



LEHIGH
UNIVERSITY®

Cell Biology of Sex

Barry Bean

for BioS 10 & 90

18 September 2009

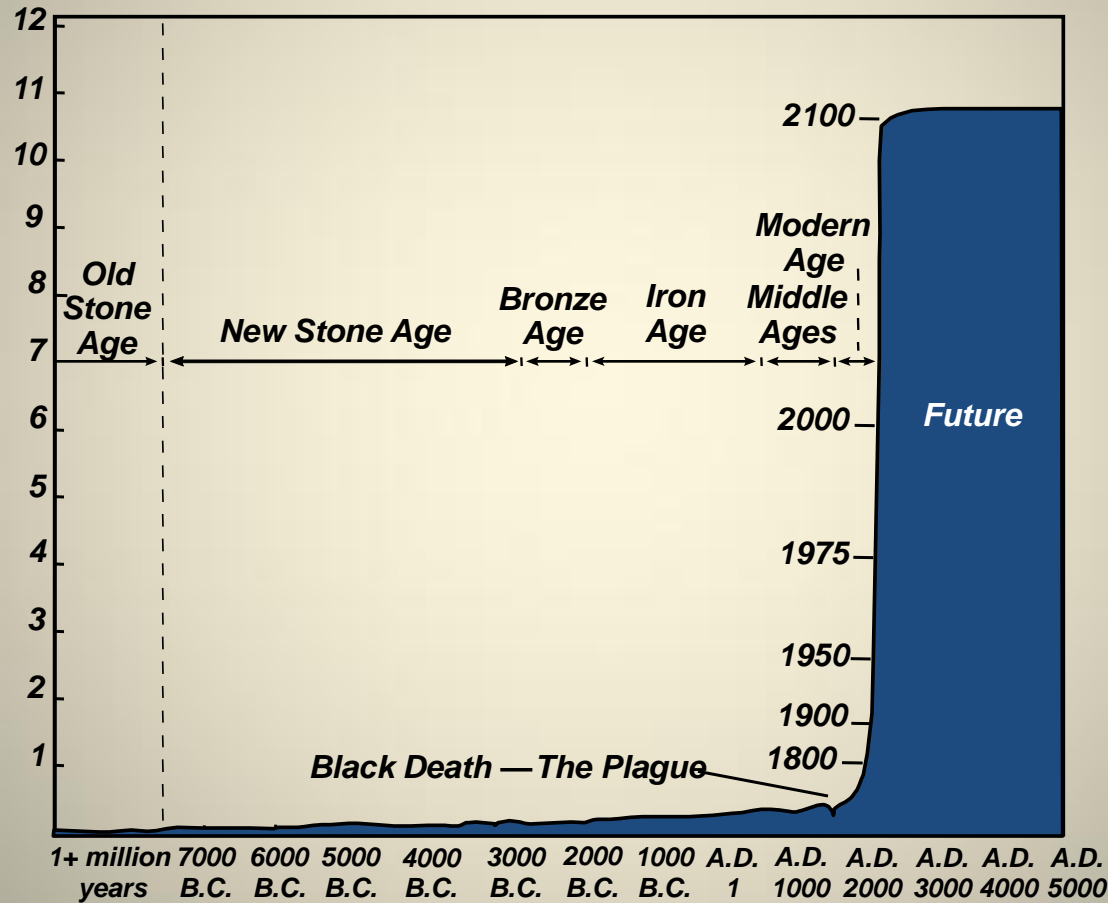


Poll

*Bean
Poll*

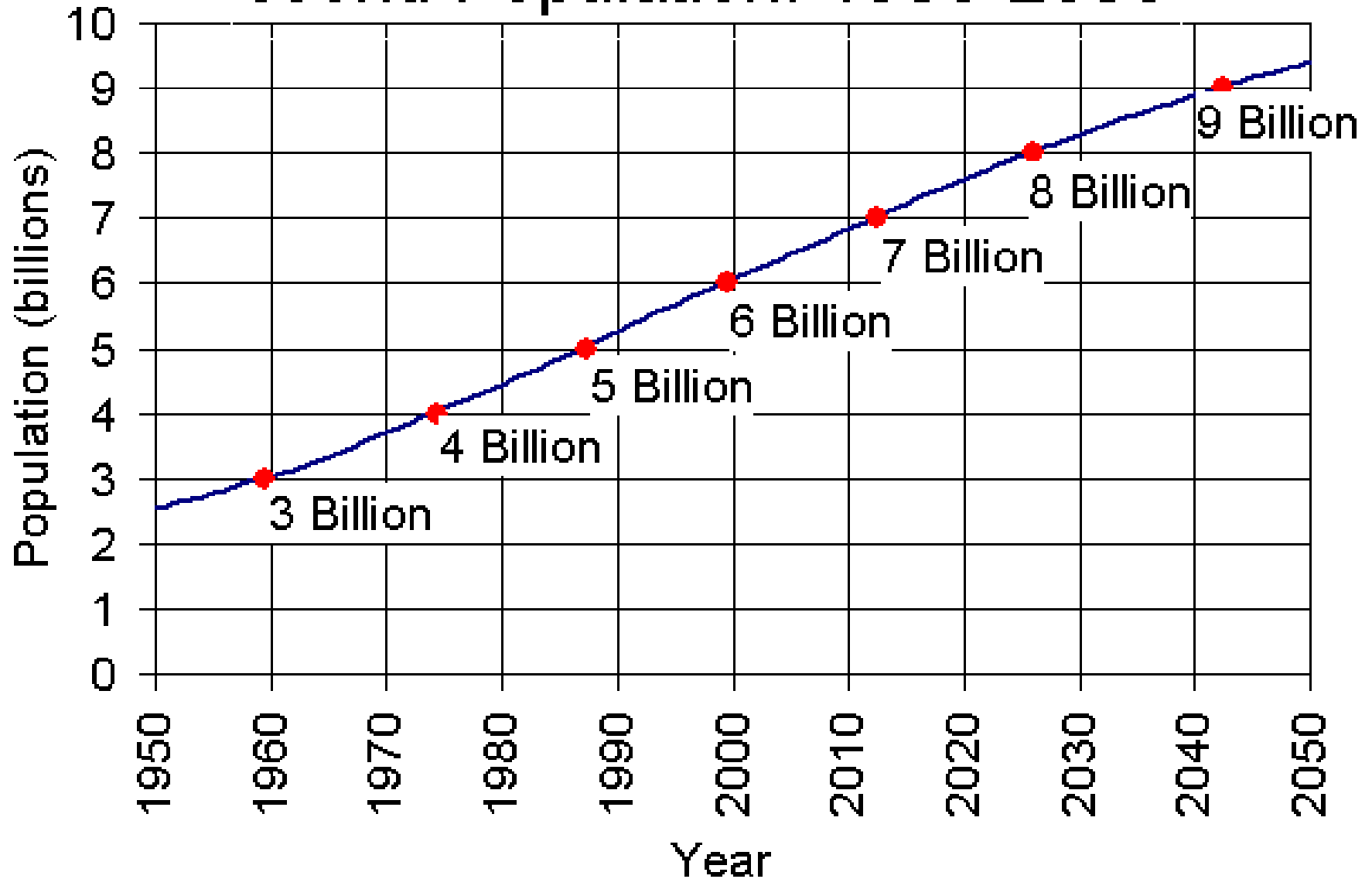
World Population Growth Through History

Billions



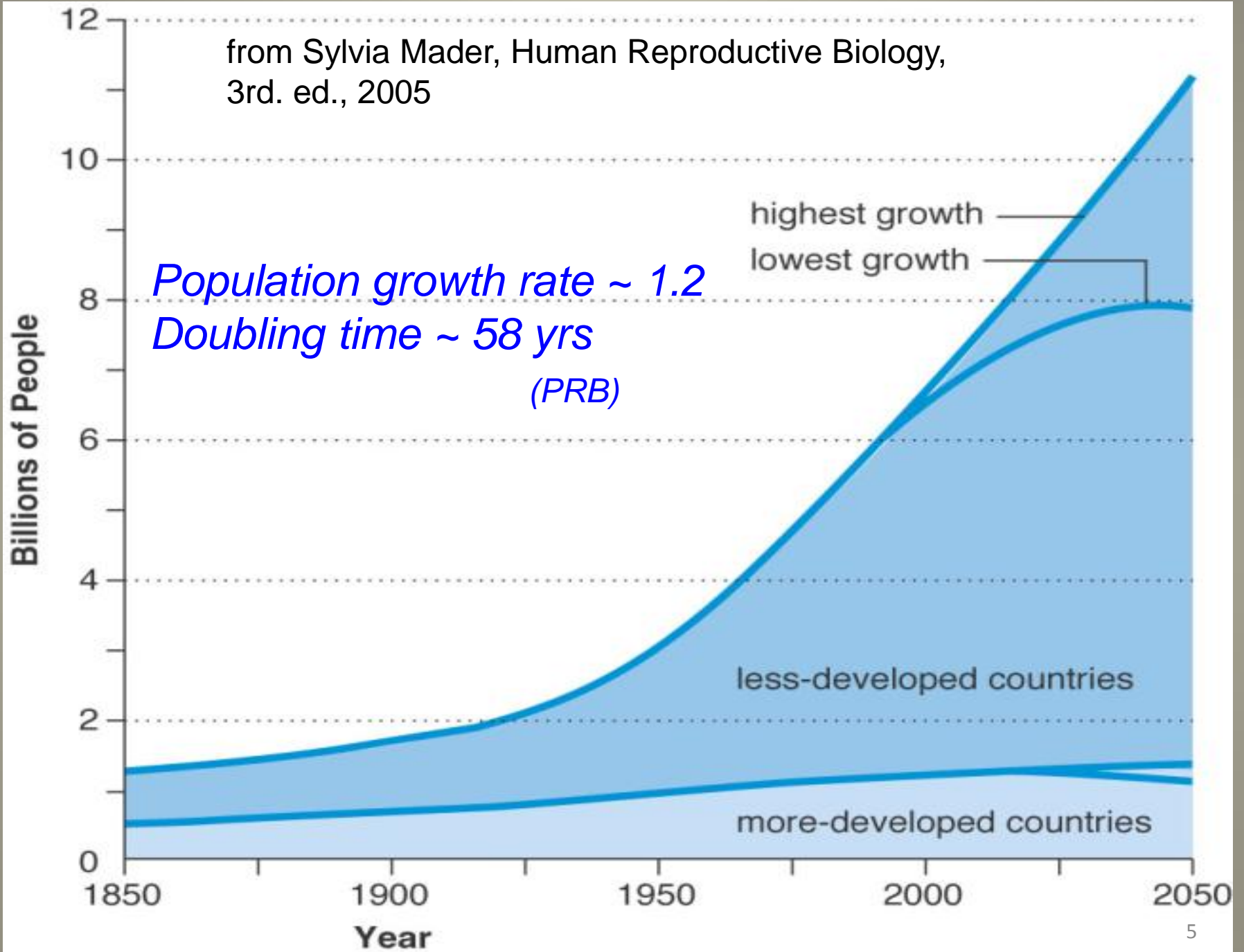
Source: Population Reference Bureau; and United Nations, World Population Projections to 2100 (1998).

World Population: 1950-2050



Source: U.S. Census Bureau, International Data Base, July 2007 version.

from Sylvia Mader, Human Reproductive Biology,
3rd. ed., 2005



Population growth rate ~ 1.2
Doubling time ~ 58 yrs
(PRB)

highest growth

lowest growth

less-developed countries

more-developed countries

It's all about YOU...

The most important day of your life...

