



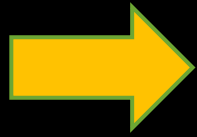
Biotechnology of Reproduction

UNIVERSITY of
TERAMO

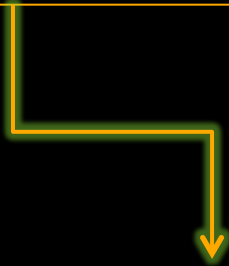
THE OOCYTE MATURATION

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THE OOCYTE MATURATION



What is the purpose of the process?



The **endpoint of meiotic maturation** is the production of an haploid oocyte

The **endpoint of oocyte maturation** is the production of an oocyte, arrested at the MII stage of meiosis, but possessing the full competence after fertilization of supporting normal embryonic development

★ Communication between oocyte and granulosa cells (GCs)

Via both GJs and secreted paracrine signals

GCs:

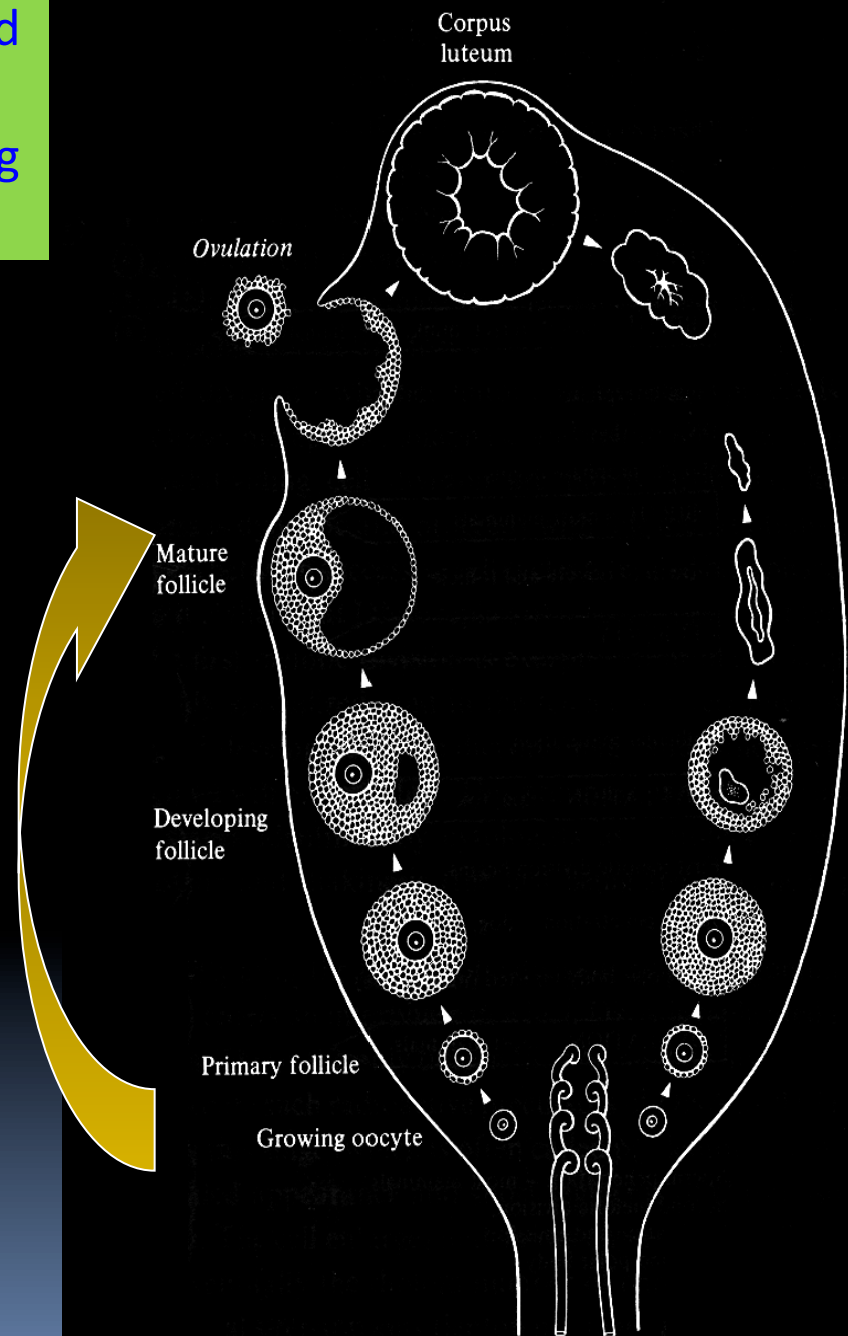
- Promote growth and development of the oocyte and acquisition of competence to resume meiosis
- Cause the maintenance of meiotic arrest in fully grown oocytes
- Participate in the induction of meiotic resumption after the pre-ovulatory surge of LH

