A REVIEW OF THE CHROMOSOME NUMBERS IN THE METAZOA

PART II

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I. INTRODUCTION

The first part of 'A Review of the Chromosome Numbers in the Metazoa' appeared in 1916 in Volume 28 of this Journal.¹ This comprised a tabulation of all chromosome numbers in Annelida, Arthropoda and Coelenterata published until the end of 1915. The present paper includes a supplementary list of numbers in these three groups which have been published from the beginning of 1916 to date (Dec. 1918), and a complete tabulation of all the other Metazoa from 1878 to date. As in the previous paper, the species are classified and the various phyla, genera, families and species are arranged in alphabetical order. Access has been had in all cases to the original publications, and all authorities are quoted in order of priority, whether in agreement or otherwise. The list includes only normal animals; the chromosome numbers of hybrids and of abnormal and pathological cases are not included. Some of the most important abbreviations used are the following:

chrom=chromosome	pa=parthenogenetic
cl=cleavage	p. b.=polar body
-cyte=spermatocyte or oocyte	prim.=primordial
div=division	pron=pronucleus
el=elements	som=somatic
emb=embryo	spc=spermatocyte
fert=fertilization	spg=spermatogonia
oog=oogonia	-tid=spermatid or ootid

'X to pole' means that X passes undivided to one pole.

'XY to poles' means that X and Y pass to opposite poles.

'From correction in' means that the tabulation as given is a correction of an earlier account.

¹ I wish to call attention to a misplacement in Part I. On page 18, the group beginning with *Chrysochus auratus* and ending with *Trirhabda virgata* belongs with the Chrysomelidae on page 16 and not with the Hydrophilidae.

II. TABULATION OF CHROMOSOME NUMBERS PART I. SUPPLEMENT (1915-1918)

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	OBSERVER	REFERENCE
A. INVERTEBRATA						
II. ARTHROPODA						
<i>b. CRUSTACEA</i>						
<i>2. Malacostraca</i>						
<i>b. Decapoda</i>						
1. <i>Brachyura</i> (Part I, p. 14)						
Cancer magister.....	100 + spg	60♂	60♂		Pasten, '18	Biol. Bull., 34, p. 277
<i>Chromatoid body in half of spermatids</i>						
<i>c. INSECTA</i>						
<i>2. Coleoptera</i>						
<i>d. Chrysomelidae</i> (Part I, p. 16; see foot-note 1)						
Diabrotica vittata.....	21♂ emb 23♀ emb	11♀		11♀ pron	Hoy, '18	Biol. Bull., 35, p. 166
<i>f. Coccinellidae</i> (Part I, p. 17)						
Epilachna borealis.....	18 cl			XX in ♀, XY in ♂	Hoy, '18	Biol. Bull., 35, p. 166
<i>3. Lucanidae</i>						
Passalus cornutus.....	26 spg 26♀ som	13♂		XY to poles in 1st	Schaffer, '17	Biol. Bull., 32, p. 407
<i>3. Diptera</i>						
<i>a. Anthomyiidae</i> (Part I, p. 21)						
Fucellia marina.....	12 som				Metz, '16	J. Exp. Zool., 21, p. 213
Homalomya sp.....	12 som		6♂		Metz, '16	J. Exp. Zool., 21, p. 213
Ophrya leucostoma.....	12 spg	6♂			Metz, '16	J. Exp. Zool., 21, p. 213

a². Asilidae

<i>Asilus lecythus</i> }	14 spg	7♂	XY	Metz, '16	J. Exp. Zool., 21, p. 213
<i>Asilus notatus</i> }	10 spg			Metz, '16	J. Exp. Zool., 21, p. 213
<i>Asilus sericeus</i>	10 spg	5♂	XY	Metz, '16	J. Exp. Zool., 21, p. 213
<i>Dasylis thoracica</i>	10 spg	6♂	XY	Metz, '16	J. Exp. Zool., 21, p. 213
<i>Deromyia winthemi</i>	12 spg	5♂		Metz, '16	J. Exp. Zool., 21, p. 213
<i>Erax rufibarbis</i>	10 spg	5♂		Metz, '16	J. Exp. Zool., 21, p. 213
<i>Leptogaster badius</i>	10 spg	5♂	XY	Metz, '16	J. Exp. Zool., 21, p. 213

a³. Bombyliidae

<i>Anthrax lateralis</i>	12 spg			Metz, '16	J. Exp. Zool., 21, p. 213
<i>Anthrax sinuosa</i>	18 spg	9♂	XY	Metz, '16	J. Exp. Zool., 21, p. 213
<i>Spogostylum simson</i>	12 oog		From figure	Metz, '16	J. Exp. Zool., 21, p. 213

d. Culicidae (Part I, p. 21)

<i>Culex pipiens</i>	6 spg 6 oog	3♂	3♂	Metz, '16	J. Exp. Zool., 21, p. 213
<i>Culex pipiens</i>	6 spg 6 oog 6 som		Possibly X attached to one spg chrom	Whiting, '17	J. Morph., 28, p. 523
<i>Culex pipiens</i>	6 som		Multiple groups (12- 72) in pupal inter- time	Hance, '17 Holt, '17	J. Morph., 28, p. 579 J. Morph., 29, p. 607
<i>Culex pipiens</i>	6 som.			Taylor, '17	Q. J. M. S., 62, p. 287
<i>Culex pipiens</i>	6 cl 3 (double) som				

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1st -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
d ¹ . Drosophilidae (see under f. Muscidae acalyptratae, Part I, p. 22)							
<i>Cladochaeta nebulosa</i>	8 oog					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila affinis</i>	10 spg 10 oog					Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila amoena</i>	8 spg 8 oog				XY	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila ampelophila</i> ...	8 oog				XY	Metz, '16	J. Exp. Zool., 21, p. 213
<i>Drosophila ampelophila</i> ...	8 spg 8 oog				XY	Metz, '16 Bridges, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila bromelae</i>	8 spg					Metz, '16	Genetics, 1, p. 1
<i>Drosophila busckii</i>	8 oog	4♂				Metz, '16 Metz, '16	Amer. Nat., 50, p. 587 J. Exp. Zool., 21, p. 213
<i>Drosophila cardini</i>	12 oog					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila caribea</i>	8 spg 8 oog				XY	Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila dimidiata</i>	8 oog					Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila earlei</i>	6 oog					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila florum</i>	8 oog					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila funebris</i>	12 spg 12 oog				Note i: '14 corrected	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila limbata</i> (nebulosa).....	8 oog					Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila melanica</i> (neglecta).....	10 spg 10 oog		5♂			Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila modesta</i>	12					Metz, '16	Amer. Nat., 50, p. 587

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<i>Drosophila obscura</i>	10 spg 10 oog	5♂			XY	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila ornaticornis</i> ..	11 oog				XY. One super- numery	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila pallida</i>	8					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila procnemis</i> ...	8 oog					Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila ramsdeni</i>	12 oog				=Sp. A of '14	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila repleta</i>	12 spg 12 oog				XY	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila robusta</i>	8 spg					Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila saltans</i>	8					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila similis</i>	12 oog					Metz, '16	Amer. Nat., 50, p. 587
<i>Drosophila tripunctata</i> ..	8 oog				=Sp. B of '14	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Drosophila virilis</i>	12 oog				XY	Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Scaptomyza adusta</i>	10 oog					Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
<i>Scaptomyza graminum</i> ...	8 spg 8 oog			4♂		Metz, '16 Metz, '16	J. Exp. Zool., 21, p. 213 Amer. Nat., 50, p. 587
e. Muscidae (Part I, p. 22)							
<i>Calliphora erythroceph- ala</i>	12 oog 12 som	6♂				Metz, '16	J. Exp. Zool., 21, p. 213
<i>Musca domestica</i>	12 oog					Metz, '16	J. Exp. Zool., 21, p. 213
<i>Phormia regina</i>	12 spg	6♂			XY to poles in 1st	Metz, '16	J. Exp. Zool., 21, p. 213
e. Ortalidae (see under f. Musca acalyptatae, Part I, p. 22)							
<i>Camptoneura picta</i>	12 spg	6♂				Metz, '16	J. Exp. Zool., 21, p. 213
<i>Chaetopsia fulvifrons</i> ...	8 spg	4♂				Metz, '16	J. Exp. Zool., 21, p. 213

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-YID	REMARKS	OBSERVER	REFERENCE
e ³ . Sapromyzidae							
g. Sarcophagidae (Part I, p. 23)							
Physgenus vittata.....	12 spg					Metz, '16	J. Exp. Zool., 21, p. 213
Ravinia peniculata.....	12 oog					Metz, '16	J. Exp. Zool., 21, p. 213
Sarcophaga tuberosa	12 spg	6♂	6♂		XY to poles in 1st.	Metz, '16	J. Exp. Zool., 21, p. 213
sarraceniae.....	12 oog				Multiple som		
Sarcophaga sp.....	12 som				groups with 24 and 48		
g ² . Sciomyzidae							
Neuroctena analis.....	12 spg		6♂		From figures	Metz, '16	J. Exp. Zool., 21, p. 213
g ³ . Sepsidae							
Piophilha casei.....	12					Metz, '16	J. Exp. Zool., 21, p. 213
g ⁴ . Statiomyidae							
Ptecticus trivittatus.....	16				XY	Metz, '16	J. Exp. Zool., 21, p. 213
h. Syrphidae (Part I, p. 23)							
Eristalis bastardi.....	12 spg	6♂			XY	Metz, '16	J. Exp. Zool., 21, p. 213
Mesogramma marginata							
Volucella obesa.....							
h ² . Trypetidae							
Euaestea melanogaster....	12					Metz, '16	J. Exp. Zool., 21, p. 213

4. Hemiptera

a. Hemiptera heteroptera

1. Belostomatidae (Part I, p. 23)

<i>Belostoma (Zaitha) fluminea</i>	24 spg	13♂	12♂	XY to poles in 2nd	Chickering, '16	Trans. Amer. Micr. Soc. 35, p. 45
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2. Coreidae (Part I, p. 24)

<i>Anasa tristis</i>	21 spg, 21♂ cl 21♂ som 22 oog, 22 ♀ cl 22♀ som			Some cells investing ovary have 44	Hoy, '16	Biol. Bull., 31, p. 329
<i>Leptocoris haematoloma</i> .	13 spg	7♂	6, 7♂	X to pole in 2nd	Porter, '17	Biol. Bull., 33, p. 316

92. Nepidae

<i>Ranatra</i> sp?.....	40 spg	21♂	20♂	XY to poles in 2nd. Another type has 8 or 10 more chroms in spg	Chickering, '18	Trans. Amer. Soc., 37, p. 132
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10. Notonectidae (Part I, p. 30)

<i>Notonecta glauca</i>	24 spg	13♂	12♂	XY to poles in 2nd	Browne, '16	Jour. Morph., 27, p. 119
<i>Notonecta irrorata</i>	24 oog					
<i>Notonecta indica</i>	26 spg	14♂	13♂	XY to poles in 2nd	Browne, '16	Jour. Morph., 27, p. 119
<i>Notonecta shoeni</i>	26 oog					
<i>Notonecta undulata</i>						
<i>Notonecta insulata</i>		13, 14♂ (2 chroms may be fused or not)	12♂	XY to poles in 2nd. Wrongly tabulated in Part I	Browne, '16	Jour. Morph., 27, p. 119

14. Reduviidae (Part I, p. 35)

<i>Pselloides (milyas) cinctus</i>	28 spg 30 oog	16♂	16♂	XY, X-3 elements	Goldsmith, '16	Biol. Bull., 31, p. 121
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II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
5. <i>Hymenoptera</i>							
b. Chalcididae (Part I, p. 43)							
Paracipidosomopsis floridans.....	8 spg 8♂ som		8♂	8♂	Pa. generation. 1st div. abortive	Patterson and Porter, '17	Biol. Bull., 33, p. 38
	16 cl 16♀ som	8♀	8♀		Fertilized egg	Patterson, '17	Biol. Bull., 33, p. 57
7. <i>Odonata</i> (See under Neuroptera, Part I, p. 51)							
Anax junius.....	27 spg					Smith, '16	Biol. Bull., 31, p. 269
Libellula basalis.....	25 spg	13♂	12, 13♂		X to pole in 1st	Smith, '16	Biol. Bull., 31, p. 269
Sympetrum semicinctum	25 spg	13♂	13♂		X to pole in 2nd	Smith, '16	Biol. Bull., 31, p. 269
8. <i>Orthoptera</i>							
a. Acrididae (Part I, p. 51)							
Acridium, see under Tetrigidae							
Chloactis.....	17 spg					McClung, '17	Jour. Morph., 29, p. 519
Chorthippus (Stenobothrus) curtipennis.....	17 spg	9♂	8, 9♂		X to pole in 1st	Robinson, '16 Lewis and Robertson, '16	Jour. Morph., 27, p. 179 Biol. Bull., 30, p. 99
Chorthippus (Stenobothrus) curtipennis.....		9♂			X	Wenrich, '17	Jour. Morph., 29, p. 471
Circotettix lobatus.....	21 spg	11♂	10, 11♂		X to pole in 1st. Supernumeraries (1 or 2) may be present, to pole in 1st	Carothers, '17	Jour. Morph., 28, p. 445
Circotettix rabula.....							
Hesperotettix brevipennis.....	23 spg	12♂				McClung, '17	Jour. Morph., 29, p. 519
Hesperotettix festivus.....							

<i>Hesperotettix pratensis</i> }	22 spg (=23)	11♂ (=12)	11♂ (=11, 12)	X attached to another chrom, to pole in 1st	McClung, '17	Jour. Morph., 29, p. 519
<i>Hesperotettix speciosus</i> }						
<i>Hesperotettix viridis</i>	19-22 spg (=23)	9-12♂ (=12 or 12+1 s.)	10-12♂ (=11, 12)	X attached or free, to pole in 1st. Other chroms may be fused in pairs. Supernumerary present in one animal	McClung, '17	Jour. Morph., 29, p. 519
<i>Mermeria bivittata</i>	22 spg (=23) 22 ♀ som (=24)	11♂ (=12)	11♂ (=11, 12)	X attached to another chrom, to pole in 1st. Farther account corrected	McClung, '17	Jour. Morph., 29, p. 519
<i>Mermeria</i> sp?.....	23 spg	12♂			McClung, '17	Jour. Morph., 29, p. 519
<i>Nomotettix</i> } see under						
<i>Paratettix</i> } Tettigidae						
<i>Phrynotettix magnus</i>	23 spg	12♂	11, 12♂	X to pole in 1st	Wenrich, '16	Bull. Mus. Comp. Zool. Harvard, 60, p. 56
<i>Stenobothrus</i> , see <i>Chorthippus</i>						
<i>Syrbula acuticornis</i>	23 spg	12♂	11, 12♂	X to pole in 1st	Robertson, '16	Jour. Morph., 27, p. 179
Tettigidae (Subfamily of Acrididae)						
<i>Acridium granulatus</i> ...	13 spg 13♂ som 14 ♀ som	7♂	6, 7♂	X to pole in 1st	Robertson, '16	Jour. Morph., 27, p. 179
<i>Acridium incurvatus</i> ...	13♂ som	7♂		X	Robertson, '16	Jour. Morph., 27, p. 179
<i>Acridium obscurus</i>	13 spg	7♂		X	Robertson, '16	Jour. Morph., 27, p. 179
<i>Acridium ornatus</i>		7♂		X	Robertson, '16	Jour. Morph., 27, p. 179
<i>Nomotettix cristatus</i> ...	13 spg			X	Rayburn, '17	Kansas Univ. Sc. Bull. 10, p. 267
<i>Paratettix eucculatus</i> ...	13 spg	7♂		X	Robertson, '16	Jour. Morph., 27, p. 179
<i>Paratettix texanus</i>		7♂			Robertson, '16	Jour. Morph., 27, p. 179

II. ARTHROPODA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-YND	REMARKS	OBSERVER	REFERENCE
Tettigidae (Subfamily of Acrididae)—continued							
<i>Tettigidea parvipennis</i>	13 spg 13♂ som 14 oog	7♂	6, 7♂		X to pole in 1st. Super-numerary X present in 1 an- imal in som and ♂ cells. To pole in 1st, same pole as X or the other	Robertson, '16 Robertson, '17	Jour. Morph., 27, p. 179 Kansas Univ. Sc. Bull. 10, p. 275
<i>Tettigidea parvipennis</i> <i>pennata</i>	13 spg 14 oog	7♂			X	Robertson, '16	Jour. Morph., 27, p. 179
<i>Trimerotropis? fallax</i> ...	23 spg	12♂	11, 12♂		X to pole in 1st	Carothers, '17	Jour. Morph., 28, p. 445
<i>Trimerotropis? suffusa</i> ...	24 ♀ som	12♂					
<i>Trimerotropis suffusa</i>		12+1 super- numery				Wenrich, '17	Jour. Morph., 29, p. 471
d. Gryllidae (Part I, p. 58)							
<i>Gryllotalpa borealis</i>	23 spg 24 oog	12♂	11, 12♂	11, 12♂	XY to poles in 1st. X=2 elements	Payne, '16	Jour. Morph., 28, p. 287
<i>Gryllotalpa vulgaris</i> from Freiburg	12 spg	6♂			XY	Payne '16	Jour. Morph., 28, p. 287
<i>Gryllotalpa vulgaris</i> from Naples	15 spg	8♂				Payne, '16	Jour. Morph., 28, p. 287
e. Locustidae (Part I, p. 59)							
<i>Jamaicana flava</i>	35 spg	18♂	17, 18♂	17, 18♂	X to pole in 1st	Woolsey, '15	Biol. Bull., 28, p. 163
<i>Jamaicana subguttata</i>	34, 35 spg	17, 18♂			2 chroms may be fused	Woolsey, '15	Biol. Bull., 28, p. 163
<i>Jamaicana unicolor</i>	33, 35 spg				2 pairs of chroms may be fused	Woolsey, '15	Biol. Bull., 28, p. 163 Tabulated in brief in Part I
<i>Locusta viridissima</i>	29 spg 28♂ som 30 oog 30 ♀ som	15♂	14, 15♂	14, 15♂	X to pole in 1st	Mohr, '16	Liège, 1916