Poll

World Population Clock

math.berkeley.edu/~galen/popclk.html

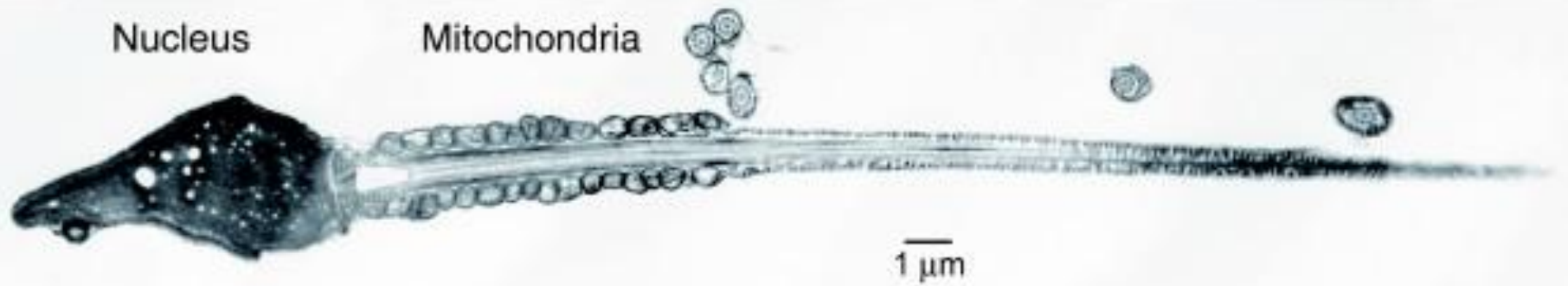
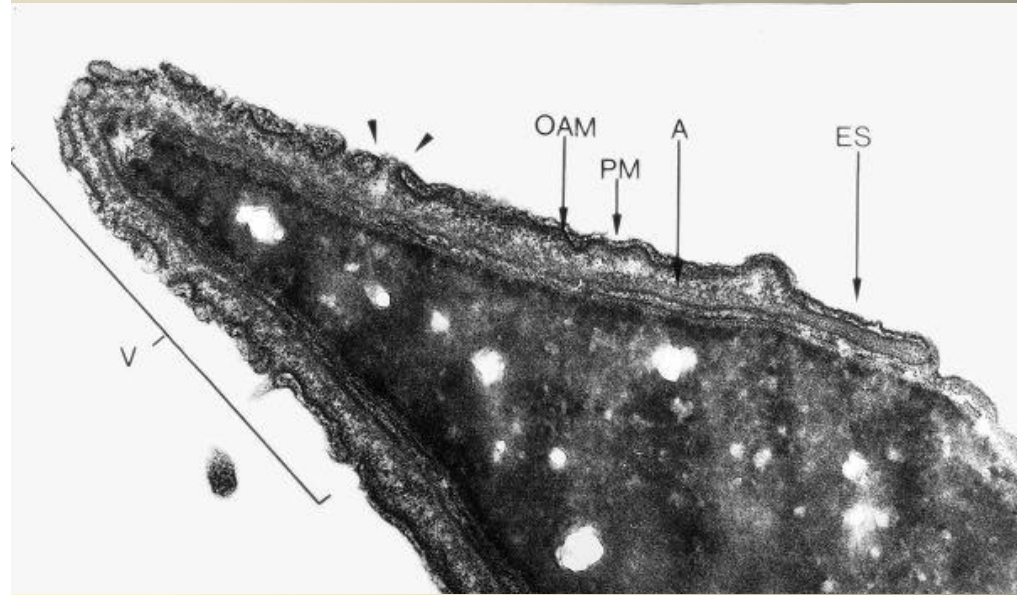
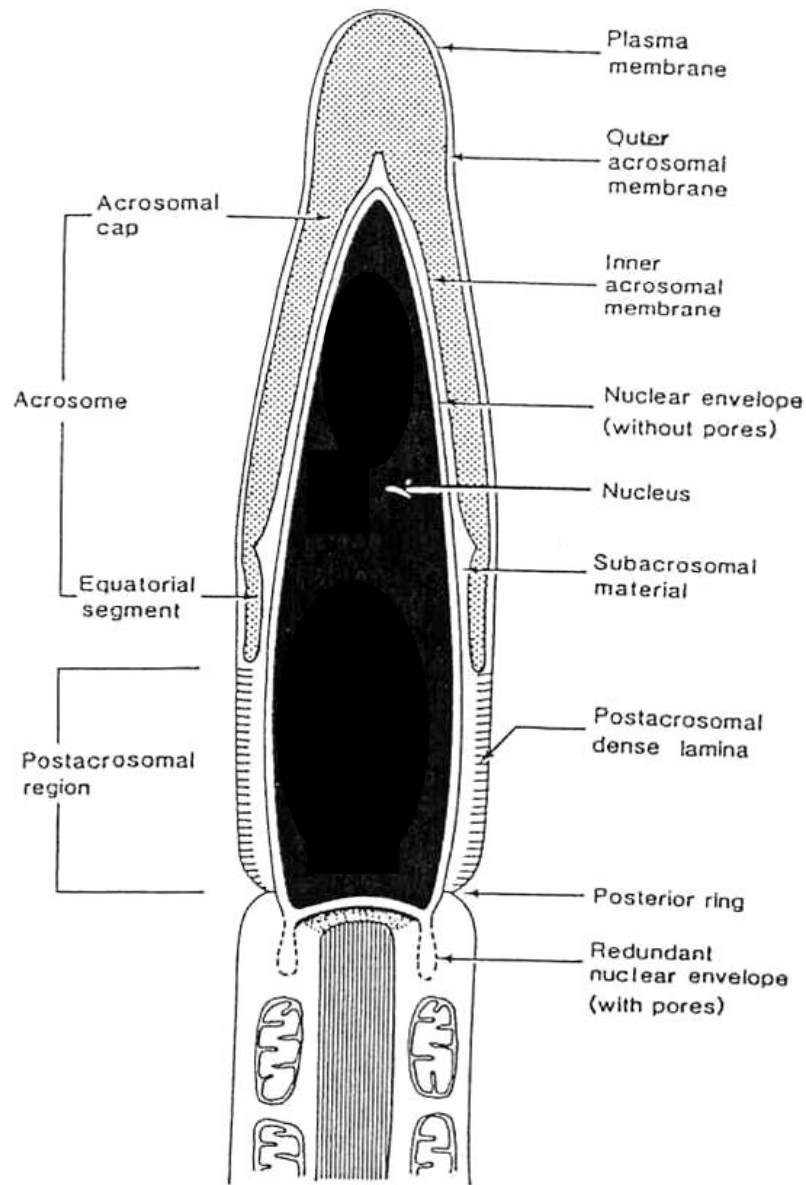


Figure 1. Montage transmission electron micrograph of a human sperm cell. The cell has a compact nucleus, conspicuous mitochondria, no endoplasmic reticulum, minimal cytoplasm and a large tail (about 45 μm in length). Superfluous cytoplasm and associated machinery is jettisoned when the sperm emerges from the testis, leaving a 'stripped down', minimalist cell.

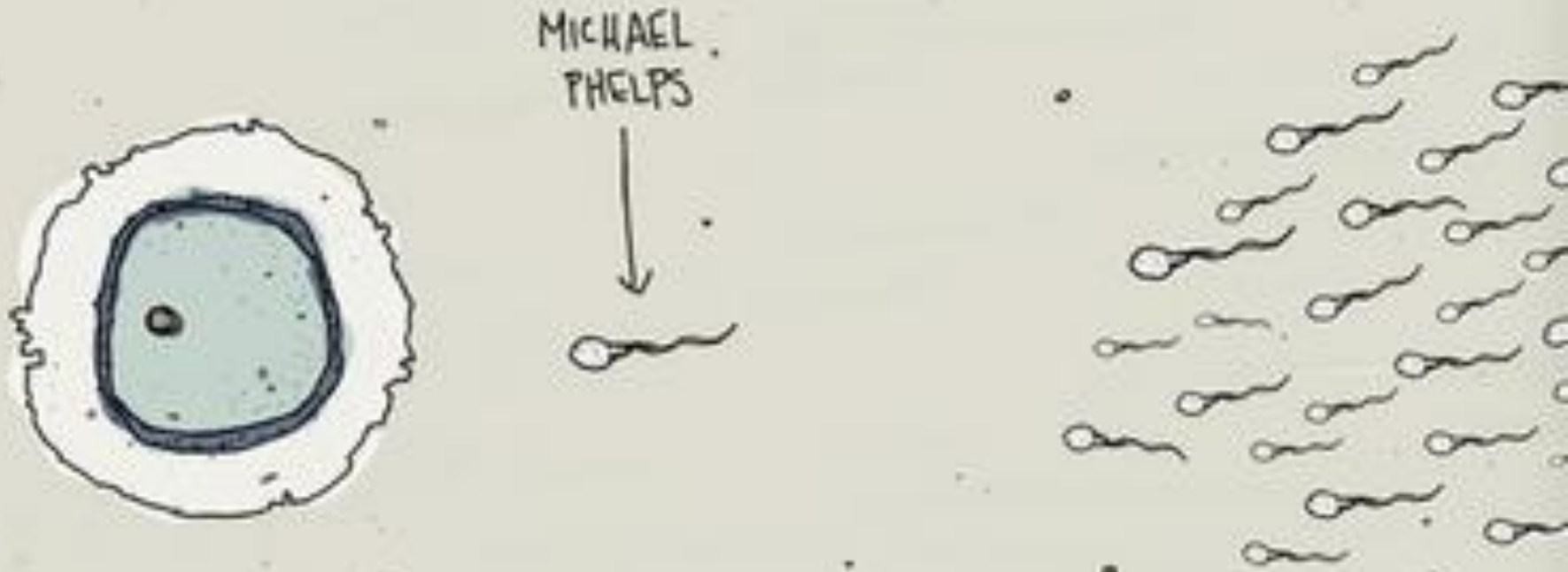
Barratt *et al.* *Journal of Biology* 2009

8:63 doi:10.1186/jbiol167

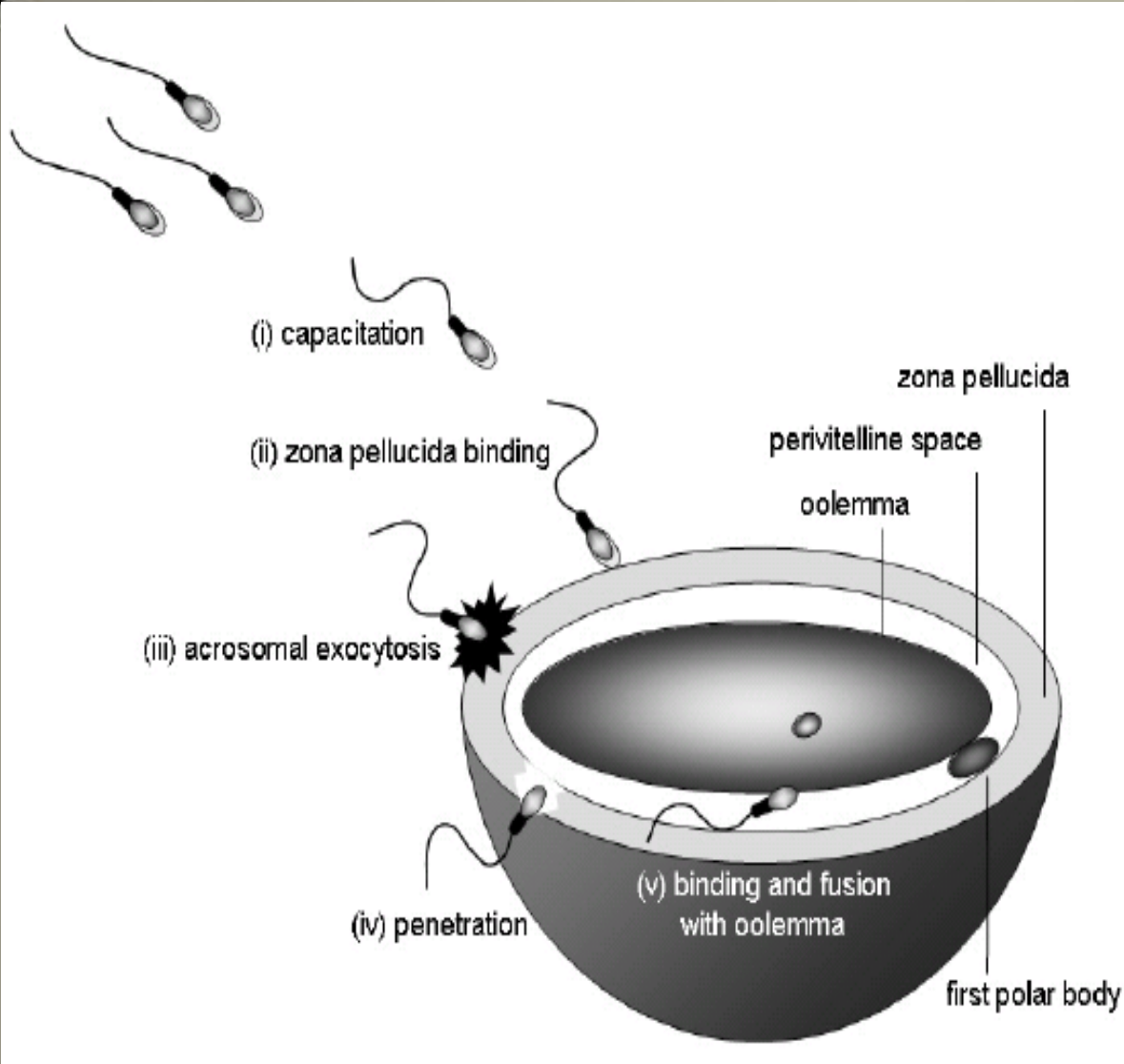


http://usuarios.lycos.es/biologiacelular1/Aparato%20reproductor%20masculino8_archivos/532047.jpg

*Assignment for Points:
Portray the role of each
compartment*



Used with permission of the artist, Patrick Moberg



Try to remember...

when you were gametes !

Think like a sperm...

Think like an oocyte...