The oocyte:

- Promotes the formation of primordial follicles
- Promotes GCs proliferation
- Promotes cumulus expansion
- Regulate GCs differentiation and function

Despite their continuous relationship and coordination, evident differences exist between oocyte and somatic cells during most of the folliculogenesis/oogenesis

★ Somatic cells proliferate noticeably, whereas the cell cycle of the oocyte is quiescent

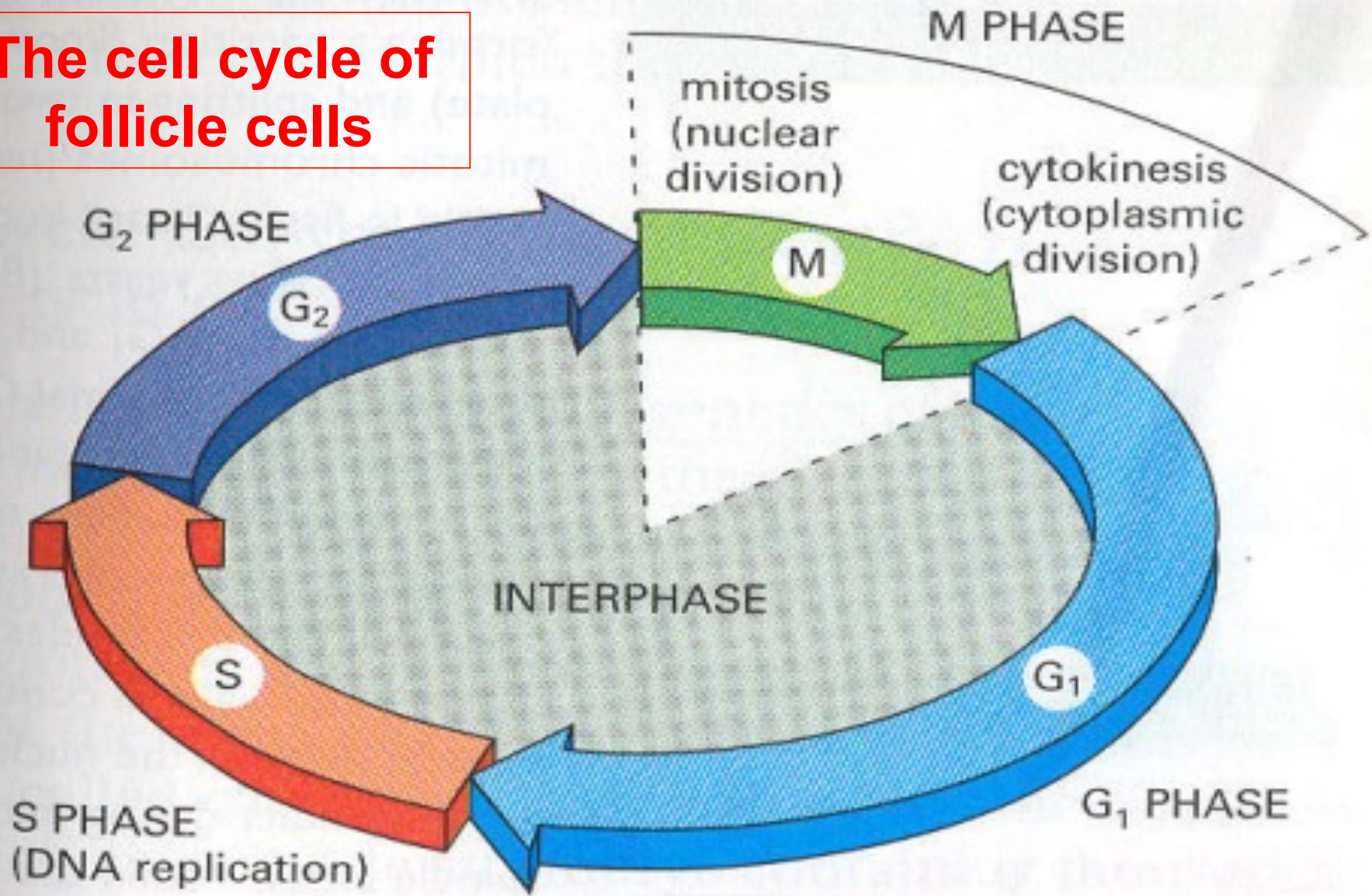


CELL CYCLE

- All cells arise by the division of an existing cell
