

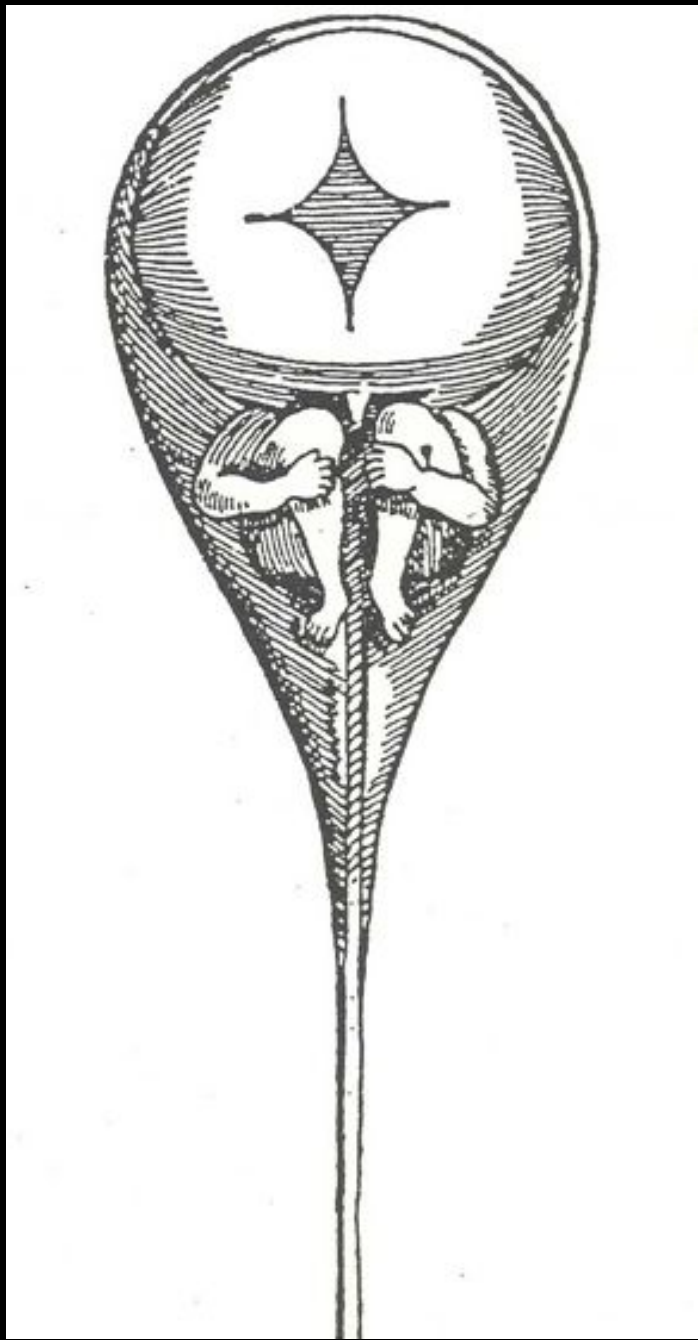
7-week-old human embryo



Human Development



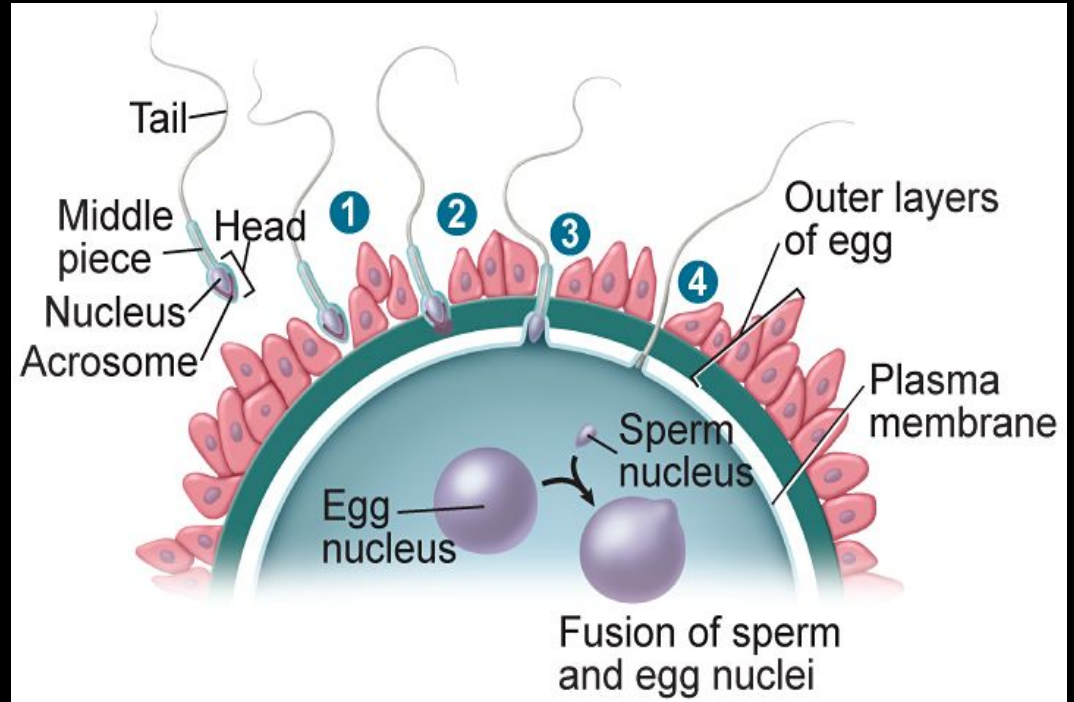
It is difficult to imagine that each of us began life as a single cell about the size of the dot at the end of this sentence.