III. COELENTERATA

a. HYDROZOA

1. *Lepidinae*

a. Anthomedusae (Part I, p. 62)

<i>Clava leptostyla</i>	12 ♀	12 ♀	12 ♀	G. T. Hargitt, '16	Jour. Morph., 27, p. 85
<i>Aequorea victoria</i>	12 ♀	12 ♀	12 ♀	G. T. Hargitt, '16	Jour. Morph., 27, p. 85

2. *Trachylinae* (Part I, p. 63)

<i>Aequorea victoria</i>	16 oog	8 ♀	8 ♀	G. T. Hargitt, '17	Jour. Morph., 28, p. 393
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PART II (1878-1948)

IV. ECHINODERMATA

a. ASTEROIDEA

<i>Asterias forbesii</i>	177 ♀	177 ♀	177 ♀	Wilson and Mathews, '95	Jour. Morph., 10, p. 319
<i>Asterias forbesii</i>	18 ♀	18 ♀	18 ♀	Tennent and Hogue, '06	J. Exp. Zool., 3, p. 517
<i>Asterias forbesii</i>	36 cl ca. 18 pa cl			May be <i>A. vulgaris</i>	Biol. Bull., 13, p. 309
<i>Asterias forbesii</i>	36 cl	18 ♀	18 ♀	Tennent, '07	Anat. Anz., 31, p. 39
<i>Asterias glacialis</i>	18 cl 18 pa cl (auto-regulation)		8-9♂ pron	Jordan, '07 Jordan, '08	Carnegie Inst. Pub. 102, p. 39
<i>Asterias glacialis</i>	36 pa cl	18 ♀	18 ♀	Field, '95	Jour. Morph., 11, p. 235
<i>Asterias glacialis</i>	18 spg 18 cl 9 pa cl	18 ♀	18 ♀	Delage, '01	Arch. Zool. exp. et gen. ser. III, vol. 9, p. 285
<i>Asterias vulgaris</i>	ca 36 som	18 ♀	18 ♀	Buchner, '11	Arch. Zellf., 6, p. 577
<i>Cribrella sanguinolenta</i>	ca 36 som	9♂	9♂	Tennent, '07	Biol. Bull., 13, p. 309
<i>Cribrella sanguinolenta</i>	ca 36 som			Jordan, '10	Arch. Zellf., 5, p. 394

b. CRINOIDEA

<i>Antedon bifida</i>	8? oog			Chubb, '06	Phil. Trans. Roy. Soc. London, 198 B, p. 447
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IV. ECHINODERMATA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
c. ECHINOIDEA							
<i>Arbacia punctulata</i>	ca. 40 cl					Jordan, '12	J. Exp. Zool., 12, p. 391
<i>Arbacia pustulosa</i>	40 cl					Baltzer, '10	Arch. Zellf., 5, p. 497
<i>Echinus acutus</i>	38 cl					Doncaster and Gray, '11	Proc. Camb. Phil. Soc. 16, p. 415
						Doncaster and Gray, '13	Q. J. M. S., 58, p. 483
<i>Echinus esculentus</i>	32 cl	16 ♀	16 ♀	16 ♀		Bryce, '03	Q. J. M. S., 46, p. 177
<i>Echinus esculentus</i>	38 cl					Doncaster and Gray, '11	Proc. Camb. Phil. Soc. 16, p. 415
						Doncaster and Gray, '13	Q. J. M. S., 58, p. 483
<i>Echinus esculentus</i>	18 cl					Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
<i>Echinus microtubercula- tus</i> var. <i>bivalens</i> (Bo- veri '05).....		18 ♀		18 ♀	In a few cases	Boveri, '90	Jen. Zeits., 17, p. 314 (Zellen-Studien III)
<i>Echinus microtubercula- tus</i> var. <i>bivalens</i>	30+cl 16-18 pa cl	16-18 ♀			Paeggs treated with strychnine	R. Hertwig, '88	Sitz. gesell. Morph. u. Physiol., München, 4, p. 99
						R. Hertwig, '95	Sitz. gesell. Morph. u. Physiol., München, 11, p. 41
						R. Hertwig, '96	Fest. Gegenbauer, 2, p. 21
<i>Echinus microtubercula- tus</i> var. <i>bivalens</i>	36 cl	18 ♀	18 ♀	18 ♂ in enu- cleated egg fragments		Stevens, '02	Arch. Entwickl., 15, p. 421
<i>Echinus microtubercula- tus</i> var. <i>bivalens</i>	36 cl 18 pa cl			18 ♂ in enu- cleated egg fragments 18 ♀	XV in ♂. From correction in '13	Baltzer, '09 Baltzer, '10 Baltzer, '13	Arch. Zellf., 2, p. 549 Arch. Zellf., 5, p. 497 Sitzungsber. Phys. med Ges. Würzburg, 6, p. 90

<i>Echinus microtuberculatus</i> var. <i>univalens</i> (Boveri, '05).....	18 cl	9 ♀	9 ♀	9 ♀ 9 ♂ in enucleated egg fragments	Boveri, '90 Boveri, '05 Stevens, '02	Jen. Zeits., 17, p. 314 (Zellen-Studien III) Jen. Zeits., 32, p. 445 (Zellen-Studien V) Arch. Entwickl., 15, p. 421
<i>Echinus microtuberculatus</i> var. <i>univalens</i>	18 cl					
<i>Echinus microtuberculatus</i> var. <i>univalens</i> (= <i>Psammechinus</i>).....	20+cl			9-12 ♂ in enucleated egg fragments	Kraheřka, '05	Bull. intern. de l'acad. des Sciences de Cracovie, '05, p. 49
<i>Echinus microtuberculatus</i> var. <i>univalens</i>	18 cl			10-12 ♂, in enucleated egg fragment	Godlewski, '06 Morgan, '95	Arch. Entwickl., 20, p. 579 Arch. Entwickl., 2, p. 268
<i>Echinus miliaris</i>	22 cl. 8-11 cl, in enucleated egg fragments fertilized					
<i>Echinus miliaris</i>	30-34 cl					
<i>Echinus sphaera</i>	18 cl				Doncaster and Gray, '11 Doncaster and Gray, '13 Delage, '01 Jordan, '08	Proc. Camb. Phil. Soc., 16, p. 415 Q. J. M. S., 58, p. 483 Arch. Zool. exp. et gen. III, 9, p. 285 Carnegie Inst. Pub. 102, p. 39
<i>Hipponoe esculenta</i>	32? cl			16-20 ♀	Pinney, '11 Tennent, '12 Pinney, '11 Retzius, '10	Biol. Bull., 21, p. 168 Jour. Morph., 23, p. 17 Biol. Bull., 21, p. 168 Biol. Untersuchungen, 15, p. 1
<i>Hipponoe esculenta</i>	32-34 cl					
<i>Mora atropos</i>	46 cl					
<i>Parechinus miliaris</i>	18 pa cl					
<i>Psammechinus</i> , see under <i>Echinus microtuberculatus</i>						
<i>Sphaerochinus granularis</i>		16-18 ♀			R. Hertwig, '96 Baltzer, '10	Fest. Gegenbaur, 2, p. 21 Arch. Zellf. 5, p. 497
<i>Sphaerochinus granularis</i> ably)	40 cl (probably)					

IV. ECHINODERMATA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST CYTE	2ND CYTE	-TJD	REMARKS	OBSERVER	REFERENCE
<i>Sphaerochinus granularis</i>	18 pa cl					Godlewski, '12	Arch. Entwick., 33, p. 196
<i>Strongylocentrotus lividus</i>	30+cl 16-18 pa cl	16-18 ♀			Pa eggs treated with strychnine	R. Hertwig, '86	Fest. Gegenbaur, 2, p. 21
<i>Strongylocentrotus lividus</i>	18 cl 18 pa cl (auto-regulation)			9 ♀		Delage, '99	Arch. Zool. exper. et gen. III, 7, p. 383
<i>Strongylocentrotus lividus</i>	36 cl			18♂ 18 ♀		Delage, '01	Arch. Zool. exper. et gen. III, 9, p. 285
<i>Strongylocentrotus lividus</i>	36 cl					Boveri, '02	Verh. phys. med. Ges. sel. Wurzburg, 36, p. 67
<i>Strongylocentrotus lividus</i>	36 cl					Petrunkewitsch, '04	Zool. Jahrb. suppl. 7, p. 77
<i>Strongylocentrotus lividus</i>	36 cl			18♂ 18 ♀	XY in ♂. From correction in '13	Baltzer, '09 Baltzer, '10 Baltzer, '13	Arch. Zellf., 2, p. 549 Arch. Zellf., 5, p. 497 Sitzungsber. Phys. Med. Gesel. Wurzburg 6, p. 80
<i>Strongylocentrotus lividus</i>	36 cl					Schaxel, '11	Arch. mikr. Anat., 76, p. 543
<i>Strongylocentrotus purpuratus</i>	36 cl 18 pa cl					Hindle, '11	Arch. Entwick., 31, p. 145
<i>Toxopneustes variegatus</i>	14-24 cl					Selenka, '78	"Befruchtung des Eies von Tox. var." Leipzig.
<i>Toxopneustes variegatus</i>	36 cl 18 pa cl			18♂		Wilson, '95 Wilson, '01 Wilson, '01	Jour. Morph., 11, p. 443 Arch. Entwick., 12, p. 529 Arch. Entwick., 13, p. 353
<i>Toxopneustes variegatus</i>	36 cl				XY (in ♀?)	Hefner, '10	Biol. Bull., 19, p. 195
<i>Toxopneustes variegatus</i>	38? cl					Pinney, '11	Biol. Bull., 21, p. 168
<i>Toxopneustes variegatus</i>	36-38 cl 19 pa cl			18 or 19♂ in enucleated eggs	X or XY in ♂	Tennent, '12 Tennent, '13	J. Exp. Zool., 12, p. 391 J. Morph., 23, p. 17

d. HOLOTHUROIDEA					
Stichopus regalis "and other Echinoderms"	28-36 spg	16-18♂	8-9♂	Field, '93 Field, '95	Anat. Anz., 8, p. 487 Jour. Morph., 11, p. 235
e. OPHUROIDEA					
Ophiocoma pumila.		ca. 18♀		Jordan, '08	Carnegie Inst. Pub. 102, p. 1
V. MESOZOA					
Dicymennea gracile.		ca. 30♀		Hartmann, '07	Mem. pub. par Cl. d. Sc. Acad. Roy. de Belgique, (4 ^e), 1, p. 1
Haplozoon armatum.	100+som			Dogiel, '08	Zeit. wiss. Zool., 89, p. 417
Rhopalura ophiocomae.	6 cl	3♀	3♀	Cauellery et Laval- lée, '08	Arch. Zool. exp. et gen., Ser. IV, t. 8, p. 421
VI. MOLLUSCA					
a. CEPHALOFODA					
Sepia officinalis.		6♀			Arch. d'Anat. micros., 8, p. 239
b. GASTROPODA					
i. Euthyneura					
a. Opisthobranchia					
1. Nudibranchia					
Diaulula sandiegensis.		12♀		MacFarland, '97	Zool. Jahrb., 10, p. 227
Doris bifida.	32 cl	16♀	16♀	Smallwood, '05	Morph. Jahrb., 33, p. 87
Montagua gouldii.	32 cl	16♀	16♀	Smallwood, '05	Morph. Jahrb., 33, p. 87
Montagua pilata.		16♀	16♀	Boveri, '90	Jen. Zeits., 17, p. 314 (Zellen-Studien III)
Phyllirhoe bucephala.	32 cl	16♀	16♀ 16♂ pron		
Pleurophyllidia californica.	20-24 cl		10-12♀	MacFarland, '97	Zool. Jahrb., 10, p. 227

VI. MOLLUSCA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST CYTE	2ND CYTE	YTD	REMARKS	OBSERVER	REFERENCE
2. Tectibranchia							
<i>Aplysia depilans</i>		16 ♀	16 ♀			Boethenck, '99	Bull. Acad. Sc. Cracovie 1899, p. 266
<i>Aplysia limacina</i>	24 cl (at least)					Carazzi, '05	Arch. ital. anat. e emb. 4, p. 231
<i>Aplysia punctata</i>		16 ♀	16 ♀	16 ♀		Janssens and El- rington, '04	La Cellule, 21, p. 315
<i>Aplysia punctata</i>	24 cl (at least)					Carazzi, '05	Arch. ital. anat. e emb. 4, p. 231
<i>Bulla solitaria</i> , see Ham- inea							
<i>Crescis acioula</i>	20 spg 20 oeg 20 som 20 cl 10 pa cl	10 ♂ 10 ♀	10 ♂ 10 ♀	9, 10 ♂ (those with 9 not functional) 10 ♀	X to pole in 2nd	Zarnik, '11	Verh. d. deutsch. Zool. Gesell., 21, p. 205
<i>Cymbulia peronii</i>	32 cl	16 ♀				Nekrassof, '03 Nekrassof, '09	Anat. Anz. 24, p. 110 Arch. mikr. Anat., 73, p. 913
<i>Cymbulia peronii</i>	36 (not stated where)					Zarnik, '11	Verh. deutsch. Zool. Gesell., 21, p. 205
<i>Haminea solitaria</i> (= <i>Bulla solitaria</i>).....					Accessory chrom	Smallwood, '04	Bull. Mus. Comp. Zool. Harvard, 45, p. 259
<i>Hyalea tridentata</i>	24 (not stated where)	16 ♀	16 ♀		X to pole in 2nd	Zarnik, '11	Verh. deutsch. Zool. Gesell., 21, p. 205
<i>Hyalocylis striata</i>	24 (not stated where)	12 ♂	10+2X (fused) ♂	10, 10 + 2 X (fused) ♂; those with 10 degener- ate	2X (fused) to pole in 2nd	Zarnik, '11	Verh. deutsch. Zool. Gesell., 21, p. 205
<i>Tiedemannia neopolitana</i>	28 (not stated where)				X to pole in 2nd	Zarnik, '11	Verh. deutsch. Zool. Gesell., 21, p. 205

b. Pulmonata

<i>Arion empiricorum</i>	16-20 ♀					Platner, '86	Arch. mikr. Anat., 27, p. 32
<i>Arion empiricorum</i>	16-20 ♀					Garnault, '89	Zool. Anz., 12, p. 10
<i>Arion empiricorum</i> (or <i>rufus</i>).....	16 ♀					Lams, '10	Acad. roy. Belgique. Cl. d. Sc. Mem. Ser. 2, t. 2, no. 4, p. 1
<i>Helix arbustorum</i>	24 ♂	24 ♂	24 ♂	24 ♂		Soós, '10	Annales Mus. Nat. Hungarici, 8, p. 231
						Small heterochrom divides in 1st besides other 24. Fate undetermined	
<i>Helix arbustorum</i>	24 ♂	24 ♂	24 ♂	24 ♂		Buresch, '11	Arch. Zellf., 7, p. 314
<i>Helix aspersa</i>	16-20 ♀					Garnault, '89	Zool. Anz., 12, p. 10
<i>Helix hortensis</i> (= <i>Tachea h.</i>).....	24 ♂	24 ♂	24 ♂	24 ♂		Kleinert, '09	Jen. Zeits., 38, p. 445
<i>Helix nemoralis</i>	24 ♂	24 ♂	24 ♂	24 ♂		Kleinert, '09	Jen. Zeits., 38, p. 445
<i>Helix nemoralis</i>	22 ♂, one animal had 28-29 ♂					Baltzer, '13	Arch. Zellf., 11, p. 151
<i>Helix pomatia</i> var. <i>bivalens</i> (Murray, '98)....	24 ♂	24 ♂	24 ♂	24 ♂		Bolles-Lee, '96 Bolles-Lee, '97 Bolles-Lee, '99 Bolles-Lee, '11	La Cellule, 11, p. 223 La Cellule, 13, p. 197 La Cellule, 16, p. 47 La Cellule, 27, p. 53
						From correction in '11	
<i>Helix pomatia</i> var. <i>bivalens</i>	24 ♂	ca. 24 ♂	prob. 24 ♂	ca. 24 ♂		Murray, '98	Zool. Jahrb., 11, p. 427
<i>Helix pomatia</i> var. <i>bivalens</i>	24 ♂	24 ♂	24 ♂	2 ♂		Ancel, '02	Bibliogr. Anat., 11, p. 149
<i>Helix pomatia</i> var. <i>bivalens</i>	24 ♂	24 ♂	24 ♂	24 ♂		Ancel, '03	Arch. Biol., 19, p. 389
<i>Helix pomatia</i> var. <i>bivalens</i>	24 ♂	24 ♂	24 ♂	24 ♂		Tschassownikow, '05	Anat. Hefte, 29, p. 313
<i>Helix pomatia</i> var. <i>bivalens</i>	24 ♂	24 ♂	24 ♂	24 ♂		Kleinert, '09	Jen. Zeits., 38, p. 445