- **CELL CYCLE**: it is the life of a cell, from the time it is generated (by the division of its parent cell) to the time it in turn divides.
- It is possible to distinguish two parts of the cell cycle:
 - **INTERPHASE**, that occupies about 90% of the cell cycle and it is a period of synthesis and growth;
 - **M PHASE**, that is a brief period of profound structural changes

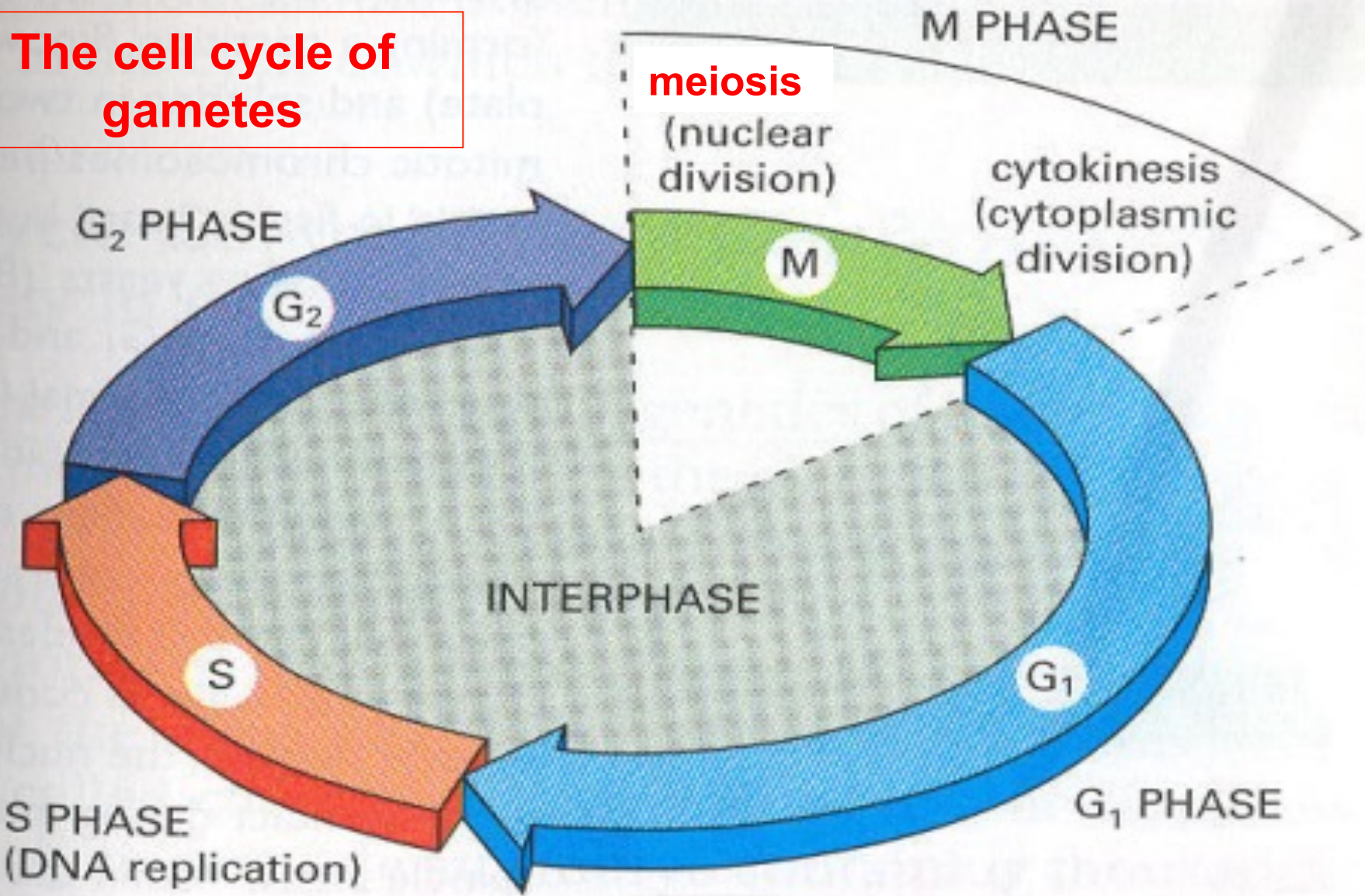
Due to **MITOSIS**, at the end of cell cycle the follicle cells contain an identical set of the parental cell's chromosomes

