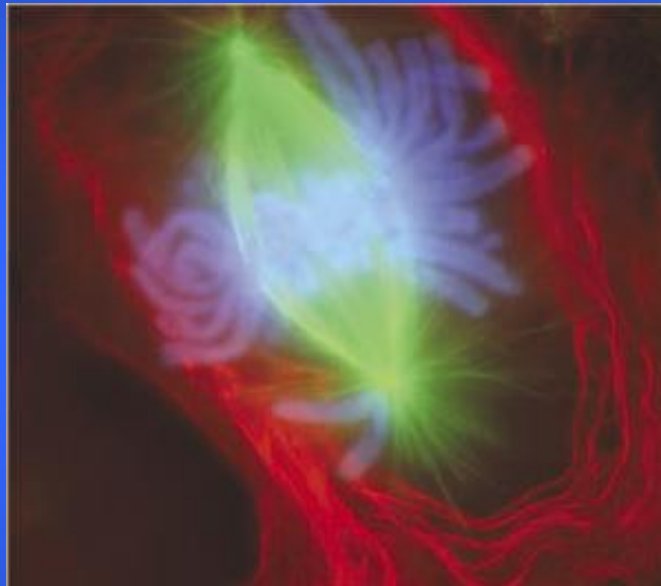


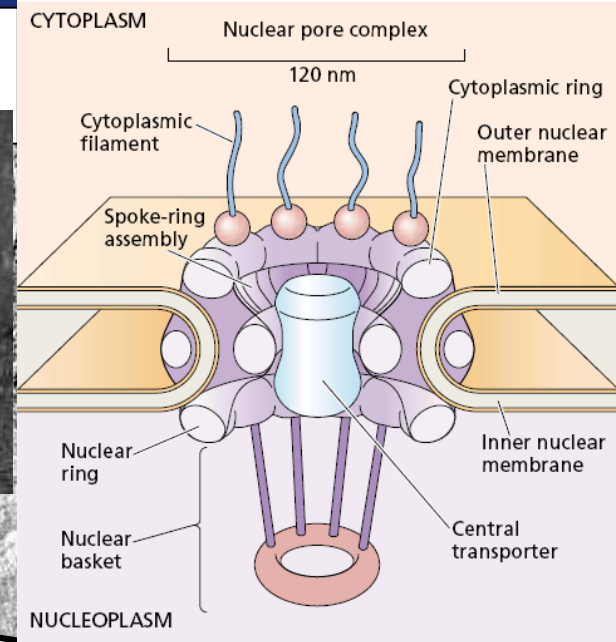
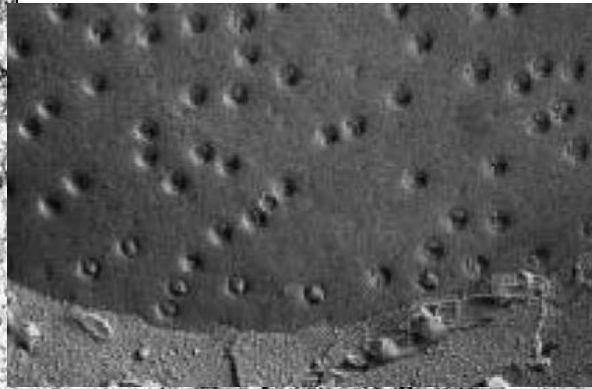
Cell Cycle



