

Cytological Studies in Spiders. III.

Studies on the Chromosomes of Fifty-seven  
Species of Spiders Belonging to Seventeen  
Families, with General Considerations  
of Chromosomal Evolution

By

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FIGS

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### EXPLANATION OF PLATES

The figures in Plates were drawn, with the exception noted, at table level with the aid of an ABBE camera lucida, using an objective 120 and an ocular 20, tube length, 180 mm, giving a magnification of ca. 4000 diameters. All the figures were reduced to approximately 2/3 for publication.

### PLATE I.

- Figs. 1-5. *Heptathela kimurai*, spermatogenesis.
- Figs. 1-3. Spermatogonia; Fig. 1 with 96 chromosomes, Fig. 2 95 chr., Fig. 3 94 ones.
- Fig. 4. Primary spermatocyte, metaphase, lateral view.
- Fig. 5. The same, polar view, with 48 chromosomes.
- Figs. 6-12. *Atypus karschi*, spermatogenesis.
- Fig. 6. Spermatogonium, metaphase plate with 44 chromosomes.
- Figs. 7-9. Primary spermatocytes, metaphases; Fig. 7 with 21 autosome bivalents and 2 X's. Figs. 8 and 9 with 21 bivalents, X's are not seen.
- Figs. 10-11. The same, profiles, 2 X's are clearly visible.
- Fig. 12. The same, anaphase, profile.

### PLATE II.

- Figs. 13-26. *Miagrammopes orientalis*. Figs. 13-15 and 18-26 spermatogenesis. Figs. 16-17 oogenesis.
- Figs. 13-15. Spermatogonial metaphases with 22 chromosomes.
- Figs. 16-17. Ogonial metaphases with 24 chromosomes.

- Fig. 18. Diakinesis.  
 Fig. 19-22. Primary spermatocyte metaphases with 10 bivalents and 2 X's.  
 Figs. 23-24. The same, lateral views. Fig. 24 with 2 X's and mis-divided autosomes.  
 Figs. 25-26. Secondary spermatocyte metaphases. Fig. 25 with 12 chromosomes and Fig. 26 10 ones.  
 Figs. 27-30. *Uloborus varians*, spermatogenesis.  
 Fig. 27. Gonial metaphase with 22 chromosomes.  
 Fig. 28. Primary spermatocyte, profile. 2200 $\times$ .  
 Figs. 29-30. Secondary spermatocytes, polar views with 10 chromosomes. 2200 $\times$ .  
 Figs. 31-36. *Dictyna foliicola*, spermatogenesis.  
 Figs. 31-32. Spermatogonial metaphases with 24 chromosomes.  
 Figs. 33-34. Primary spermatocyte metaphases, polar views with 11 autosome bivalents and 2 X's.  
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 Figs. 37-39. Primary spermatocyte metaphases, polar views with 4 chromosomes. 2200 $\times$ .  
 Figs. 40-42. Primary spermatocytes, metaphase to anaphase, profiles. 2200 $\times$ .

## PLATE III.

- Figs. 43-46. *Ariadna lateralis*. Secondary spermatocyte metaphases. Figs. 43-44 with 4 chromosomes and Figs. 45-46 with 3 ones. 2200 $\times$ .  
 Figs. 47-49. *Pholcus crypticola*, spermatogenesis.  
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 Fig. 49. Metaphase I with 11 autosome bivalents and 2 X's.  
 Fig. 50. *Drassodes* sp. Spermatogonial metaphase with 22 chromosomes.  
 Figs. 51-61. *Myrmarachne japonica*. Fig. 51, Figs. 54-58 and Figs. 60-61 spermatogenesis; Figs. 52-53 and Fig. 59 oogenesis.  
 Fig. 51. Spermatogonial metaphase plate with 28 chromosomes. 2200 $\times$ .  
 Figs. 52-53. Oogonial metaphase plates with 30 chromosomes.  
 Figs. 54-56. Primary spermatocytes, metaphases with 13 bivalents and 2 X's.  
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 Fig. 59. Primary oocyte with 15 bivalents.  
 Figs. 60-61. Secondary spermatocyte metaphases. Fig. 60 with 15 chromosomes and Fig. 61 13 ones.  
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 Fig. 62. Spermatogonial metaphase with 28 chromosomes.  
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 Fig. 67. *Hasarius adansoni*, spermatogonial metaphase with 28 chromosomes. 2200 $\times$ .

## PLATE IV.

- Figs. 68-78. *Hasarius adansoni*, spermatogenesis. 2200 $\times$ .  
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 Fig. 82. Primary spermatocyte with 13 bivalents and 2 X's.

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- Figs. 101-105. *Aelurillus dimorphus*, spermatogenesis. 2200 $\times$ .  
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 Fig. 119. Polar view of tetraploid primary spermatocyte. About 26 autosome bivalents and probably two sets of 2 X's are seen.  
 Fig. 120. Polar view of tetraploid secondary spermatocyte. 30 chromosomes are present.

## PLATE VII.

- Figs. 121-122. *Icius magister*. Secondary spermatocyte metaphases, Fig. 121 with 15 chromosomes, Fig. 122 13 ones.  
 Figs. 123-125. *Icius elongatus*, spermatogenesis.  
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- Figs. 128-130. Profile views of metaphase I. Notice great size difference of bivalents and X's.  
 Figs. 131-132. Polar views of primary spermatocyte metaphases with 15 chromosomes.  
 Fig. 133. Lateral view of primary spermatocyte telophase.  
 Fig. 134. Polar view of the same, showing 13 autosomes and 2 X's.  
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 Figs. 137-139. *Rhene atrata*, spermatogenesis.  
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 Figs. 149-158. *Lycosa cinereofusca*, spermatogenesis.  
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 Figs. 151-152. Polar views of metaphase I with 15 chromosomes. Notice great size difference of X's.  
 Figs. 153-154. Profile views of the same, here also showing great size difference of X's.  
 Fig. 155. Profile view of telophase I.  
 Figs. 156-158. Polar views of metaphase II. Fig. 156 with 15 chromosomes, Figs. 157-158 13 ones.  
 Figs. 159-162. *Lycosa coelestis*, spermatogenesis.  
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 Fig. 162. Polar view of the first division metaphase with 12 bivalents and 2 X's.

### PLATE IX.

- Figs. 163-168. *Lycosa coelestis*, spermatogenesis.  
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 Fig. 164. Lateral view of the first anaphase.  
 Fig. 165. Lateral view of the first telophase, with elongated chromatin bridge.  
 Figs. 166-168. Polar views of the second metaphase. Figs. 166-167 with 14 chromosomes, Fig. 168 12 ones.  
 Figs. 169-170. *Lycosa pseudoannulata*, spermatogenesis. Polar views of metaphase I with 13 bivalents and 2 X's.  
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 Fig. 171. Prometaphase with 13 bivalents and 2 X's, further, exist two microchromosomes at the outermost portion.  
 Fig. 172. Metaphase plate I with 13 autosomal bivalents and 2 X's.  
 Figs. 173-174. Profile views of metaphase I. Fig. 174 shows precocious separation of two microchromosomes and movement of 2 X's to a single pole.  
 Figs. 175-177. Polar views of metaphase II. Fig. 175 with 15 chromosomes, Fig. 176 13 ones, Fig. 177 15 chromosomes plus 2 microchromosomes.  
 Figs. 178-184. *Pisaura lama*, Figs. 178-181, Figs. 183-184 spermatogenesis, Fig. 182 female soma-cell.  
 Figs. 178-181. Spermatogonial metaphases with 28 chromosomes.

Fig. 182. Metaphase plate of stalk cell in ovary, 30 chromosomes.

Figs. 183-184. Polar aspects of metaphase I with 15 chromosomes. Notice smaller size of both X's.

#### PLATE X.

Figs. 185-189. *Pisaura lama*, spermatogenesis.

Fig. 185. Polar aspect of metaphase I.

Figs. 186-187. Lateral aspects of the same. Notice smaller size of X's.

Figs. 188-189. Polar aspects of metaphase II. Fig. 188 with 15 elements, Fig. 189 13 ones.

Figs. 190-197. *Dolomedes angustivirgatus*, spermatogenesis.

Fig. 190. Gonial metaphase plate with 28 chromosomes.

Figs. 191-193. Polar views of metaphase I with 15 chromosomes.

Figs. 194-195. Lateral views of the same.

Figs. 196-197. Polar views of metaphase II. Fig. 196 with 13 elements, Fig. 197 15 ones.

Figs. 198-205. *Dolomedes pallitarsis*, spermatogenesis.

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Fig. 201. Profile view of primary spermatocyte.

Figs. 202-204. Polar views of the same, 13 bivalents and 2 X's.

Fig. 205. Polar view of secondary spermatocyte with 13 elements.

#### PLATE XI.

Figs. 206-210. *Dolomedes saganus*, spermatogenesis.

Fig. 206. Gonial metaphase plate with 28 chromosomes.

Figs. 207-209. Polar aspects of metaphase I with 15 chromosomes.

Fig. 210. Polar aspect of metaphase II with 15 elements.