The cell cycle of follicle cells



Due to **MEIOSIS**, at the end of cell cycle the **oocytes and spermatozoa** contain only one copy of each parental chromosome.

The cell cycle of gametes





Pay attention!

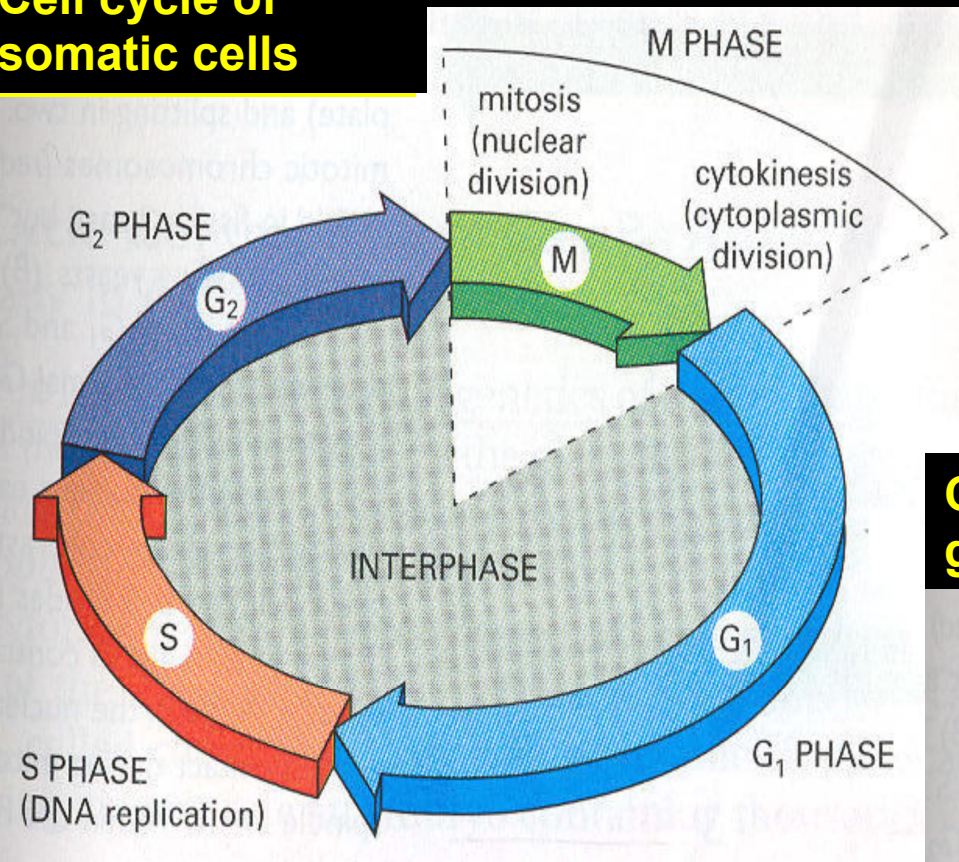
In sexually reproducing organisms, the gametes (the oocyte and the sperm) arise by a different type of cell division from the somatic cells (**meiosis** instead of mitosis).