Fertilization

Process of a sperm cell joining with an egg cell – **zygote**.

- Each normally has 23 chromosomes.
- Fertilization restores 46 chromosomes.



Cleavage

- A succession of rapid cell divisions that follow fertilization.
- The embryo does not enlarge during this period of development.
- Cleavage simply partitions the cytoplasm of one large cell (the zygote) into many small cells called **blastomeres**.



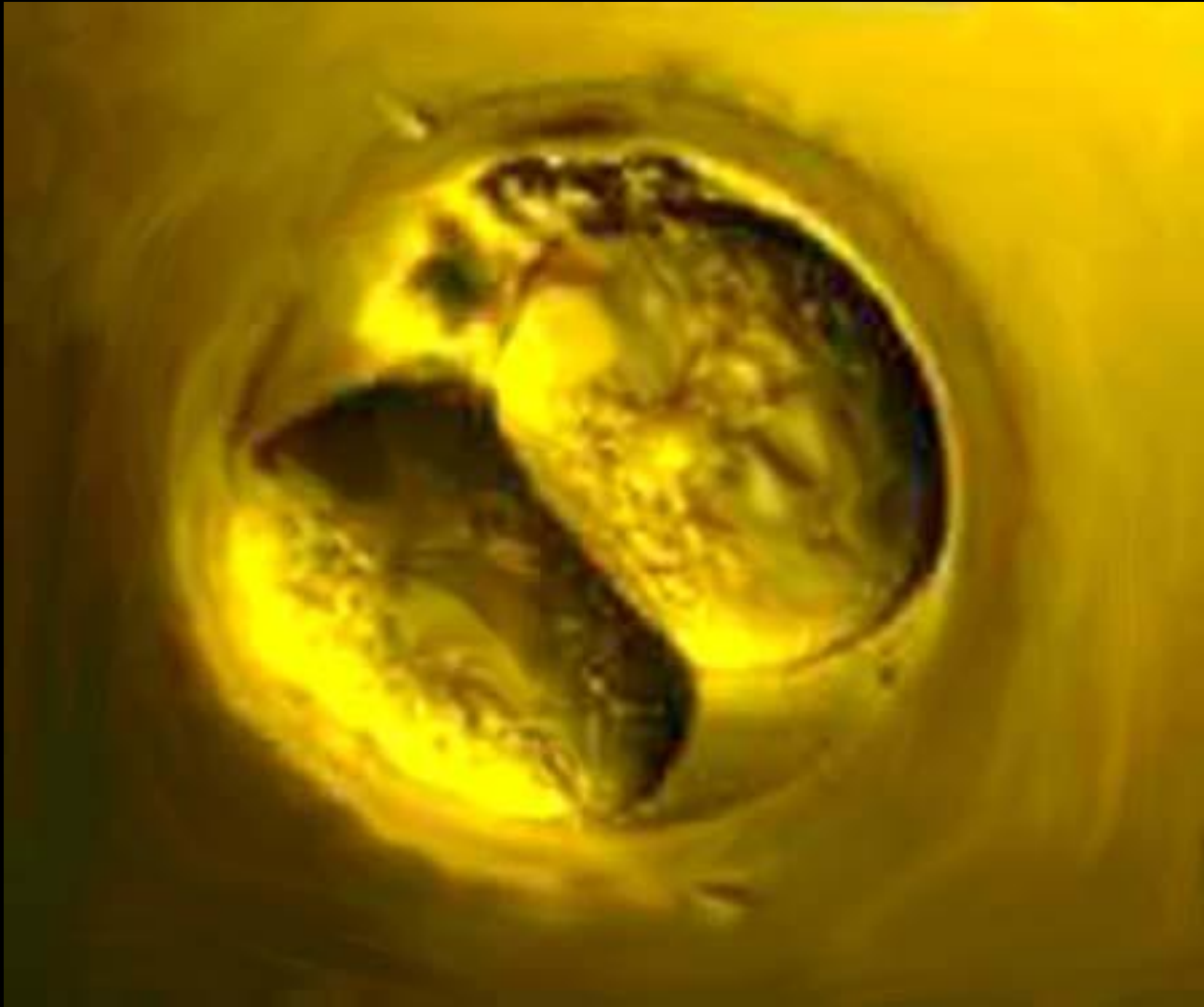
Zygote

Cleavage



Eight-cell stage

*Cleavage (divide via mitosis) forms the
2 cell stage*



They split again to form the 4 cell stage



And again to form the 8 cell stage ...