Figs. 211-217. *Dolomedes sulfureus*, Figs. 211-213, Figs. 215-217 spermatogenesis, Fig. 214 oogenesis.

Figs. 211-213. Spermatogonial metaphase plates with 28 chromosomes.

Fig. 214. Oogonial metaphase plate with 30 chromosomes.

Fig. 215. Polar view of primary spermatocyte with 13 bivalents and 2 X's.

Fig. 216. Polar view of secondary spermatocyte with 15 chromosomes.

Fig. 217. Lateral view of primary spermatocyte.

Figs. 218-221. *Agelena limbata*, spermatogenesis.

Fig. 218. Gonial metaphase plate with 44 chromosomes.

Figs. 219-221. Polar views of primary spermatocyte metaphases, with 21 autosome bivalents and 2 X's.

Figs. 222-225. *Agelena opulenta*, spermatogenesis.

Fig. 222. Gonial metaphase plate with 44 chromosomes.

Figs. 223-224. Polar views of metaphase I, with 21 bivalents and 2 X's. Fig. 224 shows widely separated 2 X's.

Fig. 225. Lateral aspect of metaphase I.

#### PLATE XII.

Figs. 226-227. *Tegenaria corasides*, spermatogenesis. Gonial metaphases with 42 chromosomes.

Figs. 228-236. *Cryphoeca silvicola*, spermatogenesis.

Figs. 228-230. Polar views of primary spermatocyte metaphases, 20 autosome bivalents and 3 X's. In Fig. 230 3 X's are not visible.

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Figs. 232-233. Lateral aspects of 3 X's taken from some metaphase I, showing their different length and irregular contours.

- Figs. 234-235. Polar aspects of secondary spermatocyte metaphases with 20 elements.  
 Fig. 236. Lateral view of secondary division telophase, showing equal separation of X's.  
 Figs. 237-242. *Uroctea compactilis*, spermatogenesis.  
 Figs. 237-240. Gonial metaphase plates with 42 chromosomes.  
 Figs. 241-242. Lateral views of first division.  
 Figs. 243-246. *Crustulina guttata*, spermatogenesis.  
 Fig. 243. Gonial metaphase plate with 22 chromosomes.  
 Fig. 244. Polar view of metaphase I with 12 elements.  
 Figs. 245-246. Lateral views of the same.  
 Figs. 247-248. *Enoplognatha folicola*, spermatogenesis. Gonial metaphase plates with 22 chromosomes.

## PLATE XIII.

- Figs. 249-259. *Lithyphantes dubius*, spermatogenesis.  
 Figs. 249-251. Gonial metaphase plates with 24 chromosomes.  
 Figs. 252-253. Profile views of metaphase I.  
 Fig. 254. Profile view of late anaphase I.  
 Figs. 255-257. Polar aspects of metaphase I with 13 chromosomes.  
 Figs. 258-259. Polar aspects of metaphase II. Fig. 258 with 13 elements, Fig. 259 11 ones.  
 Figs. 260-265. *Ariamnes cylindrogaster*, spermatogenesis.  
 Fig. 260. Gonial metaphase plate with 22 chromosomes.  
 Figs. 261-263. Lateral views of first division. Fig. 261 metaphase, Fig. 262 anaphase, Fig. 263 telophase.  
 Figs. 264-265. Polar views of metaphase I with 10 bivalents and 2 X's.  
 Figs. 266-268. *Theridium tepidariorum*, spermatogenesis.  
 Fig. 266. Gonial metaphase plate with 22 chromosomes.  
 Fig. 267. Lateral view of metaphase I.  
 Fig. 268. Polar view of the same with 10 bivalents, X's are not seen.  
 Figs. 269-271. *Theridium sterninotatum*, spermatogenesis.  
 Fig. 269. Gonial metaphase plate with 22 chromosomes.  
 Fig. 270. Polar view of metaphase I, X's are not visible.  
 Fig. 271. Profile of the same.  
 Figs. 272-274. *Nesticus* sp., spermatogenesis.  
 Figs. 272. Gonial metaphase with 24 chromosomes.  
 Fig. 273. Profile view of metaphase I.  
 Fig. 274. Polar view of the same, with 13 elements.

## PLATE XIV.

- Figs. 275-281. *Linyphia albolimbata*, spermatogenesis.  
 Figs. 275-276. Spermatogonial metaphases with 24 chromosomes.  
 Figs. 277-278. Polar aspects of primary spermatocyte metaphase, showing 11 autosome bivalents and 2 X's.  
 Fig. 279. Profile of late anaphase I.  
 Figs. 280-281. Polar views of secondary spermatocyte metaphase. Fig. 280 with 11 elements, Fig. 281 13 ones.  
 Fig. 282. *Linyphia* sp. Lateral view of primary spermatocyte metaphase.  
 Figs. 283-285. *Linyphia marginata*, spermatogenesis.  
 Fig. 283. Gonial metaphase with 24 chromosomes.  
 Figs. 284-285. Polar views of first division metaphase, 11 bivalents plus 2 X's.  
 Fig. 286. *Linyphia montana*. Metaphase plate of primary spermatocyte, showing 22 autosome bivalents and 2 X's.  
 Figs. 287-294. *Tetragnatha japonica*, spermatogenesis.

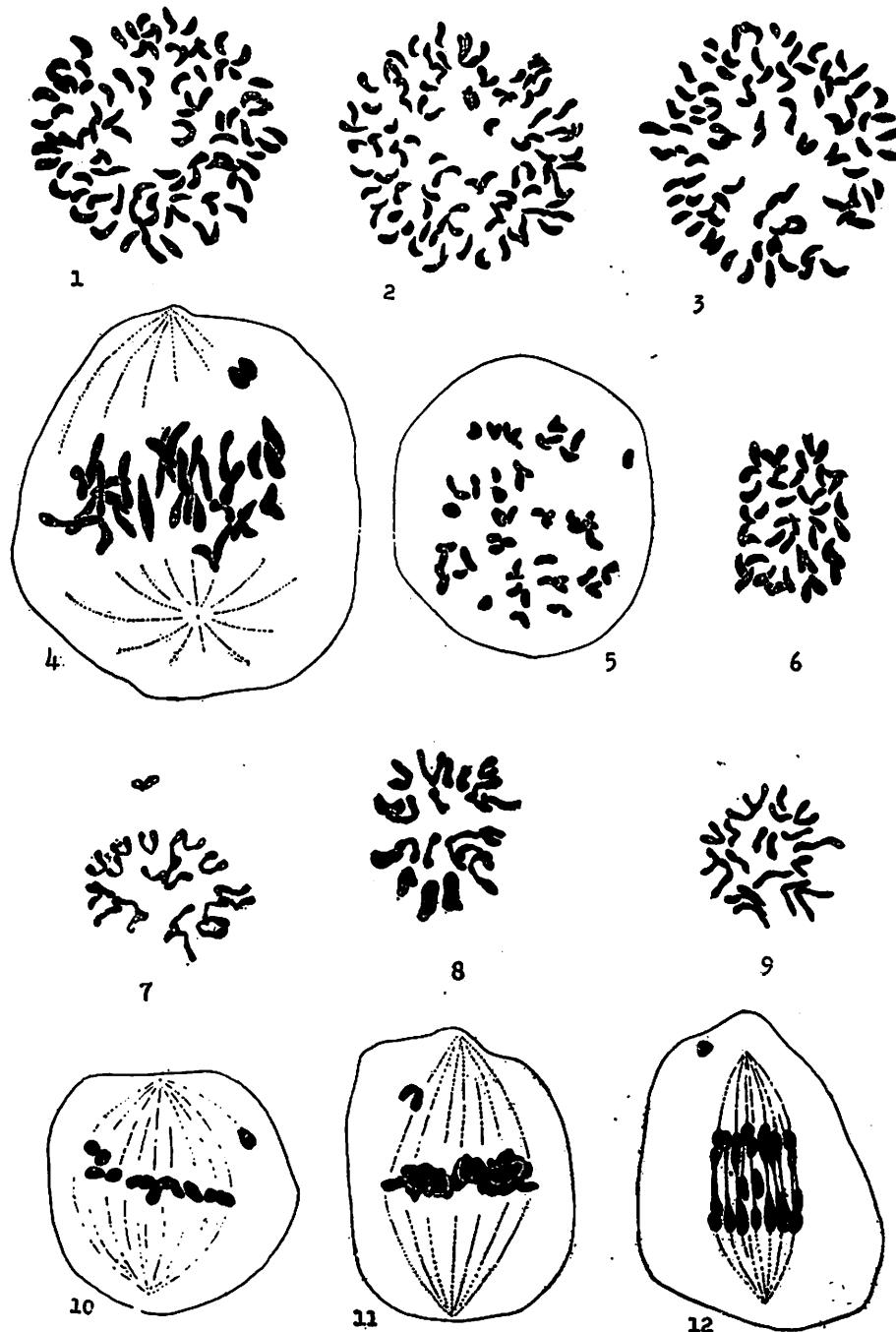
- Figs. 287-288. Gonial metaphase plates, 24 chromosomes.  
 Fig. 289. Profile of metaphase I.  
 Figs. 290-292. Polar views of the same, 11 autosome bivalents and 2 X's  
 Figs. 293-294. Polar views of metaphase II. Fig. 293 with 13 chromosomes, Fig. 294 11 ones.  
 Figs. 295-298. *Tetragnatha squamata*, spermatogenesis.  
 Figs. 295-297. Gonial metaphase plates, 24 chromosomes.  
 Fig. 298. First metaphase plate, 13 chromosomes.  
 Figs. 299-305. *Leucauge blanda*, spermatogenesis.  
 Figs. 299-302. Gonial metaphase plates, 24 chromosomes.  
 Fig. 303. Lateral aspect of metaphase I.  
 Fig. 304. Polar aspect of the same, 11 bivalents plus 2 X's.  
 Fig. 305. Polar aspect of metaphase II, 13 chromosomes.  
 Figs. 306-308. *Araneus fuscocoloratus*, spermatogenesis.  
 Fig. 306. Profile of metaphase I.  
 Fig. 307. Polar view of the same, 11 bivalents plus 2 X's.  
 Fig. 308. Polar view of first telophase, X's are not seen.