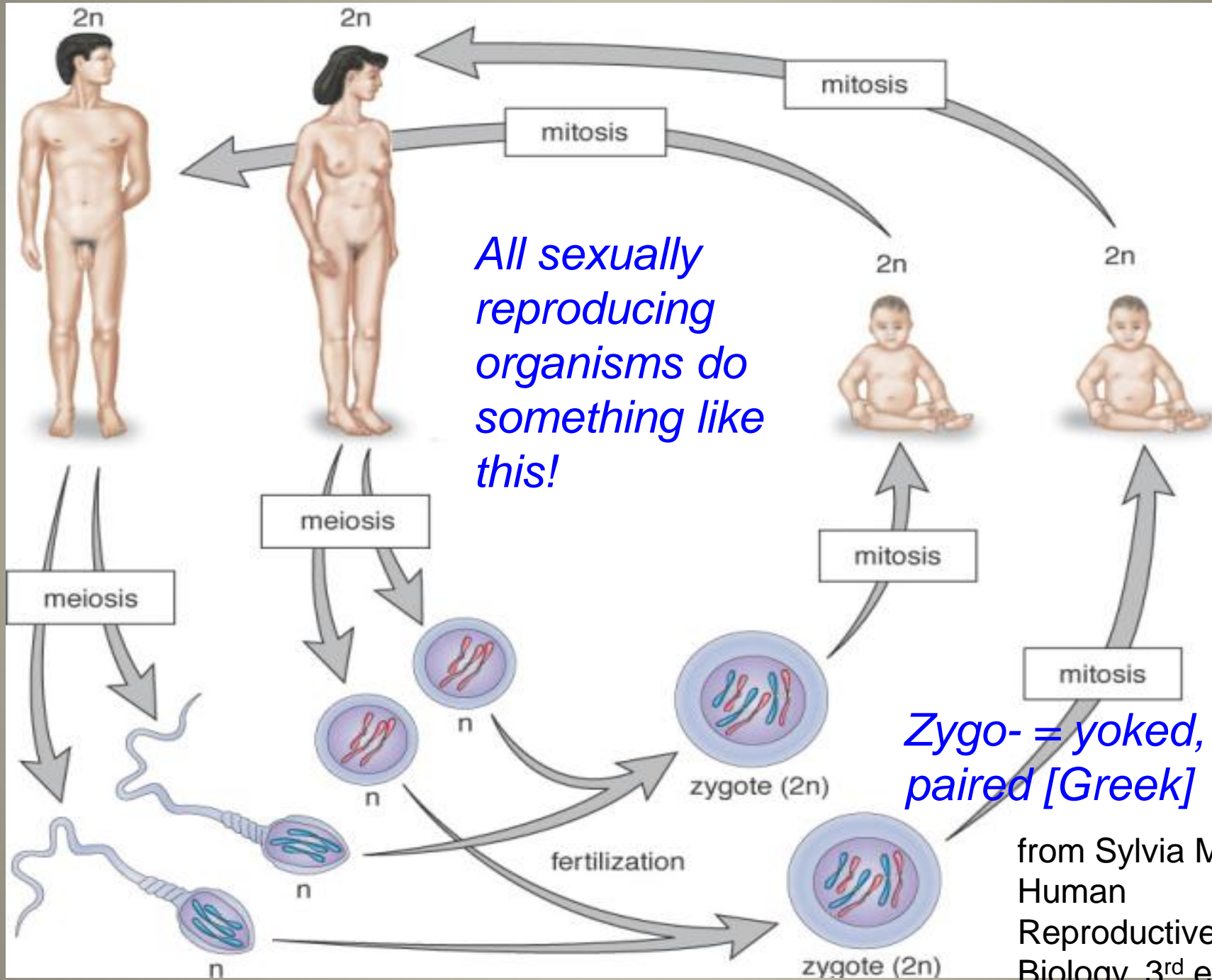
Gametes are prefabricated for action, a cascade of functions.

Gamete production includes unique patterns of gene expression and regulation.

Gametes have complex structure and many phenotypes.

Every Gamete is a genetically distinct human individual!

Here's where they came from...



All sexually reproducing organisms do something like this!

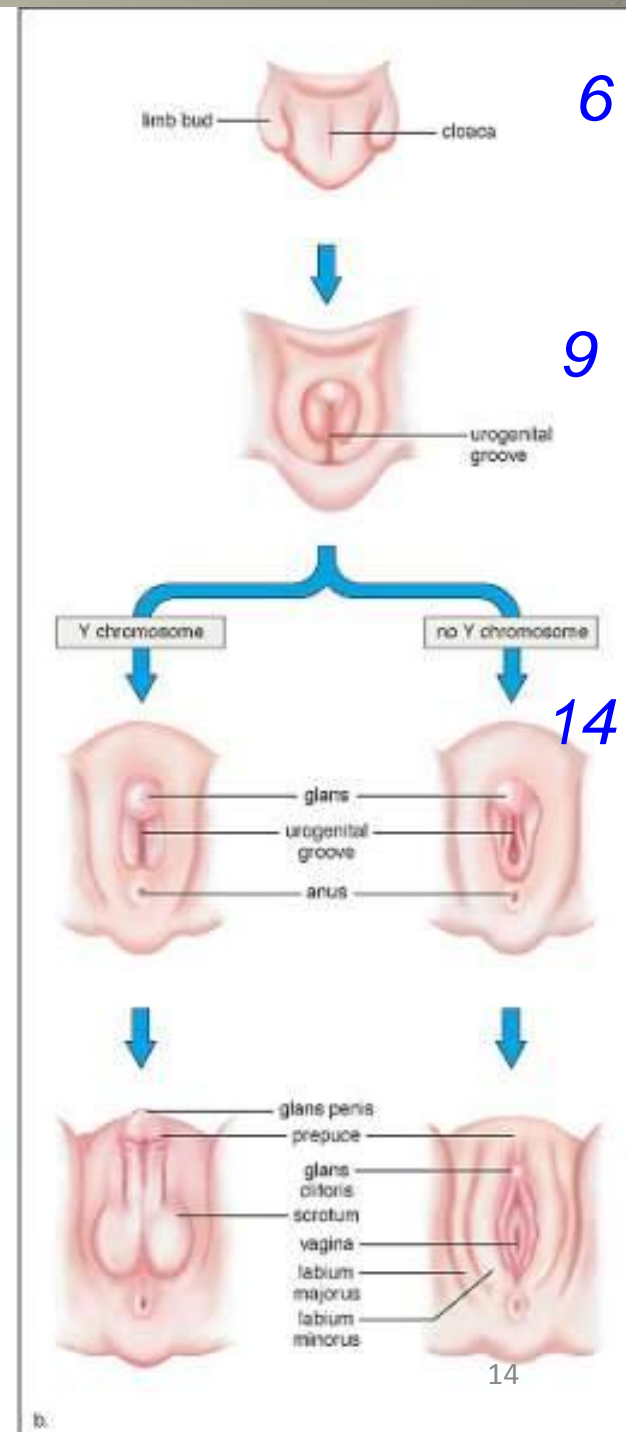
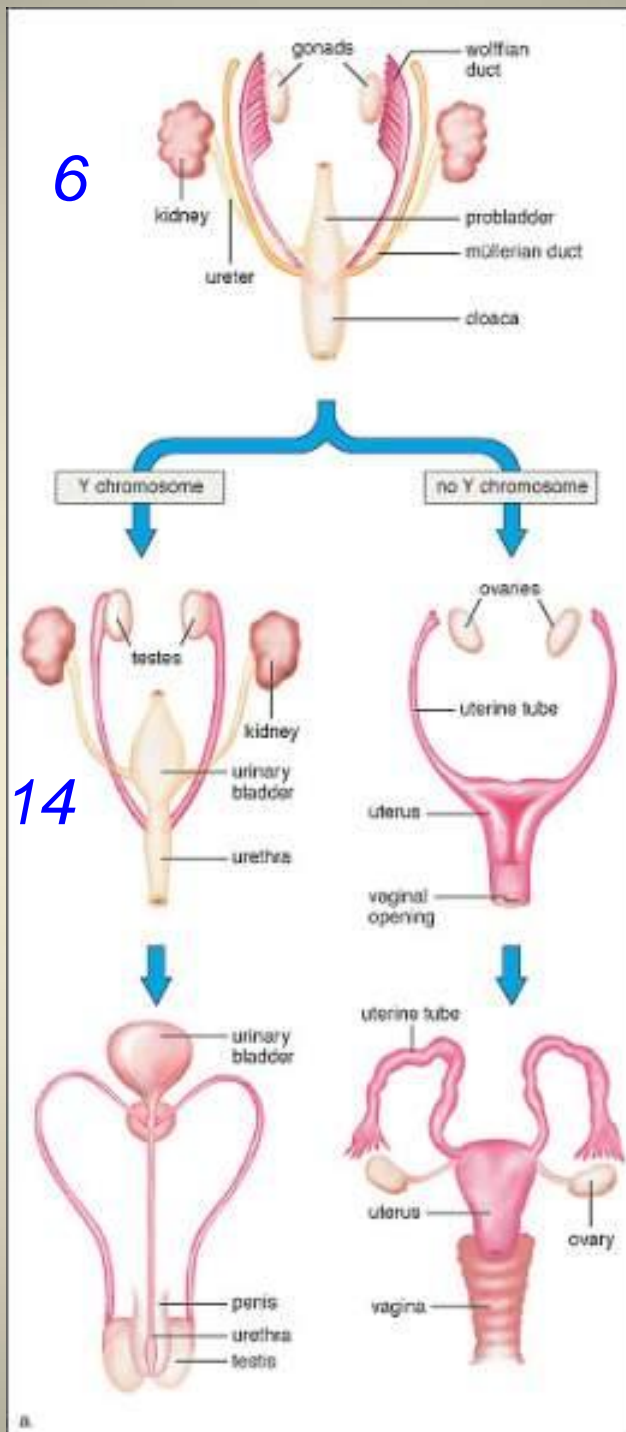
Zygo- = yoked, paired [Greek]

from Sylvia Mader, Human Reproductive Biology, 3rd ed.

Your parents...
(And YOU)

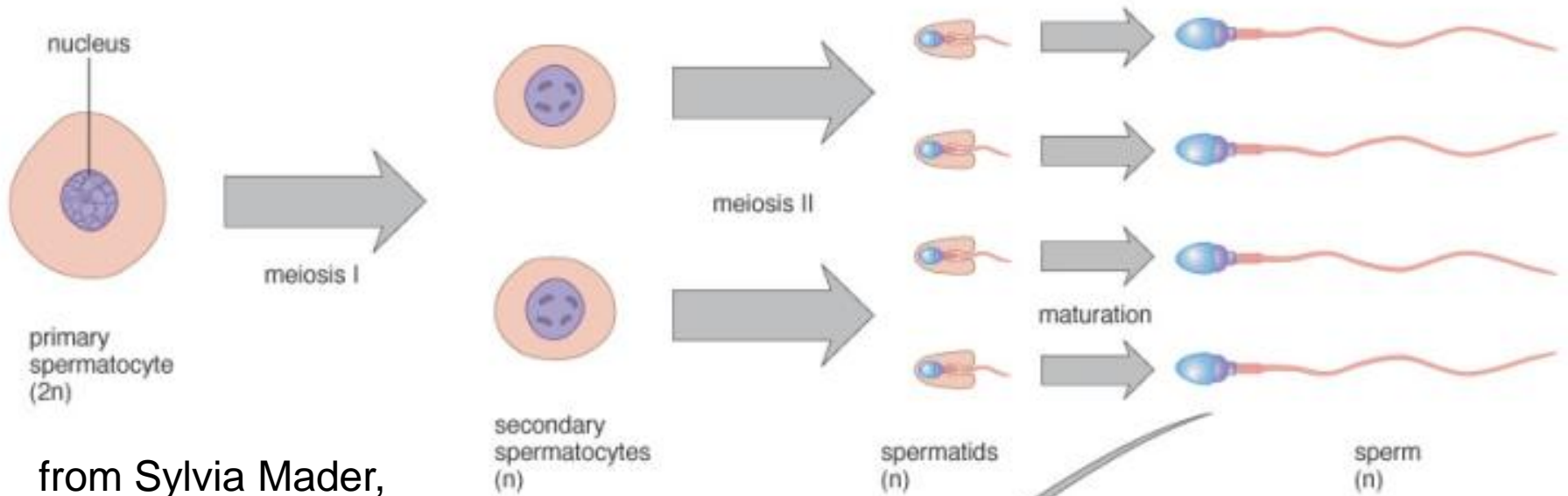
When
fetuses...

PGCs, Primordial
Germ Cells
populated the
presumptive
gonadal tissue...