And eventually form a Morula

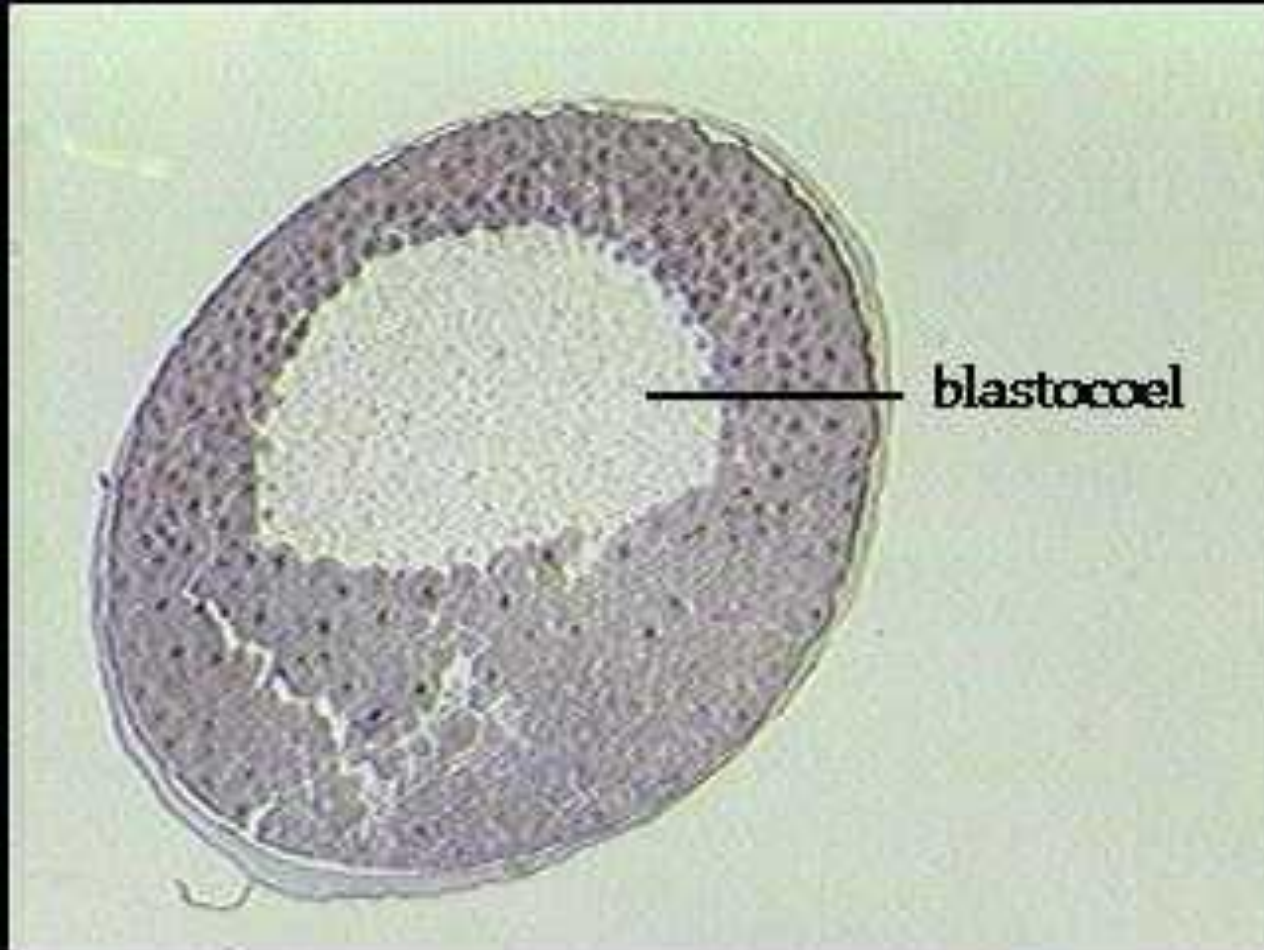


Morula

- Continued cleavage produces a solid ball of cells known as **morula**.
- 16-64 cells.

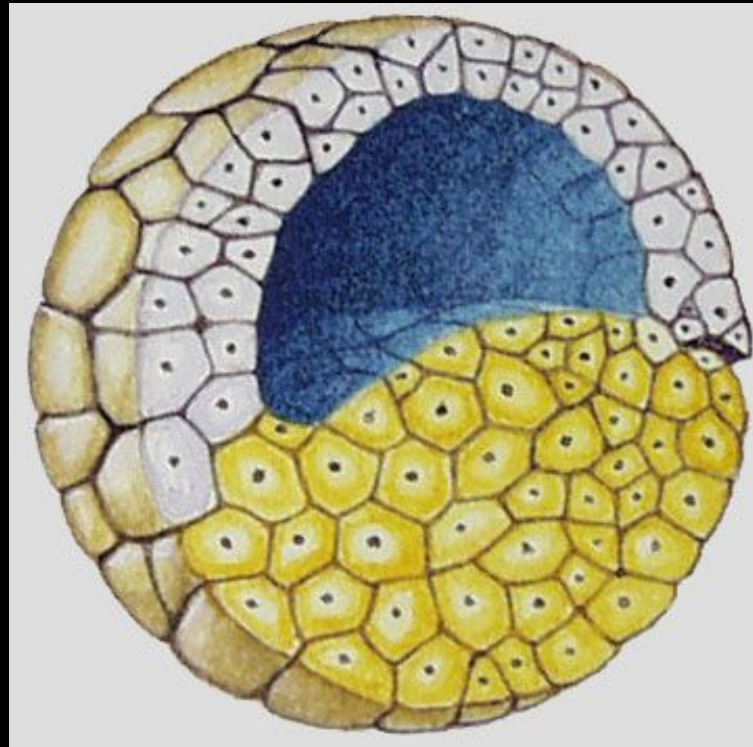


Next it becomes a blastula



Blastula (hollow ball)

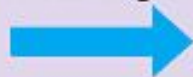
- A fluid filled cavity called **blastocoel** forms within the morula creating a hollow ball called the blastula.