Cell Division

Interphase nucleus

Nuclear pore complex

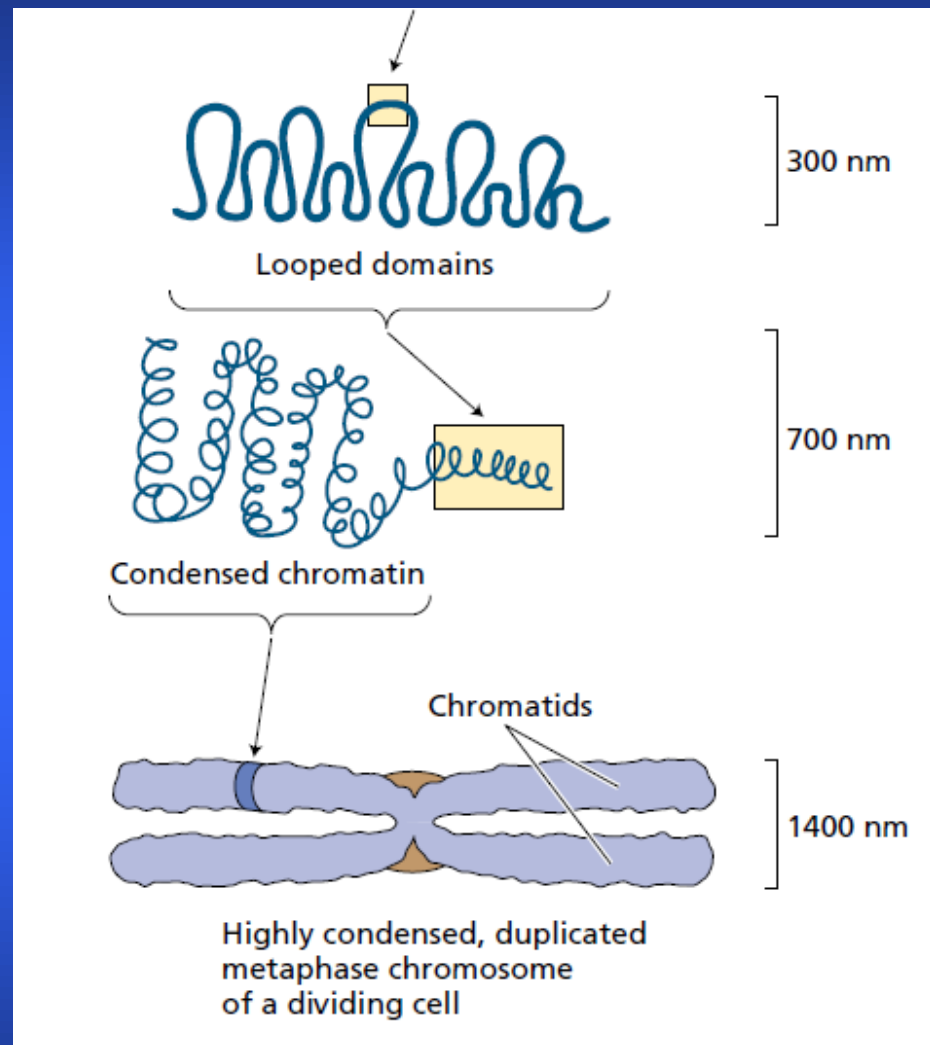
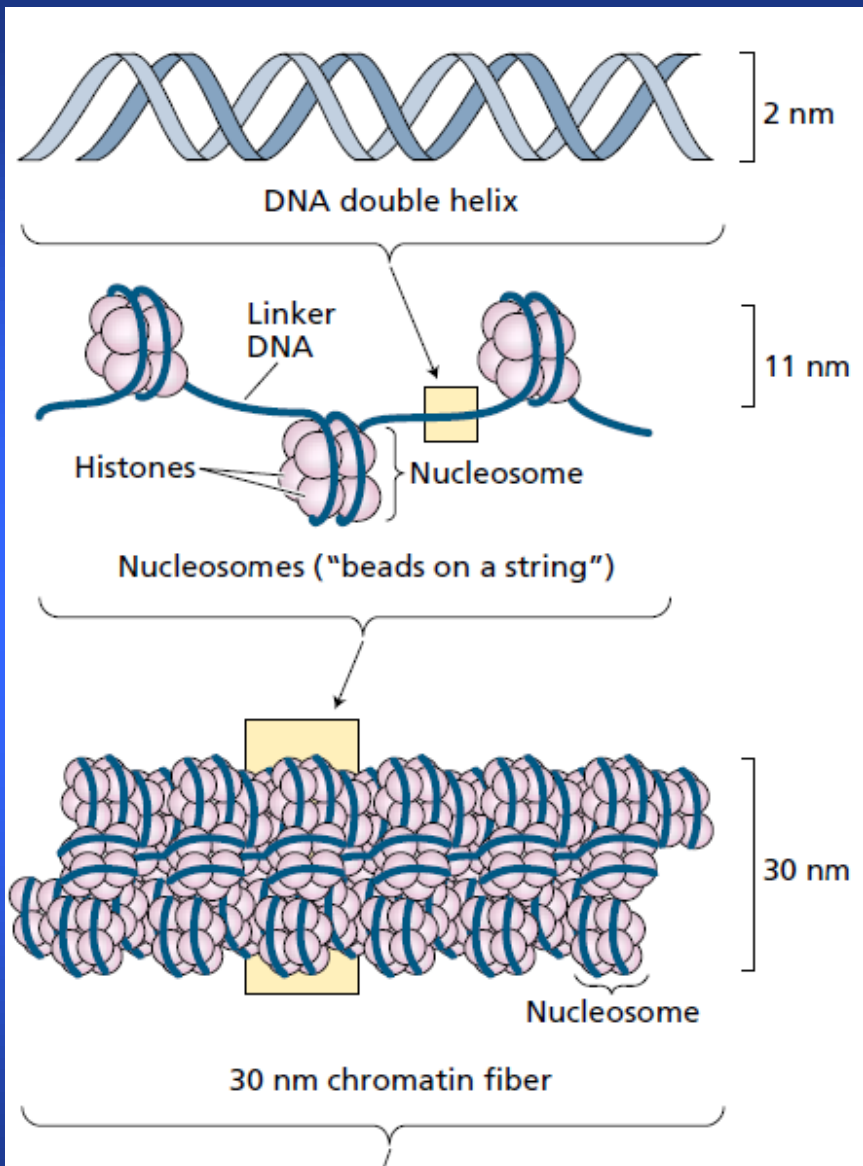