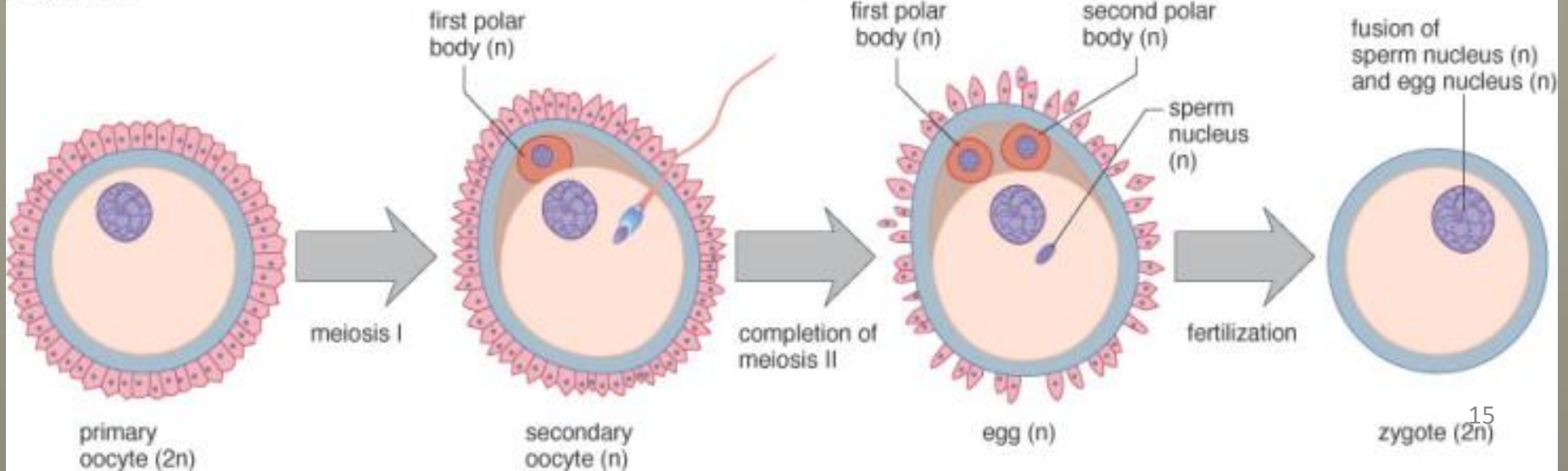
from Sylvia Mader,
Human Reproductive
Biology

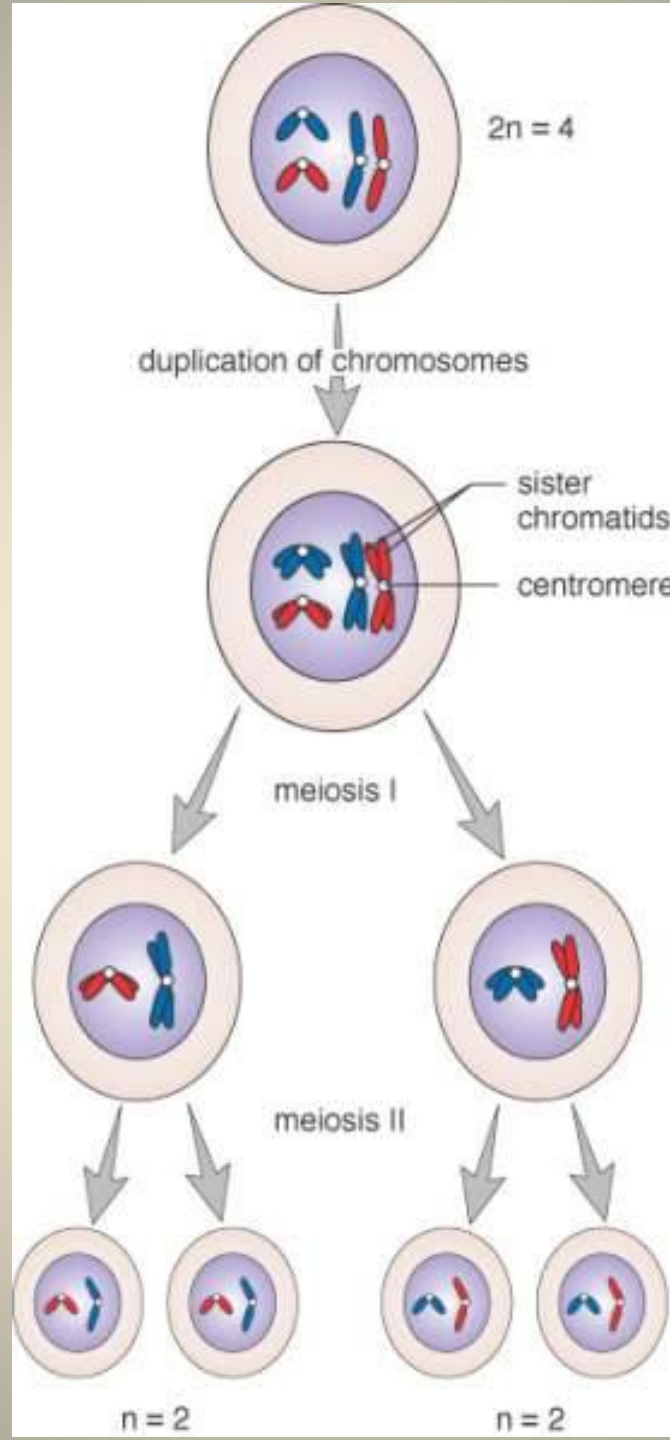
Spermatogenesis



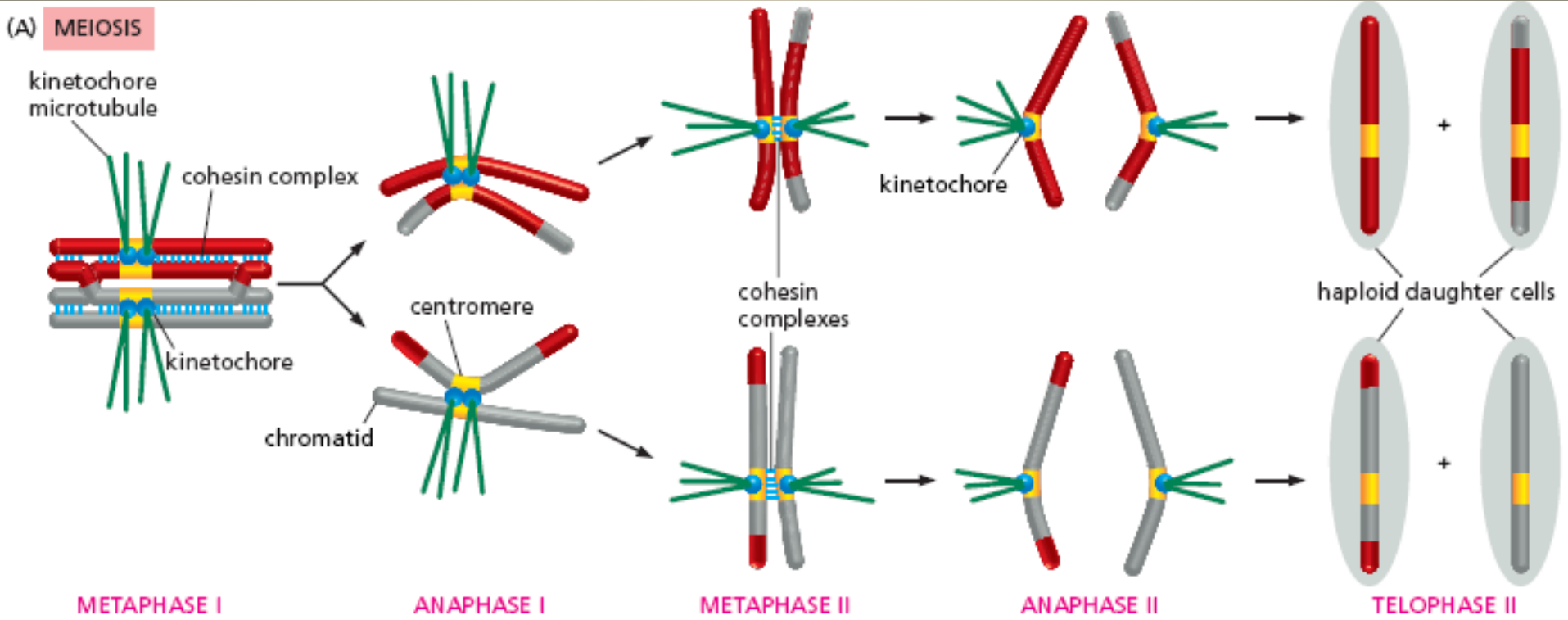
from Sylvia Mader,
Human
Reproductive
Biology, 3rd ed.

Oogenesis



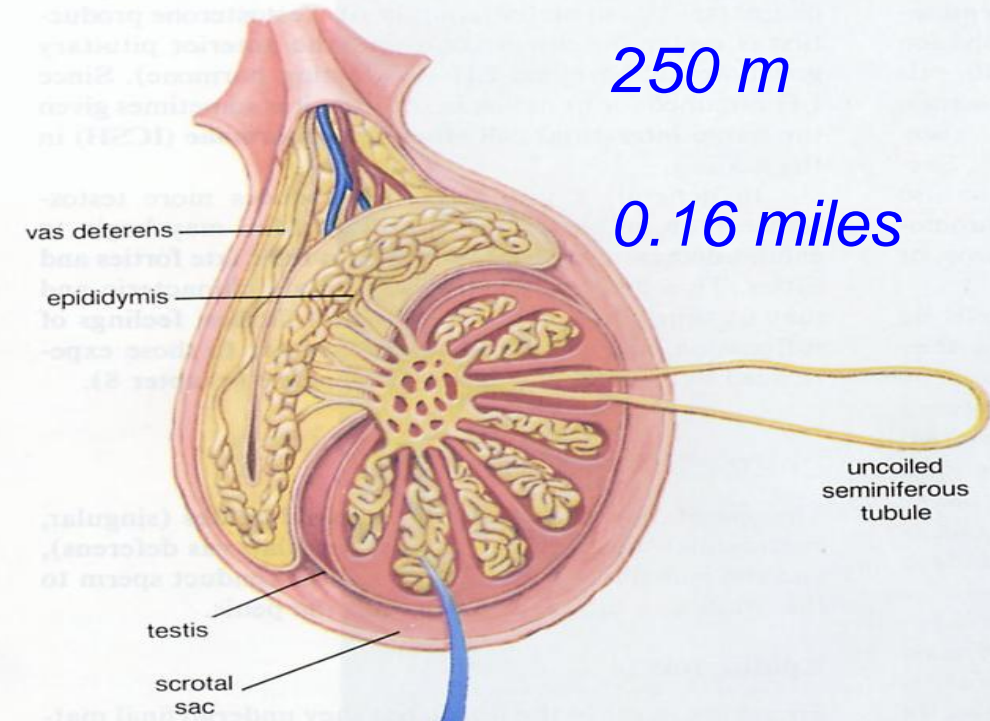


from Sylvia Mader,
Human
Reproductive
Biology, 3rd ed.



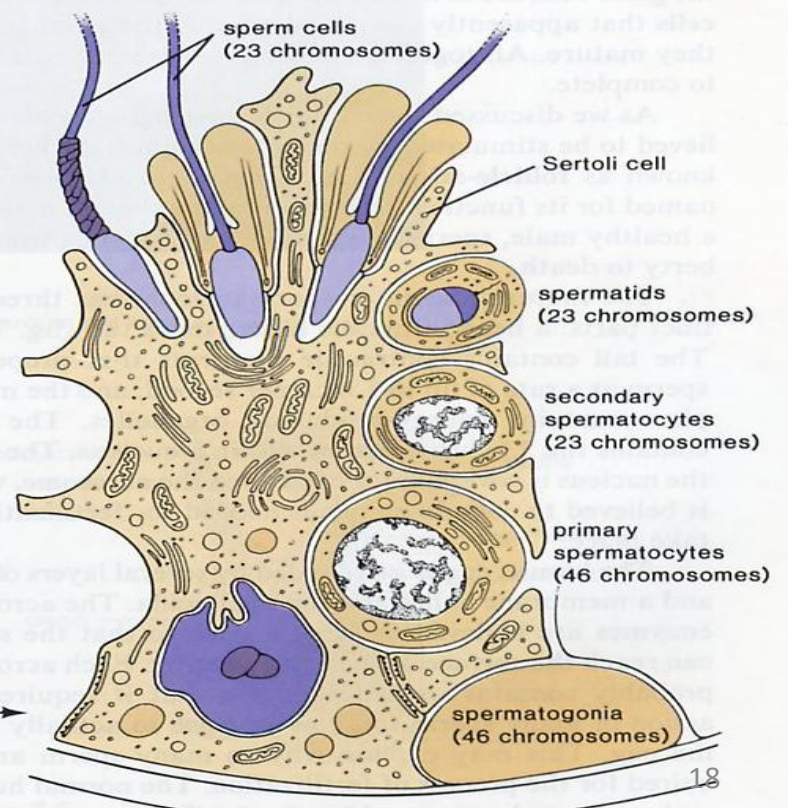
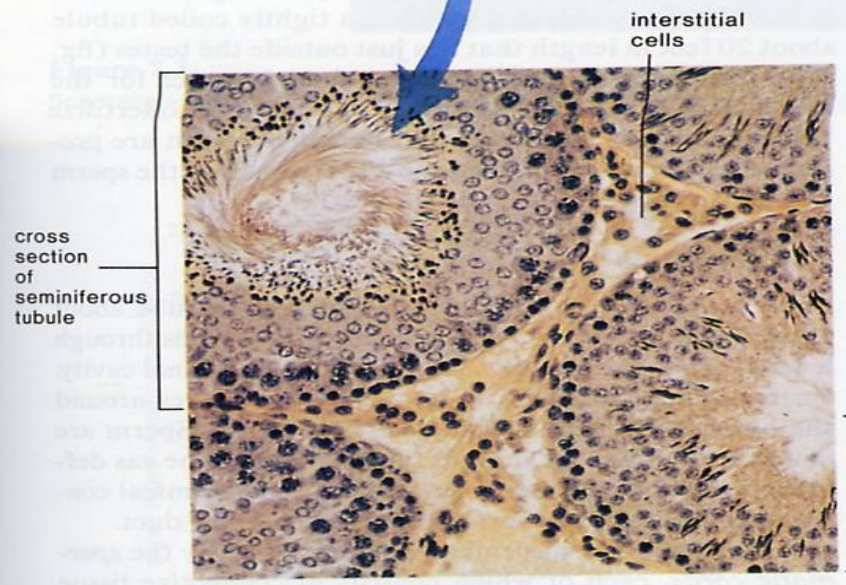
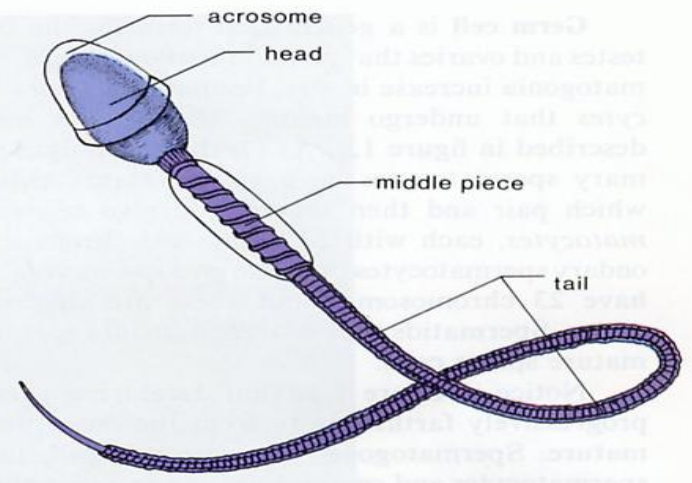
From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008

