Part One. THE SCIENCE OF EMBRYOLOGY

Chap	oter 1	
THE SCO	OPE OF EMBRYOLOGY AND ITS OPMENT AS A SCIENCE	3
1–1	Ontogenetic Development as the Subject Matter of Embryology	3
1–2	The Phases of Ontogenetic Development	4
1–3	Historical Review of the Main Trends of Thought in Embryology	7
Part Two	. GAMETOGENESIS	
Chaj	pter 2	
SPERM <i>A</i>	ATOGENESIS	19
2–1	Cells in Seminiferous Tubules	19
2-2	Meiosis	20
2–3	Differentiation of the Spermatozoa	24
Cha	pter 3	
OOGEN	ESIS	32
3–1	Growth of the Oocyte	3
3-2	Accumulation of Food Reserves in the Cytoplasm of the Oocyte	4:
3-3	Organization of the Egg Cytoplasm	5
3–4	Maturation of the Egg	6
3-5	The Egg Membranes	6

Cha	apter 4	
THE D	EVELOPING EGG AND THE ENVIRONMENT 6	;7
Part Thr	ee. FERTILIZATION AND THE BEGINNING OF EMBRYOGENESIS	
Cha	pter 5	
FERTIL	IZATION 7	5
5–1	Approach of the Spermatozoon to the Egg	5
5-2	The Reaction of the Egg 8	1
5-3	The Essence of Activation	8
5-4	Parthenogenesis	0
5-5	The Spermatozoon in the Egg Interior	2
5–6	Changes in the Organization of the Egg Cytoplasm Caused by Fertilization 96	6
Cha	pter 6	
CLEAVA	AGE	1
6–1	Peculiarities of Cell Divisions in Cleavage	1
6-2	Chemical Changes During Cleavage	4
6-3	Patterns of Cleavage 106	6
6–4	Morula and Blastula 112	4
6–5	The Nuclei of Cleavage Cells	9
6-6	Distribution of Cytoplasmic Substances of the Egg During Cleavage	
6–7	Role of the Egg Cortex	
6-8	The Morphogenetic Gradients in the Egg Cytoplasm	
6–9	Manifestation of Maternal Genes During the Early Stages of Development	
Part Four		
Chap	ter 7	
MORPHO PRIMARY	DLOGICAL ASPECTS OF GASTRULATION AND Y ORGAN FORMATION	
	Fate Maps	

	7–2	Gastrulation in Amphioxus	153
	7–3	Formation of the Primary Organ Rudiments in Amphioxus	158
	7-4	Gastrulation in Amphibians	161
	7–5	Formation of the Primary Organ	170
	7–6	Gastrulation and Formation of the Primary Organ Rudiments in Fishes	175
	7–7	Gastrulation and the Formation of the Primary Organ Rudiments in Birds	178
	Chap	oter 8	
CO	NTRO	FICATION OF EMBRYONIC PARTS AND ITS OLD DURING GASTRULATION AND PRIMARY FORMATION	189
	8-1	General Metabolism During Gastrulation	189
	8-2	Gene Activity During Gastrulation	192
	8–3	Involvement of Parental Genes in the Control of Development	194
	8-4	Determination of the Primary Organ Rudiments	197
	8-5	Spemann's Primary Organizer	202
	8-6	Analysis of the Nature of Induction	208
	8-7	Mechanism of Action of the Inducing Substances	218
	8-8	Gradients in the Determination of the Primary Organ Rudiments in Vertebrates	220
	-	pter 9	
CR AN	EATI ID IN	ON OF FORM DURING GASTRULATION SUBSEQUENT DEVELOPMENT	229
	9–1	Morphogenetic Movements	229
	9-2	Selective Affinities of Cells as a Determining Factor in Cell Rearrangements	
	9-3	Morphogenetic Movements in Epithelia	234
	9–4	Mechanism of Changes in the Shape of Cells During Morphogenesis	
	9-5	Morphogenetic Movements in Mesenchyme	246