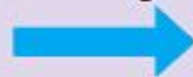
Zygote

Cleavage

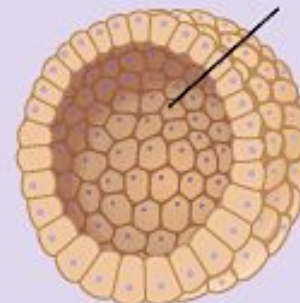


Eight-cell stage

Cleavage



**Blastula
(hollow ball)**



Blastocoel

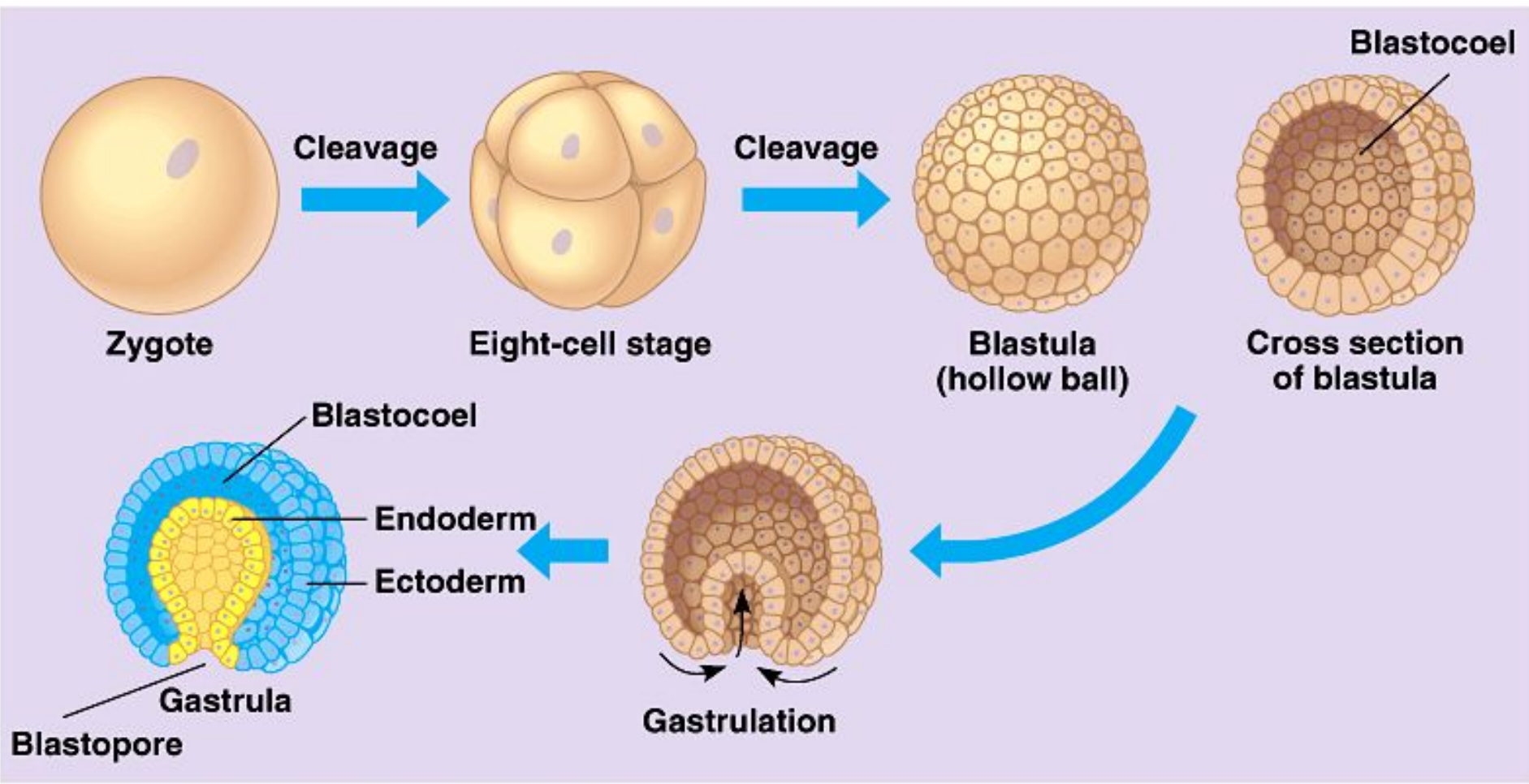
**Cross section
of blastula**

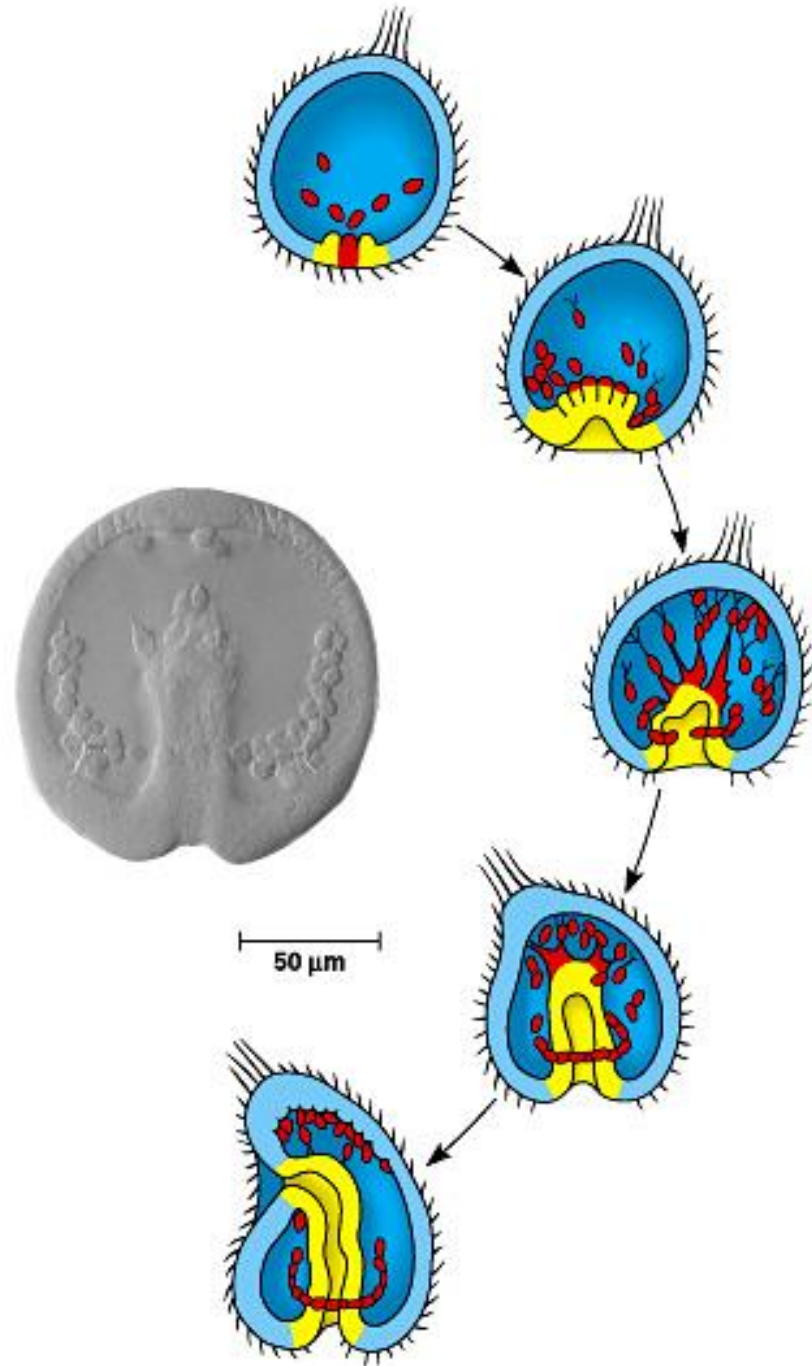
And next, a gastrula



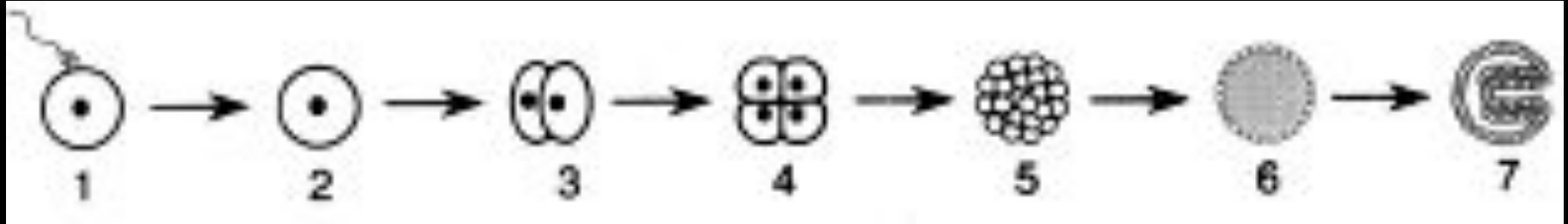
Gastrula

- **Gastrulation** – is a rearrangement of the cells of the blastula.
- Result of gastrulation is that some of the cells of blastula move to an interior location, and three cells layers are established – **invagination**.
- The three-layered embryo is called the **gastrula**.





The Regents Diagram...