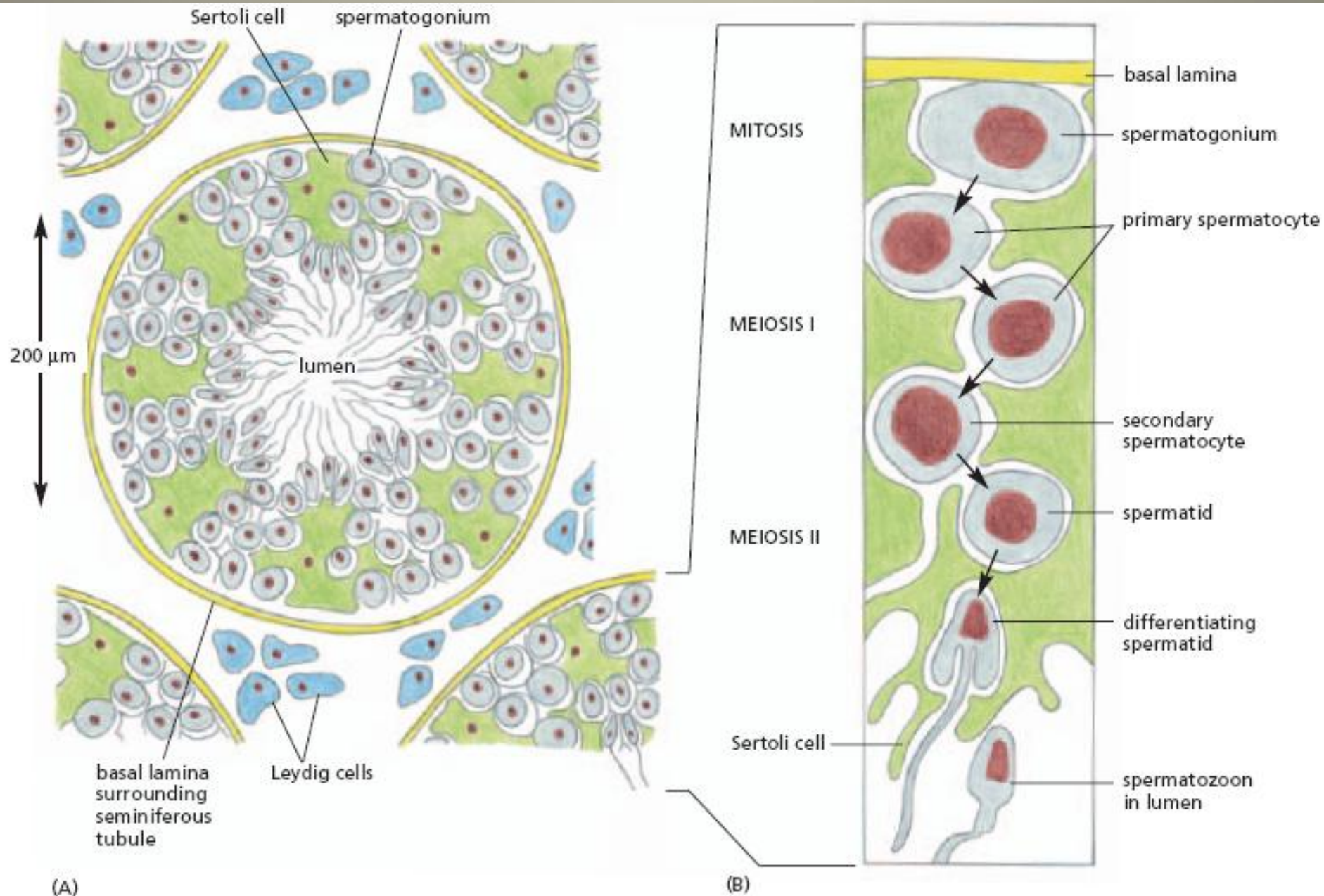
from Sylvia Mader, Human Reproductive Biology



250 m

0.16 miles





Duration of spermatogenesis

Mean: 74 days 95% CI: 69 - 80 days

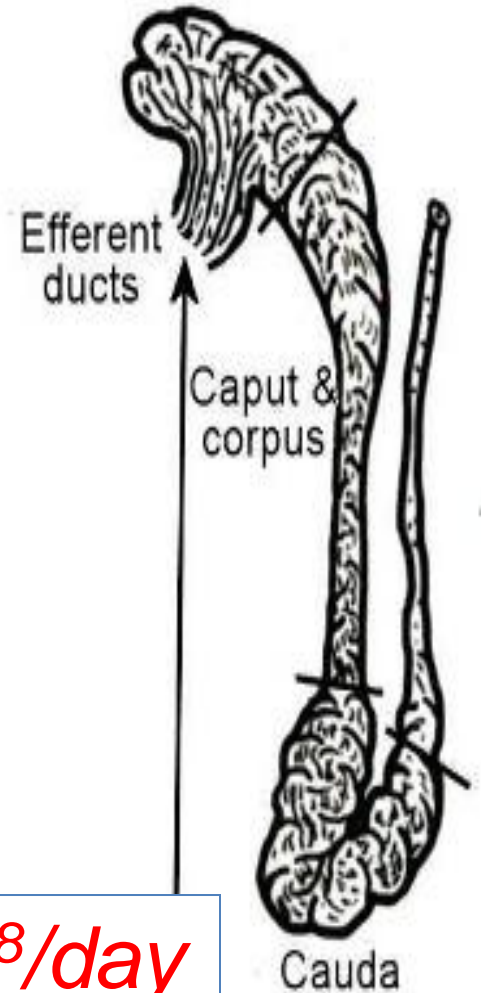
Not affected by DSP/g
or frequency of emission

Epididymal transit time

Caput+corpus: 0.7 - >3.5 days

Cauda: 1.5 - >4.5 days

Transit time varies with DSP/testis



DSP = daily sperm production ~10⁸/day

*From: Rupert Amann, Journal of Andrology,
Vol. 29, No. 5, September/October 2008*

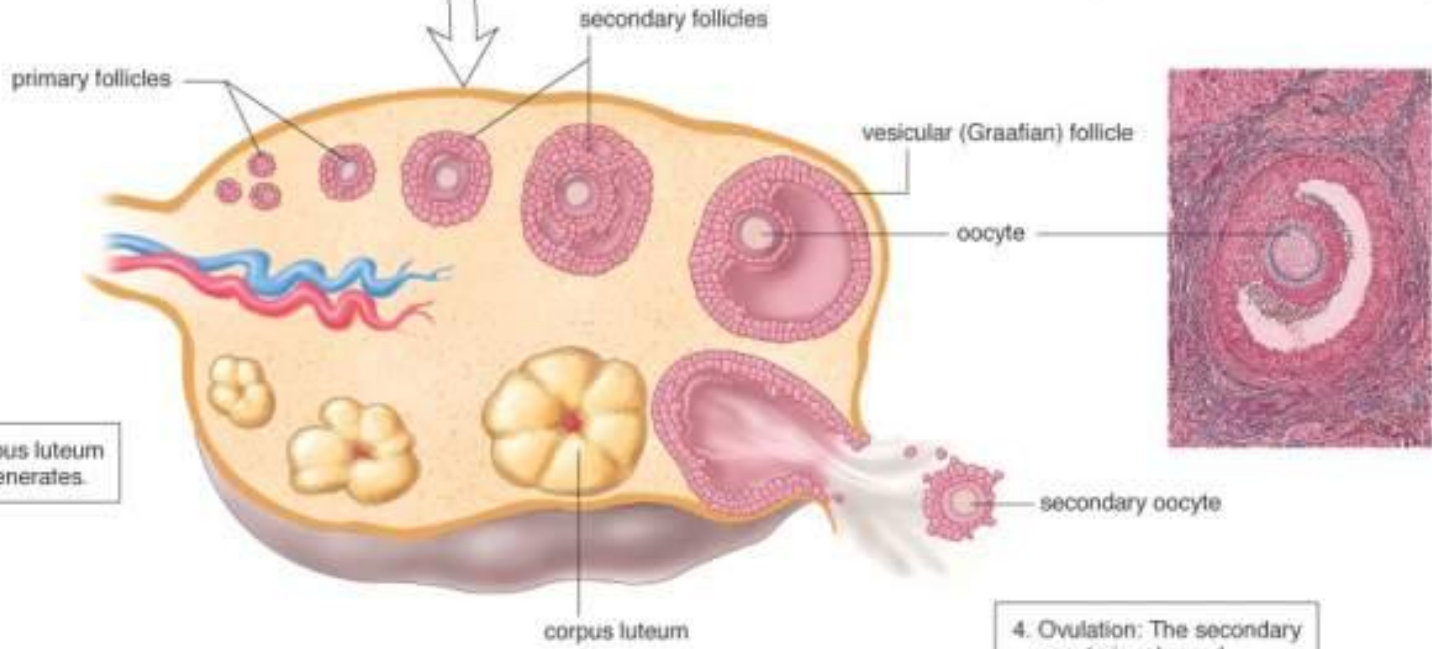
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Human
Reproductive
Biology, 3rd ed.