VI. MOLLUSCA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CITE	2ND -CITE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Helix pomatia</i> var. <i>bivallens</i>	ca. 48 spg	24♂	23, 24♂	23, 24♂. Those with 23 de- generate	Onetetrad to polein 1st	Demoll, '11 Demoll, '12 Demoll, '12	Zool. Anz., 38, p. 88 Zool. Jahrb. Suppl. 15, vol. 2, p. 107 Zool. Jahrb., Abt. Zool., 33, p. 40
<i>Helix pomatia</i> var. <i>univalens</i> (Murray, '98).....			24♂	12♂	Reduction in 2nd div.	Platner, '85 Platner, '89	Arch. mikr. Anat., 26, p. 899 Arch. mikr. Anat., 33, p. 134
<i>Helix pomatia</i> var. <i>univalens</i>	24 spg				May be spec. no.	Zimmerman, '91	Verh. Anat. Gesel., 5, p. 187
<i>Helix pomatia</i> var. <i>univalens</i>	24 spg	12♂ (=48 el)	12♂ (=24 el)	12♂	Tetrads and dyads consist of separate elements	Vom Rath, '92	Arch. mikr. Anat., 40, p. 102
<i>Helix pomatia</i> var. <i>univalens</i>	24 spg	12♂ (=48 el)	12♂ (=24 el)	12♂		Godlewski, '97	Bull. Acad. Sc. Craco- vie, 1897, p. 68
<i>Helix</i> (sp. not given).....	16? spg					Prowazek, '02	Arch. Zool. Inst. Wien, 13, p. 197
<i>Limax agrestis</i>			16♂	8♂	Reduction in 2nd div.	Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
<i>Limax cinereo-niger</i>	16 spg	8♂ (=32 el)	8♂ (=16 el)	8♂	Tetrads and dyads consist of separate elements	Platner, '89 Vom Rath, '92	Arch. mikr. Anat., 33, p. 125 Arch. mikr. Anat., 40, p. 102
<i>Limax maximus</i>		ca. 20 ♀				Washburn, '94	Amer. Nat., 28, p. 528
<i>Limax maximus</i>		16-20 ♀ (prob. 16)	16 ♀			Linville, '00	Bull. Mus. Comp. Zool. Harvard, 35, p. 211
<i>Limnea elodes</i>		16 ♀	16 ♀			Linville, '00	Bull. Mus. Comp. Zool. Harvard, 35, p. 211
<i>Tachea austriaca</i> (= <i>Helix</i> a.).....		25♂				Baltzer, '13	Arch. Zellf., 11, p. 151
<i>Tachea hortensis</i> (= <i>Helix</i> h.).....	44 spg 40-48 pa spg	22♂. (Per- haps 22, 23 22 pa (?) ♂			Questions if pa. or self-fertilized	Baltzer, '13	Arch. Zellf., 11, p. 151

2. *Streptoneura* (= *Prosobranchia*)a. *Pectinobranchia*

1. Heteropoda

<i>Carinaria mediterranea</i>	32 cl	16 ♀	16 ♀ 16 ♂ pron	Boveri, '90	Jen. Zeits., 17, p. 314 (= Zellen-Studien III)
<i>Columbella rustica</i>		16+♂		Schitz, '17	Arch. Zool. exper. et gen. Notes et Rev., 56, p. 32
<i>Enteroxenus oestergreni</i> ..	34 oog	17 ♀	17 ♀ 17 ♂	Bonnevie, '05	Anat. Anz., 26, pp. 374 and 497
<i>Enteroxenus oestergreni</i> ..	42 som	21 ♂ 21 ♀	21 ♂ pron 21 ♀ pron	Bonnevie, '06 Schreiner, '07	Jen. Zeits., 34, p. 239 Vidensk-Selsk. Skr. Math.-Naturv., 1907, no. 2, p. 1
<i>Pterotrachea mutica</i>	32 cl	16 ♀	16 ♀ 16 ♂ pron	Boveri, '90	Jen. Zeits., 17, p. 314 (Zellen-Studien II)

2. Platyopoda

<i>Bythinia tentaculata</i>	22-28 spg	24-28 ♂		Fusion of chroms in oligopyrene	Arch. Zellf., 12, p. 567
<i>Conus mediterranea</i>		14 ♂			Arch. Zellf., 10, p. 237
<i>Crepidula plana</i>	60 cl	30 ♀			Jour. Acad. Nat. Sc. Phila., 12, p. 1
<i>Fulgur carica</i>		Prob. 16 ♀			Anat. Anz., 12, p. 534
<i>Paludina vivipara</i>	16 fuse to form 4 spg	4 ♂ (=16 el)	4 ♂ (=8 el)		Jen. Zeits., 23, p. 405
<i>Paludina vivipara</i>	14 spg	7 ♂	7 ♂		Verh. Anat. Gesell., 1901, p. 23
<i>Paludina vivipara</i>	14 oog 14 som 14 cl	7 ♀			Arch. mikr. Anat., 61, p. 1
<i>Valvata piscinalis</i>	ca. 20 spg	10 ♂			Arch. mikr. Anat. 70, p. 43
<i>Vernetus gigas</i>		14 ♂			Biol. Centralb., 28, p. 555
					Arch. Zellf., 12, p. 567
					Arch. Zellf., 10, p. 237

VI. MOLLUSCA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
c. JAMELLEBRANCHIA							
Cumingea tellinoides.....		18 ♀	18 ♀			Jordan, '10	Arch. Zellf., 4, p. 243
Cumingea tellinoides.....	Prob. 36 cl 18 pa cl (2 p. b. s) 50-60 pa. cl. (no p. b. s)	18 ♀	18 ♀			Morris, '17 Morris, '18	J. Exp. Zool., 22, p. 1 Biol. Bull., 35, p. 260
Mactra.....	24 cl 12 pa cl	12 ♀	12 ♀	12 ♀	One or both p. b.'s may be retained in pa. causing va- riations in chrom no.	Kostanecki, '04 Kostanecki, '04 Kostanecki, '11	Arch. mikr. Anat., 64, p. 1 Bull. Acad. Sc. Craco- vie, 1904, p. 70 Arch. mikr. Anat., 78, Abt. II, p. 1
Unio.....		16 ♀	16 ♀			Lillie, '01	Jour. Morph., 17, p. 227

VII. MOLLUSCOIDEA

a. BRACHIOPODA

SPECIES	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Lingula anatina.....			8♂ pron 8♀		Yatsu, '02	Jour. Coll. Sc. Imp. Univ. Tokyo, 17, art. 4, p. 1

b. BRYOZOA

1. Ectoprocta

SPECIES	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
Membranipora pilosa.....		11 ♀			Bonnevie, '06 Bonnevie, '07	Arch. f. Mathem. og Naturv., 27, no. 13 Jen. Zeits., 35, p. 567
Phmatella fungosa.....	5 cl	6 or 7♂			Braem, '07	Zoologica, 10, Hefte 23, p. 1

2. *Endoprocta*

<i>Pedicellina americana</i>	22 spg 22 oog 22 cl	11♂ 11♀	11♂ 11♀	Dublin, '05	Annals N. Y. Acad. Sci., 16, p. 1
<i>Pedicellina echinata</i>		8♀		Lebedinsky, '05	Biol. Centralb., 25, p. 556

c. PHORONIDA

<i>Phoronis australis</i>		12♂ 12♀		Ikeda, '03	Annot. Zool. Japan, 4, p. 141
<i>Phoronis tijimai</i>		6♂ 6♀	3♂ 3♀	Ikeda, '01 Reduction in 2nd div.	Jour. Coll. Sc. Imp. Univ. Tokyo, 13, p. 507
				Ikeda, '03	Annot. Zool. Japan, 4, p. 141

VIII. NEMATHELMINTHES

a. ACANTHOCEPHALA

<i>Echinorhynchus acus</i>		8♀	8♀	Hamann, '91	Jen. Zeits., 18, p. 113
<i>Echinorhynchus gigas</i>	8 som	4♂	4♂	Kaiser, '93	Bibliot. Zool., 7, Part II, p. 1
<i>Echinorhynchus haeruea</i> }					
<i>Echinorhynchus poly-</i> }					
<i>morphus</i>				Hamann, '91	Jen. Zeits., 18, p. 113
<i>Echinorhynchus proteus</i> ...	8 cl	8♀	8♀	Von Voss, '10	Arch. Zellf., 5, p. 430
<i>Gigantorhynchus gigas</i> ...	6 spg	3♂	4♀	Noé, '10	Arch. ital. de Biol., 53, p. 315
<i>Gigantorhynchus hirudinaceus</i>	6 spg	3♂	3♂	Noé, '14	Mem. d. R. Acad. Lincei Ser. 6, vol. 10, p. 46

VIII. NEMATHELMINTHES—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
b. CHAETOGNATHA							
<i>Sagitta bipunctata</i>		♂♂	♂♂	4♂		Bolles-Lee, '88	La Cellule, 4, p. 105
<i>Sagitta bipunctata</i>	18 cl	9♀	9♀	9♀ pron		Boveri, '90	Jen. Zeits., 17, p. 314 (Zellen-Studien III)
<i>Sagitta bipunctata</i>	18 spg 18 som	9♂ 9♀	9♂ 9♀	9♂ 9♀		Stevens, '03 Stevens, '10	Zool. Jahrb., 18, p. 227 Jour. Morph., 21, p. 279
<i>Sagitta bipunctata</i>	18 cl	9♀		9♀		Buchner, '09 Buchner, '10	Anat. Anz., 35, p. 433 Fest. R. Hertwig 1, p. 235
<i>Sagitta bipunctata</i>	18 som	9♀				Elpatiewsky, '10	Biol. Zeits. Moskou, 1, p. 333
<i>Sagitta bipunctata</i>	18 spg	9♂	9♂			Bordas, '12 Bordas, '14	La Cellule, 28, p. 165 Mem. d. l. Real. Soc. Espan. d. Hist. nat. 10, p. 1
<i>Sagitta elegans</i>	18 som	9♂ 9♀	9♂	9♂		Stevens, '05 Stevens, '10	Zool. Jahrb., 21, p. 243 Jour. Morph., 21, p. 279
<i>Sagitta inflata</i>		9♂	9♂	9♂		Stevens, '10	Joor. Morph., 21, p. 279
<i>Sagitta inflata</i>	18 cl	9♀		9♀		Buchner, '10	Fest. R. Hertwig 1, p. 235
<i>Sagitta minima</i>		9♂	9♂	9♂		Stevens, '10	Jour. Morph., 21, p. 279
c. NEMATODA							
1. <i>Gordioidea</i>							
<i>Gordius affinis</i>	4 oog	1♀			4 chroms form 1 tetrad	Švábenik, '09	Sitz. Kon. Böhm. Gesell. d. Wissen. Prag., 1909, art. 7
<i>Gordius aquaticus</i>	7-9 cl					N. Th. Meyer, '13	Zeit. wiss. Zool., 105, p. 125
<i>Gordius aquaticus</i>	4 cl					Muhlendorf, '13 Muhlendorf, '14	Zool. Anz., 42, p. 431 Zeit. wiss. Zool., 111, p. 1

<i>Gordius gratianopolensis</i>		8 ♀				4 chroms form 1 tetrad	Camerano, '90	Mem. R. Accad. Sc. Torino, Ser. II, vol. 40, p. 1
<i>Gordius montenigrinus</i>	4 oog	1 ♀			1 ♂		Svábentík, '09	Sitz. Kon. Böhm. Gesel. d. Wissen. Prague, 1909, art. 7
<i>Gordius preslii</i>	4 spg						Vejdovsky, '94	Zeit. wiss. Zool., 57, p. 642
<i>Gordius preslii</i>							Vejdovsky, '12	Kon. Böhm. Gesel. Wissen. Prague, p. 1
<i>Gordius preslii</i>	4 oog	1 ♀				4 chroms form 1 tetrad	Švábentík, '09	Sitz. Kon. Böhm. Gesel. d. Wissen. Prague, 1909, art. 7
<i>Gordius tolosanus</i>		8 ♀					Camerano, '90	Mem. R. Accad. Sc. Torino, Ser. II, vol. 40, p. 1
<i>Gordius tolosanus</i>	4 oog	1 ♀				4 chroms form 1 tetrad	Švábentík, '09	Sitz. Kon. Böhm. Gesel. d. Wissen. Prague, 1909, art. 7
<i>Gordius tolosanus</i>	4 spg 4 oog	2 ♀					Vejdovsky, '12	Kon. Böhm. Gesel. Wissen. Prague, p. 1
<i>Gordius villoti</i>		8 ♀					Camerano, '90	Mem. R. Accad. Sc. Torino, Ser. II, vol. 40, p. 1
<i>Paragordius varius</i>	14 cl	7 ♀	7 ♀	7 ♂ pron			Montgomery, '04	Proc. Acad. Nat. Sc. Phila., 56, p. 733
<i>2. Nematodea</i>								
<i>Ancyracanthus cysticola</i>	11 spg 12 oog 11 ♂ cl 12 ♀ cl 11 ♂ som	6 ♂ 6 ♀	5, 6 ♂ 6 ♀	5, 6 ♂ and ♂ pron. 6 ♀ and ♀ pron.		X to pole in 1st	Mulsow, '11 Mulsow, '12	Zool. Anz. 38, p. 484 Arch. Zellf., 9, p. 63
<i>Angiostomum nigrovenerosum</i> (= <i>Ascaris nigrovenerosa</i>)		6 ♀ (some-times 5)	6 ♀ (some-times 5)			Hermaphroditic generation	McDowall, '08 McDowall, '08	Proc. Camb. Phil. Soc. 13, p. 309 Proc. Camb. Phil. Soc., 14, p. 613

VIII. NEMATHELMINTHES—Continued

SPECIES	DIPLOID AND PARTHENO-GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Angiostomum nigrovirens</i> (= <i>Rhabdonema nigrovirens</i>).....	12 oog	7♂, sometimes 6, heterochroms united 6♀	7♂ 6♀	6♂. Later 5, 6, heterochroms discarded in half the cells. One case 5, 7, both heterochroms to same pole 6♀	Hermaphroditic generation. 2 heterochroms to opposite poles in 2nd ♂		
<i>Ascaris canis</i> (A. mystax).....	11 emb. germ cells (♂?) 22 emb. som cells (♂?) 12 emb. germ cells (♀?) 24 emb. som cells (♀?) 22 spg 22 oog 22 cl 11 (tetrads) prim. germ cells	11♂ 11♀	11♂ 11♀	11♂ 11♀	Chrom diminution in som. cells. Walton, '16, says this is A. triquetra	Marcus, '05 Marcus, '06	Sitz. Ber. Gesel. Morph. u. Physiol. München 21, p. 39 Arch. mikr. Anat., 68, p. 441
<i>Ascaris canis</i>	30 spg 36 oog 30, 36 som	18♂ 18♀	12, 18♂ 18♀	12, 18♂ 18♀	X (=6 el) to pole in 1st. Fragmentation in som cells into 60 (in ♂) or 72 (in ♀) monad chroms	Walton, '16 Walton, '18	Jour. Parasitol., 3, p. 39 Biol. Bull., 31, p. 364 Jour. Morph., 36, p. 527
<i>Ascaris clavata</i>		24♀	24♀	24♀	In 2 cases, no. is double	Carnoy, '86	La Cellule, 3, p. 229
<i>Ascaris</i> of dog (not A. mystax).....		2 groups of 4♀	1 group of 4♀	4 (divided) ♂ pron		Carnoy, '86	La Cellule, 3, p. 1

<i>Ascaris des Hundes</i>	16 ♀	8 ♀	4 ♀	Uncertain if same as Carnoy's	Lukjanow, '89	Arch. mikr. Anat., 34, p. 397
<i>Ascaris felis</i>	9 ♂	9 ♂	9 ♂	XY to poles in 1st	Edwards, '12	Arch. Zellf., 7, p. 309
<i>Ascaris felis</i>	9 ♂	9 ♂	9 ♂	XY (or X attached to autosome) to poles in 1st	Walton, '16	Biol. Bull., 31, p. 364
<i>Ascaris incurva</i>	21 ♂ 21 ♀	14, 21 ♂ 21 ♀		XY to poles in 1st. X=8 cl. Chromatin diminution in somatic cl.	Goodrich, '14 Goodrich, '16	Biol. Bull., 27, p. 147 Jour. Exp. Zool., 21 p. 61
<i>Ascaris lumbricoides</i>	20-24 ♀ (prob. 24)	24 ♀	24 ♀		Carnoy, '86	La Cellule, 3, pp. 1, 229
<i>Ascaris lumbricoides</i>	24 ♀ (sometimes 26)	24 ♀	24 ♀		Boveri, '86	Sitz. Ber. Gesel. Morph. u. Physiol. Munchen, 2, p. 101
<i>Ascaris lumbricoides</i>			34 ♂ pron 24 ♀ pron	Chromatin diminution and breaking of chroms in somatic cleavages	Boveri, '87	Jen. Zeits., 14, p. 423 (Zellen-Studien I)
<i>Ascaris lumbricoides</i>					Bonnevie, '02	Jen. Zeits., 29, p. 275
<i>Ascaris lumbricoides</i>	24 ♂ 24 ♀	19, 24 ♂ 24 ♀	19, 24 ♂	X to pole in 1st. X=5 cl	Edwards, '10 Edwards, '10	Science, 31, p. 514 Arch. Zellf., 8, p. 422
<i>Ascaris megaloccephala</i> var. <i>bivalens</i> (Hertwig, '90).....	2 ♀		2 ♀		Schneider, '83	'Das Ei und Seine Befruchtung,' Breslau
<i>Ascaris megaloccephala</i> var. <i>bivalens</i>	4 ♂ 4 ♀	4 ♀		Diminution and fragmentation of chroms in som cl	Nussbaum, '84 Nussbaum, '02	Arch. mikr. Anat., 23, p. 155 Arch. mikr. Anat., 59, p. 647
<i>Ascaris megaloccephala</i> var. <i>bivalens</i>	2 ♂ 2 ♀	2 ♂ 2 ♀	2 ♂ pron 2 ♀ pron.		Van Beneden, '83 (84) Van Beneden and Julin, '84	Arch. Biol., 4, p. 265 Bull. Acad. Roy. des Sc. de Belgique, Ser. III, t. 7, p. 312
					Van Beneden and Neyt, '87	Bull. Acad. Roy. des Sc. de Belgique, Ser. III, t. 14, p. 216
					Van Beneden, '88	Anat. Anz., 3, p. 104