nuclear envelope

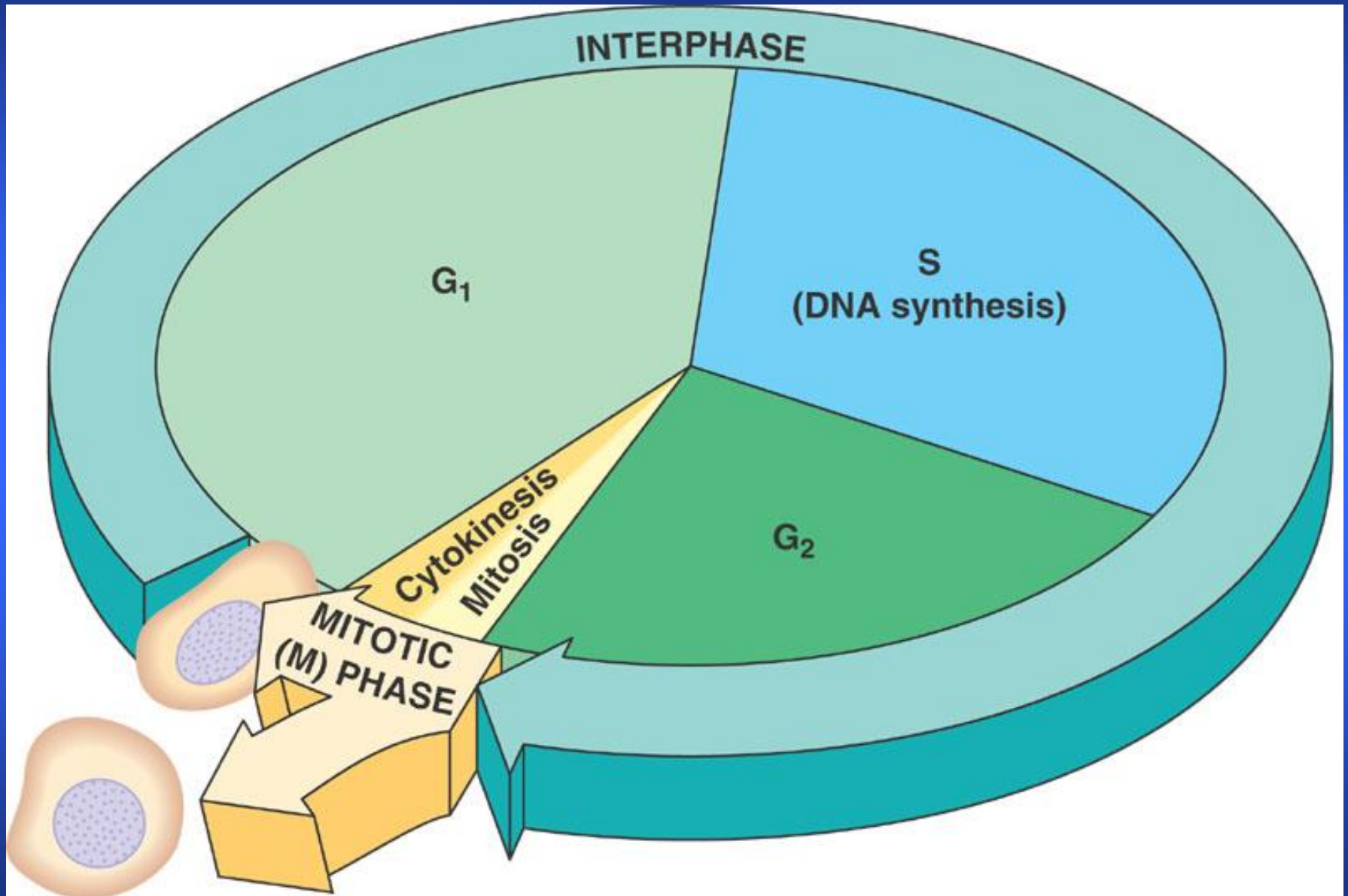
heterochromatin

euchromatin

nucleolus



„Omnis cellula e cellula“ (Rudolf Virchow, 1858)



Interphase:

G₁ (*gap 1, restriction checkpoint*) – postmitotic phase. Activation of control mechanisms defining if a cell will continue in the cell cycle (preparation for DNA synthesis/replication) or the cycle will be stopped and the cell will stay in the G₀ phase (*resting stage*).

S-phase - (*synthesis phase*) DNA synthesis/replication. At the end of S-phase chromosomes consist of two sister chromatids. Chromatids held together in centromere area (a centromere is a specific part of DNA/chromosome binding „CEN-Proteins“; in the centromeric area microtubules of division spindle are binding to the chromatids – kinetochore start to form).

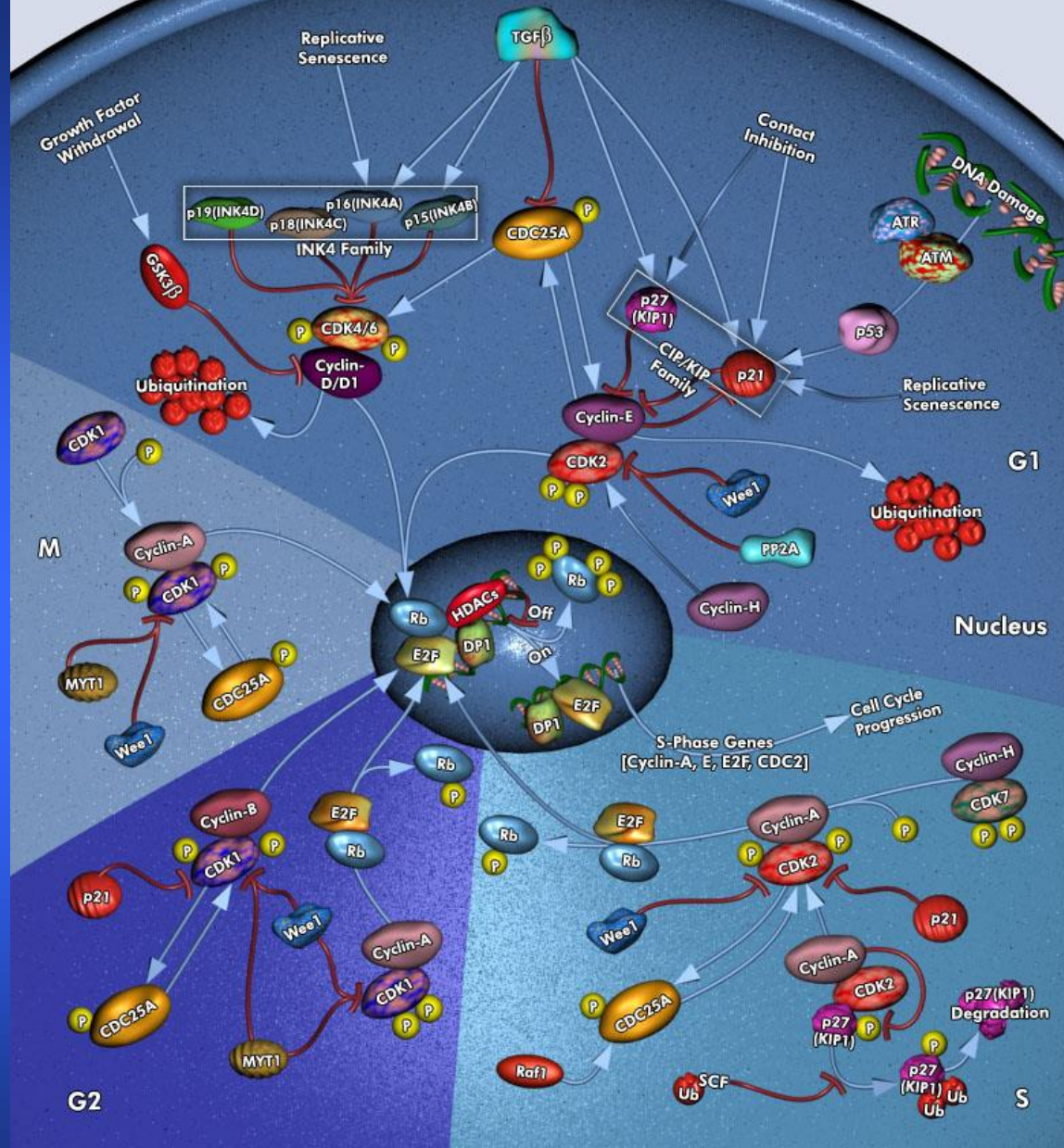
G₂ (*gap 2 checkpoint*)– premitotic phase. Molecules and structures (proteins, MT) important to enter the cell to mitosis. DNA damage blocks continuation in to the mitosis.