1. Primary follicles contain oocyte and begin producing the sex hormone estrogen.

2. Secondary follicles contain secondary oocyte and produce the sex hormones estrogen and some progesterone.

3. Vesicular (Graafian) follicle develops.

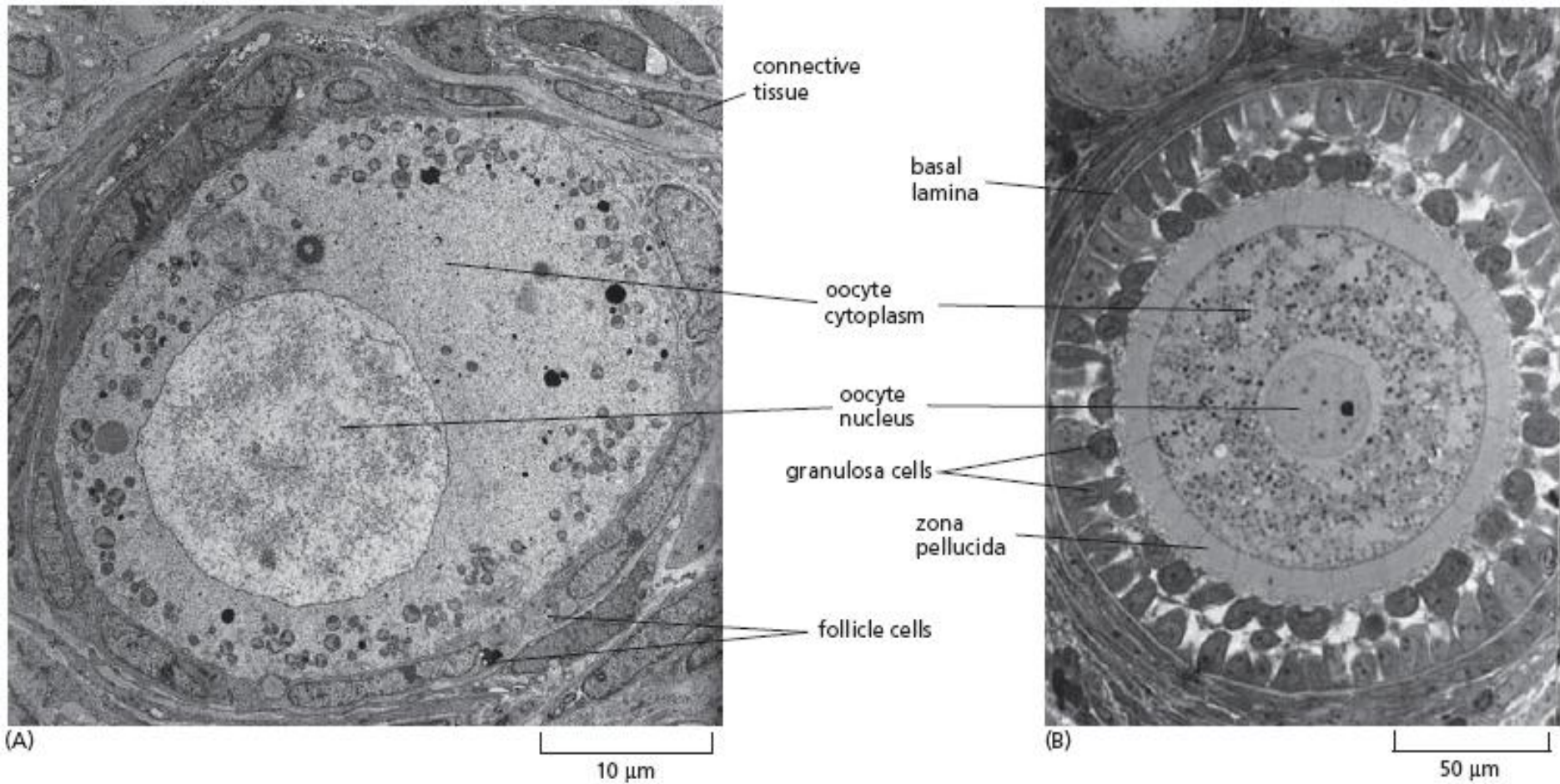


6. Corpus luteum degenerates.

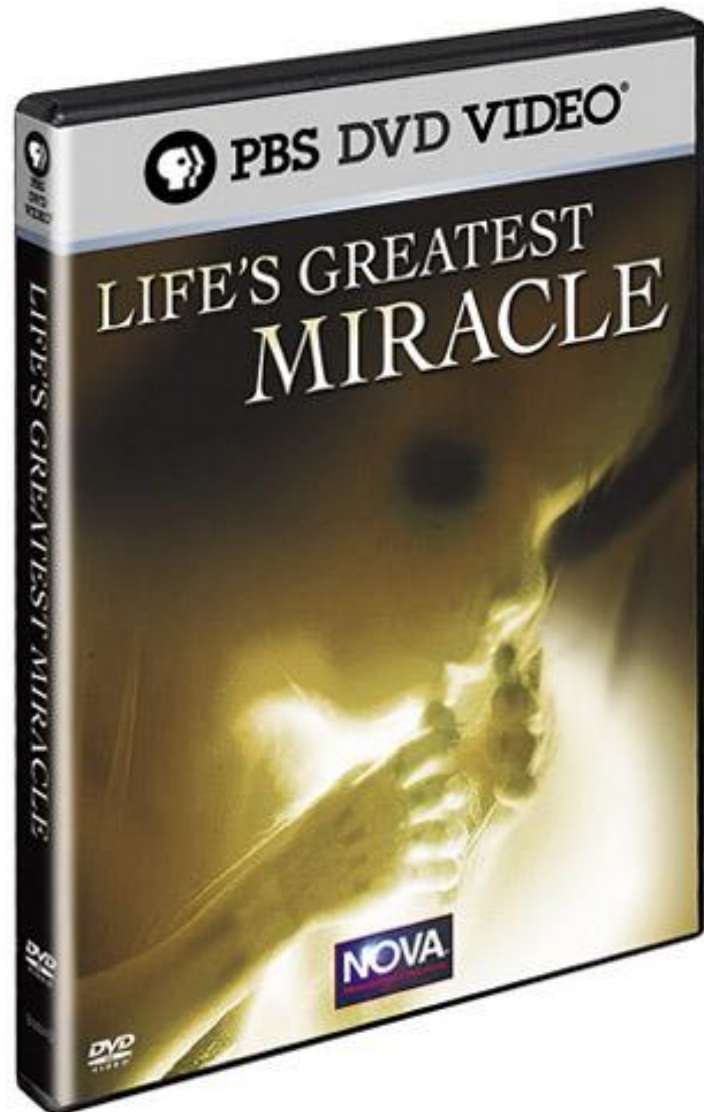
4. Ovulation: The secondary oocyte is released.

5. Corpus luteum produces the sex hormones progesterone and some estrogen.





From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008



<http://www.shoppbs.org/product/index.jsp?productId=1402972>

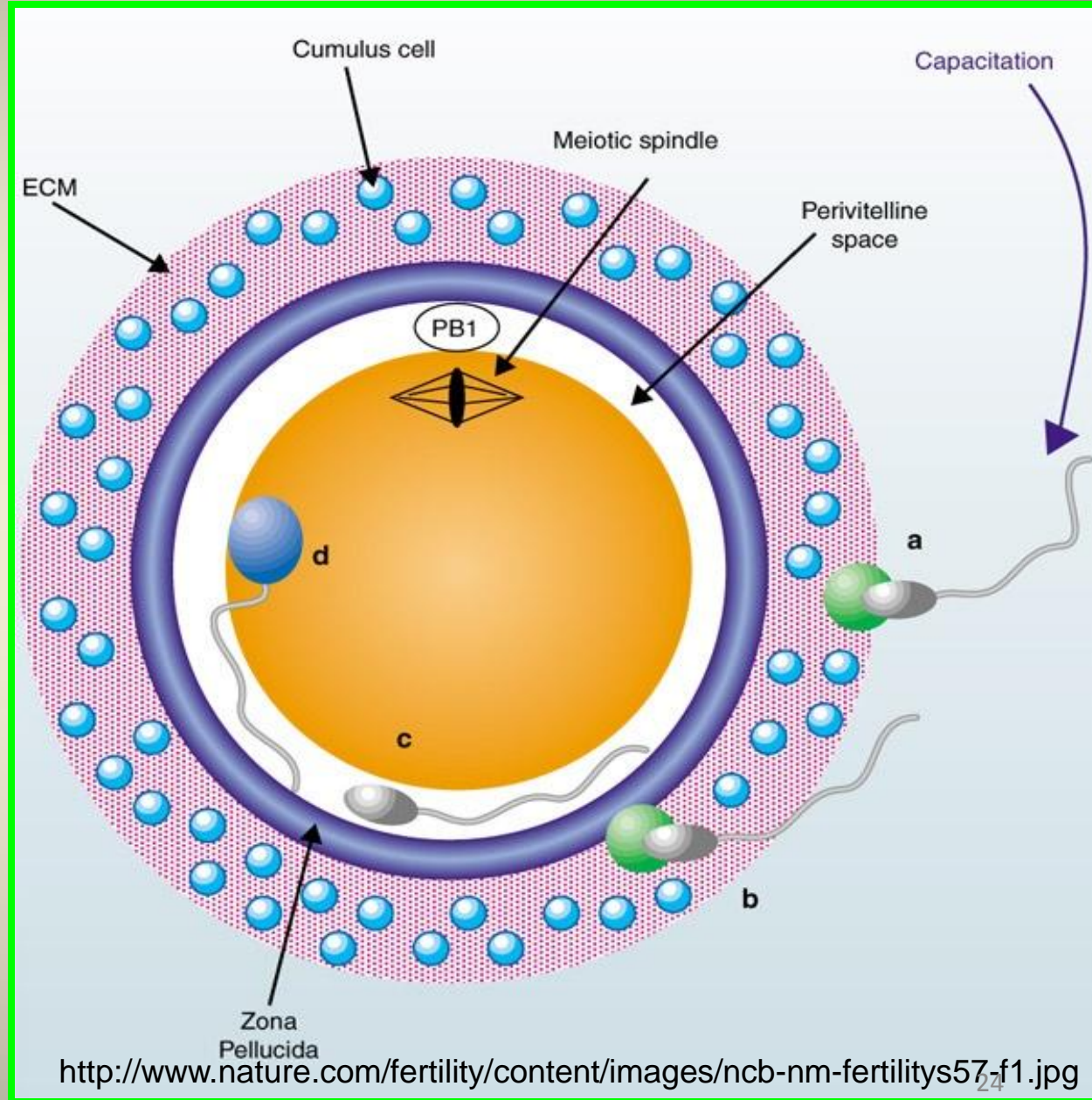
Fertilization

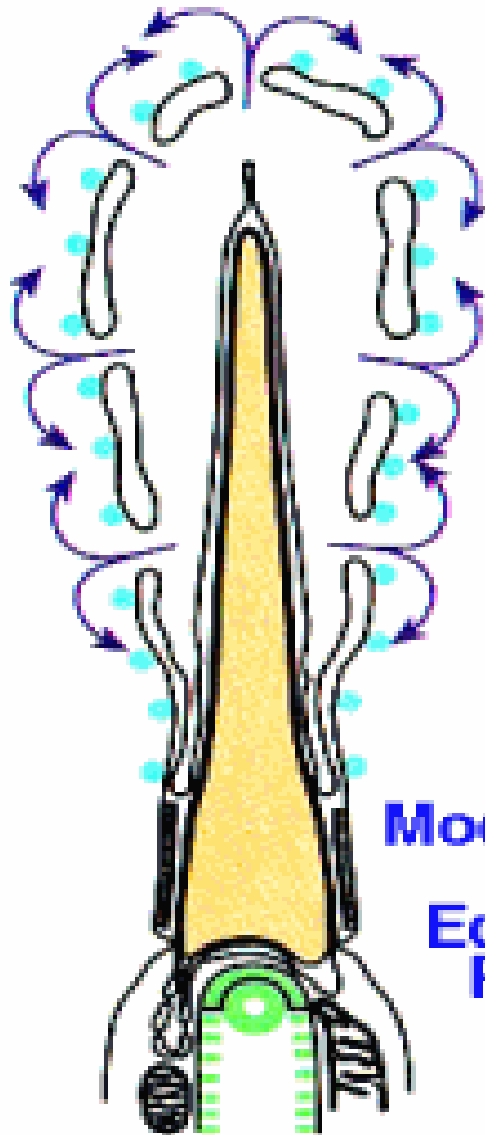
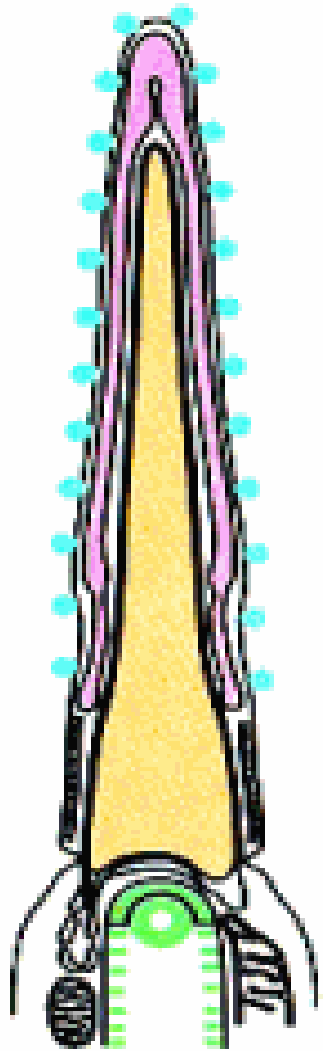
Green=Acrosome

Purple=*Zona Pelludica*

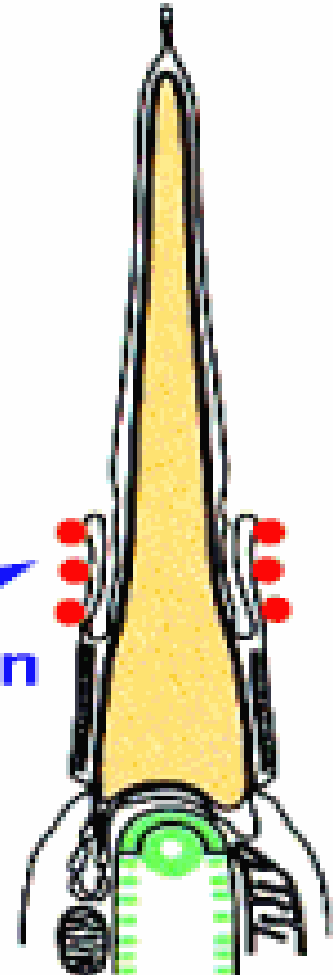
Gray= Sperm w/out
Acrosome

**note that the
acrosome
compartment
opened after contact
with the *zona pellucida*





Modification
of the
Equatorial
Region



From Cell Mol Life Sci 64 (2007)