## PLATE XV.

- Figs. 309-311. *Araneus saganus*, oogonial metaphase plates, showing 26 chromosomes.  
 Figs. 312-314. *Cyclosa sedeculata*, spermatogenesis.  
 Figs. 312-313. Polar views of metaphase I, 11 bivalents and 2 X's.  
 Fig. 314. Polar view of metaphase II, 11 chromosomes.  
 Figs. 315-317. *Larinia punctifera*, spermatogenesis.  
 Fig. 315. Gonial metaphase plate, 24 chromosomes.  
 Fig. 316. Lateral view of metaphase I.  
 Fig. 317. Polar view of the same, 11 bivalents and 2 X's.  
 Figs. 318-320. *Meta yunohamensis*, spermatogenesis.  
 Figs. 318-319. Gonial metaphase plates, 24 chromosomes.  
 Fig. 320. Polar view of metaphase I, 11 autosome bivalents and 2 X's.  
 Figs. 321-324. *Ero japonica*, spermatogenesis.  
 Fig. 321. Gonial metaphase plate, 24 chromosomes.  
 Fig. 322. Polar view of metaphase I, 11 bivalents and 2 X's.  
 Figs. 323-324. Lateral views of the same, showing characteristic movement of 2 X's and abnormal separation of some autosomes.  
 Figs. 325-330. *Ariadna lateralis*, spermatogenesis.  
 Fig. 325. Polar view of metaphase I, 4 chromosomes. 2200 $\times$ .  
 Fig. 326. Profile of the same. 2200 $\times$ .  
 Fig. 327. Profile of first telophase. 2200 $\times$ .  
 Figs. 328-330. Photographs of first division metaphase. Fig. 328 is the same plate as Fig. 325.  
 Fig. 329 shows unequal separation of X. In Fig. 330 pellicle-like structure of chromosomes is clearly seen.  
 Figs. 331-332. *Hasarius adunsoni*, tetraploid spermatocytes.

CYTOLOGICAL STUDIES IN SPIDERS. III  
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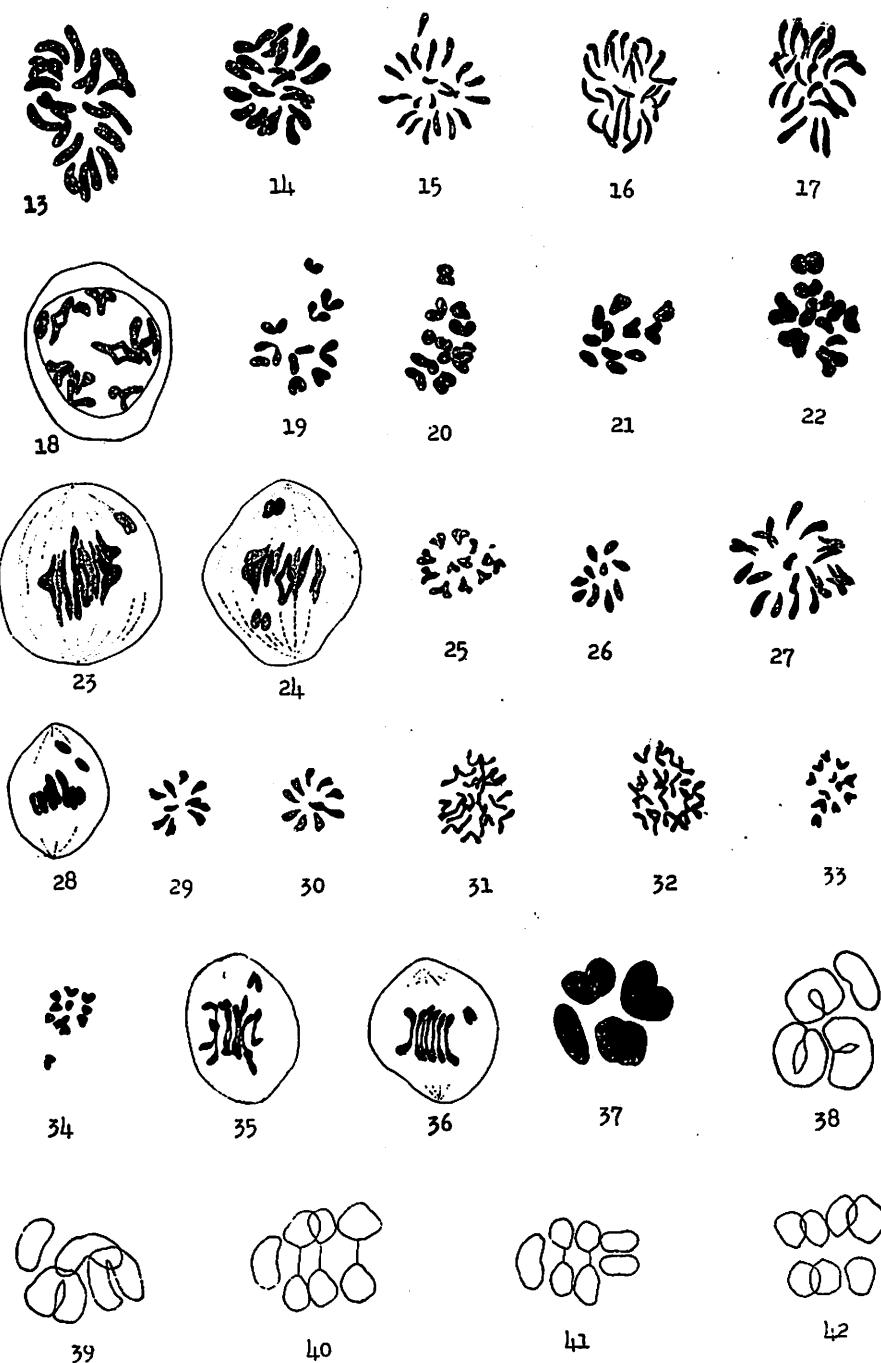
PLATE I



CYTOTOLOGICAL STUDIES IN SPIDERS. III

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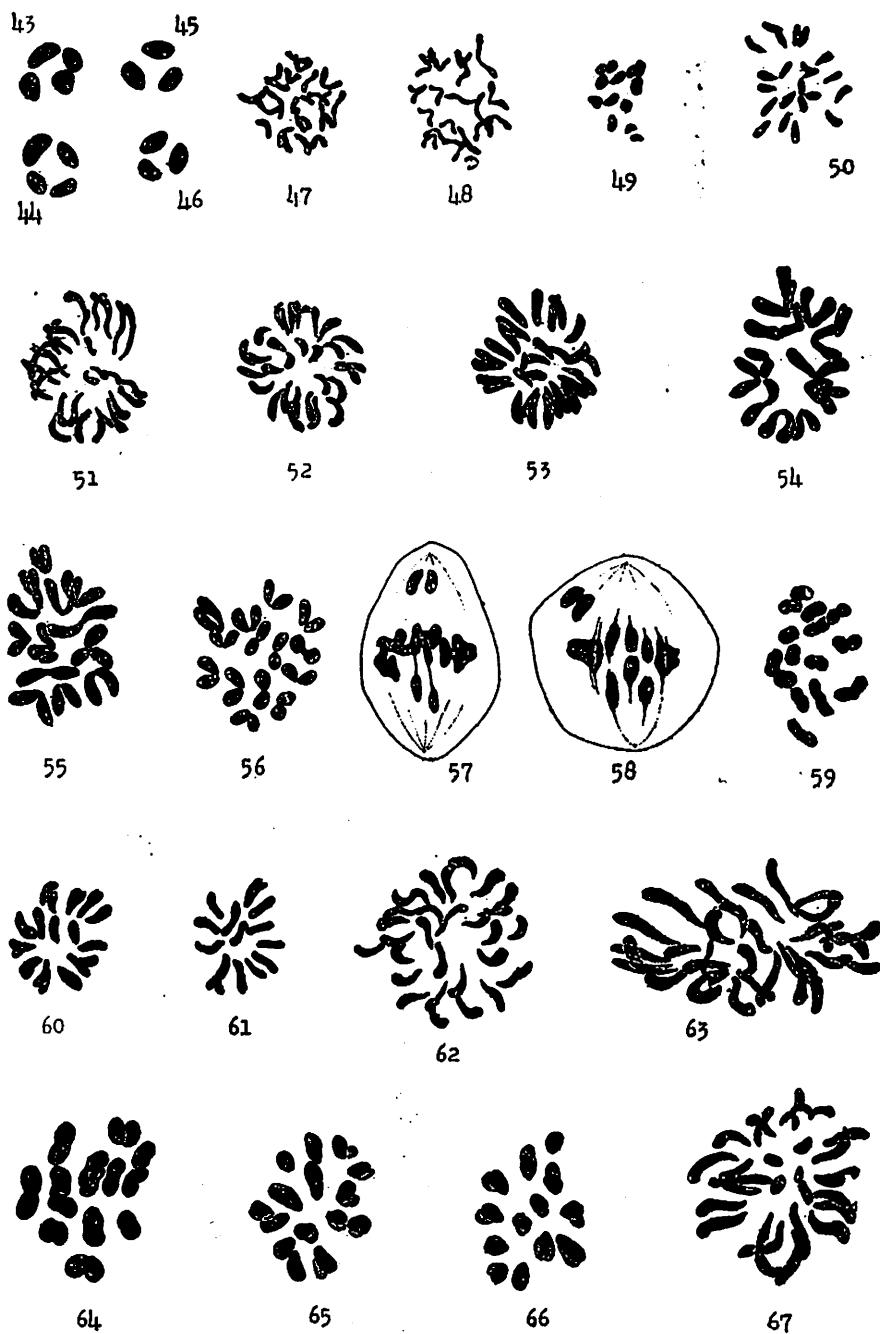
PLATE II