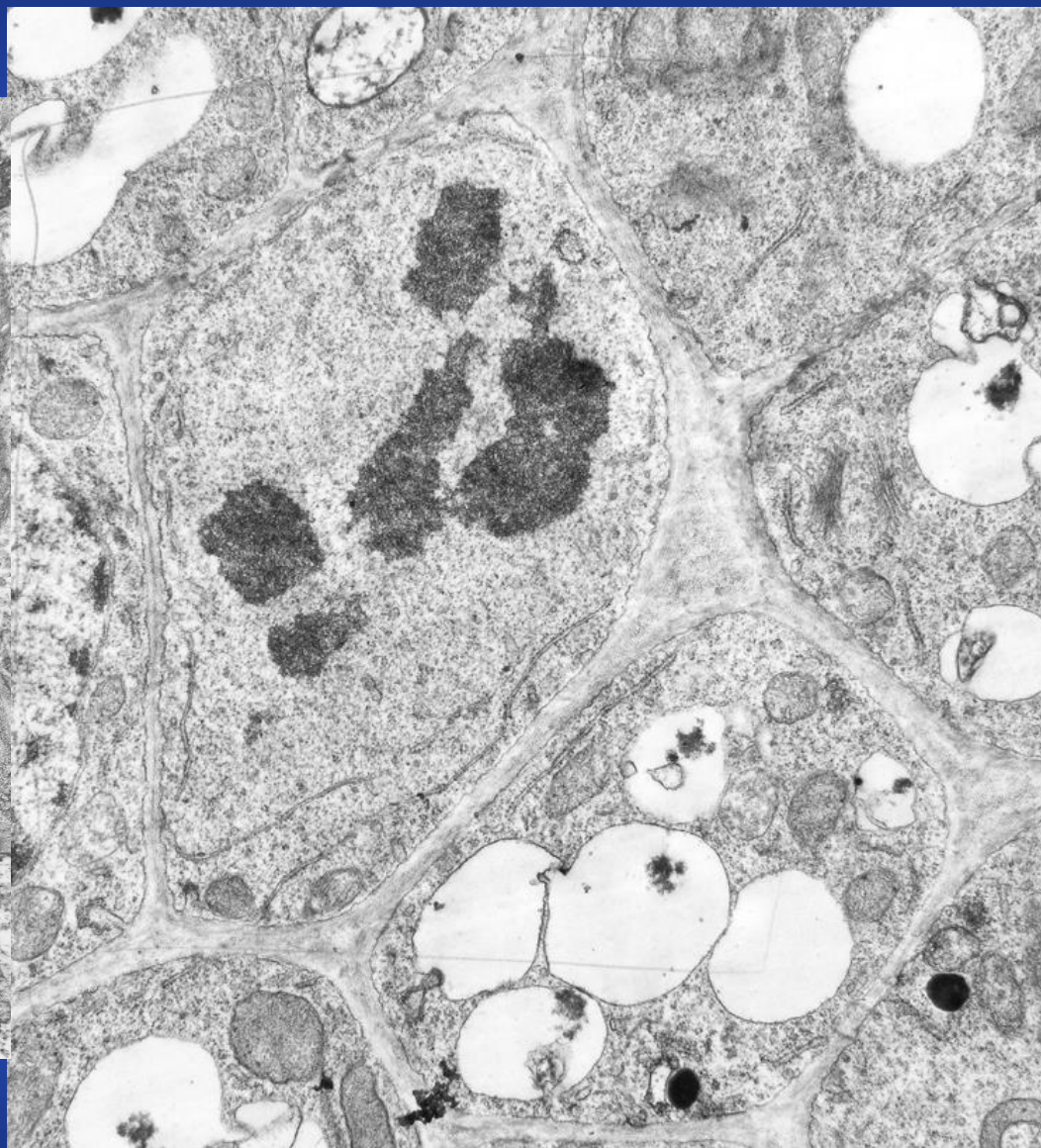
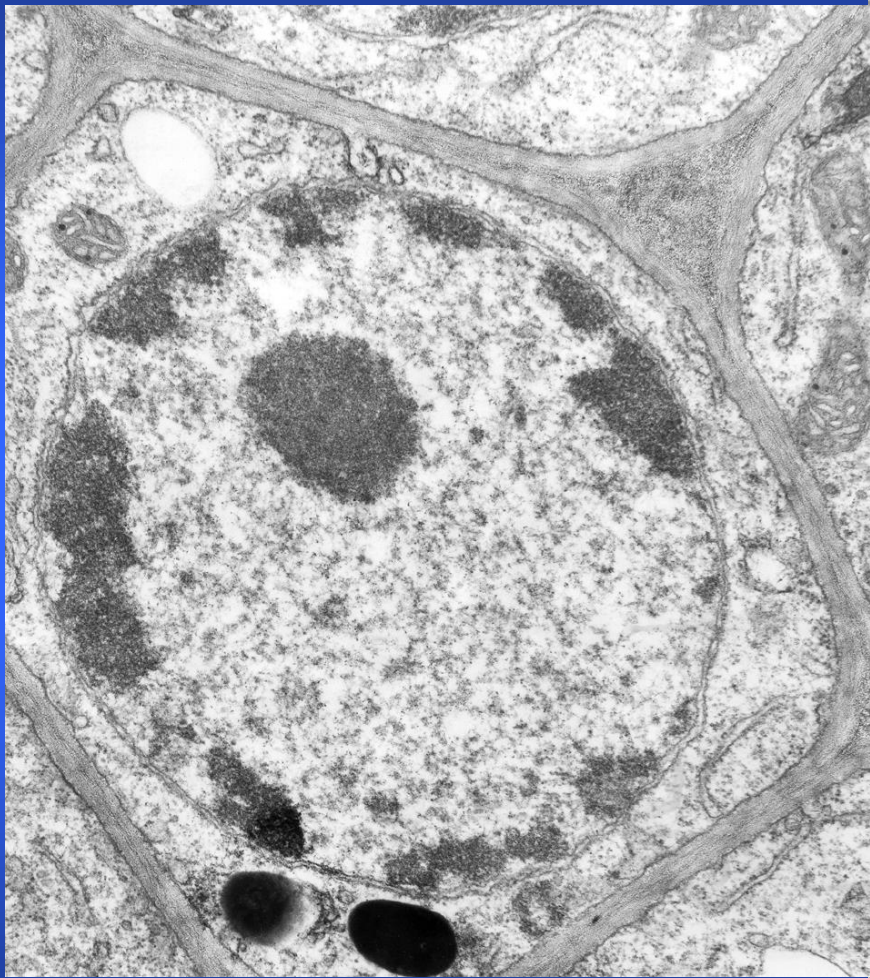
Proteins enabling activation or inhibition specific cell processes participate on the regulation/control of the cell cycle. They are *cyclin-dependent kinases*.