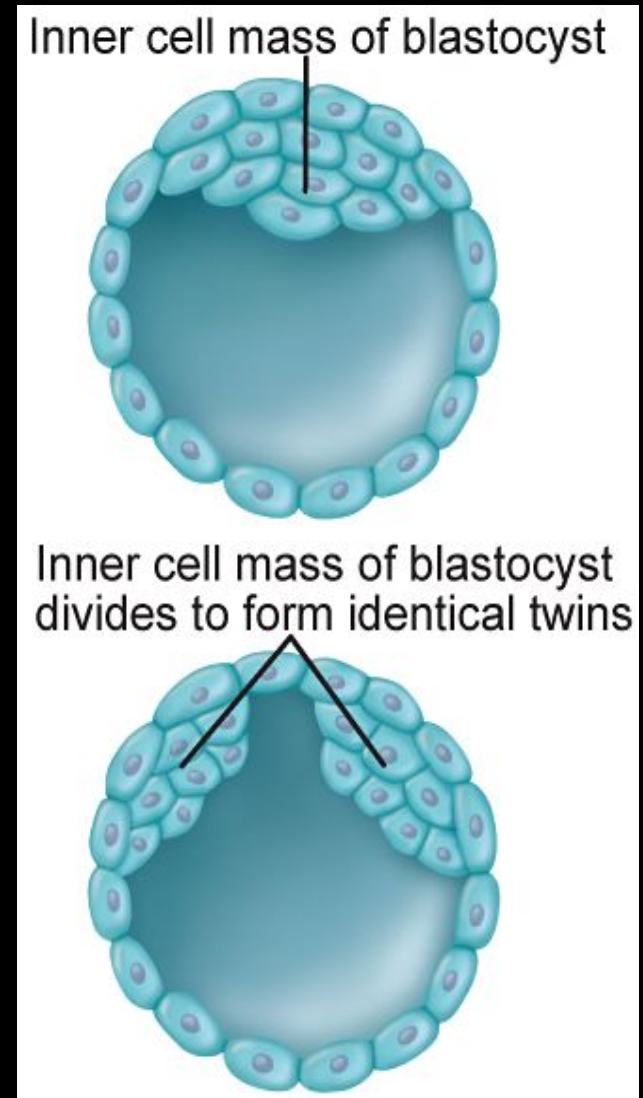


1. Sperm and ovum
2. Zygote (fertilized ovum)
3. 2-cell stage
4. 4-cell stage
5. Morula
6. Blastula
7. Gastrula

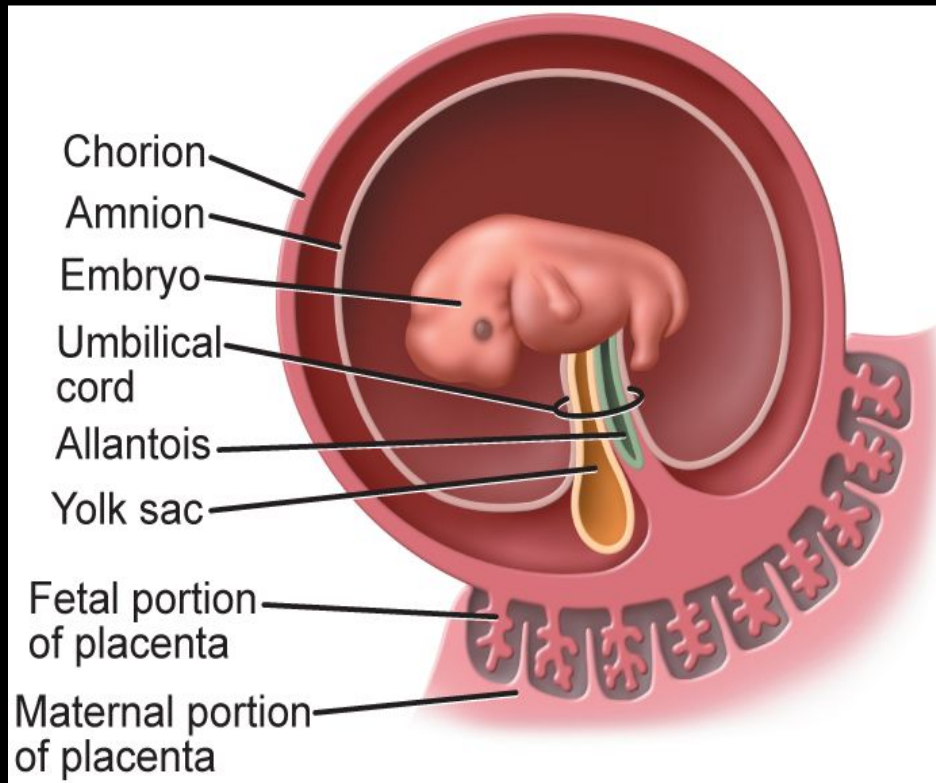
Early Development

- The fertilized egg is called a zygote.
- By the third day, the embryo, called a morula, leaves the oviduct and enters the uterus.

- By the fifth day, the morula has developed into a blastocyst.
- The blastocyst attaches to the wall of uterus around the sixth day and is fully implanted by Day 10.