CYTOTOLOGICAL STUDIES IN SPIDERS. III

PLATE III

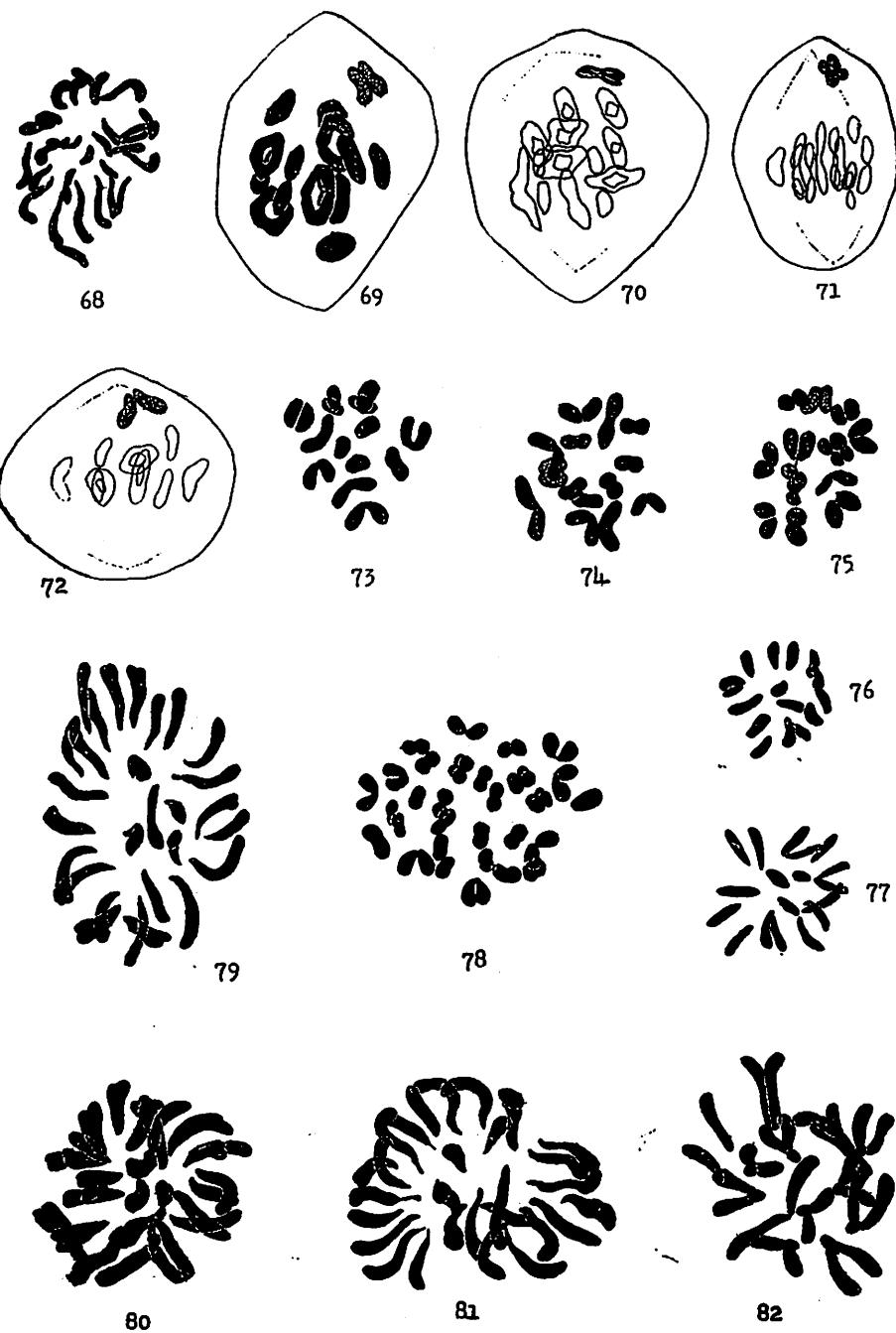
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CYTOTOLOGICAL STUDIES IN SPIDERS. III

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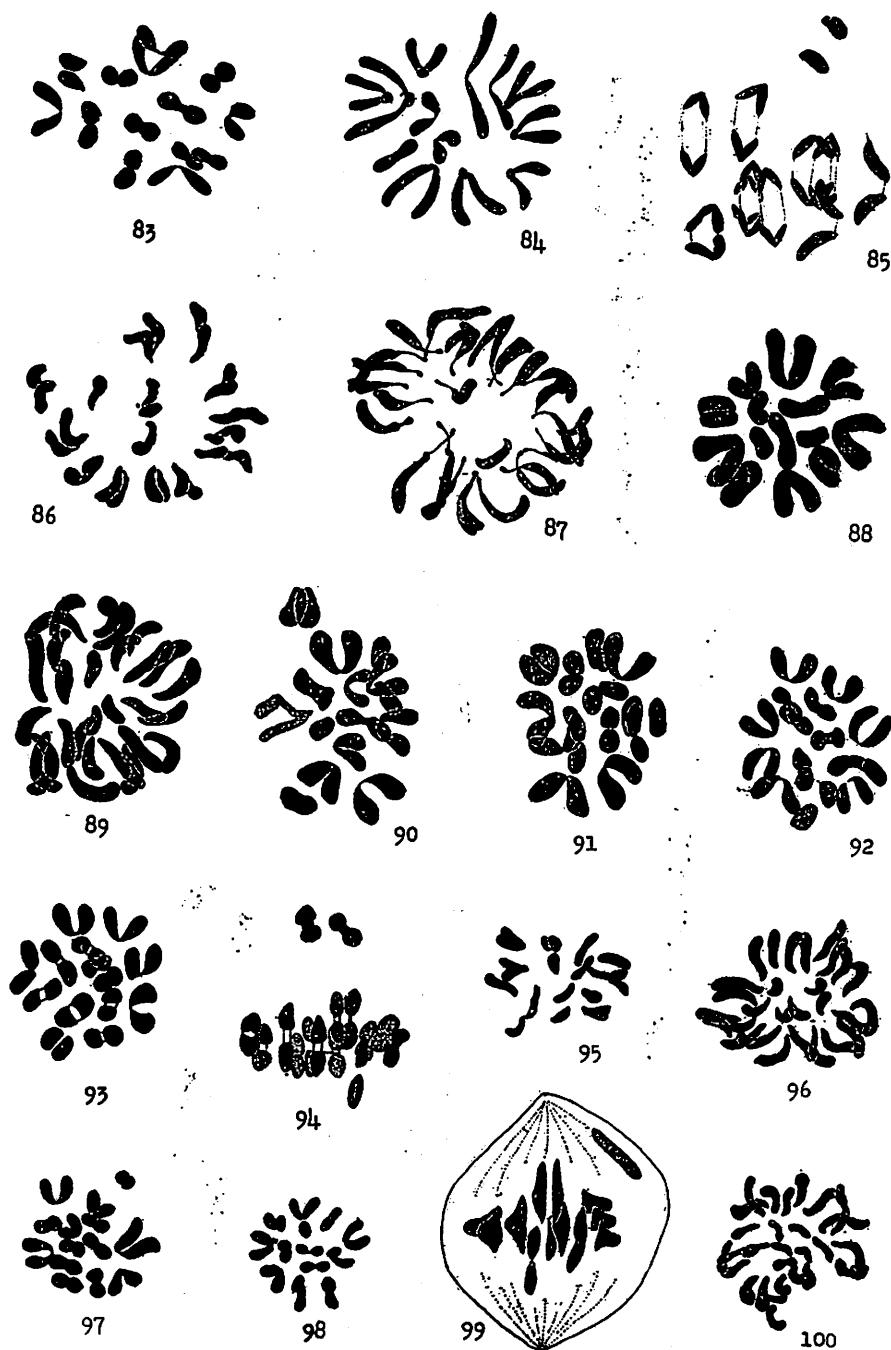
PLATE IV