Kinases (phosphotransferases) ensure specific binding of phosphate (e. g. from ATP) on to the specific substrate (phosphorylation).

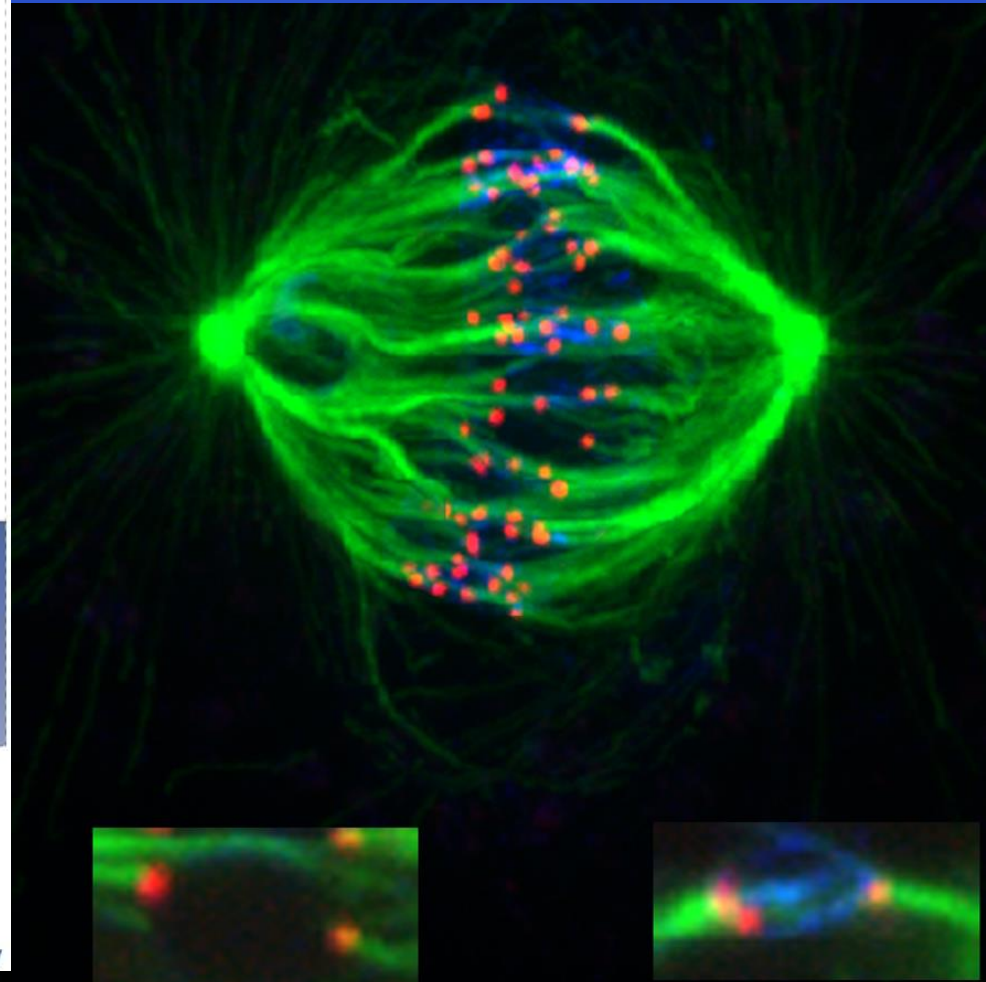
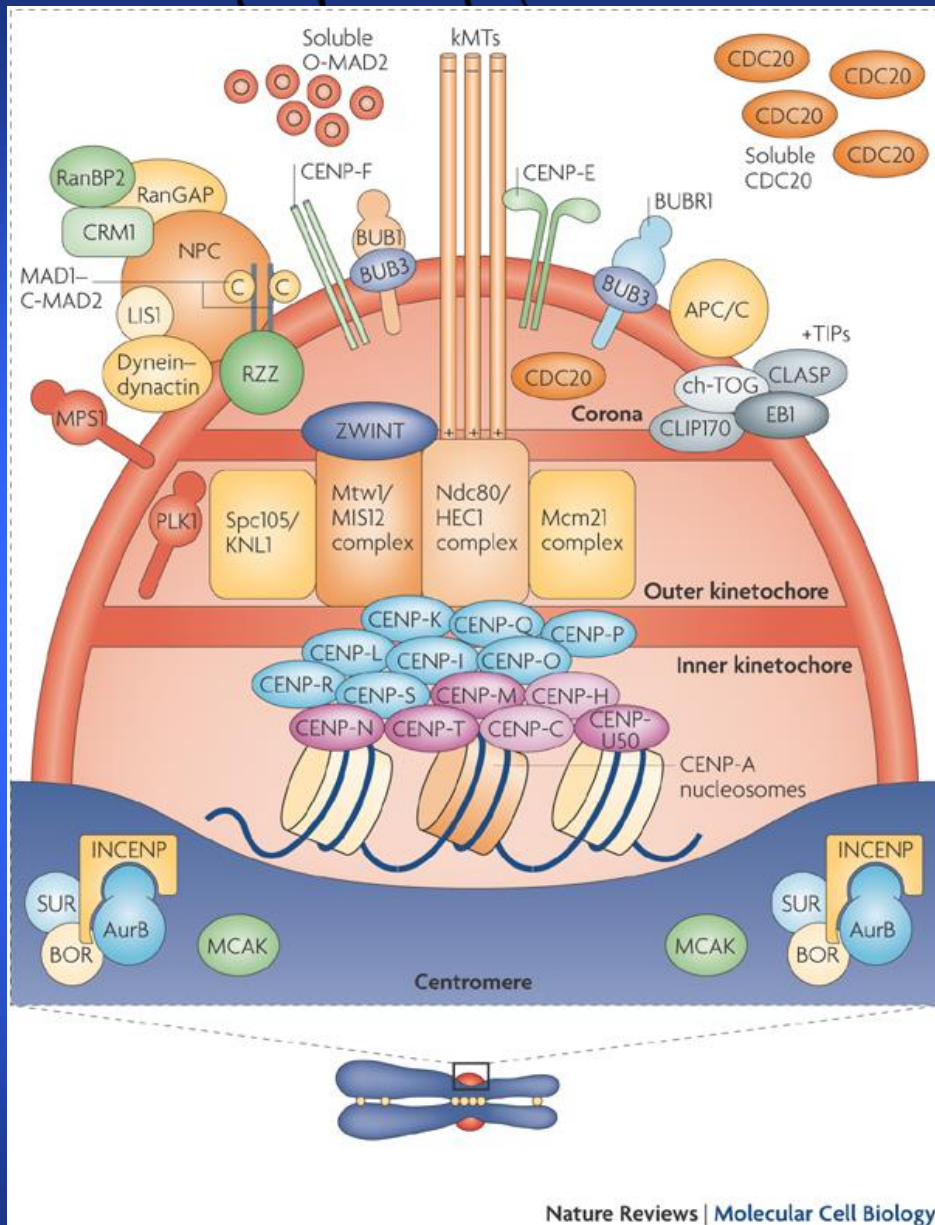
Phosphatases ensure hydrolysis of phosphate group from the substrate (dephosphorylation).