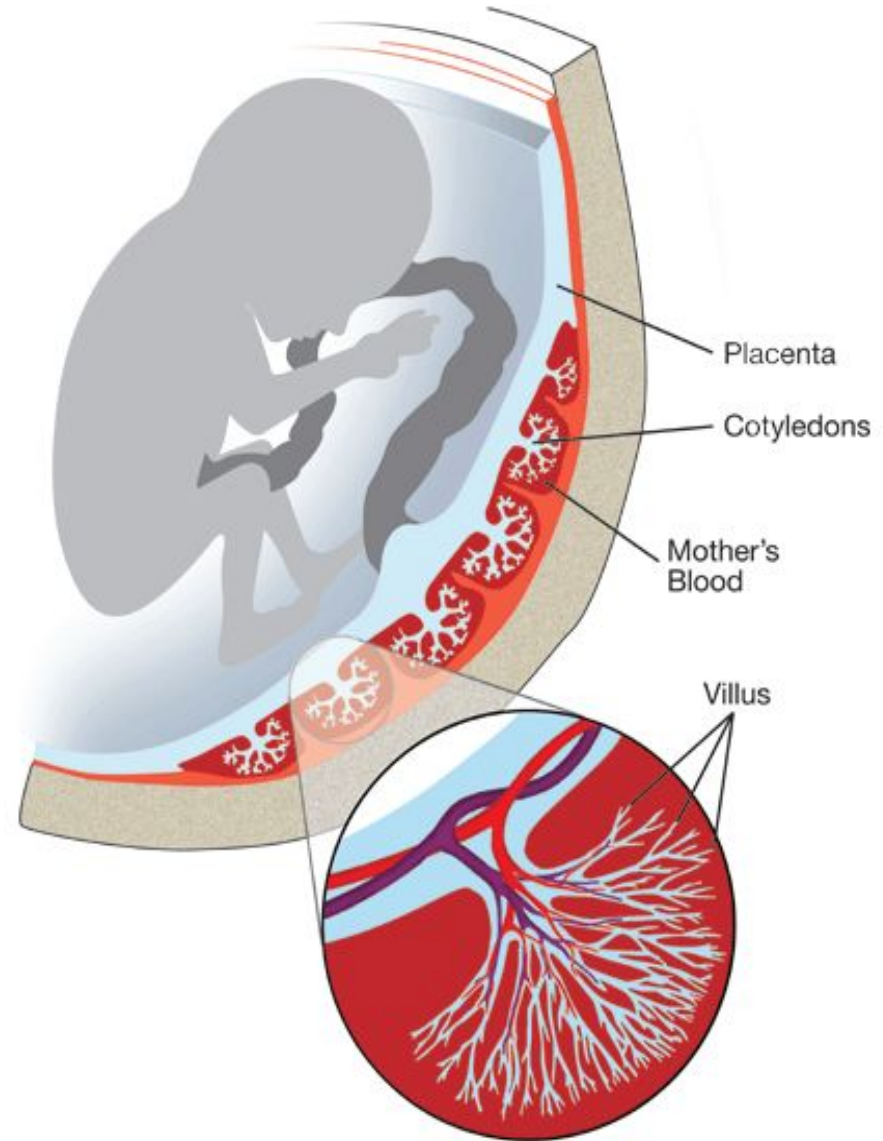
Extraembryonic Membranes



- Four extraembryonic membranes form.
- These membranes are the amnion, the chorion, the yolk sac, and the allantois.

The Placenta

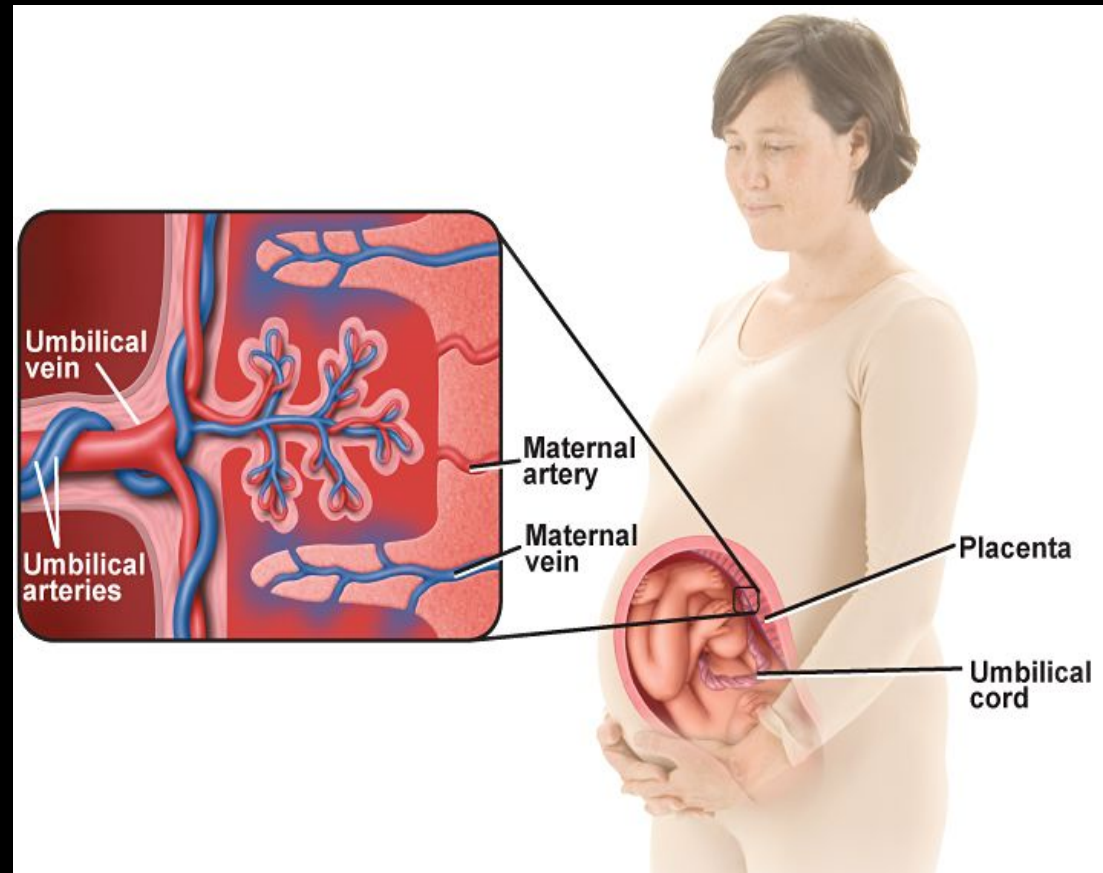
- Provides food and oxygen and removes wastes
- The placenta has two surfaces
- A fetal side that forms from the chorion
- A maternal side that forms from uterine tissue