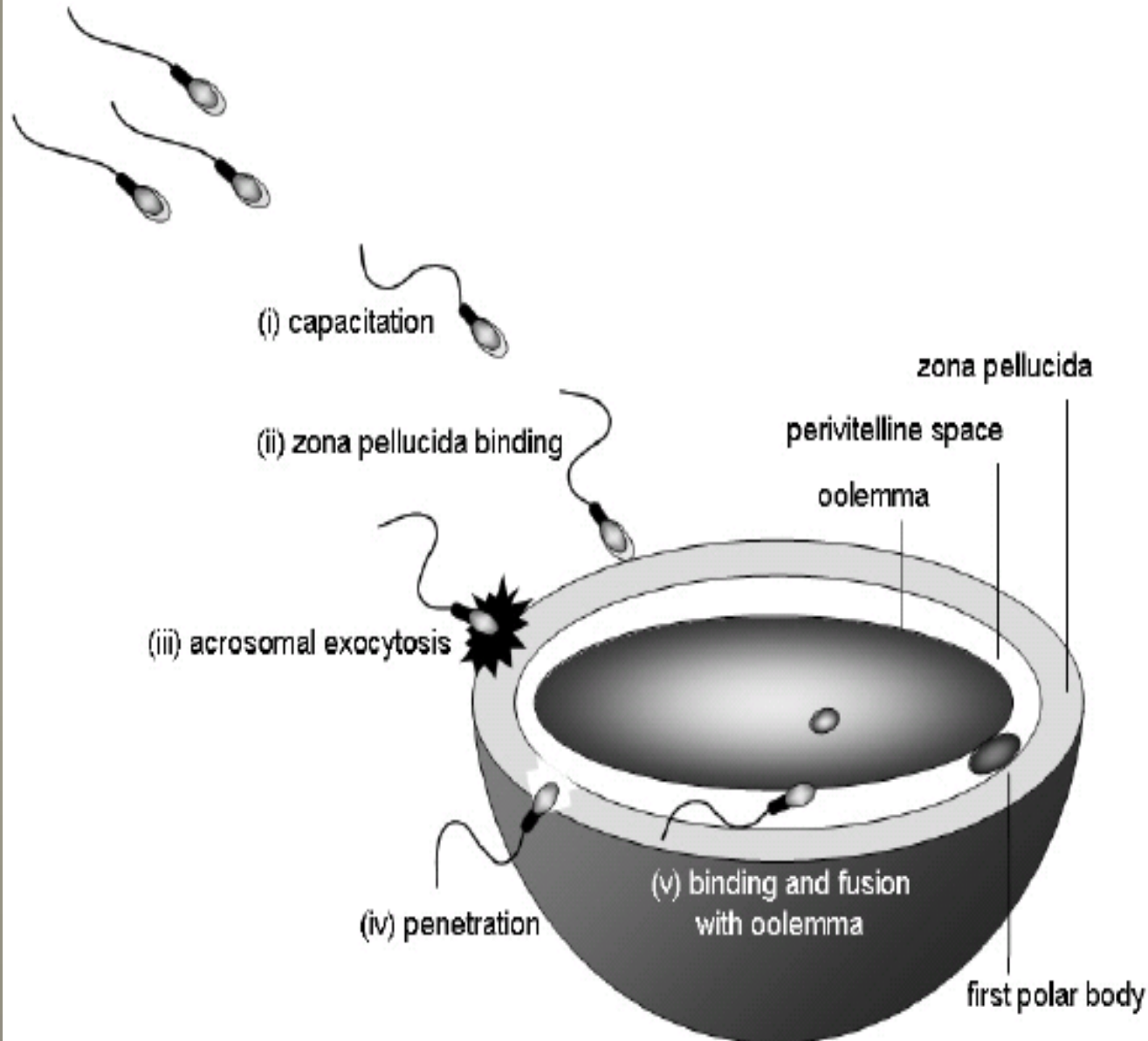
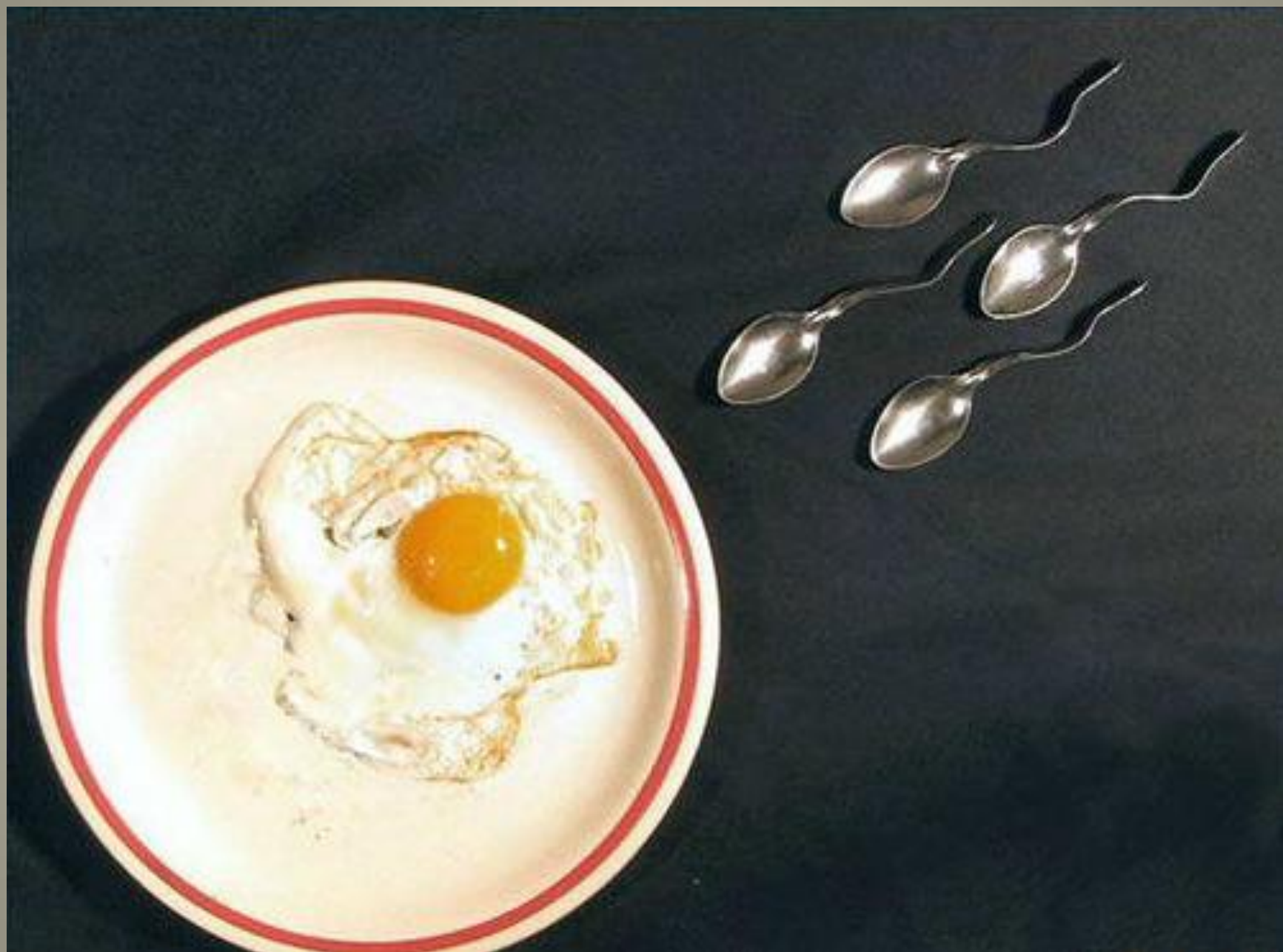
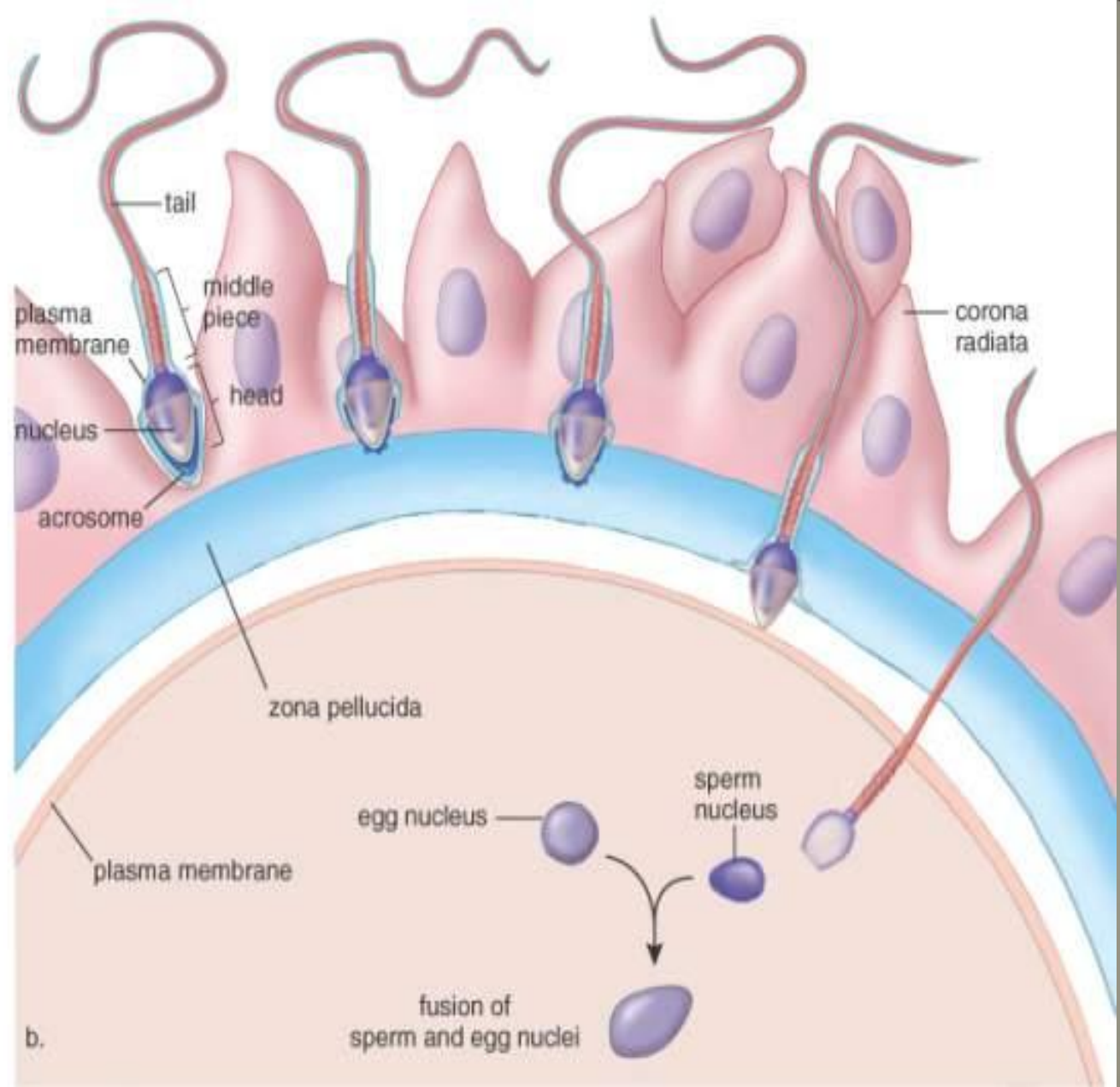
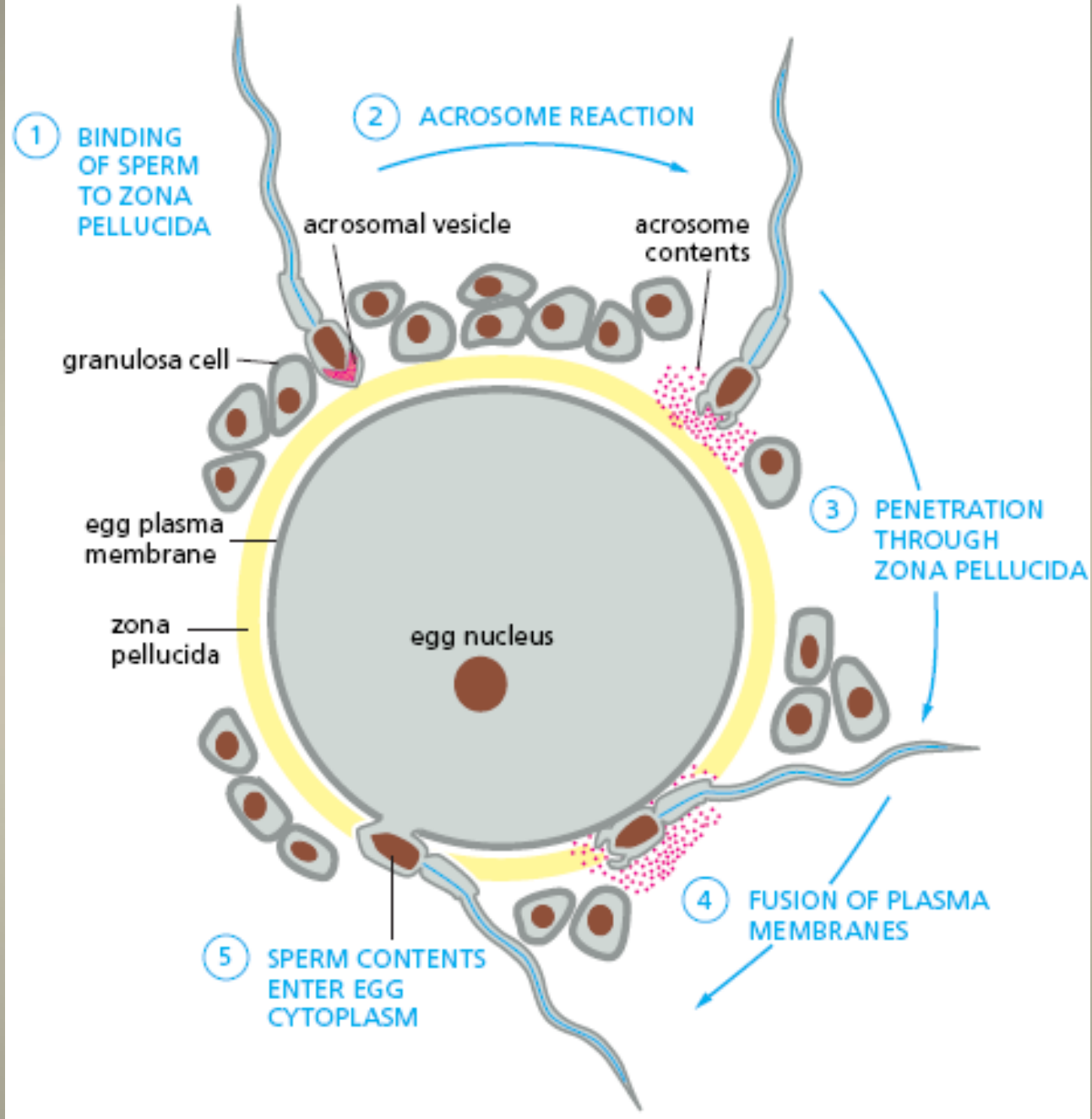