Cyclins and Cell Cycle Regulation





Microtubules of division spindle attach in the centromeric area to the chromatides and separate them to the poles of future daughter cells



MITOSIS:

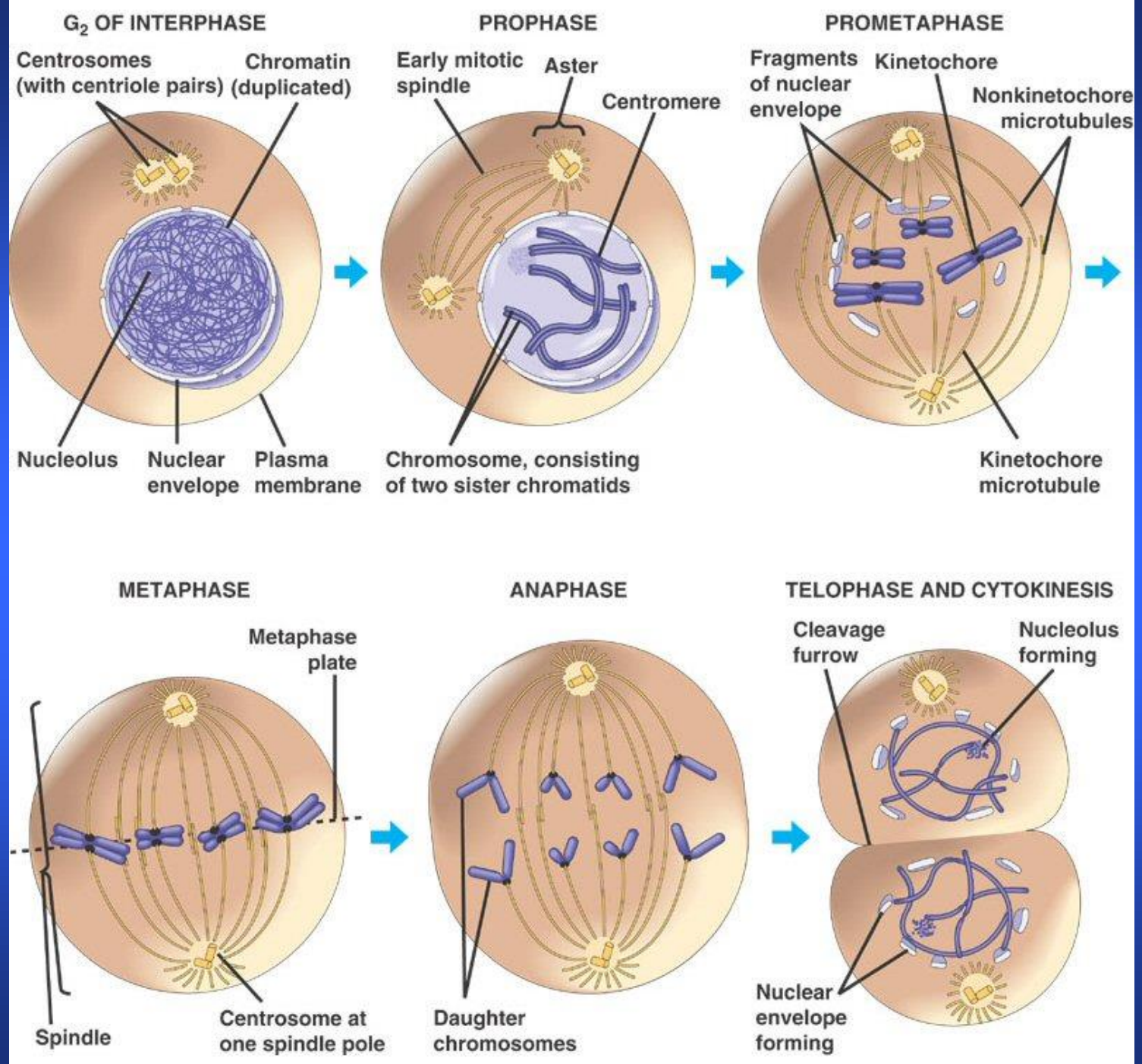
Prophase: Chromatin condensates, gradually coils up. Disintegration of nuclear membrane and nucleoli occurs. Gradually the division spindle microtubules form (in animal cells centrioles ensures MT nucleation, which migrates to the poles of the cell in prophase; in the cells of higher plants centrioles are not present). In prophase the chromosomes visualise like diffuse fibre structures.

