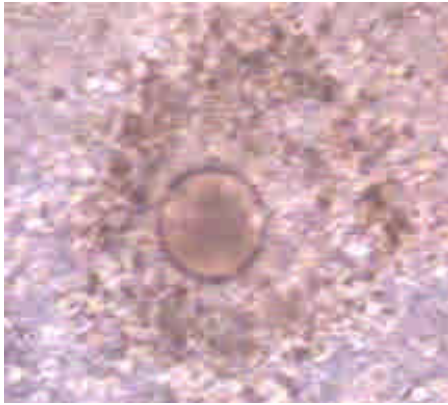


Developmental Biology 2007

Organogenesis

**Fertilization → Egg activation → Cleavage → Gastrulation
→ Regional specification**

Fertilization: Beginning a new organism



Mature Human Egg:

large egg in comparison to surrounding granulosa cells.



Fertilized Human Zygote:

male and female nuclei fusing in centre of cell,
2 polar bodies on right.



4 Cell Human Embryo:

during each mitotic division the embryo does not
increased in size and divides the existing cytoplasm.

Carnegie Stages of Human Development

Dr Mark Hill, Cell Biology Lab, School of Medical Sciences (Anatomy), UNSW

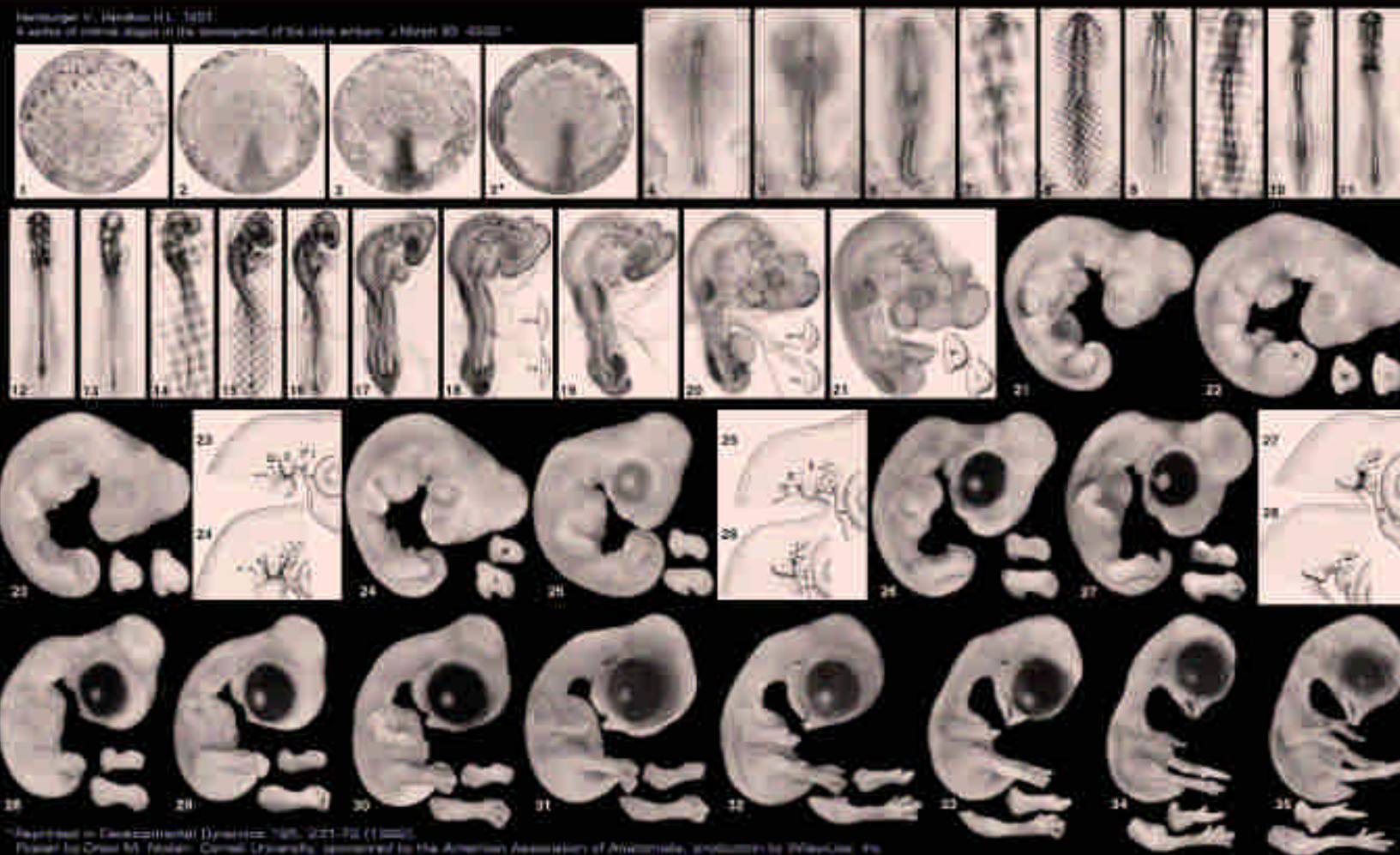


<http://embryology.med.unsw.edu.au/wwwhuman/Stages/Stages.htm>

In Memory of Viktor Hamburger: 1900-2001

NORMAL STAGES OF CHICK EMBRYONIC DEVELOPMENT

Hamburger V., Hamilton H.L. 1951.
A series of normal stages in the development of the chick embryo. *J Morphol* 89: 49-121.



The stages of chick embryonic development are of the first and second series and are arranged in the order of their appearance. The stages of the first series (Hamburger, Hamilton 1951) are a series of stages in the early stages of development of the embryo, including the stages of cleavage, gastrulation, and neurulation. The stages of the second series (Hamburger, Hamilton 1951) are a series of stages in the later stages of development, including the stages of organogenesis and the formation of the major organs and systems. The stages of the third series (Hamburger, Hamilton 1951) are a series of stages in the final stages of development, including the stages of hatching and the formation of the adult chick.

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Carnegie Stages Comparison

Data For Carnegie Stages Comparison Graph (Species/Days)														(All Species Data)		
Species	Stage	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Human	Days	20	22	24	28	30	33	36	40	42	44	48	52	54	55	58
Mouse	Days	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16
Rat	Days	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5

Hamburger & Hamilton staged the **chicken embryo** in 1951.
---describes feature of the chicken that can be seen at specific times (mean of a range) after fertilization.

References
Human
O'Rahilly, Early human development and the chief source of information on staged human embryos. Eur. J. Obstet. Gynec. Reprod. Biol. 9 p273 (1979)
Mouse
Theiler, The house mouse. Springer-Verlag, NY (1972)
Rat
Witschi, Growth. Altman and Dittmer (ed), Fed. Soc. Exp. Biol., Washington (1962)
Reference for Staging the Mouse Embryo