VIII. NEMATHELMINTHES—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Ascaris megalocephala</i> var. <i>bivalens</i>	4 cl	2 groups of 4 each ♀	2 groups of 2 each ♀	2♂ pron 2 ♀ pron		Carnoy, '85 Carnoy, '86 Carnoy and Le- brun, '97	La Cellule, 2, p. 1 La Cellule, 3, pp. 1 and 29 La Cellule, 13, p. 61
<i>Ascaris megalocephala</i> var. <i>bivalens</i>	4 cl	2 ♀	2 ♀	2♂ pron 2 ♀ pron 3♂ pron (2 cases)	Diminution and fragmentation of chroms in some cl X sometimes fused with other chrom., sometimes sepa- rate	Boveri, '87 Boveri, '87 Boveri, '87 Boveri, '88 Boveri, '04 Boveri, '09 Boveri, '09 Boveri, '10	Sitz. Gesell. Morph. u. Physiol. Munchen, 3, p. 71 Anat. Anz., 2, p. 588 Jen. Zeits., 14, p. 423 (=Zellen-Studien I) Jen. Zeits., 15, p. 685 (=Zellen-Studien II) "Ergeb. Konstitution d. chrom.", Jena d. Zellkerns, Jena Arch. Zellf., 3, p. 181 Arch. Zellf., 4, p. 132 Fests. R. Hertwig, III, p. 129
<i>Ascaris megalocephala</i> var. <i>bivalens</i>		2 groups of 4 each ♀	2 groups of 2 each ♀	2♂ pron 2 ♀ pron		Van Gehuchten, '87	Anat. Anz., 2, p. 751
<i>Ascaris megalocephala</i> var. <i>bivalens</i>	4 cl	2 groups of 4 each ♀ 2 ♀ (=8 cl)	2 groups of 2 each ♀ 2 ♀ (=4 cl)	2♂ pron 2 ♀ pron 2 ♀ pron	Also "parachromo- somes"	Zacharias, '87 Zacharias, '87 Zacharias, '12 Zacharias, '12	Anat. Anz., 2, p. 787 Arch. mikr. Anat., 30, p. 111 Anat. Anz., 42, p. 353 Zool. Anz., 40, p. 25
<i>Ascaris megalocephala</i> var. <i>bivalens</i>	4 cl			2♂ pron 2 ♀ pron		Dostolevsky, '88	Anat. Anz., 3, p. 646
<i>Ascaris megalocephala</i> var. <i>bivalens</i>	4 cl	2 groups of 4 each ♀	2 groups of 2 each ♀	2 ♀ 2♂ pron		Kultschitzky, '88 Kultschitzky, '88	Sitz. k. Akad. wissen. Berlin, 88, p. 17 Arch. mikr. Anat., 31, p. 567
<i>Ascaris megalocephala</i> var. <i>bivalens</i>	4 spg 4 oög	2♂ 2 ♀	2♂	2♂		Hertwig, '90	Arch. mikr. Anat., 36, p. 1

Ascaris megalocephala var. bivalens.....	4 spg	2♂	2♂	2♂		Brauer, '93	Arch. mikr. Anat., 42, p. 153
Ascaris megalocephala var. bivalens.....	4 sex cells					Von Wasielewski, '93	Arch. mikr. Anat., 41, p. 324
Ascaris megalocephala var. bivalens.....	4 (or 2 double) cl. Sometimes 6. Sometimes fragmenta- tion in prim- ary germ cells, giving 8- 12+					Vom Rath, '94	Biol. Centralb., 14, p 449
Ascaris megalocephala var. bivalens.....	4 cl. Some- times frag- mentation or double fert., giving 3-6					Herla, '95	Arch. Biol., 13, p. 423
Ascaris megalocephala var. bivalens.....	4 cl 2 cl (anomaly)					Zoja, '96	Arch. mikr. Anat., 47, p. 218
Ascaris megalocephala, var. bivalens.....	4 oog	2♀	2♀	2♀	2♀	Sabaschnikoff, '97	Bull. Soc. Imp. d. Nat. d. Moscou, 9, p. 82
Ascaris megalocephala, var. bivalens.....		2♀	2♀	2♀	2♀	Moszkowski, '02	Arch. mikr. Anat., 59, p. 388
Ascaris megalocephala, var. bivalens.....	4 cl	2♀	2♀	2♀	2♀ pron 2♂ pron	Montgomery, '04	Biol. Bull., 6, p. 137
Ascaris megalocephala, var. bivalens.....	4 cl	2♂ 2♀	2♀	2♀		Montgomery, '08	Arch. Zellf., 2, p. 66
Ascaris megalocephala, var. bivalens.....		2♀	2♀	2♀		Tretjakoff, '05	Arch. mikr. Anat., 65, pp. 358 and 383
Ascaris megalocephala, var. bivalens.....						Griggs, '06	Ohio Naturalist, 6, p 519
Ascaris megalocephala, var. bivalens.....	5 spg 5 cl					Boring, '09	Arch. Zellf., 4, p. 120
							One small chrom in some eggs of most worms, due to fragmentation or a sex chrom

VIII. NEMATHELMINTHES—Continued

SPECIES	DIPLOID AND PARHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	5 spg	3♂	3♂ or 2, 3	2, 3♂	X to pole in 1st or 2nd (3 worms)	Edwards, '10 Edwards, '10	Science, 31, p. 514 Arch. Zellf., 5, p. 422
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	4 cl	2♀	2♀	2♀ 2♂ pron		Retzius, '11	Biol. Untersuchungen, 16, p. 21
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	4 cl			2♂ pron 2♀ pron		Vejdovsky, '12	König. Böhm. Gesel. Wissen. Prag, p. 1
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	1-8 cl 27♂ (?) emb. 36♀ (?) emb.			1-2♂ pron	Abnormalities in cl. (one animal).	Kautzsch, '12	Arch. Entwickl., 35, p. 642
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	5 cl (♂?) 6 cl (♀?) or 4 cl	3♀ or 2	3♀ or 2	3♀ or 2 2 or 3♂ pron	X separate or fused with another chrom	Frolowa, '12	Arch. Zellf., 9, p. 149
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	4 spg 4 oog 4 cl	2♂ 2♀	2♂ 2♀	2♂ 2♀		Fauré Fremiet, '13	Arch. d'Anat. mikr., 15, p. 435
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	4 oog		2♀			Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>		2♀				de Saedeleer, '13	La Cellule, 28, p. 301
<i>Ascaris megalocephala</i> , var. <i>bivalens</i>	2-7 cl	4♀, rarely 5 due to piece from chrom. bro- ken off	4♀, some- times 8, no 1st p. b.; 3 or 6 due to frag- ments	2♀, also sev- eral due to fragmenta- tion	One animal. Dyads instead of tetrads	Geinitz, '15	Arch. Zellf., 13, p. 585
	4 cl (no X) 5 cl (1 X) 6 cl (2 X) 7 cl (X and only 1 p. b.) ca. 32♂ emb (49-54) ca. 60♀ emb (58-62)	3♀	2♀ (no X) 3♀ (1 X) 4♀ (2 X)	2♀ (no X) 3♀ (1 X) 4♀ (2 X)	Three animals. X (double) to pole in 1st or 2nd, or di- vides in both. X = 8 elin. embryos. Rarely X=4 el		

<i>Ascaris megalocephala</i> , var. <i>trivalens</i> (Zacharias, '12).....	3 cl				1♂ (3) pron 2♀ (3) pron	Probably cross biv. X univ. Sometimes small ac- ces. chrom	Zacharias, '12	Biol. Centralb., '32, p. 718
<i>Ascaris megalocephala</i> , var. <i>univalens</i> (Hertwig, '90).....	2 cl	1♀	1♀	1♀	1♀ 1♂ pron	Chromatin diminution and fragmentation of chroms in som cells	Boveri, '87 Boveri, '88 Boveri, '92 Boveri, '99 Boveri, '04 Boveri, '09	Jen. Zeits., 14, p. 423 (Zeller-Studien I) Jen. Zeits., 15, p. 685 (Zeller-Studien II) Sitz. Gesel. Morph. u. Physiol. München 8, p. 114 Fests. Von Kupffer, p. 333 "Erbh. Konstitution d. chrom. Substanz d. Zellen", Jena Arch. Zellf., 3, p. 181
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 cl				1♂ pron 1♀ pron		Dostolevsky, '88	Anat. Anz., 3, p. 646
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 cl						Kultschitzky, '88	Arch. mikr. Anat., 31, p. 567
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 spg 2 oog		1♂	1♂	1♂		Hertwig, '90	Arch. mikr. Anat., 36 p. 1
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 spg 2 oog 2 cl		1♂ 1♀	1♂ 1♀	1♂ 1♀		Schneider, '91	Arch. Zool. Inst. Wien, 9, p. 179
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 sex cells						Von Wasielewski, '93	Arch. mikr. Anat., 41, p. 324
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 spg		1♂	1♂	1♂		Brauer, '93	Arch. mikr. Anat., 42, p. 153
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 cl	4 el♀		2 el♀	1♀ 1♂ pron		Herla, '95	Arch. Biol. 13, p. 423
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 cl				1♂ pron 1♀ pron		Carney and Lebrun, '97	La Cellule, 13, p. 61
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 sex cells 2 cl					Diminution and fragmentation of chroms in som cl	Nussbaum, '02	Arch. mikr. Anat., 59 p. 647

VIII. NEMATHELMINTHES—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST-CYTE	2ND-CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 spg	1♂	1♂	1♂		Tretjakoff, '05	Arch. mikr. Anat., 65, p. 383
<i>Ascaris megalocephala</i> , var. <i>univalens</i>		1♀				Bonnevie, '08	Arch. Zellf., 2, p. 201
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	3 cl				Small chrom due to fragmentation or a sex chrom (in 1 or 2 eggs)	Boring, '09	Arch. Zellf., 4, p. 120
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	3 cl				X in ♂. One worm	Edwards, '10	Arch. Zellf., 5, p. 422
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 oog	1♀ (=4 el)				Blaukertz, '10	Arch. Zellf., 6, p. 1
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 cl			1♂ pron 1♀ pron		Zacharias, '12	Anat. Anz., 42, p. 353
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 spg 2 oog	1♀		1♂ pron 1♀ pron		Held, '12	Verh. Anat. Gesel., 26, p. 242
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 oog	1♀ 1♂				Fauré-Fremiet, '13	Arch. d'Anat. mikr., 15, p. 435
<i>Ascaris megalocephala</i> , var. <i>univalens</i>	2 oog	1♀ 1♂				Retzius, '14	Biol. Untersuchungen, 17, pp. 19 and 30
<i>Ascaris nigrovenosa</i> , see <i>Angiostomum</i> n.	22 sex cells					Walton, '16	Jour. Parasitol., 3, p. 39
<i>Ascaris triquetra</i>	8 cl	8♀	4♀	2♀ 4♂ pron		Carnoy, '86	La Cellule, 3, pp. 1 and 63
<i>Coronilla scillicola</i> (or ro- busta).....	12 cl					Martini, '03	Zeit. wiss. Zool., 74, p. 501

<i>Filaria papillosa</i>	11♂ cl 12♀ cl	6♀	6♀	5, 6♂ ^a 2♀ Prob. 4♂ pron		Meves, '15	Arch. mikr. Anat., 87, II, p. 12
<i>Filaroides mustelorum</i> ...	16 cl	8♀	4♀	4, 5♂ ^a 5♀		Carnoy, '86	La Cellule, 3, pp. 1 and 63
<i>Heterakis</i> sp?.....	9 spg	5♂ ^a 5♀	4, 5♂ ^a 5♀	4, 5♂ ^a 5♀	X to pole in 1st	Boveri, '09	Arch. Zellf., 4, p. 136
<i>Heterakis dispar</i>	9 spg 10 oog	5♂ ^a 5♀	4, 5♂ ^a 5♀	4, 5♂ ^a 5♀	X to pole in 1st	Gulick, '11	Arch. Zellf., 6, p. 339
<i>Heterakis infixa</i>		5♂ ^a 5♀	4, 5♂ ^a 5♀	4, 5♂ ^a 5♀	X to pole in 1st	Gulick, '11	Arch. Zellf., 6, p. 339
<i>Heterakis vesicularis</i>	9 spg 10 oog	5♂ ^a 5♀	4, 5♂ ^a 5♀	4, 5♂ ^a 5♀	X to pole in 1st	Gulick, '11	Arch. Zellf., 6, p. 339
<i>Ophlostomum mucronatum</i>	12 cl	6 (double) ♀	6 (double) ♀	6♀ 4+♂ pron		Carnoy, '86	La Cellule, 3, pp. 1 and 63
<i>Oxyuris ambigua</i>	3-4? spg	1-3♀	1-3♀	1-3♀		Löwenthal, '89 Löwenthal, '90	Inter. Monats. Anat. u. Physiol., 6, p. 364 Inter. Monats. Anat. u. Physiol., 7, p. 375
<i>Rhabditis aberrans</i>	18 cl 18 som	10♂ ^a (=8 biv. +2 univ.) Rarely 9 biv. no univ. 18♀	10♂ ^a	9♂ ^a 18♀	Only 1 p. b. Sperm degenerate in egg, dearly 14 XY to poles in 2nd ♂. Occasionally one sex chrom dis- carded in Rest- körper	Kruger, '12 Kruger, '13	Zool. Anz., 40, p. 233 Zeit. wiss. Zool., 105, p. 37
<i>Rhabditis nigrovirens</i> ...	11 cl (♂?) 12 cl (♀?)	6♂ ^a 6♀	5, 6♂ ^a 6♀	5, 6♂ ^a (sperm with 5 not functional) 6♀	Separate generations X to pole in 1st	Boveri, '11	Verh. phys. med. Ge- sells. Würzburg, 41, p. 83
<i>Rhabdonema nigrovirens</i> , see <i>Angiostomum</i> n.	12 oog 12 som. ♀	5+2 X♂ ^a 6♀	5+2 X♂ ^a 6♀	5, 6, 7♂ ^a (sperm with X to pole in 2nd or 7 degenerate) 6♀	Hermaphroditic generation X to pole in 2nd or X to each pole		
<i>Sclerostomum</i> (= <i>Strophylus</i>) <i>edentatum</i> ... <i>Sclerostomum equinum</i> ... <i>Sclerostomum vulgare</i> ...	11 spg 12 oog	6♂ ^a 6♀	5, 6♂ ^a 6♀	5, 6♂ ^a 6♀	X to pole in 1st or 2nd	Kühnz, '13	Arch. mikr. Anat., 83, Abt. 11, p. 191

VIII. NEMATHELMINTHES—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Spiroptera strumosa</i>	12 cl	8 ♀	4 ♀	2 ♀ 4 ♂ pron		Carnoy, '86	La Cellule, 3, pp. 1 and 63
<i>Strongylus</i> , see <i>Sclero-</i> <i>stomum</i>							
<i>Strongylus filaria</i>	12 spg 12 oog 12 cl	6 ♂ 6 ♀	6 ♂	6 ♂ 6 ♀		Struckmann, '06	Zool. Jahrb., 22, p. 577
<i>Strongylus paradoxus</i>		6 ♀				Struckmann, '06	Zool. Jahrb., 22, p. 577
<i>Strongylus paradoxus</i>	11 spg 12 oog 11 el ♂ 12 el ♀	6 ♂ 6 ♀	5, 6 ♂ 6 ♀	5, 6 ♂ 6 ♀	X to pole in 1st	Gulick, '11	Arch. Zellf., 6, p. 339
<i>Strongylus tenuis</i>		6 ♂	6 ♂	5, 6 ♂	X to pole in 2nd	Gulick, '11	Arch. Zellf., 6, p. 339
<i>Strongylus tetracanthus</i> ..		6 ♀				Meyer, '95	Jen. Zeits., 22, p. 391

IX. NEMERTINEA

a. DIMYARIA

<i>Tetrastemma vermiculus</i> ..		4 ♀	2 ♀	2 ♀		Lebedinsky, '97 Lebedinsky, '97	Arch. mikr. Anat., 49, p. 503 Biol. Centralb., 17, p. 113
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b. TRIMYARIA

<i>Cerebratulus lacteus</i>				5 ♀ (in p. b.)		C. B. Wilson, '00	Q. J. M. S., 43, p. 97
<i>Cerebratulus lacteus</i>	36 or 38 cl	18 or 19 ♀				Yatsu, '07 Yatsu, '09	Biol. Bull., 13, p. 300 Jour. Morph., 20, p. 353
<i>Cerebratulus marginatus</i> ..	32 cl	16 ♀	16 ♀	16 ♀		Coe, '99	Zool. Jahrb., 12, p. 425
<i>Cerebratulus marginatus</i>		16 ♂	16 ♀	16 ♀		Kostanecki '02	Bull. Inter. Acad. Sc. Cracovie 1902, p. 270

<i>Lineus gessnerius</i>	32 ? cl	8 ♀	8 ♀	Arnold '99	Trav. Soc. Imp. Nat. St. Petersburg no. 9, p. 1
<i>Lineus lacteus</i>	16 cl	16? ♀	8 ♀	Meek '13	Phil. Trans. Roy. Soc. London 203B, p. 1.
<i>Lineus ruber</i>	8 ♀ (=32 el)	8 ♀	8 ♂ pron	Nussbaum and Oxner, '13	Zeit. wiss. Zool., 107, p. 78
<i>Micrura caeca</i>	32 cl	16 ♀		Coe, '99	Zool. Jahrb., 12, p. 425

X. PLATHELMINTHES

a. CESTODA

<i>Avitellina centripunctata</i>	12-14 ? som	4? ♀		Gough, '11	Q. J. M. S., 56, p. 317
<i>Moniezia expansa</i>		6-9 ? ♂		Child, '07	Biol. Bull., 12, pp. 89, 191
<i>Moniezia planissima</i> ... }		6-16 ♀ (prob. 12-15 ♀)		Von Janicki, '07	Zeit. wiss. Zool., 87, p. 685
<i>Taenia serrata</i>					

b. TREMATODA

1. *Digenetica*

<i>Bilharzia haematobia</i> , see <i>Schistosomum haematobium</i>	20 spg 20 oog 20 cl	10 ♂ 10 ♀		Von Kennitz, '13	Arch. Zellf., 10, p. 470
<i>Brachycoelium salmandrae</i> (= <i>B. crassiole</i>) ...	20 oog	10 ♀	10 ♀	Goldschmidt, '08	Arch. Zellf., 1, p. 232
<i>Dicrocoelium lanceatum</i> (= <i>Distomum lanceolatum</i>).....	20 spg	10 ♂		Dingler, '10	Arch. Zellf., 4, p. 672
<i>Dicrocoelium lanceatum</i> (= <i>Distomum lanceolatum</i>).....	16 pa cl	16 ♀	One p. b. for pa.	Cary, '09	Zool. Jahrb., 28, p. 595
<i>Diplostiscus temporatus</i> ...		6-8 ♀		Henneguy, '06	Arch. d'Anat. micros., 9, p. 47
<i>Distomum hepaticum</i> ...					
<i>Distomum hepaticum</i> , see <i>Fasciola hepatica</i>					