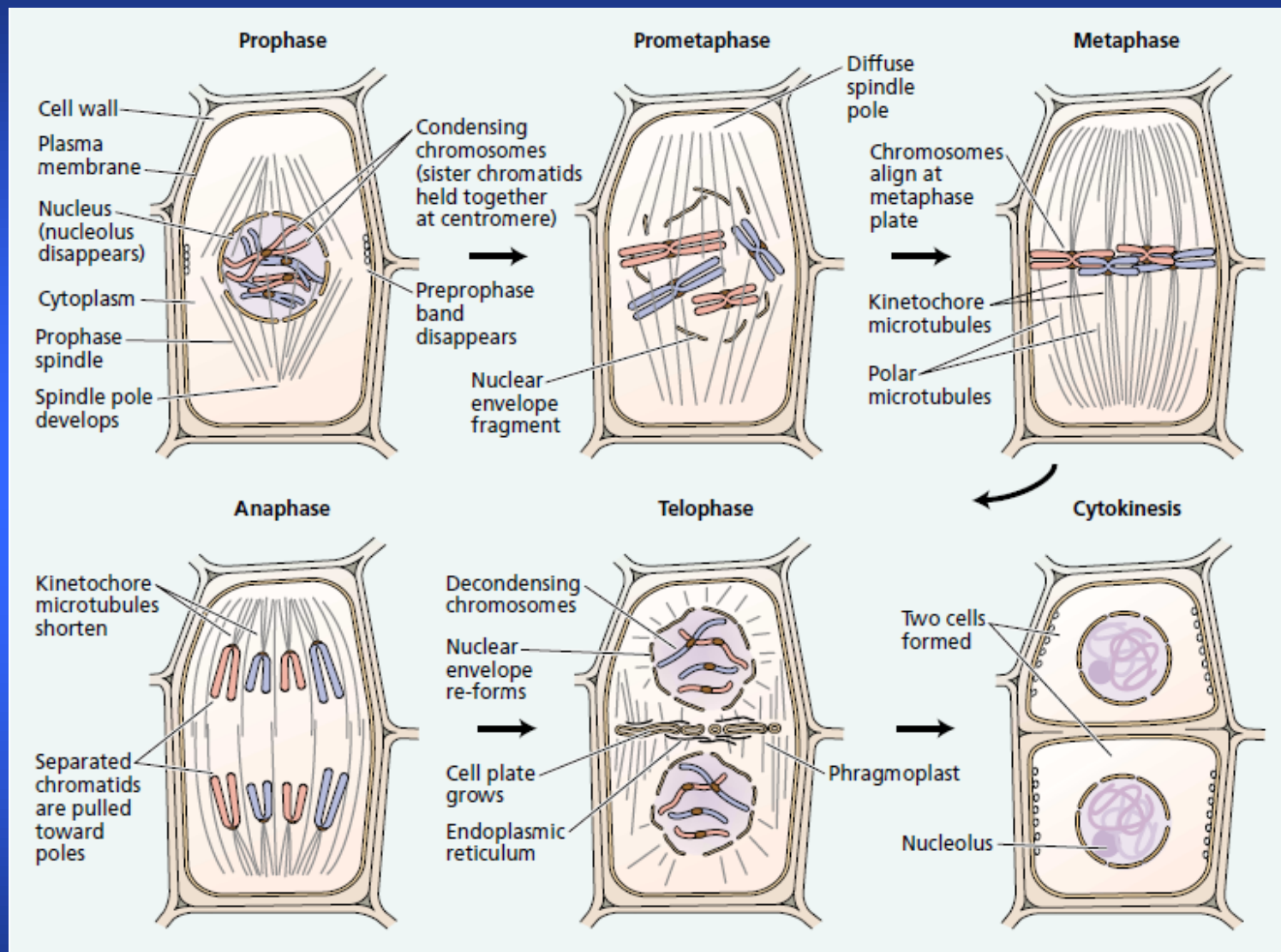
Metaphase: Condensed and spiralled chromosomes (still doublechromatid, their separation occurs at the end of metaphase) group in the equatorial plane (perpendicular to the main axis of the cell) – *mitotic spindle*.

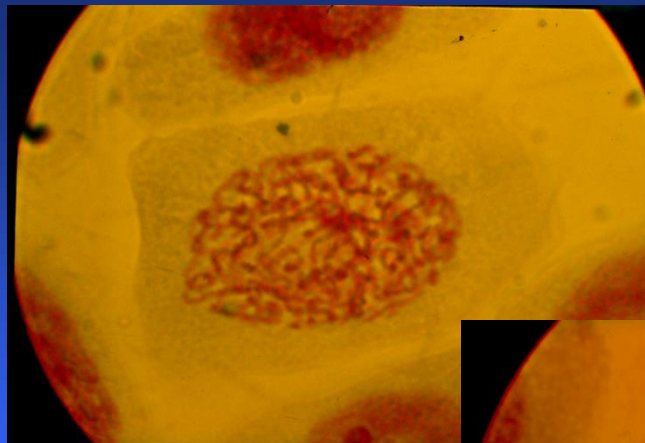
Anaphase: Individual chromatids bound via kinetochore to the division spindle MT migrate to the cell poles.

Telophase: Chromosomes are located and grouped on cell poles, a process of interphase nucleolus starts: chromosomes decoil and decondense – mainly euchromatine; a formation of nuclear membrane starts – participates of ER; nucleoli start to form in the region of nucleolar organizers. In plants phragmoplast and cell plate start to form; the division spindle disintegrates.

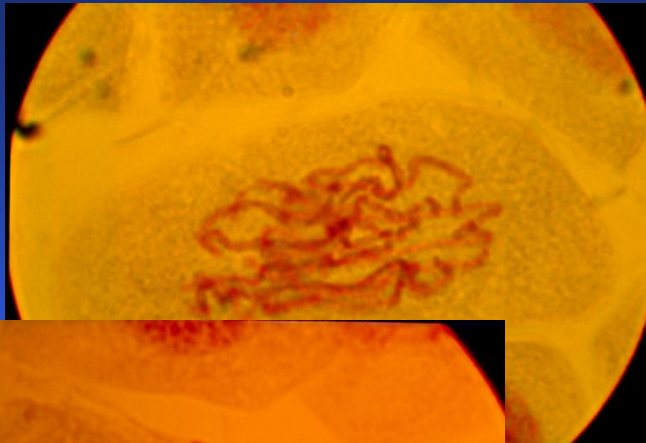
Cytokinesis: Dividing cell forms two independent daughter cells, formation of nucleolus and a new cell wall finishes (in animal cells a constriction and separation of daughter cells occur).