A. As an embryo develops, the chorionic villi begin to grow into the uterine wall.

B. Nutrients, oxygen, and wastes diffuse across maternal and fetal blood vessels.

C. The placenta contains tissue from both mother and fetus.

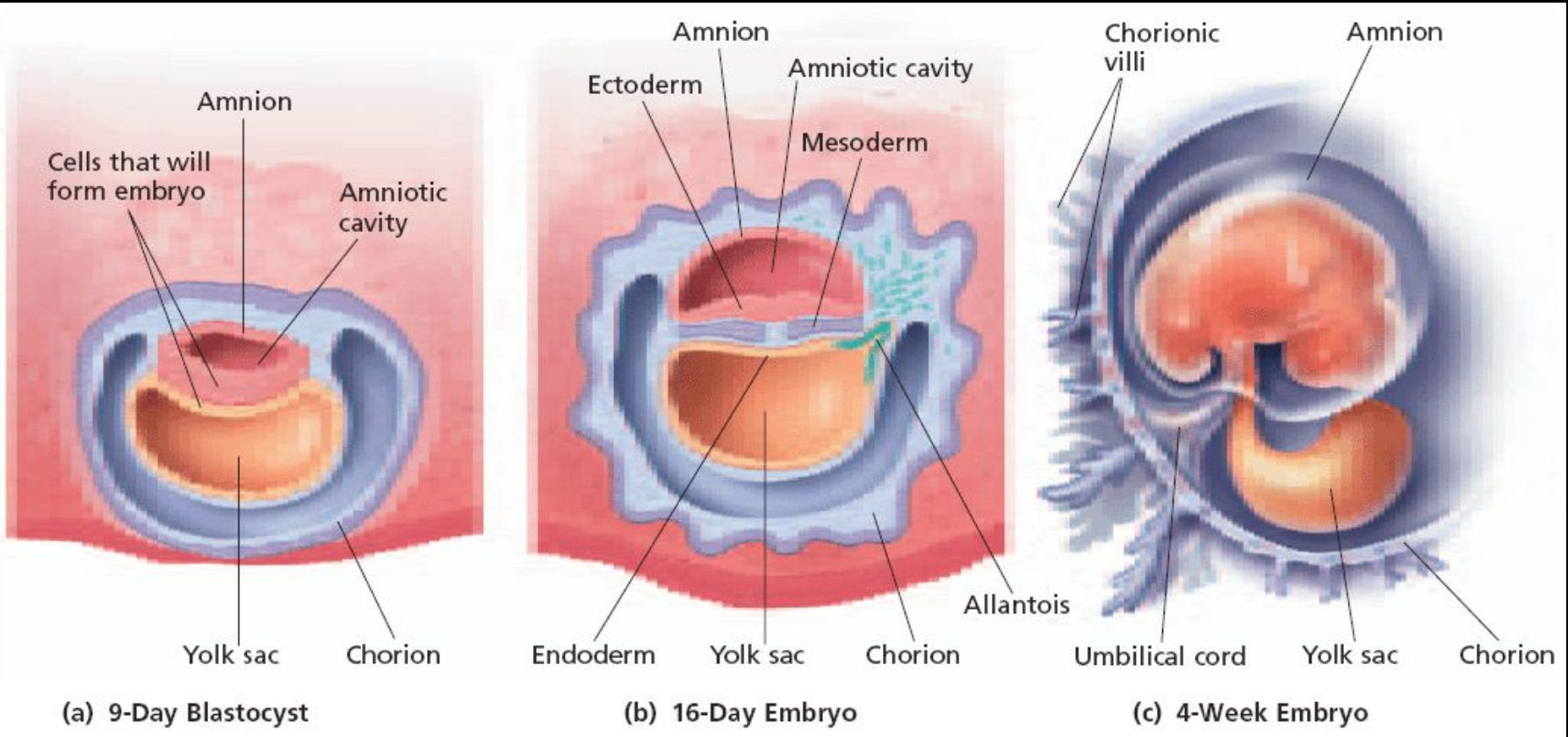


Three Trimesters of Development

- Human development takes around 266 days from fertilization to birth.
- This period known as **gestation**, or pregnancy.
- The pregnancy is divided into three trimesters.

The First Trimester

- All tissues, organs, and organ systems begin to develop.
- For the first 8 weeks of pregnancy, the developing human is called an **embryo**.
- At the end of eight weeks, the embryo is called a **fetus**.
- By the end of the fourth week the heart begins to beat.
- During the second month arms and legs take shape.



(a) 9-Day Blastocyst

(b) 16-Day Embryo

(c) 4-Week Embryo

The Second Trimester

- Period of growth

The Third Trimester

- The fetus continues to grow at a rapid rate.
- Fat accumulates under the skin to provide insulation for the fetus once it is born.

Preventable Causes of Birth Defects

Cause	Defect
Alcohol consumption	<ul style="list-style-type: none">• Mental retardation
Cigarette smoking	<ul style="list-style-type: none">• Health problems related to premature births and underweight babies
Lack of folic acid in diet	<ul style="list-style-type: none">• Anecephaly (head and brain do not completely form)• Spina bifida (nerve cells from the spinal cord are exposed leading to paralysis)
Cocaine	<ul style="list-style-type: none">• Low birth weight• Premature birth• Possible permanent brain damage and behavioral disorders
Methamphetamine	<ul style="list-style-type: none">• Premature birth• Extreme irritability

Birth

- Birth occurs in three stages: dilation, expulsion, and the placental stage.
- The beginning of the birthing process is called **labor**.

Infancy

- The first two years of life

Childhood and Adolescence

- Childhood is the period of growth and development that extends from infancy to adolescence.
- Puberty marks the beginning of adolescence.
- Begins between ages 8 to 13 in girls and ages 10 to 15 in boys.

Adulthood

- At the end of adolescence, physical growth is complete, marking the beginning of adulthood.
- Decrease in muscle mass, a slowing of overall metabolism, and a decreased pumping ability of the heart.



**ЗАРОДЫШ
2-МЕСЯЧ-
НЫЙ**



**ПЛОД
4 МЕСЯЦА**



**НОВО-
РОЖДЕН-
НЫЙ**



2 ГОДА



6 ЛЕТ



12 ЛЕТ



25 ЛЕТ