CYTOTOLOGICAL STUDIES IN SPIDERS. III

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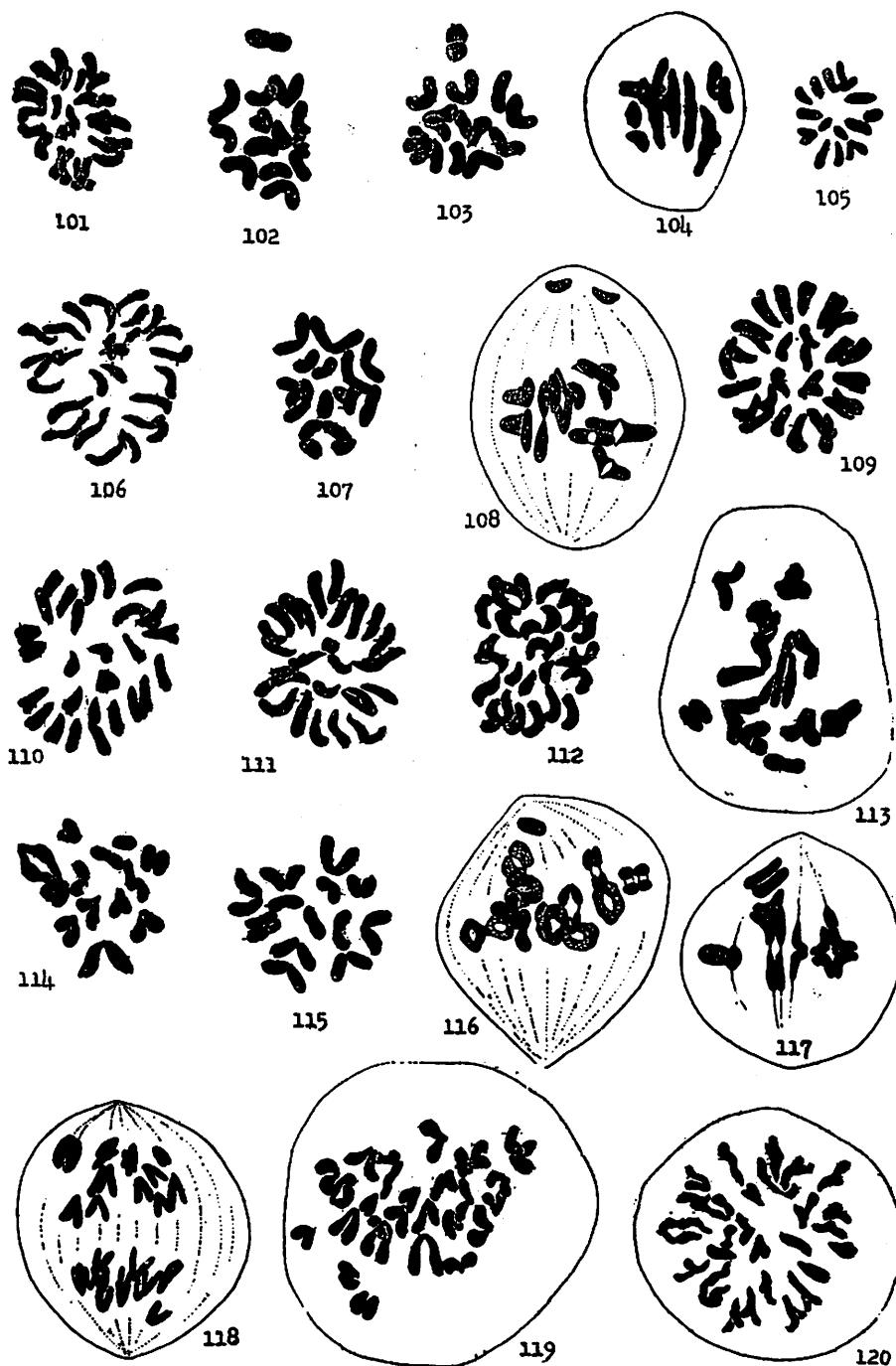
PLATE V



CYTOTOLOGICAL STUDIES IN SPIDERS. III

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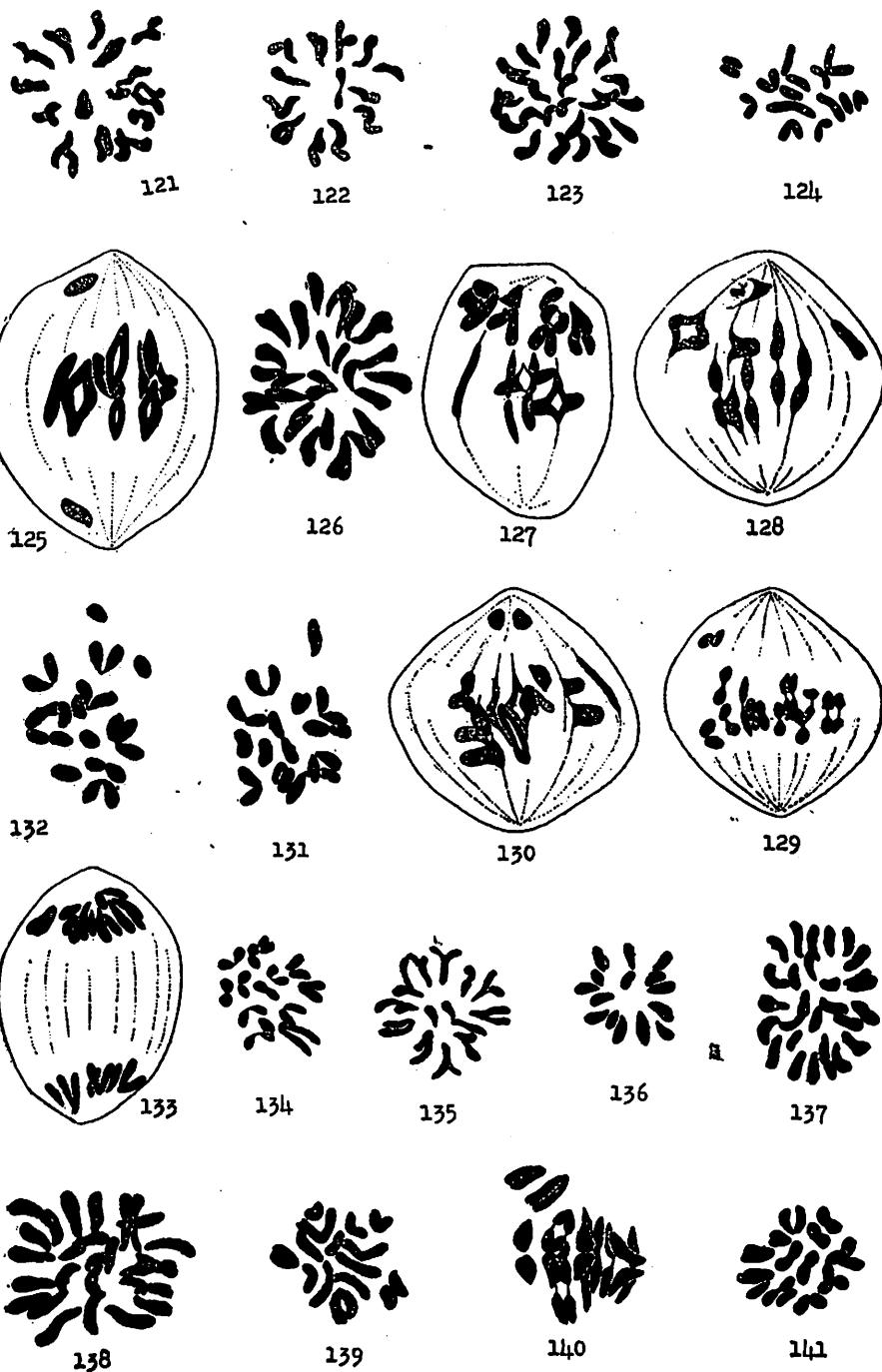
PLATE VI



