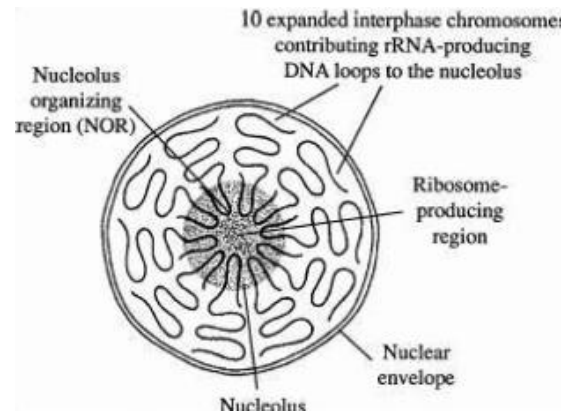
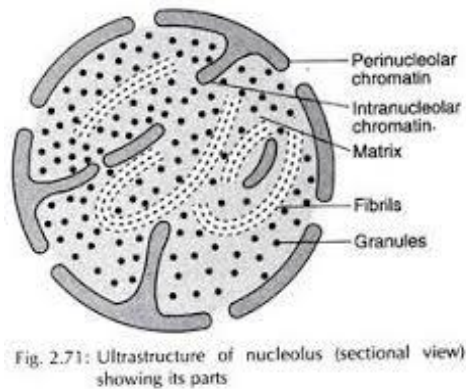


# THE NUCLEOLUS

## STRUCTURE OF NUCLEOLUS

---

Nucleolus is a distinct structure observed at light microscopy after standard histological staining. It is a nuclear compartment containing highly dense chromatin and a number of associated proteins. In the nucleolus, ribosomal RNA (rRNA) is synthesized and ribosomal subunits are assembled. It was described by F. Fontana in 1781.



## OCCURRENCE

---

- Cells usually have more than one nucleolus, and the total number depends on the cell type, differentiation state and physiology of the cell.
- Mammal cells may contain from 1 to 5 nucleoli. The size of the nucleolus may change along with the cell activity, sometimes becoming larger than 1  $\mu\text{m}$  in diameter. In interphase, several nucleoli may join together to form a larger ones.
- In general, cells having intense protein synthesis show larger nucleoli. It is also larger in large size cells and in growing cells.
- However, in some cells, like spermatozooids, the nucleolus is not visible. Nucleolus disappears during mitosis, allowing chromatin to be packaged into chromosomes.
- Although the nucleolus is not always visible, and disappears in some cell cycle phases, a cell without nucleolus is regarded as dead or it is dying.

## FUNCTIONAL SIGNIFICANCE

---

- Nucleolus is the sub-nuclear site of ribosome biogenesis.
- A nucleolus is often regarded as a cluster of transcriptionally active rRNA genes surrounded by a cloud of densely packed transcription products in the form of preribosomal particles at various stages of their maturation pathway.
- Genes coding for ribosomal RNA (rRNA) and the transcription products of these genes are not randomly and diffusely distributed throughout the interphase nucleus, but instead are concentrated in a specific nuclear domain occupied by the nucleolus.

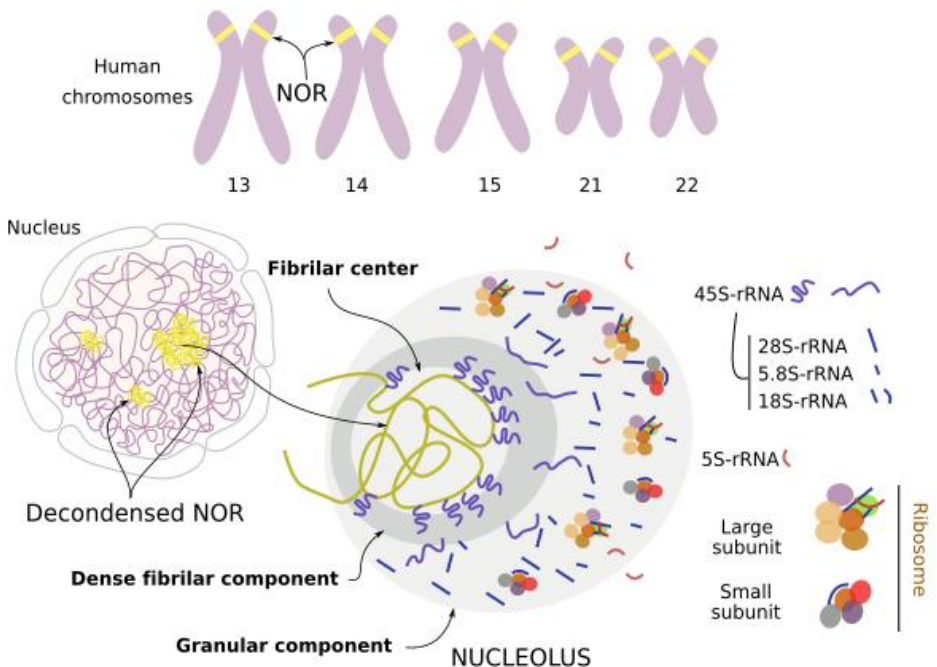
## NUCLEOLUS DIAPPEARS IN MITOTIC PROPHASE

- The nucleolus disappears during the mitotic prophase, allowing the reorganization of chromatin to make up the chromosomes.
- Both, nucleolar chromatin and proteins are distributed and packaged in different chromosomes.
- During telophase, nucleolar chromatin decondensates and gather nucleolar proteins to form new nucleoli. For a nucleolus to be formed, it is not only necessary the gathering of these chromatin and proteins, but also nucleolar activity must be initiated: transcription and splicing of pre-45 S ribosomal RNA, and ribosomal subunits assembling.

## ULTRASTRUCTURE OF NUCLEOLUS (DURING INTERPHASE)

- Electron microscopy reveals nucleoli consist of three morphologically distinct nucleolar components.

- fibrillar centres (FC):** Within the granular mass are one or several rounded regions of low electron density or fibrillar center, or nucleolar organizer, is not present in all eukaryotes and its function is not fully understood.



- It contains DNA segments with many copies of the gene for pre-45S RNA, the primary ribosomal RNA transcript that gives 3 of the 4 rRNA for constituting the ribosomal subunits.
- Granular component (GC):** In the granular component the resulting rRNA segments are further processed and assembled into the ribosomal subunits. The bulk of the nucleolus in metabolically active cells is made of particles resembling ribosomes, and is hence termed the
- Dense fibrillar component (DFC):** They are surrounded by a compact layer of densely staining fibrous material, the dense fibrillar component (DFC), which is especially prominent in plant cells.

**RELATIONSHIP BETWEEN NUCEOLUS, NUCLEAR ENVELOPE & NUCLEAR PORE COMPLEX (NPC)**

---