The result is that **an individual egg or sperm cell is haploid**, that is, it contains only one copy of each parental chromosome



**Fusion of an egg and sperm at
FERTILIZATION restores the
diploid ($2n$) state**

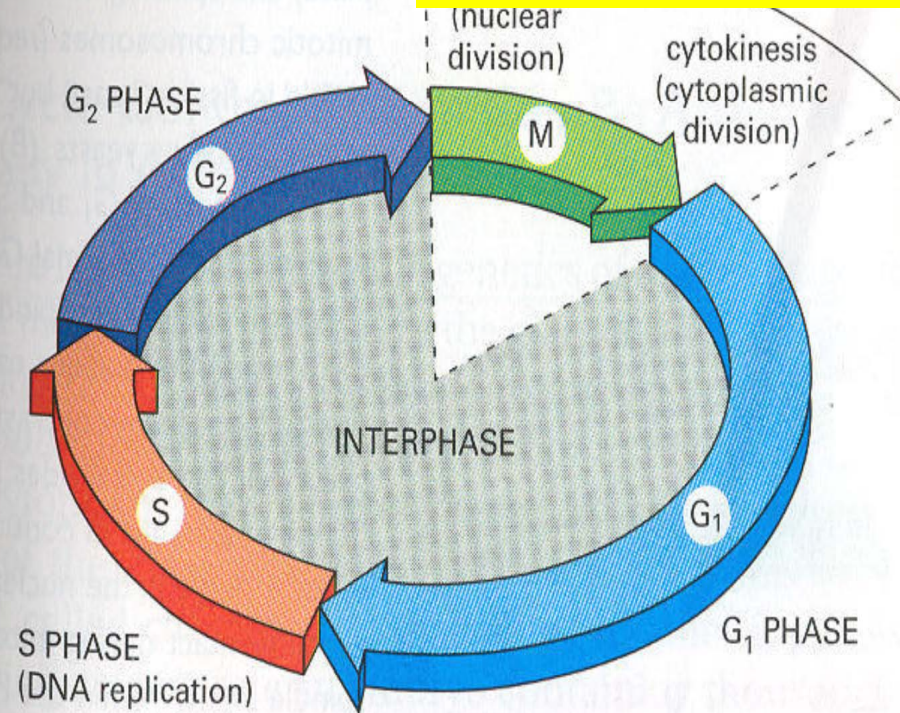
Cell cycle of somatic cells



Summarizing.....