CYTOTOLOGICAL STUDIES IN SPIDERS. III

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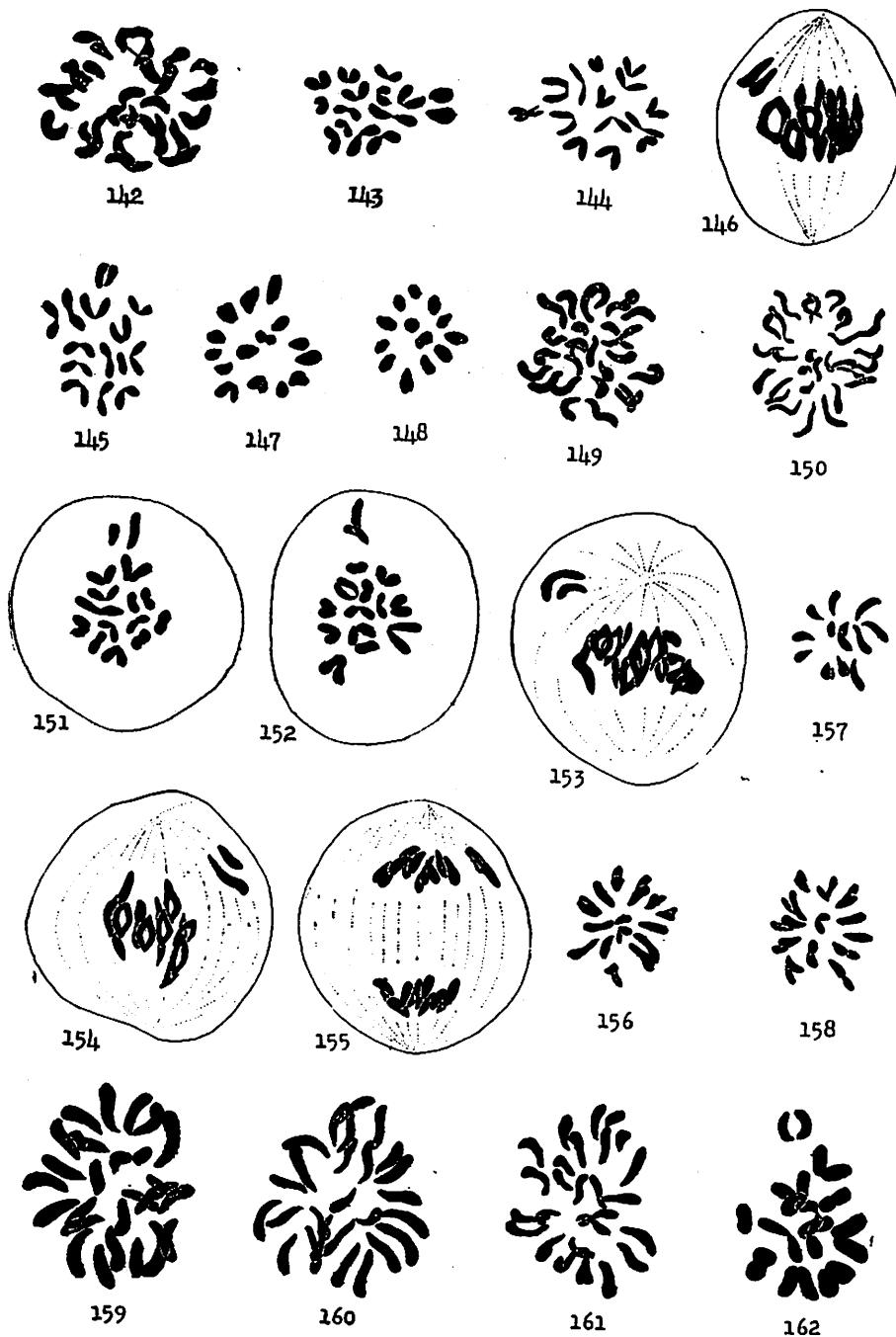
PLATE VII



CYTOTOLOGICAL STUDIES IN SPIDERS. III

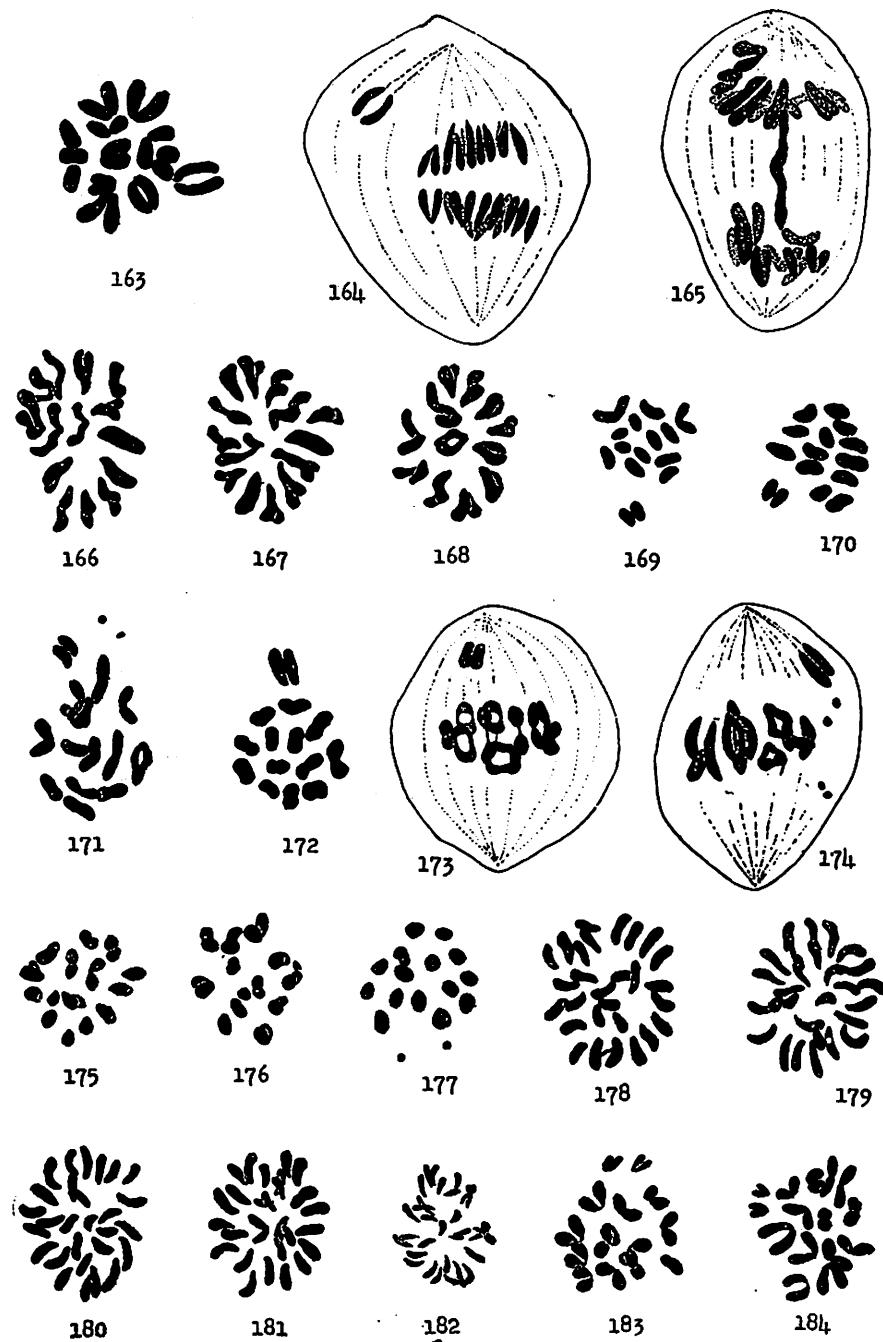
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PLATE VIII