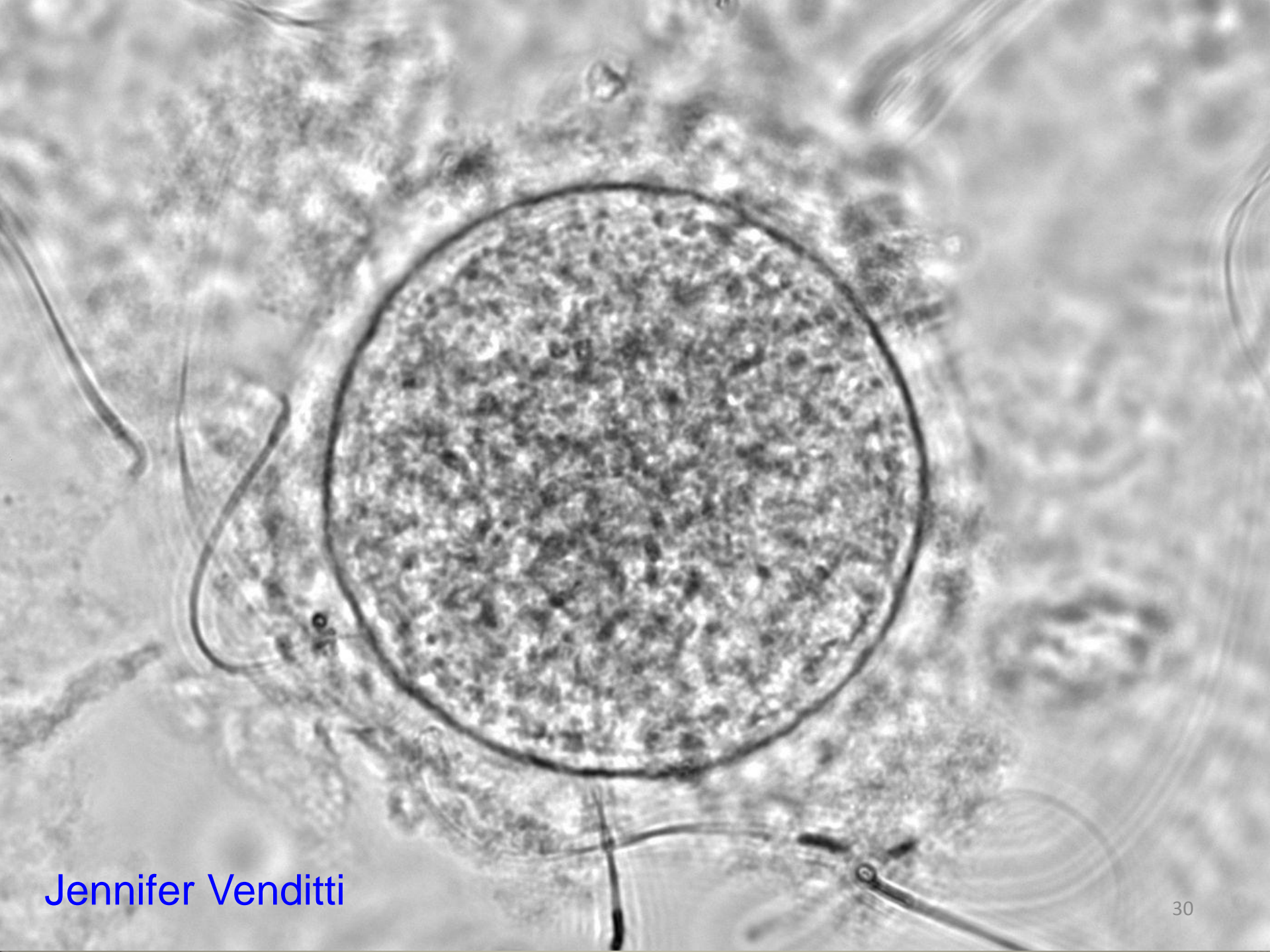
Figure 1. Mammalian fertilisation. Within the female reproductive tract (i) sperm undergo a series of surface and intracellular transformations, collectively termed capacitation, which enables them (ii) to bind to the zona pellucida (ZP) and (iii) undergo the acrosome reaction. (iv) The release of hydrolytic enzymes from the acrosome facilitates sperm passage through the ZP and (v) fusion with the oolemma.

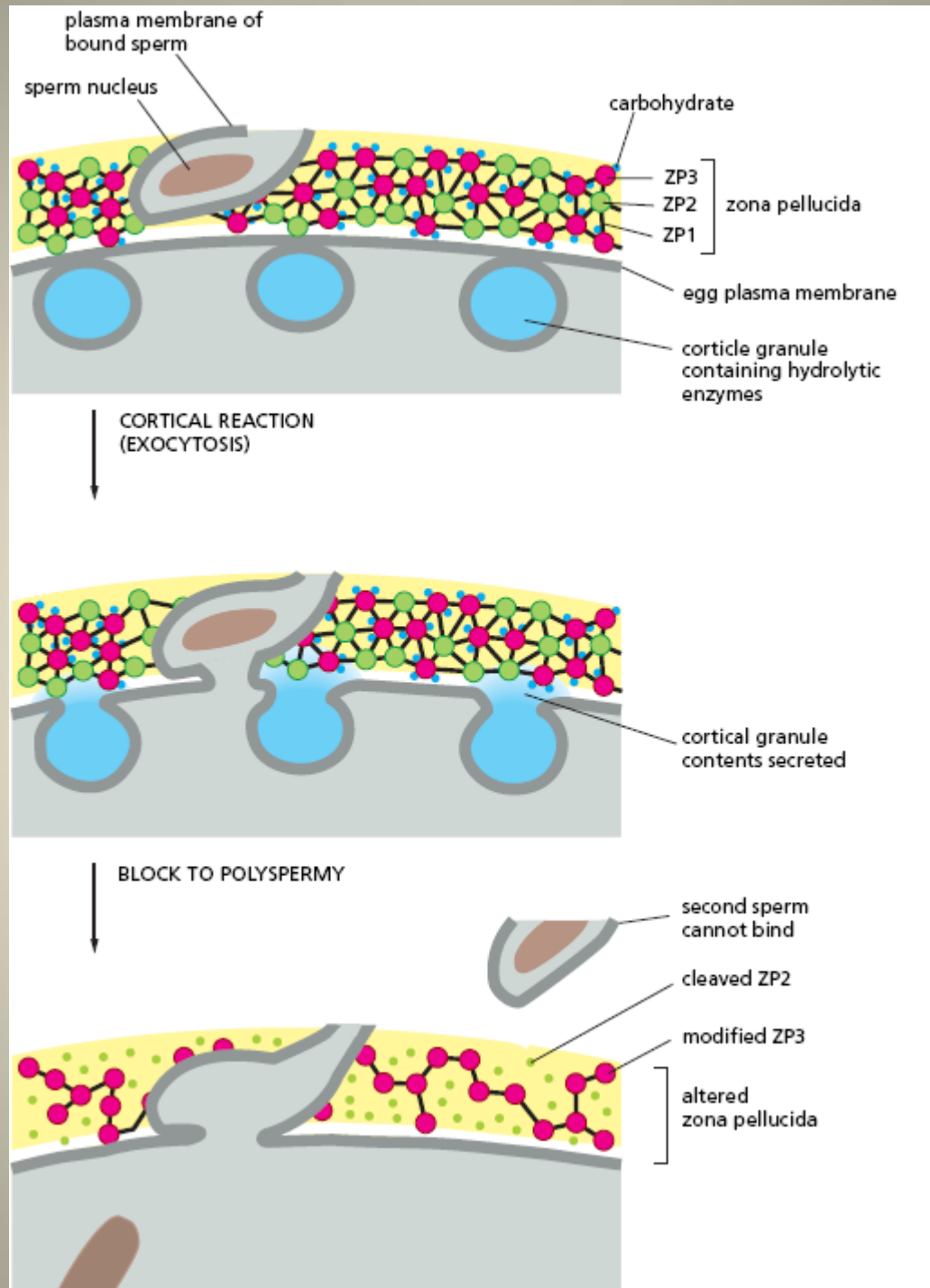






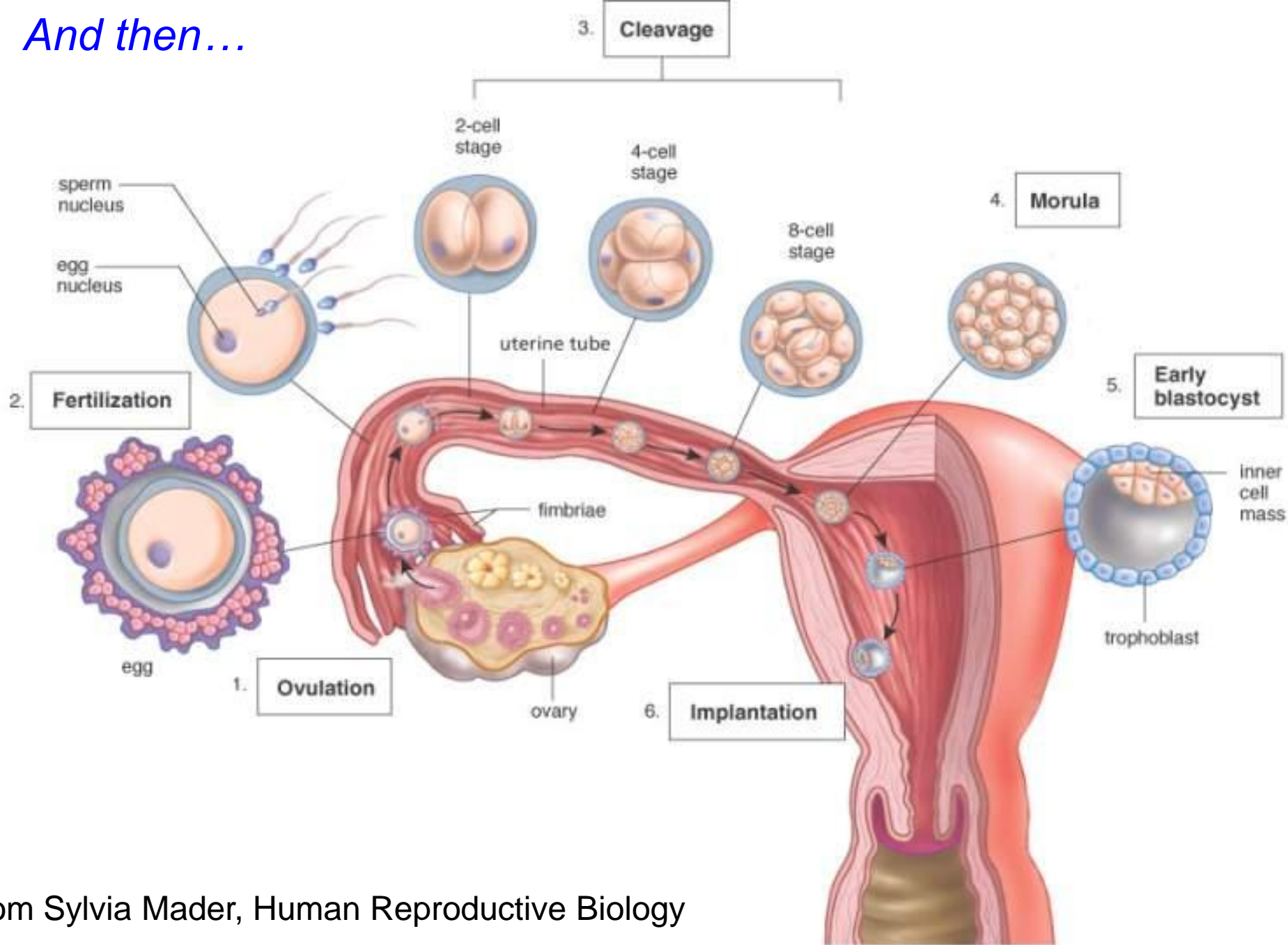
From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008





*From Alberts et al.,
Molecular
Biology of
the Cell, 5th
ed., 2008*

And then...



from Sylvia Mader, Human Reproductive Biology

Questions

Discussion

Editorials

Jokes

Thanks! Watch DVD