X. PLATHELMINTHES—Continued

SPECIES	DIPLOID AND PARHENO- GENETIC	1ST CYTE	2ND CYTE	TYD	REMARKS	OBSERVER	REFERENCE
<i>Distomum lanceolatum</i> , see <i>Dicrocoelium lan-</i> <i>ceatum</i>							
<i>Distomum turgidum</i>	18 cl	9 ♀	9 ♀	9 ♀		Levy, '14	Arch. mikr. Anat., 85, Abt. II, p. 123
<i>Fasciola hepatica</i> (= <i>Dic-</i> <i>stomum hepaticum</i>).....	8 cl			4♂ pron 4 ♀ pron		Schubmann, '05	Zool. Jahrb., 21, p. 571
<i>Fasciola hepatica</i>	12 oog 12 cl	6 ♀, some cases 12 ♀, no reduc- tion	6 ♀	6 ♀		Schellenberg, '11	Arch. Zellk., 6, p. 443
<i>Fasciola hepatica</i>	10 (pairs) spg 10 (pairs) oog	10 (pairs) ♂ 10 (pairs) ♀	5 (pairs) ♂	5 (pairs) ♂	5 pairs to each pole in 1st div.	Dehorne, '11	Arch. Zool. exp. et gen. Ser. V, t. 9, p. 1
<i>Schistosomum haemat-</i> <i>obium</i> (= <i>Bilharzia ha-</i> <i>ematobia</i>).....	14 spg	8♂ 8 ♀	6, 8♂	6, 8♂	2 X to pole in 1st	Lindner, '14	Arch. Zellk., 12, p. 516
<i>Zoogonous mirus</i>	10 spg 10 oog 10 cl 10 som	10 ♀	10 ♀	5 ♀ 5♂ pron	Reduction in 2nd div. 5 to each pole	Goldschmidt, '05 Goldschmidt, '08	Zool. Jahrb., 21, p. 607 Arch. Zellk., 2, p. 348
<i>Zoogonous mirus</i>	20+cl 22-26 som	11-13 ♀	11-13 ♀	11-13 ♀ 10-13♂ pron		Schreiner, '08	Slav. Vidsensk-Selsk. Christiana, Math- Naturw., 1, no. 5, p. 1
<i>Zoogonous mirus</i>	12 spg 12-14 cl (prob. 12 cl) 12-14 som	6♂ 6 ♀	6 ♀	6♂ pron 6 ♀		Gregoire, '09	La Cellule, 25, p. 243
<i>Zoogonous mirus</i>	11-14 oog (prob. 12 oog) 11-14 cl 12 som	6-7 ♀	6 ♀	7♂		Wassermann, '11 Wassermann, '12 Wassermann, '13	Sitz. Gesel. Morph. u. Physiol. München, 27, p. 128 Verh. Anat. Gesel., 26, p. 47 Arch. mikr. Anat., 83, Abt. II, p. 1

2. *Monogenetica*

Gyrodactylus elegans....	8 cl (some- times 9)	8 ♀	Prob. 8 ♀	Karyomerites	Von Janicki, '03	Zool. Anz., 26, p. 241
Gyrodactylus elegans....		8 ♀	8 ♀	Reduction in 2nd	Kathariner, '04	Zool. Jahrb. Suppl., 7, p. 519
Gyrodactylus elegans....	12 spg 12 cl	6 ♀	6 ♀	Karyomerites	Gille, '14	Arch. Zell., 12, p. 415
Polystomum integerri- mum.....	ca. 20 cl	10 ♀			Halkin, '02	Arch. Biol., 18, p. 291
Polystomum integerri- mum.....	8 cl	8 ♀	8 ♀		Goldschmidt, '02	Zeit. wiss. Zool., 71, p. 397

c. TURBELLARIA

1. *Polydoridae*

Cycloporus papillosus....	16 cl	8 ♀	8 ♀	8 ♀	Francotte, '97	Mem. Cour. Acad. Roy. Belgique, 55, p. 5
Eustylochus ellipticus....	20 cl	10 ♀	10 ♀	10 ♀ pron 10 ♂ pron	Francotte, '98	Arch. Zool. exper. et gen., Ser. III, t. 6, p. 189
Leptoplana tremellaris....	16 cl	8 ♀	8 ♀		Van Name, '99	Trans. Conn. Acad. Sc. 10, p. 263
Oligoclades auritus.....		8 ♀			Francotte, '97	Mem. Cour. Acad. Roy. Belgique, 55, p. 5
Planocera inquilina.....		10 ♀	10 ♀	9-10 ♀	Francotte, '97	Mem. Cour. Acad. Roy. Belgique, 55, p. 5
Planocera inquilina.....		10 ♀			Wheeler, '94	Jour. Morph., 9, p. 167
Planocera nebulosa.....	20 cl	10 ♀	10 ♀	10 ♀ 10 ♂ pron	Patterson and Wieman, '12	Biol. Bull., 23, p. 271
Prosthecteraeus vittatus..	12 cl	6 ♀	6 ♀	6 ♀ 6 ♂ pron	Van Name, '99	Trans. Conn. Acad. Sc. 10, p. 263
					Klinckowstrom, '97	Arch. mikr. Anat., 48, p. 587

X. PLATHELMINTHES—Continued

SPECIES	DIPLOID AND PARATHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Prosthoeceus vittatus</i> ...		6 ♀	6 ♀	6 ♀ pron		Francotte, '97	Mem. Cour. Acad. Roy. Belgique, 55, p. 5
<i>Prosthoeceus vittatus</i> ...		6 ♀				Francotte, '98	Arch. Zool. exp. et gen. Ser. III, t. 6, p. 189
<i>Prosthoeceus siphunculus</i>						Gerard, '01	La Cellule, 18, p. 139
<i>Stylocheus pelidium</i>	16 cl	8 ♀	8 ♀	8 ♀		Francotte, '98	Arch. Zool. exp. et gen. Ser. III, t. 6, p. 189
		9 ♀				Gerard, '01	La Cellule, 18, p. 139
<i>2. Rhabdocoela</i>							
<i>Graffia gemellipara</i>	8 cl	4 ♀				Patterson, '12	Biol. Bull., 22, p. 173
<i>Graffia gemellipara</i> , see <i>Paravortex g.</i>	ca. 7 cl				Probably refers to cleavage	Schneider, '83	"Das Ei und Seine Be- fruchtung," Breslau
<i>Mesostomum ehrenbergi</i> ...	10 cl			5 ♀	Summer egg	Bresslau, '04	Zeit. wiss. Zool., 76, p. 213
<i>Mesostomum ehrenbergi</i> ...	10 oog	5 (pairs) ♀	5 ♀	5 ♀ pron		Von Voss, '14	Arch. Zellf., 12, p. 159
<i>Paravortex cardii</i>	4 cl		4 ♀ (=8 el)	2 ♀ (=4 el)		Hallez, '08	C. R. Acad. Sc., 147, p. 314
						Hallez, '08	Arch. Zool. exper. et gen., Ser. IV, t. 9, p. 429
<i>Paravortex gemellipara</i> (<i>Graffia g.</i>).....	8 cl		4 ♀			Ball, '16	Jour. Morph., 27, p. 453
<i>Polychoerus caudatus</i> ...	31 cl					Gardiner, '98	Jour. Morph., 15, p. 73
<i>Vortex viridis</i>	4 spg 4 som	2 ♂	2 ♂		Two chroms fuse in 2nd div.	Lepeschkin, '10	Biol. Zeits. Moscow, 1, p. 104

3. *Tricladida*

Dendrocoelum lacteum...	16 cl	8 ♀ (4-8), 4 in prophase	8 ♀ (4 in prophase)	4 ♀	No. doubled in 1st and 2nd metaphase; 4 to each pole in 1st and 2nd div.	Matteson, '04 Matteson, '04	Zool. Anz., 27, p. 34 Zeit. wiss. Zool., 77, p. 274
Dendrocoelum lacteum...		8 ♂	8 ♂			Schleip, '07	Zool. Jahrb., 24, p. 129
Dendrocoelum lacteum...	14 spg	7 ♀				Gelei, '13	Arch. Zellf., 11, p. 51
Dendrocoelum lacteum, see Planaria lactea							
Planaria alpina.....	20-24 spg					Rappeport, '15	Arch. Zellf., 14, p. 1
Planaria gonoccephala....	16 spg 16 oog	8 ♂ 8 ♀	8 ♂	8 ♂		Schleip, '06 Schleip, '07	Zool. Jahrb., 23, p. 357 Zool. Jahrb., 24, p. 129
Planaria lactea (=Dendrocoelum lacteum)....	16 oog	8 ♀ 8 ♂	8 ♂	8 ♂		Arnold, '09	Arch. Zellf., 3, p. 431
Planaria lactea, see Dendrocoelum lacteum							
Planaria polyehra.....	16 cl	8 ♀ (4-8), 4 in prophase	8 ♀ (4 in prophase)	4 ♀	No. doubled in metaphases; 4 to each pole in 1st and 2nd div.	Matteson, '04 Matteson, '04	Zool. Anz., 27, p. 34 Zeit. wiss. Zool., 77, p. 274
Planaria simplicissima.....	8 spg 6 cl 6 som	3 or 4 ♂ 3, 4, 6 ♀	3 or 4 ♂ 3-6 ♀		May be two kinds, 3 and 6 reduced	Stevens, '04	Proc. Acad. Nat. Sc. Phila., 56, p. 208
Planaria torva.....	16 cl	8 ♀ (4-8), 4 in prophase	8 ♀ (4 in prophase)	4 ♀	No. doubled in metaphases; 4 to each pole in 1st and 2nd div.	Matteson, '04 Matteson, '04	Zool. Anz., 27, p. 34 Zeit. wiss. Zool., 77, p. 274
Polycelis nigra.....		8 ♂	8 ♂			Schleip, '07	Zool. Jahrb., 24, p. 129
Procerodes gerlachei.....	12 spg 12 som	6 ♂	6 ♂			Böhning, '07	Arch. Biol., 23, p. 1
Thysanozoon broochi....	18 spg 18 cl	9 ♂ 9 ♀	9 ♀	9 ♂ pron 9 ♀		Van der Stricht, '97 Van der Stricht, '98	Verh. Anat. Ges. 11. p. 92 Arch. Biol. 15, p. 367
Thysanozoon broochi....	18 cl	9 ♀	9 ♀			Schockaert, '02 Schockaert, '05	La Cellule, 20, p. 101 La Cellule, 22, p. 1

XI. PORIFERA

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Clathrina coriacea</i>	ca. 16 collar cells					Robertson and Menehin, '10	Q. J. M. S., 55, p. 611
<i>Grantia compressa</i>	8-10 spg 8-10 oög	8-10 ♀				Dendy, '14	Q. J. M. S., 60, p. 313
<i>Sycandra raphanus</i>	32 cl			16 ♀		Maas, '99	Anat. Anz., 16, p. 290
<i>Sycandra raphanus</i>	8 oög 16 cl	8 ♀	8 ♀	8 ♀		Jørgensen, '09	Arch. Zellf., 4, p. 163

XII. ROTIFERA

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Hydatina senta</i>		10 or 12 ♀ egg 5♂ pa egg 12 winter egg			No. p. b.'s 1 p. b. Prob. 2 p. b.'s	Lessens, '98 Lessens, '98	La Cellule, 14, p. 419 Zool. Anz., 21, p. 617
<i>Hydatina senta</i>		22-25 ♀ pa egg 11-13 ♂ pa egg 14 winter egg (fert)			1 p. b. 2 p. b.'s 2 p. b.'s	Whitney, '09	J. Exp. Zool., 6, p. 137

B. PROTOCHORDATA

I. ACRANIA (CEPHALOCHORDA)

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Amphioxus lanceolatus</i> ...			10? ♀		1 count	Van der Stricht, 95	Bull. Acad. roy. Bel- gique, Ser. 3, t. 30, p. 539. Same as Arch. Biol., 14, p. 469
<i>Amphioxus lanceolatus</i> ...	24 cl	12? ♀	10-15 ♀ (prob. 12)			Van der Stricht, 96	Arch. mikr. Anat., 50, p. 15
<i>Amphioxus lanceolatus</i> ...	24 oög	12 ♀	12 ♀	12 ♀		Sobotta, '97 Cerfontaine, '05 Cerfontaine, '05	Acad. roy. Belgique, Cl. de Science, '05, p. 643. Same as Arch. Biol., 22, p. 229

II. UROCHORDA

<i>Ascidia mentula</i>		9 ♀				Boveri, '90	Jen. Zeits., 17, p. 314 (Zellen-Studien III)
<i>Ciona intestinalis</i>	18 cl				9♂♂ pron 9♀♀ pron	Boveri, '90	Jen. Zeits., 17, p. 314 (Zellen-Studien III)
<i>Distalpia occidentalis</i>			12♀♀			Bancroft, '99	Bull. Mus. Comp. Zool. Harvard, 35, p. 57
<i>Phallusia mamillata</i>	16 cl (13-16)	8 ♀	8 ♀		8♂♂ (4-9) 8♂♂ pron (8 or 9)	Hill, '93 Hill, '95	Rep. Brit. Assoc. Adv. Sci. Ipswich, p. 474 Q. J. M. S., 38, p. 315
<i>Styelopsis grossularia</i>	4 spg 4 oog	4♂♂ 8♀	2♂♂ 4♀		1♂♂ 2♀	Julin, '93	Bull. sc. Fr. et Bel- gique, 25, p. 93

C. VERTEBRATA

I. AMPHIBIA

a. ANURA

<i>Alytes obstetricans</i>	32 spg	16♂♂				Janssens, et Wil- lems, '09	La Cellule, 25, p. 151
<i>Bombinator igneus</i>		12+♀	5-7 ♀			Lebrun, '01	La Cellule, 19, p. 315
<i>Bufo calamita</i>						Bataillon, '10	Arch. Zool. exp. et gen., Ser. V, p. 6, t. 101
<i>Bufo lentiginosa</i>	24 spg 24 oog	12♂♂ 12♀	12♂♂ 12♀		12 ♀	King, '02 King, '07	Anat. Anz., 21, p. 411 Amer. Jour. Anat., 7, p. 343
<i>Bufo vulgaris</i>		8-10 ♀	8 ♀			King, '08	Jour. Morph., 19, p. 369
						Carnoy and Le- brun, '00	La Cellule, 17, p. 199
<i>Bufo vulgaris</i>	18-24 oog					Lebrun, '01	La Cellule, 19, p. 315
						Della Valle, '07	Atti R. Accad. Sc. di Napoli, Ser. 2a, no. 13, vol. 13, p. 1
<i>Bufo vulgaris</i>		8-9 ♀				Bataillon, '10	Arch. Zool. exp. et gen., Ser. V, t. 6, p. 101
<i>Pelodytes punctatus</i>		6 ♀				Bataillon, '10	Arch. Zool. exp. et gen., Ser. V, t. 6, p. 101