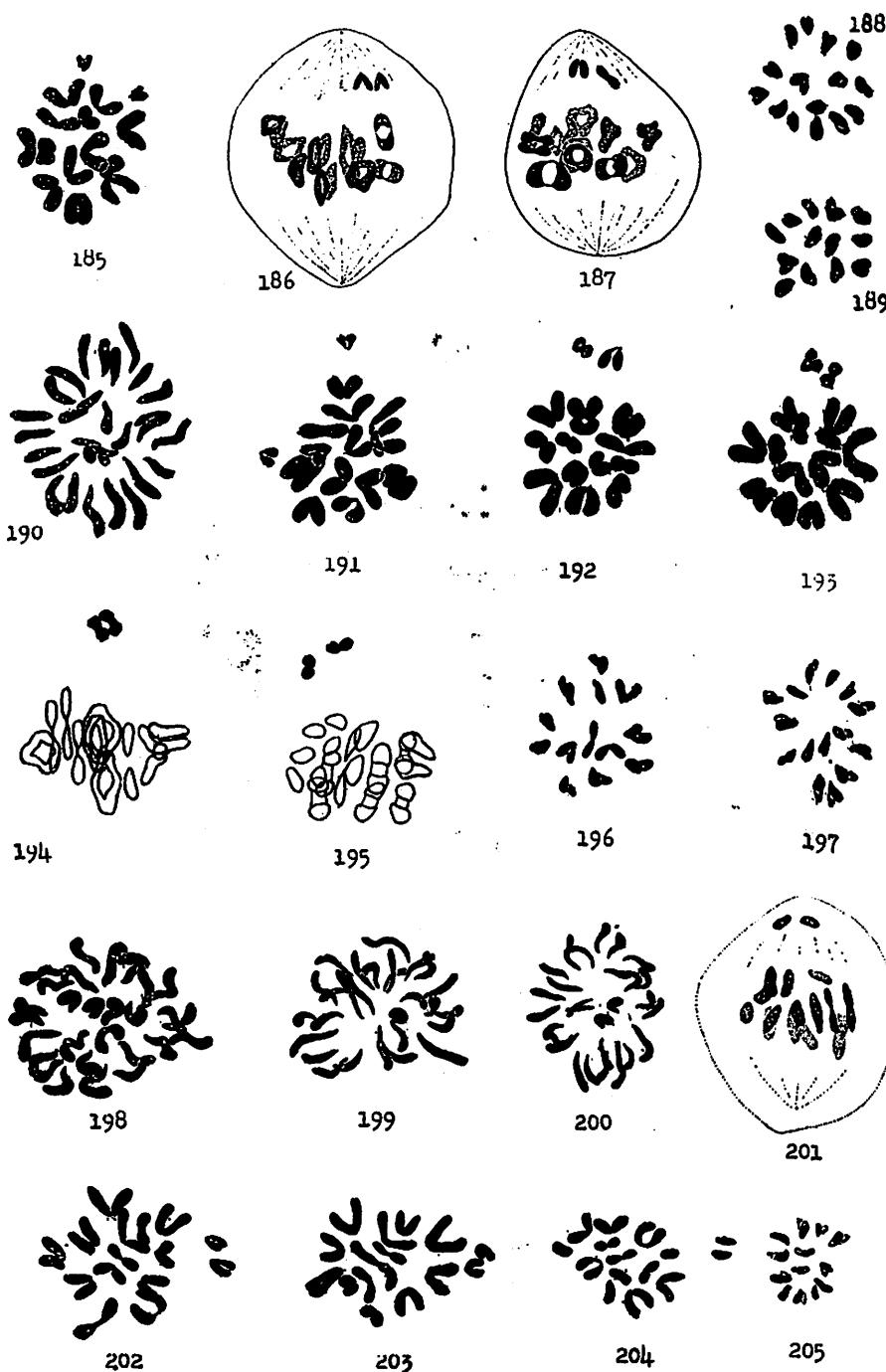
CYTOTOLOGICAL STUDIES IN SPIDERS. III  
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PLATE IX



CYTOTOLOGICAL STUDIES IN SPIDERS. III  
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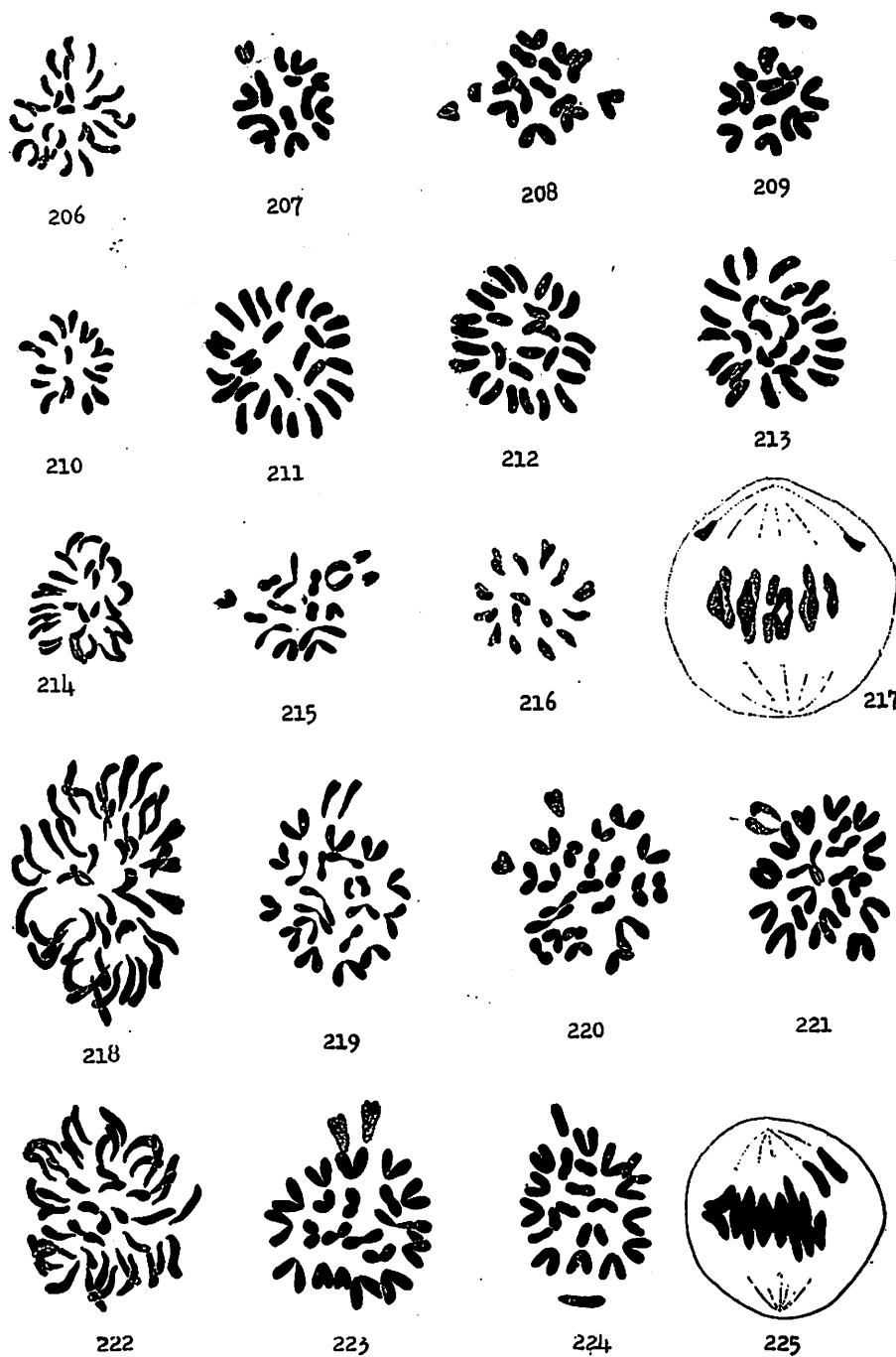
PLATE X



CYTOTOLOGICAL STUDIES IN SPIDERS. III

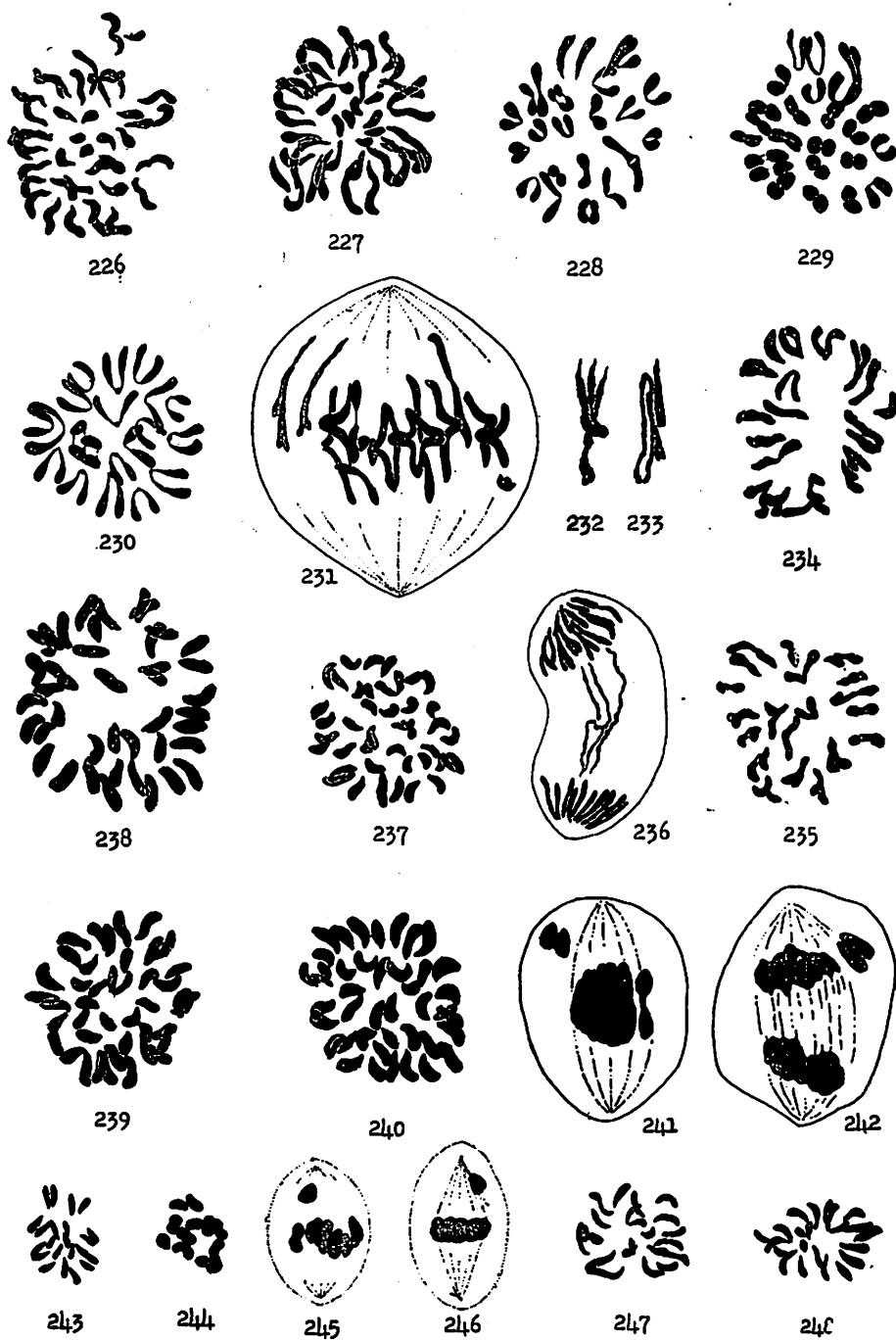
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PLATE XI