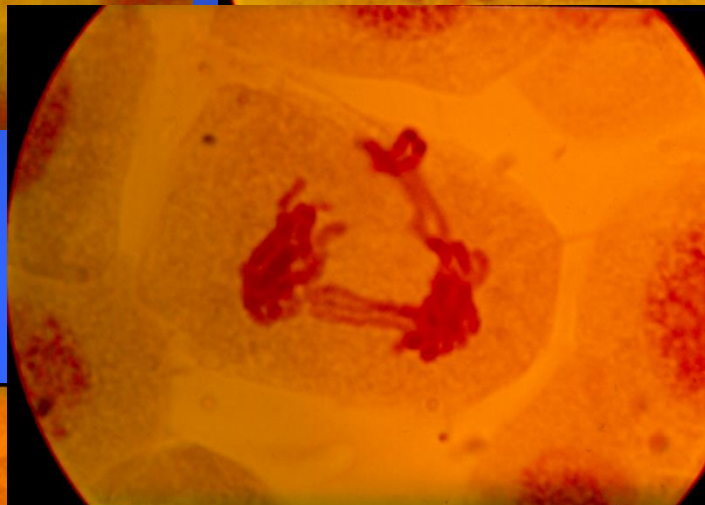




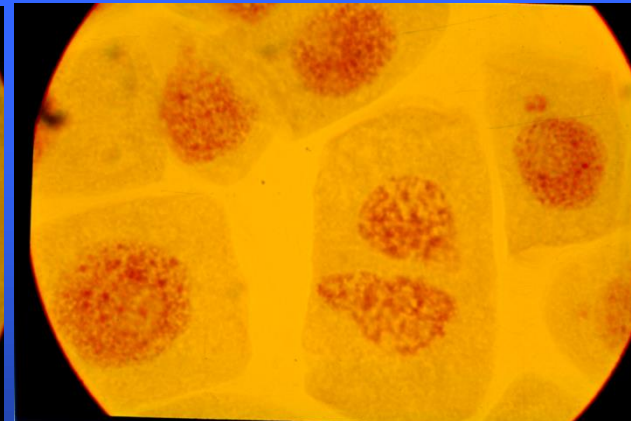
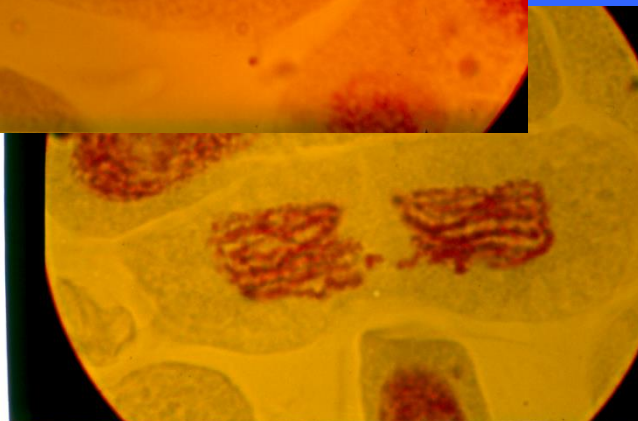
prophase



metaphase

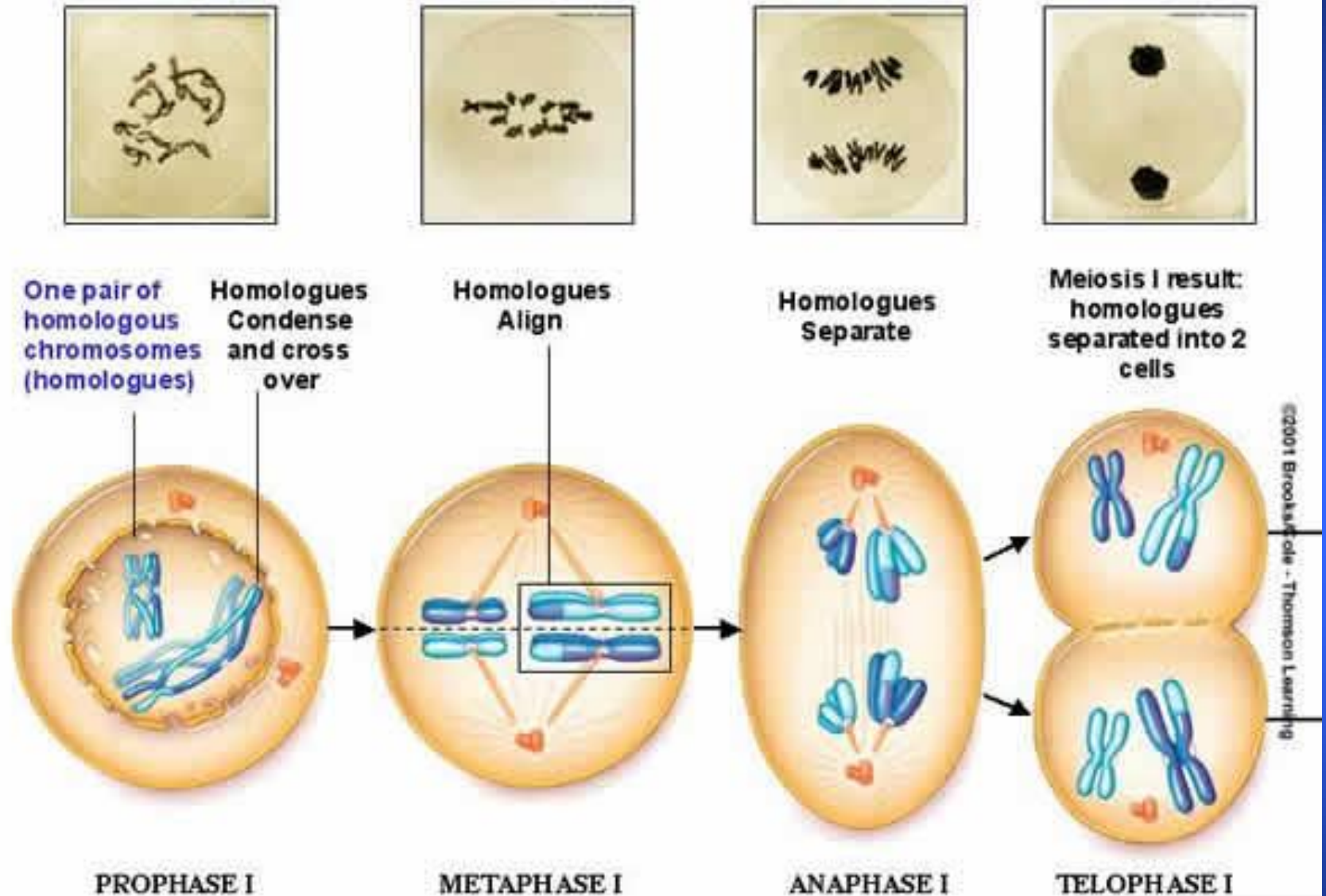


anaphase



telophase

Meiosis – first part – heterotypic (reduction) division



MEIOSIS I: Separate the Homologues

Meiosis – second part – homeotypic (equation) division