Chapter 10

EMBRYO	ONIC ADAPTATIONS AND THE DEVELOPMENT	
OF MAM	IMALS	253
10–1	The Extraembryonic Structures in Reptiles and Birds	254
10-2	Mammalian Eggs	259
10–3	Cleavage, Blastocyst, and Development of Germinal Layers in Mammals	263
10-4	Relations Between the Embryo and the Maternal Body in Mammals	273
10-5	Placentation	
10-6	Review of Placentae in Different Groups of Mammals	
10-7	Physiology of the Placenta	
10–8	Hormonal Control of Ovulation and Pregnancy	291
Part Five.	ORGANOGENESIS	
Chap	ter 11	
GENERA	L INTRODUCTION TO ORGANOGENESIS	297
11-1	Development of General Body Form	297
11–2	Normal Stages of Development	299
11–3	The Anatomy of Representative Stages of Development of the Frog and Chick Embryos	302
Chapt	er 12	
DEVELOR IN VERT	PMENT OF THE ECTODERMAL ORGANS EBRATES	330
12–1	Development of the Central Nervous System	330
12-2	D. J. C.J. D.	353
12–3		361
12–4	The Fate of the Epidermis and the Structures Derived from It	364

Chapter 13

		PMENT OF THE MESODERMAL ORGANS EBRATES	5
	13–1	The Fate of the Somites and the Origin of the Somatic Muscles	5
	13–2	The Axial Skeleton: Vertebral Column and Skull	7
	13-3	Development of the Paired Limbs	2
	13-4	Development of the Urinary System	4
	13-5	Development of the Heart 40	2
	13-6	Development of the Blood Vessels 40	9
	13-7	Development of the Reproductive Organs 42	!3
	Chap	ter 14	
		PMENT OF THE ENDODERMAL ORGANS EBRATES	Ю
	14–1	The Relation Between the Archenteron and the Definitive Alimentary Canal	10
	14-2	Development of the Mouth	18
	14-3	Development of the Branchial Region 45	53
	14–4	Development of the Accessory Organs of the Alimentary Canal: Lungs, Liver, Pancreas, Bursa Fabricii	57
	14-5	Determination of the Endodermal Organs	
Pai	rt Six.	DIFFERENTIATION AND GROWTH	
	Chap	ter 15	
		L CONSIDERATIONS ON GROWTH AND ENTIATION	67
	15–1	Definitions	67
	15–2	Mechanisms of Cell Reproduction 4	69
	15–3	Relation of Cell Proliferation to Differentiation	76

Chap	oter 16	
DIFFERI	ENTIATION	478
16–1	The Chemical Basis of Differentiation	478
16–2		
16-3		
16-4		
16-5		
16-6	Control of the Reactive Ability of Tissues by the Genotype	512
16-7	Sequence of Gene Action in Development	515
Chap	oter 17	
GROWT	н	519
17-1	Measurement of Growth and Its Graphic Representation	519
17-2	Growth on the Cellular and Organismic Levels	
17–3	Interpretation of Growth Curves	
17–4	Proportional and Disproportional Growth of Organs	529
Part Seve	n. MORPHOGENETIC PROCESSES IN THE LATER PART OF ONTOGENESIS	
Chap	ter 18	
METAMO	ORPHOSIS	535
18–1	Changes of Organization During Metamorphosis in Amphibians	536
18-2	Causation of Metamorphosis in Amphibians	540
18–3	Tissue Reactivity in Amphibian Metamorphosis	543
18-4	Processes of Induction During Amphibian Metamorphosis	544
18-5	Molting and Its Relation to Metamorphosis in Insects	545
18-6	Causation of Molting and Metamorphosis	550

CONTENTS xvii

18–7	Nature of the Factors Controlling Molting and Metamorphosis in Insects	555
18-8	Mechanism of Action of Insect Hormones	557
18-9	Final Remarks on Metamorphosis	
Chap	ter 19	
REGENE	RATION	562
19–1	Typical Case of Regeneration: The Renewal of a Limb in a Salamander	562
19–2	Regenerative Ability in Various Animals	564
19-3	Stimulation and Suppression of Regeneration	
19-4	Histological Processes Concerned in Regeneration	571
19–5	Release of Regeneration	579
19-6	Relation of the Regenerating Parts to the Remainder of the Organ and to the Organism as a Whole	581
19–7	Polarity and Gradients in Regeneration	585
19-8	Reconstitution from Isolated Cells	
Chap	ter 20	
ASEXUA	L REPRODUCTION	592
20-1	Occurrence and Forms of Asexual Reproduction	592
20-2	Sources of Cellular Material in Asexual Reproduction	595
20-3	Comparison of Blastogenesis and Embryogenesis	600
REFERE	NCES	. 605
INDEX		. 635