I. AMPHIBIA—Continued

SPECIES	DIPLOID AND PARHENO- GENETIC	1ST -CYTE	2ND -CYTE	-RID	REMARKS	OBSERVER	REFERENCE
<i>Rana catesbeiana</i>	26 oog					Swingle, '17	Biol. Bull., 33, p. 70
<i>Rana esculenta</i> "Gruener Frosch".....	24 som					Schottländer, '88	Arch. mikr. Anat., 31, p. 426
<i>Rana esculenta</i>	24 (not stated where)					Vom Rath, '95	Arch. mikr. Anat., 46, p. 168
<i>Rana esculenta</i>	16 spg					Champy, '13	Arch. Zool. exp. et gen. 52, p. 13
<i>Rana esculenta</i>	ca. 25 spg	13♂	12, 13♂	12, 13♂	X to pole in 1st	Levy, '15	Arch. mikr. Anat., 86, II, p. 85
<i>Rana fusca</i> (?).....	24 spg	12♂	12♂	12♂		Vom Rath, '95	Arch. mikr. Anat., 46, p. 168
<i>Rana fusca</i>	12 pa cl	12 ♀				Bataillon, '10	Arch. Zool. exp. et gen. Ser. V, t. 6, p. 101
<i>Rana fusca</i>	20+ pa som				Regulation to nor- mal no.	Brachet, '11	Arch. Biol., 26, p. 337.
<i>Rana pipiens</i>	25 spg 26 oog	13♂	12, 13♂		X to pole in 1st	Swingle, '17	Biol. Bull., 33, p. 70
<i>Rana temporaria</i>		8♂				Bertacchini, '96	Inter. Monats., 13, p. 409
<i>Rana temporaria</i>		8-10 ♀	10 ♀			Carnoy et Le- brun, '00	La Cellule, 17, p. 199
<i>Rana temporaria</i> (or <i>fusca</i>).....	24 cl ca. 12 pa cl					Lebrun, '01	La Cellule, 19, p. 315
<i>Rana</i> "Frosch".....	16 som				Leucocytes	Levy, '13	Arch. mikr. Anat., 82, II, p. 65
"Grenouille".....	12 (pairs) som 6 pa som			6♂ 6 ♀		Dekhuyzen, '91	Anat. Anz., 6, p. 220
"Leopard frog".....	20+ pa spg				Adult pa frog. Ob- servation of Gold- schmidt	Dehorne, '10 Dehorne, '11 Loeb, '18	C. R. Acad. Sc. Paris, 150, p. 1451 C. R. Acad. Sc. Paris, 152, p. 1123 Proc. Nat. Acad. Sc., 4, p. 60

b. URODELA

<i>Amblystoma</i> 'Siredon'.....	12 cl	4-10 ♀ (prob. 8)	8 ♀			Kölliker, '89	"Geweblehre des Menschen"
'Axolotl'.....	ca. 16 cl	15 ♀ (14-16)	15 ♀ (14-16)			Fick, '93	Zeit. wiss. Zool., 56, p. 329
'Axolotl'.....	ca. 30 cl					Jenkinson, '04	Q. J. M. S., 48, p. 407
'Siredon (Amblystoma)'.....	24 som					Muckermann, '13	La Cellule, 28, p. 231
<i>Amblystoma</i>	24 som					Mack, '14	Kansas Univ. Sc. Bull. 9, p. 119
<i>Amphiuma</i>		12 ♂	12 ♂	12 ♂		McGregor, '09	Jour. Morph., 15, Suppl. p. 56
<i>Aneides lugubris</i> (Auto-dax).....	28 spg (23-30)	14 ♂ (in 2 cases 15)				Snook and Long, '14	Univ. California Pub. II, p. 311
<i>Batrachoseps attenuatus</i>	24 spg	12 ♂	12 ♂	12 ♂		Eisen, '00	Jour. Morph., 17, p. 1
<i>Batrachoseps attenuatus</i>	24 som	12 ♂	12 ♂	12 ♂		Janssens et Du- nez, '03	La Cellule, 20, p. 419
<i>Cryptobranchus alleghe- niensis</i>		12 ♀ (prob.)				Janssens, '05	La Cellule, 22, p. 377
<i>Desmognathus fuscus</i>		12 ♂	12 ♂	12 ♂		Smith, '12	Jour. Morph., 23, p. 61
<i>Desmognathus fuscus</i>						Kingsbury, '99	Zool. Bull., 2, p. 203
<i>Desmognathus fuscus</i>						Kingsbury, '02	Amer. Jour. Anat., 1, p. 99
<i>Desmognathus fuscus</i>	24 spg	12 ♂	12 ♂	12 ♂		Montgomery, '03	Biol. Bull., 4, p. 259
<i>Diemyctilus torosus</i>		12 ♀ (10-12)	10-12 ♀			Lebrun, '02	Biol. Bull. 3, p. 1
<i>Geotriton fuscus</i>	24 spg	12 ♂	12 ♂	12 ♂		Lebrun, '02	La Cellule, 20, p. 1
						Terni, '10	Monit. Zool. Ital., 21, p. 169
						Terni, '11	Arch. ital. Anat. e Emb., 10, p. 1
						Terni, '14	Arch. Zellf., 12, p. 1

I. AMPHIBIA—Continued

SPECIES	DIPLOID AND PARTHENO- GENIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Molge pyrrhogastra</i>	24 spg	12♂			X or XY attached to another chrom. to pole in 1st. Free or attached in 2nd. Detached pieces from chroms = super-numerary, equally distributed in 1st	Muckermann, '13 King, '12	La Cellule, 38, p. 231 Anat. Record., 6, p. 405
<i>Necturus maculosus</i>							
<i>Plethodon cinereus</i>	24 spg	12♂				Montgomery, '03	Biol. Bull., 4, p. 259
<i>Salamandra atra</i>	16 spg					Champy, '13	Arch. Zool. Exp. et gen., 52, p. 13
<i>Salamandra maculosa</i>	24 som	12♂	12♂	12♂		Flemming, '82 Flemming, '82 Flemming, '87	Arch. mikr. Anat., 20, p. 1 'Zellsubstanz, Kern und Zelltheilung' Arch. mikr. Anat., 29, p. 389
<i>Salamandra maculosa</i>	24 som ca. 16 testisepi- thelium and egg fol- licle cells					Rabl, '85 Rabl, '89	Morph. Jahrb., 10, p. 214 Anat. Anz., 4, p. 21
<i>Salamandra maculosa</i>	12 (double) spg 12 (double) oog 24 som (some- times 12 double)	1♂ (=48 el)	12♂ (=24 el)	12♂	Tetrads and dyads = separate elements	Vom Rath, '93 Vom Rath, '94	Zeit. wiss. Zool., 57, p. 97 Biol. Centralb., 14, p. 449
<i>Salamandra maculosa</i>	24 spg 24 oog 24 som	12♂	12♂			Meves, '95 Meves, '97 Meves, '11	Anat. Anz., 10, p. 635 Arch. mikr. Anat., 48, p. 1 Arch. mikr. Anat. 77, II, p. 273

<i>Salamandra maculosa</i> . . .	24 spg	12♂ 12♀	12♂ 12♀	Janssens, '00 Janssens, '01 Janssens, '02 Janssens, '04 Schreiner, '07 Della Valle, '09 Della Valle, '11 Dehorne, '10 Dehorne, '11 Champy, '13 Muckermann, '13 Von Erlanger, '96	Anat. Anz., 17, p. 520 La Cellule, 19, p. 5 Anat. Anz., 21, p. 129 Anat. Anz., 24, p. 648 Arch. Biol., 22, p. 419 Archivio Zoologico, 4, p. 1 Archivio Zoologico, 5, p. 119 C. R. Acad. Sc. Paris, 150, p. 1451 Arch. Zellf., 6, p. 613 Arch. Zool. exp. et gen., 52, p. 13 La Cellule, 28, p. 231 Zool. Anz., 19, p. 401
<i>Salamandra maculosa</i> . . .	24 spg	12♂	12♂		
<i>Salamandra maculosa</i> . . .	4-43 blood cells 19-27 larval peritoneum			12♂	
<i>Salamandra maculosa</i> . . .	12 (pairs) spg 12 (pairs) som				
<i>Salamandra maculosa</i> . . .	16 spg				
<i>Salamandra maculosa</i> . . .	24 spg 24 som				
'Salamander'	24 som				
'Siredon,' see under Amblystoma					
<i>Triton alpestris</i>		12♀	12♀	Carnoy et Lebrun, '99 Lebrun, '01	La Cellule, 16, p. 203 La Cellule, 19, p. 315
<i>Triton alpestris</i>	24 spg	12♂ 12♀	12♂ 12♀	Janssens, '00 Janssens, '01 Janssens, '02 Janssens, '04 Champy, '13	Anat. Anz., 17, p. 520 La Cellule, 19, p. 5 Anat. Anz., 21, p. 129 Anat. Anz., 24, p. 648 Arch. Zool. exp. et gen., 52, p. 13
<i>Triton alpestris</i>	18-24 spg				
<i>Triton cristatus</i>		12♀	12♀	Carnoy et Lebrun, '99	La Cellule, 16, p. 203
<i>Triton cristatus</i>	24 spg	12♂ 12♀	12♂ 12♀	Janssens, '00 Janssens, '01 Janssens, '02 Janssens, '04 Jolly '04	Anat. Anz., 17, p. 520 La Cellule, 19, p. 5 Anat. Anz., 21, p. 129 Anat. Anz., 24, p. 648 Arch. d'Anat. micros., 6, p. 455
<i>Triton cristatus</i>	24 som 12 regenerating blood cells				

I. AMPHIBIA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TUD	REMARKS	OBSERVER	REFERENCE
<i>Triton cristatus</i>	18-24 spg					Champy, '13	Arch. Zool. exp. et gen. 52, p. 13
<i>Triton cristatus</i>	24 spg	12♂	12♂			Meek, '13	Phil. Trans. Roy. Soc. London, 203B, p. 1
<i>Triton palmatus</i>	18-24 spg					Champy, '13	Arch. Zool. exp. et gen. 52, p. 13
<i>Triton punctatus</i>	ca. 12-16 som					Retzius, '81	Biol. Untersuchungen, '81, p. 109
<i>Triton punctatus</i>	24 spg	12♂ 12♀	12♂ 12♀			Janssens, '00 Janssens, '01 Janssens, '02 Janssens, '04	Anat. Anz., 17, p. 520 La Cellule, 19, p. 5 Anat. Anz., 21, p. 129 Anat. Anz., 24, p. 648
<i>Triton taeniatus</i>		12-14 ♀				Born, '94	Arch. mikr. Anat., 43, p. 1
<i>Triton taeniatus</i>		12 ♀	12 ♀			Carnoy et Le- brun, '99	La Cellule, 16, p. 203
<i>Triton vulgaris</i>	18-24 spg					Champy, '13	Arch. Zool. exp. et gen. 52, p. 13
<i>Triton vulgaris</i>	12 pa som				Sperm destroyed with radium	Hertwig, O., '13	Arch. mikr. Anat., 82 II, p. 1
<i>Triton</i>	20 + som (prob. 24)					Rabl, '85	Morph. Jahrb., 10, p. 214
<i>Triton sp.</i>	24 spg	12 (gemini)♂				Moore and Em- bleton, '05 Moore and Ar- nold, '05	Proc. Roy. Soc., Lon- don, 77, p. 535 Proc. Roy. Soc., Lon- don, 77, p. 593

II. AVES
a. ANSERES

<i>Anas boschas</i> <i>Aythya ferina</i> <i>Carina moschata</i> <i>Lamprocyba sponsa</i> <i>Mareca penelope</i>	ca. 16 spg.	8♂	8♂		Schöneberg, '13	Arch. mikr. Anat., 83, Abt. II, p. 324
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b. COLUMBAE

Columba livia domestica	16 spg	8♂	4♂ (occasionally 8)	8 sperm nuclei	Second pairing of chroms before 2nd div.	Guyer, '00 Guyer, '02	Dissertation Univ Chicago Univ. Cincinnati Bull. 21, Ser. II, vol. II, p. 1
Columba livia domestica	16 cl	8♀	8♀	8♀		Harper, '04	Amer. Jour. Anat., 3, p. 349
Columba 'Pigeon'.....	ca. 16 spg	8♂	4♂	4♂		Smith, '12	Q. J. M. S., 58, p. 159
Turtur risorius.....	16 spg	8♂	4 (occas. 8) ♂		Second pairing of chroms before 2nd div.	Guyer, '00 Guyer, '02	Dissertation Univ Chicago Univ. Cincinnati Bull. 21, Ser. II, vol. II, p. 1

c. GALLINAE

Gallus domesticus.....	8♂ ♀	8♂ ♀	4, 5♂ (fusion in pairs, may be incomplete giving 6, 7, etc.)	4, 5♂. Those with 4 prob. degenerate	X to pole in 1st. X=2 elements in spg and ♂ som; X=1 element in oog and ♀ som. From correction in '16	Loyez, '06	Arch. d'Anat. micros. 8, p. 239
Gallus 'Huhn'.....	8-16 (pairs) ♀ (prob. 12)	9♂				Sonnenbrodt, '08	Arch. mikr. Anat., 72, p. 415
Gallus gallus domesticus (= common fowl; Langshan, Plymouth Rock, Rhode Is. Red, and chick embryos)	18 spg 18♂ som					Guyer, '09 Guyer, '16	Anat. Anz., 34, p. 573 Biol. Bull., 31, p. 221
Gallus domesticus.....	12♀ pa cl 12 som				Prob. no reduction	Lecaillon, '10 Lecaillon, '10	C. R. Soc. Biol., 69, p. 34 Arch. d'anat. micros., 12, p. 511
Gallus 'Gold Campine fowl'...	18-20 spg	8-10♂			Clumping in 2nd spc.	Cutler, '18	Jour. Genetics, 7, p. 155
Numida meleagris dom. (= domestic guinea)....	17 spg	9♂	8, 9♂	4, 5♂ (bivalent) (few with 6)	X to pole in 1st. Second pairing of chroms before 2nd div.	Guyer, '09	Anat. Anz., 34, p. 502
Phasianus 'Pheasant'.....	20-22 spg	10-11 ♂	5-6♂		Secondary pairing and fusion in 2nd div., forming 1-8 masses	Cutler, '18	Jour. Genetics, 7, p. 15

III. MAMMALIA

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>a. CARNIVORA</i>							
<i>1. Canidae</i>							
Canis.....	64? som (8, multiple, in some cells)					Vom Rath, '94	Biol. Centralb., 14, p 449
Canis Dog.....	21 spg 22? som	11♂	10, 11♂	10, 11♂	X to pole in 1st	Malone, '18	Trans. Amer. Micr. Soc., 37, p. 97
<i>2. Felidae</i>							
Felis 'Chat'.....	35 spg 36 oog (24-43) 36 som	18♂ 12♀ ('09)	17, 18♂	17, 18♂	1 heterochrom in ♂ to pole in 1st; 2 heterochrom in ♀	Von Winwartet Sainmont, '09 Von Winwartet, '14	Arch. Biol., 24, p. 165 Arch. Roy. Belgique. Bull. Cl. Sc., no. 4 p. 221
'Chatte'.....		12♀ (at least)				R. Vander Stricht, '11	Arch. Biol., 26, p. 365
'Cat, domestic'.....		14-17♀	14-16♀			Longley, '11	Amer. Jour. Anat., 12, p 139
<i>3. Viverridae</i>							
Herpestes 'Mongoose'.....		ca. 24♂			No X	Jordan, '14	Carneg. Inst. Pub., 182, p. 165
<i>b. Chiroptera</i>							
Rhinolophus hipposid- eros.....		16♀	16♀			Athias, '12	Arch. R. Inst. Bacter. Cam. Pest. Lisbonne, 3, p. 287
Vesperugo noctula.....		9-10♀	9-10♀			Van der Stricht, '10	Acad. Roy. Belgique. Cl. d. Sc. Mem. Ser. 2, t. 2, no. 2, p. 1

Vesperugo 'Bat'.....	24 spg (at least)	15-22 ♀	18-24 ♀	'Heterochromosomes?'	Jordan, '12 Athias, '12	Anat. Anz., 40, p. 513 Arch. R. Inst. Bacter. Cam. Pest. Lisbonne, 3, p. 287
Vesperugo serotinus.....						
c. EDENTATA						
Tatu novemcinctum (= 9-banded Armadillo)...	31? spg 32 oog	16 ♀ (14-19)		X ? in ♂	Newman and Paterson, '10 Newman, '12	Jour. Morph., 21, p. 359 Biol. Bull., 23, p. 100
d. MARSUPIALIA						
Didelphys aurita.....		12? ♀	12? ♀		Hill, '18	Q. J. M. S., 63, p. 91
Didelphys virginiana (= Opessum).....	17 spg 17 som	9 ♂	4, 5 ♂ (=8, 9, univalents)	X to pole in 1st. Second pairing of chroms after 1st div.	Jordan, '11	Arch. Zellf., 7, p. 41
Marsupialia 'Deuteltiere'.....			4 (often) ♂		Von Bardeleben, '98 Benda, '06	Jen. Zeits., 24, p. 475 Semon Zool. Forsch. Australia u. Malay Archipel., p. 439
Peraneles.....						
Phaengsta.....		8 ♂				
e. MONOTREMATA						
Echidna.....		8-12 ♂			Benda, '06	Semon Zool. Forsch. Australia u. Malay Archipel., p. 415
Ornithorhynchus.....						
f. PRIMATES						
Homo sapiens 'Mensch'.....	22-28 som (prob. 24)			Cornea	Flemming, '32 Flemming, '38	Arch. mikr. Anat., 20, p. 1 Anat. Anz., 14, p. 171
'Mensch'.....	18-40 som			'Normal tissue'	Hansemann, '91	Virch. Arch., 123, p. 356

III. MAMMALIA—Continued

SPECIES	DIPLOID AND PARACHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Homo sapiens</i> —continued							
'Mensch'.....	8 spg (= 16 el)	8♂	4♂	4♂	3 men, 21, 23 and 46 yrs. old	Von Bardeleben, '92 Von Bardeleben, '97 Von Bardeleben, '98	Verh. Anat. Gesel. Wien, p. 202 Arch. Anat. u. Phys. (Anat. Abt) Suppl., p. 193 Jen. Zeits., 24, p. 475
'Man'.....		18♂ (15-49)			Man 54 yrs. old	Wilcox, '00	Anat. Anz., 17, p. 316
'Mensch'.....	32?				Material not described	Fick, '05	Arch. Anat. u. Physiol. (Anat. Abt) Suppl., p. 179
'Man (Homo)'.....	32 spg	16♂ (gemini)				Moore and Arnold, '05 Moore and Walker, '06	Proc. Roy. Soc. London, 77B, p. 563 Univ. Liverpool Reports, 196, p. 1
'L'homme'.....	ca. 24 spg	12♂			Material not described	Duesberg, '06	Anat. Anz., 28, p. 475
'Man'.....	22 spg	12♂, few have 14	5, 7♂ (= 10, 12 univalents)	5, 7♂ (= 10, 12 univalents)	Negro 30 yrs. old 2 X to pole in 1st. Second pairing of chroms after 1st div.	Guyer, '10	Biol. Bull., 19, p. 219
'L'homme'.....	24 som	ca. 12♂	ca. 18 + 3♂			Branca, '10 Branca, '11 Branca, '12	C. R. Assoc. Anat., 12, p. 5 Bibl. Anat., 21, p. 233 C. R. Assoc. Anat.
'Mensch'.....		ca. 12♂			Man 23 yrs. old. No X chrom	Gutherz, '12	Arch. mikr. Anat., 79, (2), p. 79
'L'homme'.....	47 spg (46-49) 48 oög	24♂ (23-25)	23, 24♂	23, 24♂	♂ count from 4 men 21, 23, 25, 41 yrs. old. ♀ count from 4 mo. embryo. X to pole in 1st	Von Winiwarter, '12	Arch. Biol., 27, p. 91
'Man'.....		12♂	10, 11 or 12♂	10, 11 or 12♂	2 X to pole in 1st or 2nd. Each divides once. Negro aged 50	Montgomery, '12	Jour. Acad. Nat. Sc., Phila., 15, p. 1