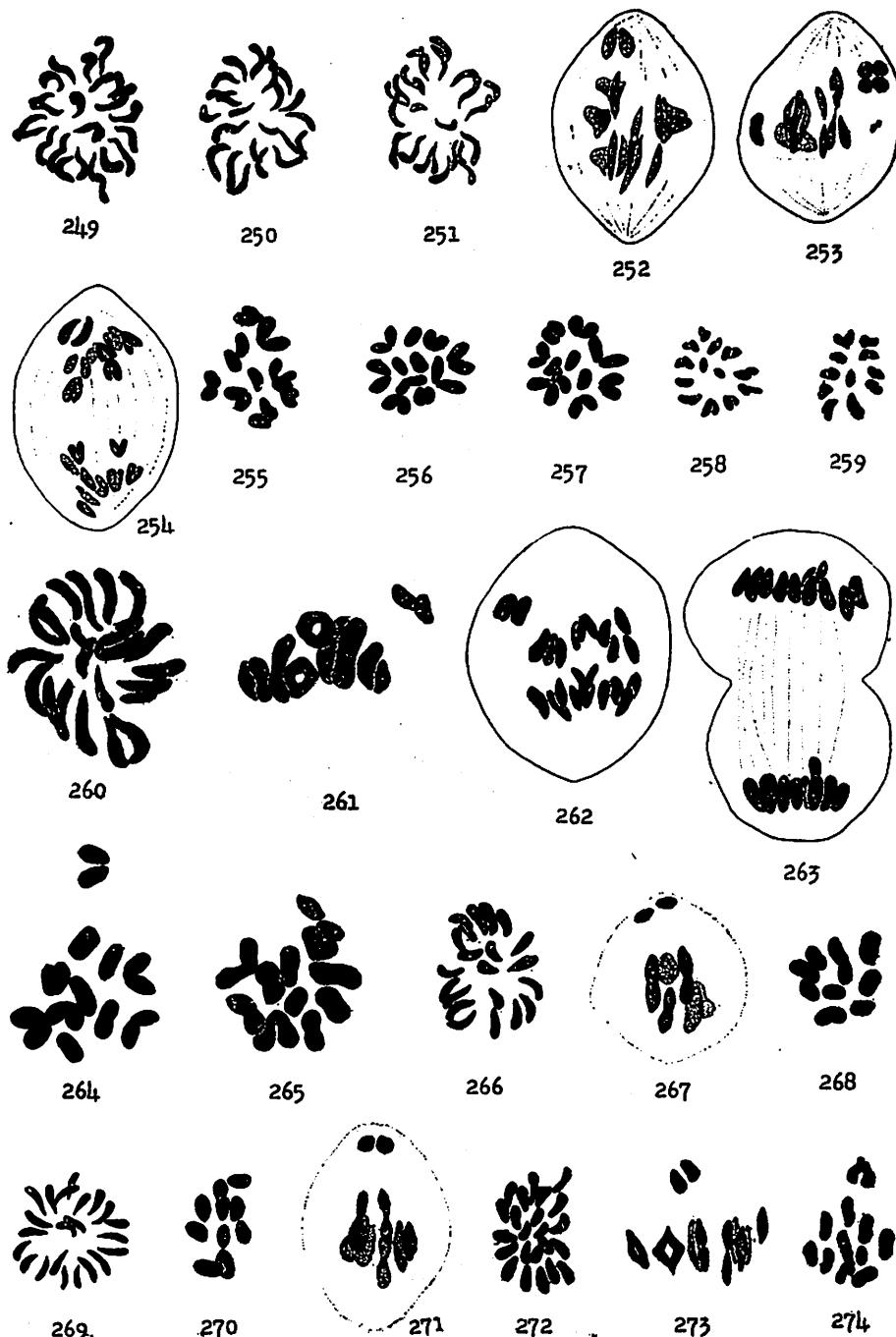
CYTOTOLOGICAL STUDIES IN SPIDERS. III  
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PLATE XII



CYTOTOLOGICAL STUDIES IN SPIDERS. III  
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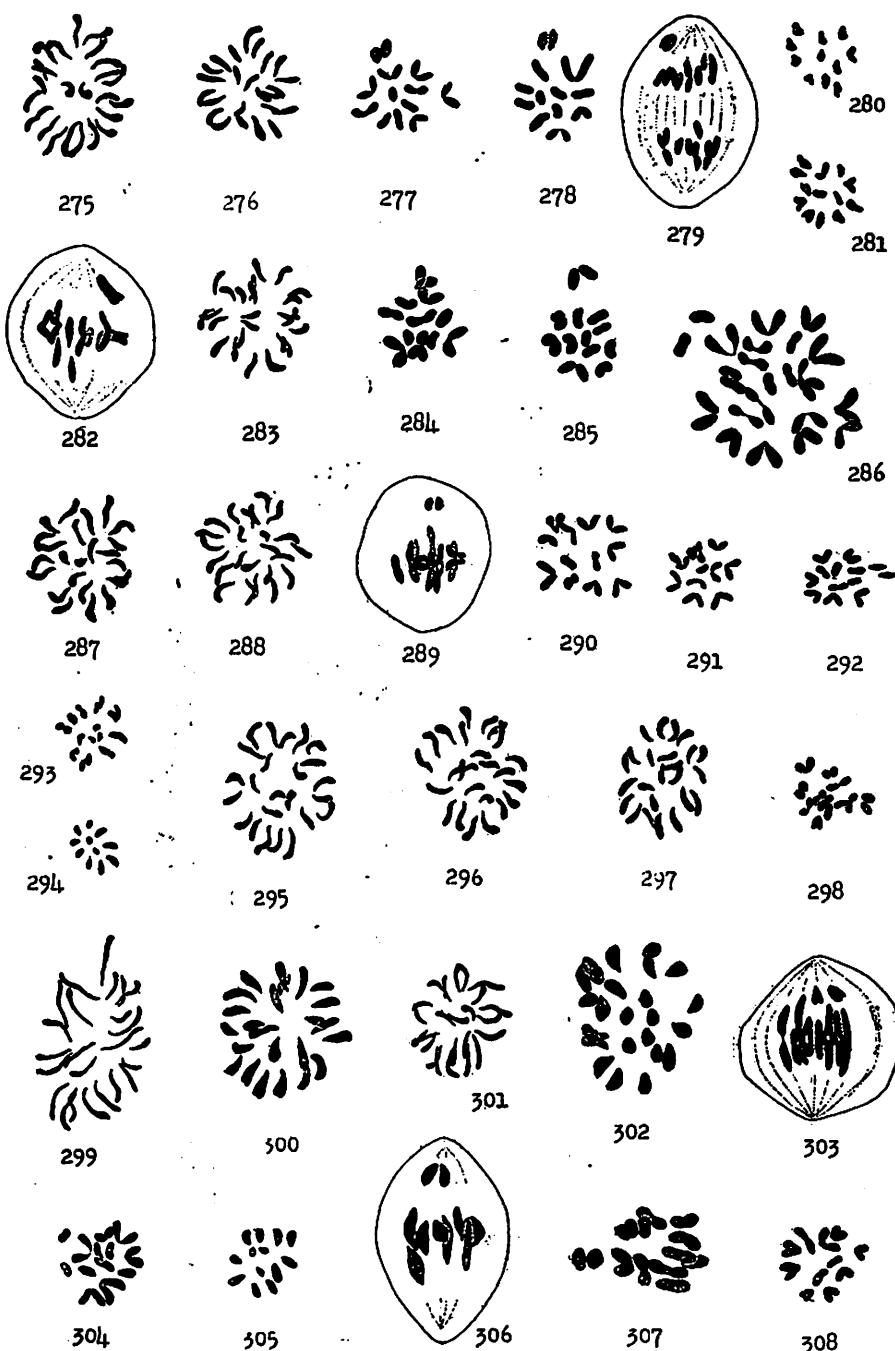
PLATE XIII



CYTOTOLOGICAL STUDIES IN SPIDERS. III

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PLATE XIV



CYTOTOLOGICAL STUDIES IN SPIDERS. III  
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PLATE XV