Cell cycle of gametes

M phase: MEIOSIS



- Nuclear division of gametes is different from that of follicle cells (**meiosis instead of mitosis**)
- During folliculogenesis somatic cells proliferate, whereas **the cell cycle of oocyte is arrested**



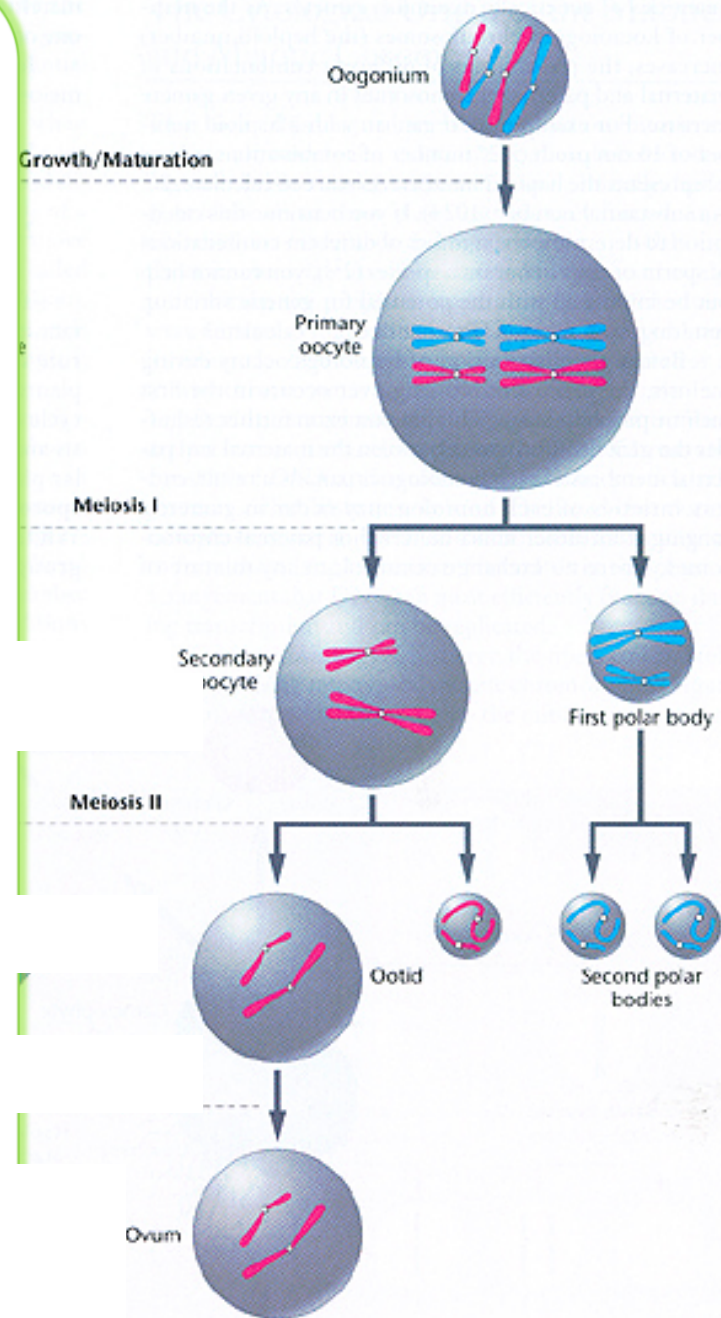
Pay attention!

During folliculogenesis:

- **intense proliferation of the follicle cells.**
- **In each ovarian follicle, the somatic cells do not increase their volume, they actually increase their number!**
- **the oocyte is quiescent, its cell cycle having been arrested at the prophase of the first meiotic division (dictyate stage or GV stage)**