'Man'.....	24 spg. 33-38 som, mostly 34	12♂	12♂	12♂	12♂	From 9 mm. embryo, also negro and white (age 37) adults. XY to poles in 2nd	Wieman, '13 Wieman, '17 Jordan, '14	Amer. Jour. Anat., 14, p. 461 Amer. Jour. Anat., 21, p. 1 Carneg. Inst. Pub. 132, p. 165
<i>o. RODENTIA</i>								
Cavia 'Meerschweinchen'.....	16 spg				8♂		Von Bardeleben, '92	Verh. Anat. Gesell., '92, p. 202
'Meerschweinchen'.....	Prob. 24 som						Flemming, '98	Anat. Anz., 14, p. 171
'Guinea-pig'.....	32 spg	16♂ (gemini)	16♂				Moore and Walker, '06	Liverpool Univ. Rep., '06, p. 1
'Guinea-pig'.....	56? spg	28♂	24-28 ♀	24? ♀		XY to poles in 1st	Stevens, '11	Biol. Bull., 21, p. 155
Cavia porcellus.....							Athias, '12	Arch. R. Inst. Bacter. Cam. Pest. Lisbonne, 3, p. 287
'Cobaye'.....	16 som	8 ♀	8 ♀	16 (10-16) ♀	8 ♀		Lams, '13	Arch. Biol., 28, p. 229
Elionys quercinus.....		16 ♀					Athias, '09 Athias, '12	Anat. Anz., 34, p. 1 Arch. R. Inst. Bacter. Cam. Pest. Lisbonne, 3, p. 287
Lepus 'Kaninchen'.....	24? som						Flemming, '98	Anat. Anz., 14, p. 171
'Lapin'.....	41-43 oeg 36-46 som (mostly 42)	10-12 ♀ (from Honoré)					Von Winiwarter, '00 Von Winiwarter, '01	Arch. Biol., 16, p. 685 Arch. Biol., 17, p. 33
'Rabbit'.....	28-36 spg	14-18♂					Barrat, '07	Proc. Roy. Soc. London, 79B, p. 372
'Rabbit'.....	22 spg	12♂ (=11)	11♂			XY to poles in 1st. XY sometimes double in 1st	Bachhauber, '16	Biol. Bull., 30, p. 294
Microtus incertus.....		28-34 ♀	28-34 ♀				Athias, '12	Arch. R. Inst. Bacter. Cam. Pest. Lisbonne, 3, p. 287

III. MAMMALIA—Continued

SPECIES	DIPLOID AND PARHENO- GENETIC	1ST -CITE	2ND -CITE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Mus decumanus</i> (see also 'Rat'.....)	32 spg	16♂ (gemini)			Earlier accounts of Moore corrected in '05	Moore, '93 Moore, '94 Moore and Arnold, '05 Moore and Walker, '06 Lenhossék, '98	Anat. Anz., 8, p. 683 Intern. Monatschr., 11, p. 129 Proc. Roy. Soc., London, 77B, p. 563 Univ. Liverpool Reports, '06, p. 1 Arch. mikr. Anat., 51, p. 215
'Ratte'.....		12♂ (8-12)				Von Ebner, '99 Von Ebner, '02	Sitz. Ber. d. k. Akad. Wissen. Wien, 108 (3), p. 429 Kölliker's 'Geweblehre des Menschen,' III
'Wanderratte'.....	167 spg	8♂	8♂ (8-16)			Regaud, '01 Regaud, '01 Regaud, '09	C. R. Soc. Biol., 53, p. 406 Arch. d'Anat. micros., 4, p. 231 Arch. d'Anat. micros., 11, p. 291
'Rat'.....	20-30 spg	ca. 12♂				Duesberg, '08 Sobotta u. Burkhart, '10 Van Hoof, '11	Arch. Zellf., 1, p. 399 Anat. Hefte, 42, p. 433 La Cellule, 27, p. 289
'Mus decumanus var. albinos'.....	24 som (prob)	12♂ (prob) 16♀ (10-20)	12♂ (prob) '16? ♀ (8-16)			Tafani, '89	Atti R. Accad. Lincei, Rendiconto, Ser. 4, vol. 5, p. 119 (also in Pub. Inst. St. sup. Firenze, Med-chirurg.-Arch. Anat. norm. e path., 5, p. 1
'Weisse Ratte'.....	More than 24 spg	16♂	Prob. 16♂			Hermann, '89	Arch. mikr. Anat., 34, p. 53
<i>Mus musculus</i> 'Mus musculus, var. blanche et noire'.....	207 cl	20♀	20♀				
'Maus'.....		16♂					

'Grau Maus'.....	24? oog	6 groups of 4 ♀		Earlier accounts corrected in '07	Holl, '93 Holl, '93	Verh. Anat. Gesell. Göttingen, '93, p. 122 Sitz. Ber. d. k. Akad. Wiss. Wien, 102 (3), p. 249
'Maus, weisse, grau und Tanz'.....	30+cl	16 ♀ (10-19)	16? ♀		Sobotta, '93 Sobotta, '95 Sobotta, '07 Sobotta, '08	Verh. Anat. Gesell. Göttingen, '93, p. 111 Arch. mikr. Anat., 45, p. 15 Anat. Hefte, 35, p. 493 Verh. phys.-med. Gesell. Würzburg, 39, p. 241
'Souris blanche'.....	12 spg (10-12)	12 ♂ (double). Some cells 16 (double)	12 ♂ (single). Some cells 16	6 ♂. Some cells 8	Lukianow, '98	Arch. So. Biol. St. Petersburg, 6, p. 285
'Mouse'.....	24 spg				Moore and Arnold, '05 Moore and Walker et '06 Gerlach, '06	Proc. Roy. Soc. London, 77B, p. 563 Univ. Liverpool Reports, '06, p. 1 'Über die Bildung der Richtungskörper bei Mus musculus', Wiesbaden
'Mus musculus'.....		12 ♀	12 ♀		Lams et Doorme, '07 Melissinos, '07	Arch. Biol., 23, p. 259 Arch. mikr. Anat., 70, p. 577
'Mus musculus=souris blanche'.....		12 ♀ (12-15)	12 ♀	12 ♀	Coe and Kirkham, '07 Kirkham, '08	Science, 25, p. 778 Biol. Bull., 12, p. 259 Trans. Connecticut Acad. Arts and Sc., 13, p. 65
'Mus musculus var. alba'.....		8 ♀	8 ♀		Long, '08 Long and Mark, '11 Kingery '14	Science, 27, p. 443 Carnegie Institute Publ., 142, p. 1 Biol. Bul., 21, p. 240
'White mouse'.....		12 ♀ (12-24 due to precocious division)	12 ♀ (=24 unit)	12 ♀	Yocum, '17	Univ. California Pub., 16, p. 371
'Mouse, white, black and hybrid whiteX gray'.....		20 ♀	20 ♀	20 ♀		
'White mouse'.....		12-24 ♀	12-30 ♀			
'House mouse'.....		20 ♂	20 ♂	19, 20 ♂		

III. MAMMALIA—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1ST-CYTE	2ND-CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Mus norvegicus albinus</i> (=white rat).....	40 (pachytene threads of oocyte)	19♂	18, 19♂			Pratt and Long, '17	Jour. Morph., 20, p. 441
<i>Mus norvegicus albinus</i> ..	37 spg 37♂ som				X to pole in 1st	Allen, '18	Jour. Morph., 31, p. 133
<i>Mus rattus</i> , see also <i>Mus</i> <i>decumanus</i>							
' <i>Mus rattus albus</i> '.....		8 ♀	8 ♀			Melissinos, '07	Arch. mikr. Anat., 70, p. 577
' <i>Mus rattus albinus</i> '....	More than 24 spg	16♂	Prob. 16♂			Van Hoof, '11	La Cellule, 27, p. 289
<i>Sciurus</i> ' <i>Heureuil</i> '.....	24 + som	ca. 16♂				Van Mollé, '07	La Cellule, 24, p. 257
h. UNGULATA							
<i>Bos</i> ' <i>Stier</i> '.....	16 spg			8♂		Van Bardeleben, '82	Verh. Anat. Gesell., '92, p. 202
' <i>Taureau</i> '.....	24 spg (20-25)	12♂	12♂			Schoenfeld, '02	Arch. Biol., 18, p. 1
' <i>Taureau</i> '.....	Prob. 24 spg (20-24)	12♂				Van Hoof, '13	La Cellule, 30, p. 7
<i>Equus</i> ' <i>Pierde</i> '.....		10-16♂				Kirillow, '12	Arch. mikr. Anat., 79, II, p. 125
' <i>Horse</i> '.....	37 spg	19♂	9, 10♂ (quad- rivalent)	9, 10♂ (biva- lent)	X to pole in 1st. Chroms pair in tel- ophase of 1st div.	Wodsedalek, '14	Biol. Bull., 27, p. 295
' <i>Mule</i> '.....	51 spg	34-49♂ (mostly 40- 45) some univalent			X. Cells disinte- grate, no 2nd spc	Wodsedalek, '16	Biol. Bull., 30, p. 1-38

<i>Sus 'Pig'</i>	18 spg 18 som ♂ 20 oeg 20 som ♀, sometimes 10 by pair- ing	10♂	8, 10♂	4, 6♂ (auto- somes biva- lent)	2 X to pole in 1st	Wodsdalek, '13 Wodsdalek, '13	Science, 38, p. 30 Biol. Bul., 25, p. 8
<i>Sus scrofa</i>	40 spg (1 giant cell 74) 40-58 som (1 cell 74)	20♂			Variation in no. due to fragmentation	Hance, '17 Hance, '18	Jour. Morph., 30, p. 155 Biol. Bull., 35, p. 33

IV. PISCES							
a. CYCLOSTOMATA							
<i>Bdellostoma burgeri</i>	48? spg					Schreiner, '08	Arch. Zellf., 1, p. 152
<i>Myxine glutinosa</i>	ca. 50 som					Retzius, '90	Verh. d. biol. Vereins Stockholm, 2, p. 80
<i>Myxine glutinosa</i>	ca. 52 spg ca. 52 som	26♂ (possibly 27)	26♂			Schreiner, '04 Schreiner, '04	Anat. Anz., 24, p. 561 Arch. Biol., 21, p. 183

b. DIPNOI							
<i>Lepidosiren paradoxa</i>	Prob. 38 som (34-37)					Murray, '06	Anat. Anz., 28, p. 203
<i>Lepidosiren paradoxa</i>	38 som	19♂ gemini				Agar, '11 Agar, '12	Q. J. M. S., 57, p. 1 Q. J. M. S., 58, p. 285

c. ELASMOBRANCHII							
<i>Pristiurus melanostomus</i>		30-50 ♀	ca. 18 ♀	ca. 18 ♀		Kastschenko, '90	Zeit. wiss. Zool., 50, p. 428
<i>Pristiurus</i>	ca. 36 spg 30-36 oeg 30-36 som	ca. 18 ♀	ca. 18 ♀	ca. 18 ♀		Ruckert, '92	Anat. Anz., 7, p. 107
<i>Pristiurus</i> <i>Raja macrorhynchus</i> <i>Raja maculata</i>	24 spg	12♂	12♂	12♂		Moore, '95 Farner and Moore, '04	Q. J. M. S., 38, p. 275 Q. J. M. S., 43, p. 489
<i>Scyllium canicula</i>		30-50 ♀				Kastschenko, '90	Zeit. wiss. Zool., 50, p. 428

IV. PISCES—Continued

SPECIES	DIPLOID AND PARTHENO- GENETIC	1st -CYTE	2ND -CYTE	-TUD	REMARKS	OBSERVER	REFERENCE
<i>Scyllium canicula</i> <i>catulus</i>	24 spg	12♂	12♂	12♂		Moore, '94 Moore, '95 Farmer and Moore, '04	Anat. Anz., 9, p. 547 Q. J. M. S., 38, p. 275 Q. J. M. S., 48, p. 489
<i>Scyllium canicula</i>		20-24♂	14-16♂			Rawitz, '99	Arch. mikr. Anat., 53, p. 19
<i>Scyllium canicula</i>		17-19♀				Cerruti, '08	Atti real. Accad. Sc. fis. e math., Napoli, II a, vol. 13
<i>Spinax niger</i>	60-70 spg	30-50♀				Schreiner, '07	Arch. Biol. 22, p. 419
<i>Torpedo ocellata</i>						Kastschenko, '90	Zeit. wiss. Zool., 50, p. 428
<i>Torpedo</i>	24 spg	12♂	12♂	12♂		Moore, '95 Farmer and Moore, '04	Q. J. M. S., 38, p. 275 Q. J. M. S., 48, p. 489
<i>d. TELEOSTII</i>							
<i>Ctenolebrus adpersus</i>	38-48 cl					Pinney, '18	Jour. Morph., 31, p. 225
<i>Fundulus heteroclitus</i>	36 cl					Moenkhaus, '04	Amer. Jour. Anat., 3, p. 29
<i>Fundulus heteroclitus</i>	45 cl					Pinney, '18	Jour. Morph., 31, p. 225
<i>Menidia notata</i>	36 cl					Moenkhaus, '04	Amer. Jour. Anat., 3, p. 29
<i>Salmo fario</i> (= 'Forelle')		ca. 12♀	ca. 12♀	ca. 12♀		Böhm, '91	Sitz. Gesel. Morph. u. Physiol. München, 7, p. 63
'Forelle'	12 cl (prob.)				Sperm treated with radium. Not pa	Oppermann, '13	Arch. mikr. Anat., 83, Abt II, p. 307
<i>Trutta fario</i> (= 'Forelle')	24 cl	12♀	12♀	12♀		Behrens, '98	Anat. Hefte, 10, p. 227
<i>Trutta lacustris</i>		At least 24♀	At least 24♀			Blanc, '94	Ber. Naturf. Gesel. Freiburg, 8, p. 163 (= Festschr. Weismann)

V. REPTILIA
a. CHELONIA

SPECIES	DIPLOID AND PARHENO- GENETIC	1ST -CYTE	2ND -CYTE	-TID	REMARKS	OBSERVER	REFERENCE
<i>Chrysemis marginata</i> . . .		17♂			X to pole in 1st	Jordan, '14	Science, 39, p. 438
<i>Cistudo carolina</i>		16♂				Jordan, '14	Science, 39, p. 438

b. LACERTILIA

<i>Anguis fragilis</i> 'Orvet'		12 ♀				Loyez, '05	Arch. de l'Anat. mikr., 8, p. 69
<i>Anguis fragilis</i>	36? som	18? ♀				Trinci, '03	Mem. R. Accad. Sc. Bologn. Ser. VI, vol. 5, p. 167
<i>Lacerta agilis</i>	Prob. 24 spg (20-28)	Prob. 12♂ (10-15)				Tellyesniczky, '97	Math. u. Naturw. Ber. Hungarn, 13, p. 303
<i>Lacerta stirpium</i>	24 oog	8-12 ♀				Loyez, '05	Arch. de l'Anat. mikr., 8, p. 69

III. HISTORICAL AND CRITICAL

The first attempt to count chromosomes in the Metazoa was made in 1878 by Selenka, in his "Befruchtung des Eies von Toxopneustes." He gave the number in the cleavage cells as varying between 14 and 24, a rather wide range and not very close to the mark (36). Retzius² in 1881 gave the number for Triton punctatus as between 12 and 16 in the somatic cells, also somewhat far from correct (24). The next observation, by Flemming³ on the salamander in 1882, was accurate and correct, and to him therefore belongs the credit of establishing a definite number of chromosomes for a definite species. He was also the first to attempt a count on human cells, given in the same publication. Very shortly after this, Strassburger,⁴ '82, gave definite and correct numbers for several species of plants. Then came three papers giving the chromosome numbers in Ascaris, Anton Schneider's 'Das Ei und seine Befruchtung' in 1883, Nussbaum's⁵ paper in 1884 and the very thorough and brilliant work of Van Beneden⁶ which was published in 1883, although it did not appear till April 1884. Soon after, still in the '80's, came Carnoy's and Boveri's papers on the nematodes and other works on the nematodes, molluscs and vertebrates. Since then, chromosome counts have been made by many observers on about 960 different species of animals.

Several lists of chromosome numbers have appeared previously, the first by Wilson in 'The Cell' in 1900, a partial list which included about fifty species of animals and a few plants. In 1905, Enriques⁷ gave an incomplete list of numbers in animals, expressing the different numbers in mathematical formulae, as powers of 2 and 3. Montgomery⁸ in 1906 gave a list which was supposed to be very nearly complete, but there are many omissions and a good many inaccuracies in the list. Montgomery's

² G. Retzius. 1881. Biol. Untersuchungen, p. 109.

³ W. Flemming. 1882. Arch. mikr. Anat., 20, p. 1.

⁴ E. Strasburger. 1882. Arch. mikr. Anat., 21.

⁵ M. Nussbaum. 1884. Arch. mikr. Anat., 23, p. 155.

⁶ E. Van Beneden. 1883. Arch. de Biol., 4, p. 265.

⁷ Paolo Enriques. 1905. Archivio di Fisiologia, 2, p. 258.

⁸ T. H. Montgomery. 1906 Trans. Amer. Philos. Soc., 21, p. 97-162.

general conclusion was that chromosome number should be considered as an important factor in taxonomy and that animals having widely different numbers should be placed in different genera. McClung has also been a strong advocate of the value of chromosome numbers in taxonomy. Della Valle's⁹ list in 1909 is of little value, as it is a prejudiced one, given entirely with the object of showing that chromosome numbers are inconstant and of little importance. Two comprehensive lists of chromosome numbers in plants have appeared recently, Tischler's¹⁰ and Ishikawa's¹¹ in 1916. The latter is exclusively a list of numbers, his general conclusions being reserved for a further publication. Tischler's list is accompanied by able discussions and criticisms, his general conclusion being that it is still too soon to solve any large phylogenetic problems on the basis of chromosome investigations. It may be of interest as a comparison with the work on animals to give some of his statements concerning numbers in plants. The Asco- and Basidiomycetes have very small numbers, the mosses and Gymnosperms in general small numbers, whereas the Algae, Pteridophytes and Angiosperms have species with both small and large numbers. The Magnoliaceae and Nymphaeaceae (Angiosperms) and the Ophioglossaceae, Equisitaceae and Lycopodiales (Pteridophytes) have very high numbers, although not a great many species have been studied cytologically. Finally Winge¹² in 1917 has given an additional list in plants and has concluded from that and from Tischler's list that the numbers in related species are in arithmetical progression,—e. g. the chrysanthemums with 9, 18, 27, 36, and 45,—these arising by hybridization of species with like numbers; and that in general numbers occur in factors of 2 and 3 (an idea similar to that of Enriques), the numbers 8 (2.2.2) and 12 (2.2.3) occurring most frequently.

