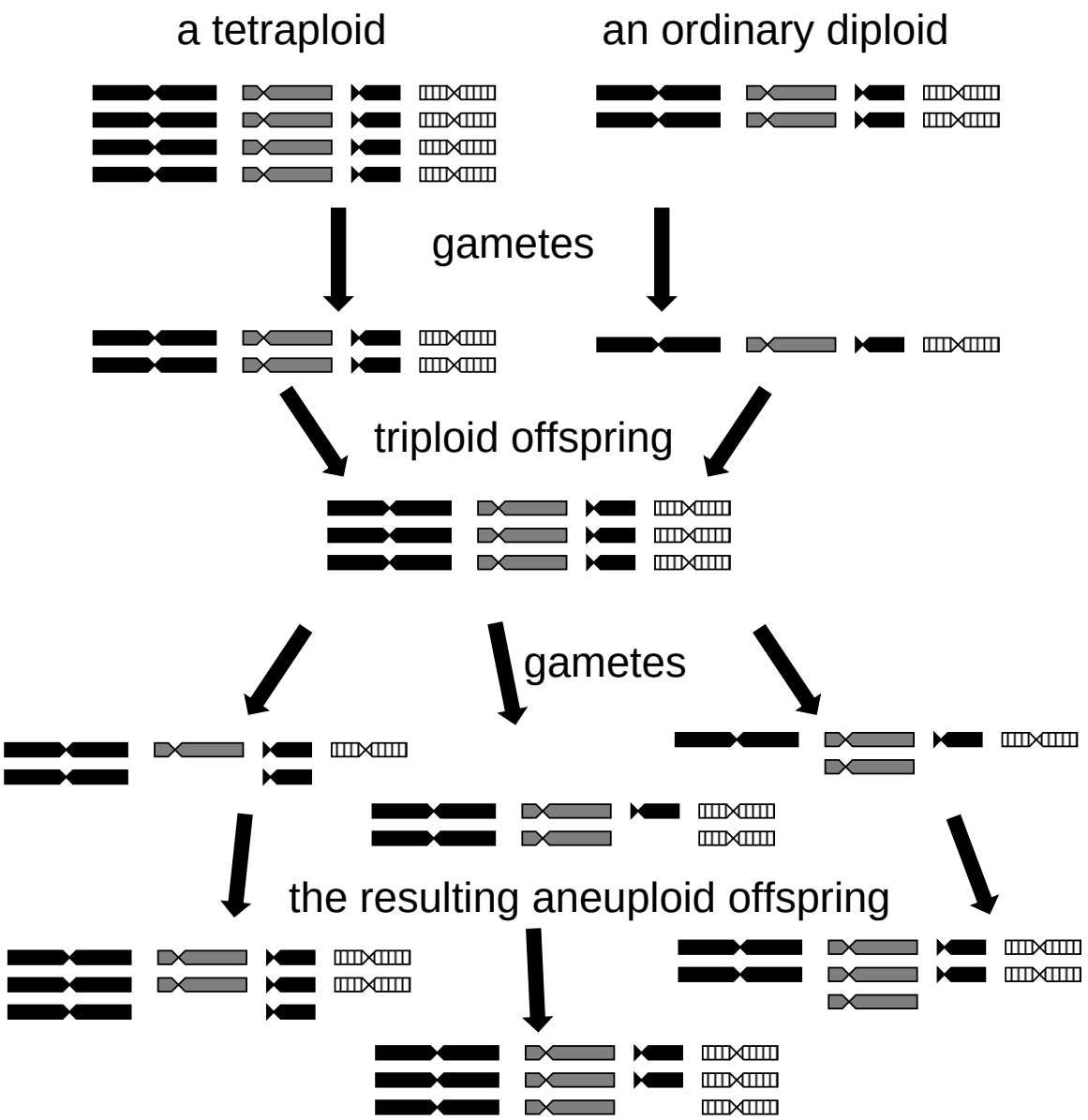
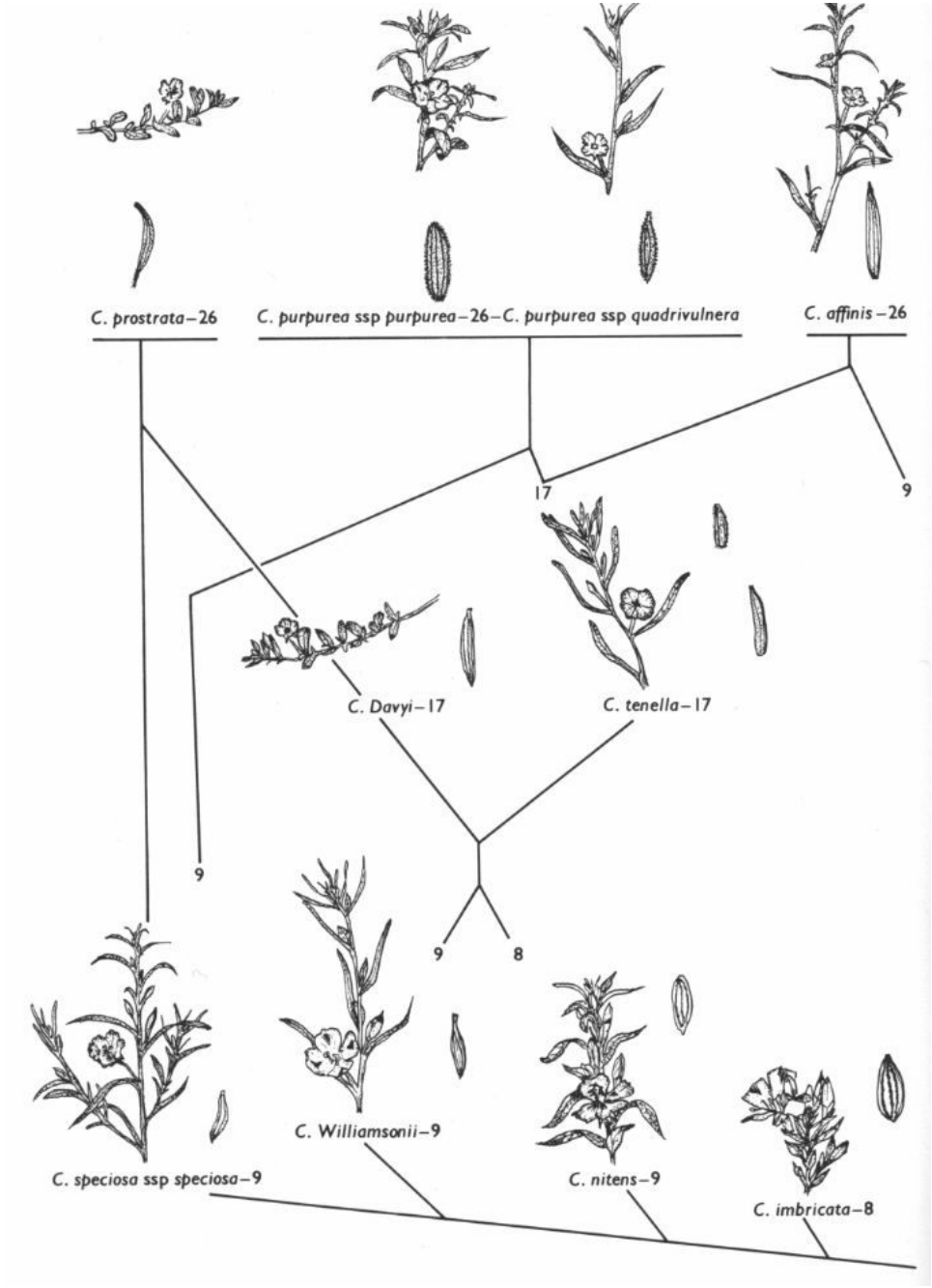


Fig. 4.12 Karyotypes of various genera of gymnosperms. (**a**) *Pinus*, showing the symmetrical karyotype characteristic of the families Pinaceae, Cupressaceae, and most genera of Taxodiaceae. (**b**), (**c**), Moderately asymmetrical karyotypes of *Amentotaxus argyrotaenia* (Taxaceae) and *Stangeria paradoxa* (Cycadaceae).

Barriers between mating of polyploids and euploids




C. prostrata–26
C. purpurea ssp purpurea–26–C. purpurea ssp quadrivulnera
C. affinis–26
17
9
C. Davyi–17
C. tenella–17
9
9
8
C. speciosa ssp speciosa–9
C. Williamsonii–9
C. nitens–9
C. imbricata–8

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(except that we had to use Microsoft Windows to project this as the X server I have in Linux is not too great)