

Contents

	Preface	page ix
	Acknowledgements	xi
1	Oogenesis	1
	The events of oogenesis	1
	Visible organisation and its origins	9
	The extent of spatial determination in oocytes	18
	Conclusions	30
2	From oocyte to zygote	31
	The events	31
	Ooplasmic segregation	32
	(a) Bipolar differentiation	32
	(b) <i>Lymnaea</i>	38
	(c) Sea urchins	39
	(d) Ascidians	41
	(e) Amphibians	45
	The extent of spatial determination	49
	(a) Work with egg fragments	49
	(b) Centrifugation	55
	(c) Rotations and other interference with amphibian eggs	57
	(d) Differentiation without cleavage	64
	Conclusions	65
3	Does cleavage cut up a preformed spatial pattern?: the case of spiralian embryos	68
	Spiral cleavage patterns	69
	Lineage plans and fate maps	71
	Mosaic development after separation of blastomeres	75
	The role of the D quadrant: the first two cleavages	78
	(a) Polar lobes	78
	(b) Unequal first cleavages	83
	(c) Equal first cleavages	85

The role of the D quadrant: later stages	85
(a) Lobe-bearing species	86
(b) Species with unequal first cleavages	89
(c) Species with equal first cleavages	90
The fine-structure and biochemistry of spiralian development	93
Conclusions	95
4 The limits of mosaicism in non-spiralian cleavage	96
Ascidians	96
Amphioxus	107
Ctenophores	109
Hydrozoans	112
Nematodes	113
Insects	119
Sea urchins	127
Starfish	133
Amphibians	133
Mammals	138
Conclusions	142
5 Cellular interactions in the morula and blastula: the case of sea urchin embryos	144
Normal development and fate maps	144
Cell isolations and abnormal combinations	147
Chemical animalisation and vegetalisation	154
Models of determination	156
Approaches to a physiology of determination	158
The biochemistry of the morula and blastula	160
Conclusions	167
6 Interactions at morula and blastula in other embryos	168
Insects	168
Other arthropods and other echinoderms	187
Amphibians	188
Ascidians and Amphioxus	197
Spirally cleaving embryos	199
Hydrozoans	204
Mammals	205
Conclusions	209
7 Interactions between moving cells: the case of amphibian gastrula	211
Morphogenetic movements	211

Fate maps through gastrulation	214
Spemann's organiser	215
The development of explants and implants from the early gastrula	219
Changes in spatial properties during gastrulation	221
Inductive effects of simple culture media	226
Heterogenous inductors	228
The competence of the ectoderm	231
The transmission of inductive stimuli	234
Attempts to identify inducer molecules	237
Biochemical events in the gastrula	240
What is determined at the end of gastrulation?	246
Conclusions	251
8 Spatial determination in the gastrulae of other groups	253
Sea urchins	253
Insects	258
Spiralian embryos	261
Ascidians and Amphioxus	262
Some lower vertebrates	263
Hydrozoans	265
A note on the mammals	266
Conclusions	266
9 Determination in embryos showing partial cleavage	267
Cephalopods	267
Teleosts	273
Reptiles	283
Birds	285
(a) Descriptive embryology	285
(b) Causal analysis	290
(c) Biochemical aspects	295
A note on the mammals	299
Conclusions	301
10 Patterns and mechanisms in early spatial determination	304
Patterns	304
Mechanisms	312
References	320
Index	423