Oocyte meiosis

The endpoint
of meiosis is
the production
of an haploid
oocyte

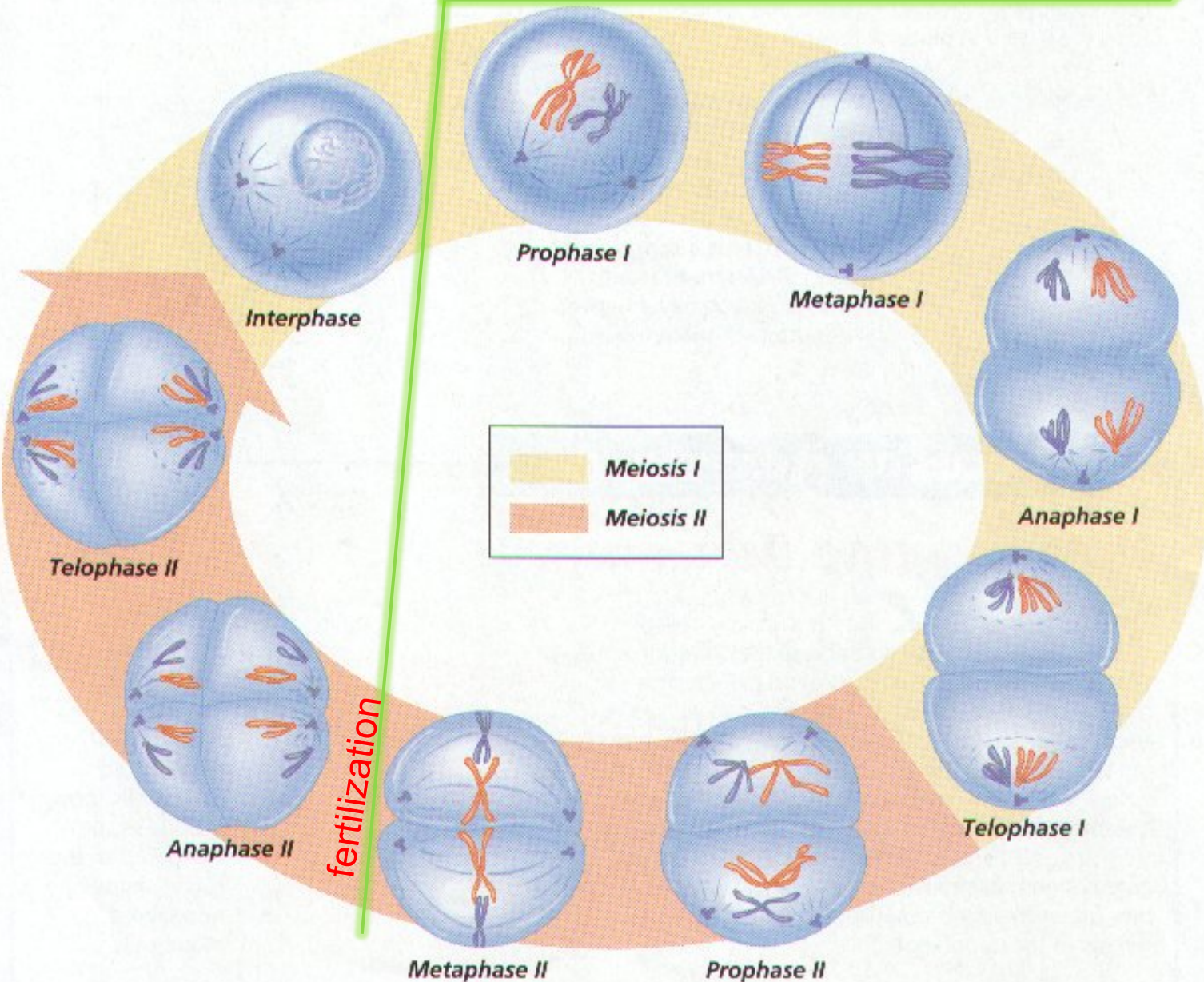


MEIOTIC MATURATION

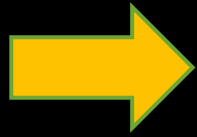
**In most Mammals it is a well defined phase
that goes
from GV to MII stage**

Only after fertilization the oocyte will complete meiosis

Oocyte meiotic maturation



Unit 1: Biology of gametes



THE OOCYTE MATURATION

✓ *Definition*

✓ *What is the purpose of the process?*

◆ *What triggers the process?*

◆ *How long is the process?*

◆ *What happens to the oocyte during maturation?*