A cursory survey of Tischler's or Ishikawa's list of numbers in plants and of my own list in animals is sufficient to show that very

⁹ P. Della Valle. 1909. *Archivio Zoologico*, 4, p. 1-177.

¹⁰ G. Tischler. 1916. *Progressus Rei Botanicae*, 5, p. 164-260.

¹¹ Mitsuharu Ishikawa. 1916. *The Botanical Magazine*, Tokyo, 30, p. 404-448.

¹² O. Winge. 1917. *C. R. Travaux du Laboratoire de Carlsberg*, 13.

closely related species may have widely different numbers, and that the numbers in related species are not usually in arithmetical ratio although occasionally they are, especially in plants. It is also apparent that numbers which are resolvable into factors of 2 and 3 are of frequent occurrence, as one would expect since nearly half of the numbers between 2 and 20 (the most frequently occurring numbers) are resolvable into these factors. However, it is equally apparent that other numbers not resolvable into these factors are also of frequent occurrence.

In using the present tabulation for any generalizations or conclusions, several facts must be taken into consideration. Many of the observations recorded are of too early a date to be of much value. Other observations are contradictory and in many cases it is impossible to judge which is correct; this is largely due to difficult material and is especially true for the mammals, where for man the number of chromosomes varies between 8 and 48 (diploid) according to different authorities.

IV. CHROMOSOME NUMBERS

In looking over the fore-going list, there can be no doubt to an unprejudiced mind that the constancy of chromosome numbers for a species is a fact, and that any variation in number for a definite species is an exception to the general rule. Such variations occur regularly in *Notonecta insulata*, *Jamaicana unicolor* and *J. subguttata*, and *Hesperotettix viridis* where two or more chromosomes may be united or separate; in species with supernumeraries (see p. 66); in cases where multiple groups occur (e. g. *Culex pipiens*, *Notonecta*, *Anasa*), and where fragmentation has taken place (e. g. *Ascaris*, pig). A few sporadic variations occur in certain species owing to the lack of conjugation of two univalents (e. g. *Lygaeus turcicus*, *Coenus delius*, *Euschistus*) and a few which have not been explained (e. g. *Trichopepla*, *Lygaeus reclinatus* which is now under investigation). When a range of numbers is given instead of one definite number, it is usually due either to the early date at which the observation was made or to difficult material rendering accurate counting impossible.

There is however a great range of numbers among the different forms of animals. As is well known, there is only one chromosome in the haploid groups of *Ascaris megalocephala univalens*; some species of *Gordius* (Nematode) also are reported as having only one chromosome in the reduced groups and *Styelopsis* (Ascidian) as having only one in the spermatid. Indeed, according to Moore, '93, there is only one chromosome in the oogonia of *Apus* (Phyllopod crustacean). Animals having only two chromosomes in the haploid groups are: *Ascaris megalocephala bivalens*, *Cyclops viridis brevispinosus*, *Pediculopsis graminum* (arachnid), *Icerya purchasi* (Homoptera), *Tetrastemma vermiculus* (Nemertean), *Vortex viridis* and *Paravortex cardii* (Rhabdocoels). At the other end of the series are: two species of *Cambarus* (Decapod), with 104 and 100 (reduced), *Artemia* (Phyllopod) with 84, *Cancer* and *Hippa* (Decapods) with 60, *Astacus* (Decapod) with about 58 and *Nyssia* (Moth) with 56. The number occurring most frequently among the forms investigated is 12; other numbers occurring very frequently are 6, 7, 8, 9, 10, 11 and 16.

There is also often a considerable range in number among different forms belonging to the same class, e. g. *Nematoidea* (1-24 reduced), *Aphidae* (3-20), *Copepoda* (2-17). The classes showing the greatest constancy are the *Acrididae* (Orthoptera) and the *Urodeles* (Amphibia). The *Diptera* and the *Nematodes* have, in general, low numbers whereas the *Decapods* and *Lepidoptera* have high numbers.

A chromosome is really a compound structure, carrying many characters or genes which are themselves the elements of heredity. However genes may arise, it is conceivable that in some cases one or more new genes may be placed in a chromosome without disturbing its integrity, the number of chromosomes in related species thus remaining the same. On the other hand such additional genes may disturb the existing complex and cause the whole mass of genes to be entirely redistributed, thus causing a change in chromosome number in nearly related species. Should a certain group of genes be placed in one chromosome in one species and in two in another, there would not be necessarily any difference in these two species. It would seem, however,

that there might be a tendency in any large group of related animals for the genes to segregate out according to some definite pattern.

If, therefore, we make a list of all the chromosome numbers which have been reported for all the species of a certain class¹³ of Metazoa, leaving out of account results which are conflicting or are too old to be accurate, we find that a certain number of chromosomes is characteristic of that class; that is, there are considerably more species having that number of chromosomes than any other number. This I will call the 'type number.' The type number of a class of animals is the most frequently occurring number and may be considered tentatively as the fundamental chromosome group. One or more chromosomes of this group or of a group derived from it may split into two (or more) parts, or they may fuse, thus causing the differences in number which occur in related forms. Whether the double groups which occur in closely related forms in many plants (e. g. *Oenothera gigas* and *O. lamarckiana*, *Drosera longifolia* and *D. rotundifolia*, *Spiranthes cernua* and *S. gracilis* etc.) and in some animals (e. g. the bivalens and univalens varieties of *Ascaris megaloccephala*, *Helix pomatia*, *Echinus microtuberculatus*, *Artemia salina*; *Cyclops viridis* and *C. gracilis*, *Anopheles* sp? and *Anopheles punctipennis* etc.) are derived in all cases by a splitting of all the chromosomes of the simple group, it is difficult to say. It may be, as suggested by Gates and supported by Strassburger that the double groups are derived in some cases at least, by a failure of cell division after the division of the chromosomes. A slight change in number may also be obtained by the disappearance of a whole chromosome, but this must be rare. All numbers referred to hereafter are the haploid numbers, and X, when present, is counted as one chromosome, even when it consists of several elements.

The type number for the Coelenterates cannot be determined yet, as the data are too scanty and the results conflicting (e. g. *Hydra*). Possibly it is 12. For the Nematelminthes, the type

¹³ The term "class" is used loosely to include related families, orders or classes of ordinary classification.

number is 6, for the Echinoderms 18, for the Amphibia, the only class of Vertebrates satisfactory for generalizations, it is 12. For the Plathelminthes, the type number is 8, for the molluscs 16, for the Annelids 16. As one might expect in a group with so many distinct subgroups, the Arthropods have several type numbers. For the Crustacea it is 8 (the Malacostraca have higher numbers), for the Hemiptera 7, Orthoptera 12, Coleoptera 10, Diptera 6, Lepidoptera 31. It is of interest that the type numbers in the enterocoelous series are all multiples of 6 or 6, whereas those of the teloblastic series (except the tracheates) are multiples of 8 or 8. It is also of interest that the molluscs and Annelids which are so closely related have the same type number 16. The subgroups which are degenerate or highly modified (e. g. Trematodes, Acanthocephala) usually do not have the type number of their groups. The data for the insects are the fullest and the most reliable and these offer the best study of changes in chromosome numbers.

The type number for the Hemiptera is 7 (haploid), including an XY pair or an X. Other numbers occur, all of which can be attributed to the fusion or splitting of chromosomes of the type group. The two *Thyantas* have been a puzzle, owing to their likeness in form and the wide divergence in chromosome number. *Thyanta custator* has a diploid number of 16, which would mean 8 haploid including X or Y. *Thyanta calceata* has 28 in the ♀ diploid, 27 ♂ (owing to X being of two parts, Y of one), which would mean a haploid number of 14 ♀, 13 ♂. These numbers may be explained on the supposition that in *Thyanta custator* one chromosome of the type group has split in two, whereas in *Thyanta calceata* all of these have split except Y. Evidence of this splitting is given by X, which is of two parts, not always separate in *T. calceata*, each about the same size as Y and about half as large as the X in *T. custator*. This explanation may be expressed as follows:

	TYPE	THYANTA CUSTATOR	T. CALCEATA
♀	6+X	6+1+X	6+6+2X
♂	6+Y	6+1+Y	6+6+Y

The same explanation holds for the two *Banasas*, one of which, *B. dimidiata* has a haploid number of 8 (like *Thyanta custator*) and the other, *B. calva* has a haploid number of 13 (like *T. calceata*, except that X is single). *Euschistus crassus* differs from five other species of the same genus which have the type number, in having one less. A comparison of Foot and Strobbe's figures of this species with their figures of the other species would indicate that a union of two large chromosomes has taken place. That the chromosome number does change by the fusion or splitting of chromosomes is shown by the *Notonectidae*. In three species (Browne, '16) there are 13 chromosomes, including two small ones, and in two species there are 12 chromosomes including only one small one. In a sixth species, *N. insulata*, the second small chromosome may be seen attached to another chromosome in the first division of some cells, while in other cells it is free, whereas in the second division it is permanently fused with the other chromosome. The d-chromosome of *Nezara* may also represent a stage in splitting or fusion, as suggested by Wilson. The fact that the X chromosome may consist of two or more parts, as in *Syromastes*, *Phylloxera* and some *Reduvioids*, would indicate that other chromosomes whose identity is not so easily established, may also split into two or more parts.

The type number for the *Diptera* is 6, including XY which are, however, not always distinguishable. There is a decided tendency for the chromosomes to fuse, especially among the *Drosophilas*, most of which have 4 chromosomes, and the *Culicidae*, most of which have 3. In *Anopheles punctipennis*, (Stevens, '11), the X and Y are seen to be attached to another pair in the diploid groups. Metz, '16, has made a careful study of the chromosomes in the genus *Drosophila*, and has shown that many groups having a larger number of chromosomes contain rod shaped ones which are represented in groups with a smaller number by half as many V-shaped ones, two rods uniting to form a V. When the linkage groups in other species of *Drosophila* have been worked out as extensively as in *D. melanogaster*, it may be possible to establish the relation between chromo-

somes of different species and to determine whether fusion of chromosomes has actually taken place.

The Orthoptera have been carefully studied by McClung and his students, and they have found a great constancy, especially among the Acrididae. The type group for the Orthoptera is 12 including X. In *Stenobothrus* (*Chorthippus*), which has 9, Robertson has shown that three of these are really compound. In *Chortophaga*, there is a union of chromosomes in the diploid groups (McClung, '14). In two species of *Hesperotettix* (McClung, '17), X is fused with another chromosome, while in another species, *H. viridis*, it may be fused or free, and fusion may occur among other pairs, correspondingly decreasing the number of chromosomes. Also in *Mermeria bivittata* (McClung, '17) X is fused with another chromosome, while in other species it is free. Among the Locustidae, *Jamaicana* (Woolsey, '15) shows steps in change of number. Some individuals of *J. unicolor* have 31 rod-shaped chromosomes and 2 Vs. in the diploid groups; some individuals of *J. subguttata* have 33 rods and 1 V; other individuals of these two species and all of *J. flava* have all rods and a diploid number of 35. Robertson ('16) has suggested that the 2 V-shaped chromosomes of *Steiroxys* are represented by 4 rods in *Decticus*, giving a total of two more in the diploid group of the latter. An unpublished account of Mohr agrees with this in showing the two Vs in *Steiroxys* and he also shows them in *Locusta viridissima* (diploid number 29) whereas no Vs are present in several other genera whose diploid number is 31. Robertson also points out that several Vs are present in *Gryllus domesticus*, which, if counted as twice as many rods, would give the number of chromosomes in *G. assimilis*; as no figures are given of the latter, this cannot be verified.

There is therefore considerable evidence from the Orthoptera, Diptera and Hemiptera that chromosome numbers change by the splitting and fusion of chromosomes. The splitting of the sex chromosomes, which occurs in many other groups than the insects (see p. 66) indicates the probability that a similar process may take place among the other chromosomes.

Sex chromosomes in insects

SEX CHROMOSOME	GROUP	FAMILY	EXCEPTIONS	TO POLE IN	EXCEPTIONS
X	Orthoptera	Acrididae Blattidae Gryllidae Locustidae Phasmidae	Gryllotalpa; XY Forficulidae?	1st	
X	Hemiptera homoptera	Aphidae Cercopidae Fulgoridae Jassidae Membracidae	Enchenopa bi- nottata (X or XY?)	1st	Enchenopa bi- nottata (X, 2nd; or XY, 1st?)
X	Hemiptera heteroptera	Coreidae Hydrometridae Pyrrochoridae	Some Metapo- dius (XY)	2nd	Archimerus (1st)
X	Coleoptera	Elateridae Lampyridae One Carabidae Some Chryso- melidae One Silphidae		1st	Photinus, 2 sp. (2nd)
XY	Diptera	Anthomyidae Asilidae Bombyliidae Culicidae Drosophilidae Muscidae Sarcophagidae Statiomyidae Syrphidae		1st	
XY	Hemiptera heteroptera	Belostomidae Galgulidae Lygaeidae Nabidae Nepidae Notonectidae Pentatomidae Reduviidae	Oedancala (X)	2nd	Tingis (Tingiti- dae) (1st)

Sex chromosomes in insects—Continued

SEX CHROMOSOME	GROUP	FAMILY	EXCEPTIONS	TO POLE IN	EXCEPTIONS
XY	Coleoptera	Buprestidae Cerambycidae Cincindellidae Coccinellidae Lucanidae Melandryidae Meloidae Scarabaeidae Staphylinidae Tenebrionidae Some Carabidae Some Chrysomelidae One Silphidae		1st	

V. HETEROCHROMOSOMES

The most conspicuous heterochromosomes are the sex chromosomes, an unpaired X or an unequal XY pair, which occur most characteristically in certain groups of insects. As may be seen from the accompanying table, an unpaired X occurs in practically all the Orthoptera and Hemiptera homoptera and in some families of the Hemiptera heteroptera and Coleoptera; an XY occurs in practically all the Diptera and in some families of the Hemiptera heteroptera and Coleoptera. In some families of the Coleoptera, an X is found in some genera and an XY in others. The sex chromosomes undergo their differential division in the *first* maturation in the Orthoptera, Hemiptera homoptera (except Enchenopa?), Diptera and Coleoptera (except Photinus), and in the *second* maturation division in the Hemiptera heteroptera (except Archimerus and Tingis). Sex chromosomes have not been described in any Hymenoptera, and are not of general occurrence in the Lepidoptera, though here an equal XY in the ♂ has been described in several species, an XY in the ♀ in Phragmatobia and an X in the ♀ in Abraxas. Among the other Arthropods, an X

has been described in some Myriapods, most Arachnids (Araneida) and a few Copepods, but in no other Crustacea and not in *Peripatus*. Sex chromosomes have not been described in any Annelids, Coelenterates, Nemertines, Porifera, Rotifera, Protochordates or fishes and for only one Plathelminth. A few cases of their occurrence have been reported in the Echinoderms, molluscs, Amphibia, Birds, Reptiles and mammals. In the Nematodes they are of frequent occurrence. In all cases it is the ♂ which is heterozygous except in the Lepidoptera and birds and the genetic evidence agrees with the cytological. Although X and XY are typically single elements, the X consists in some cases of two or more elements closely or loosely associated. An unpaired X of two elements has been described for *Syromastes*, two species of *Phylloxera*, *Leptinotarsa*, *Agalena* (spider), *Hyalocylis* (mollusc), *Schistosomum* (Trematode), *Rhabditis*, fowl, and man and pig; an X of two elements accompanied by a single Y for *Thyanta calceata*, *Gryllotalpa borealis*, *Cincindella* and some of the Reduvioids. In other Reduvioids, *Galgalus*, *Notonecta indica* and *Ascaris incurva*, the X of an XY pair consists of three or more parts—of 8 in the last named, and in *Ascaris lumbricoides* and *A. canis*, an unpaired X consists of five and six elements respectively. A Y consisting of several elements has been described for *Phragmatobia*, and a Y of two elements in one testis of *Odontota* (Coleoptera). In a few cases the sex chromosomes are attached to another chromosome during part at least of their history: *Ascaris megalocephala*, *Leptynia*, *Dixippus*, *Hesperotettix*, *Mermeria bivittata*, *Anopheles punctipennis* and *Necturus*.

Another set of heterochromosomes are the supernumerary chromosomes, which typically accompany sex chromosomes and divide in only one division, but are distributed irrespective of X and Y; they are constant in number in an individual, but differ in different individuals of the same species. They have been found in *Metapodius*, *Euschistus variolarius*, *Banasa calva*, *Diabrotica*, *Ceuthophilus*, *Drosophila ornatipennis*, *Circotettix*, *Trimerotropis*, *Hesperotettix viridis*, *Tettigidea parvipennis*, some spiders and *Necturus*.

A third set of heterochromosomes are the m-chromosomes, small chromosomes which remain condensed in the growth period and conjugate late. These are characteristic of the coreid Hemiptera and occur in some of the Lygaeidae; they accompany an unpaired X except in *Metapodius* and *Ichnodemus* where they accompany an XY.

Finally there are those chromosomes which are normal in behavior but consist of unequal parts. To this class belong the d-chromosome of *Nezara hiliaris* and the compound chromosome of *Notonecta insulata*, which divide equally in the two divisions, and the unequal tetrads of some of the Orthoptera which divide into unequal parts in one division: *Schistocerca* (Hartmann, '13); *Acridium granulatus*, *Tettigidea parvipennis* (Robertson, '16); *Arphia*, *Dissosteira*, *Brachystola* (Carothers, '13); and *Phrynotettix* (Wenrich, '16).

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