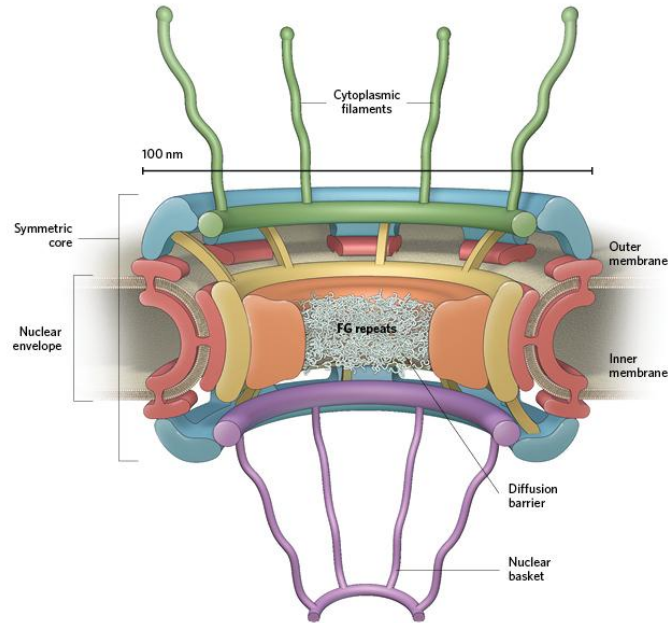


NUCLEAR PORE COMPLEX

Structure & Functions

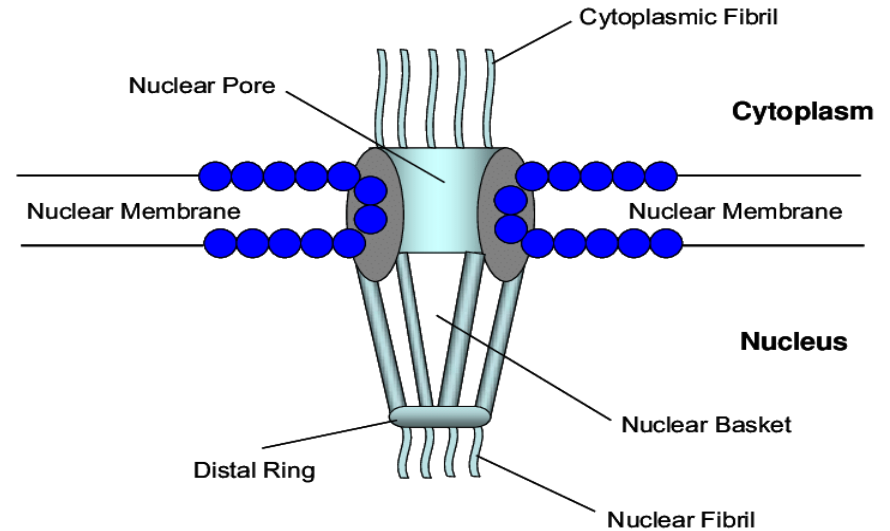


NUCLEAR PORE COMPLEX

The nuclear pore complex (NPC) is a macromolecular protein assembly embedded in the double lipid bilayer of the nuclear membrane

It is the sole gateway of macromolecular traffic between the nucleus and cytoplasm. The NPC serves as a barrier to inhibit the free molecular flux in and out of the nucleus, and selectively transports macromolecules destined for nucleus and/or cytoplasm,

Thus, NPC functions as a selective and bidirectional transporter.



NUCLEAR PORE COMPLEX

This structures are composed of over 30 different proteins and 60–125 MDa of mass depending on type of species.

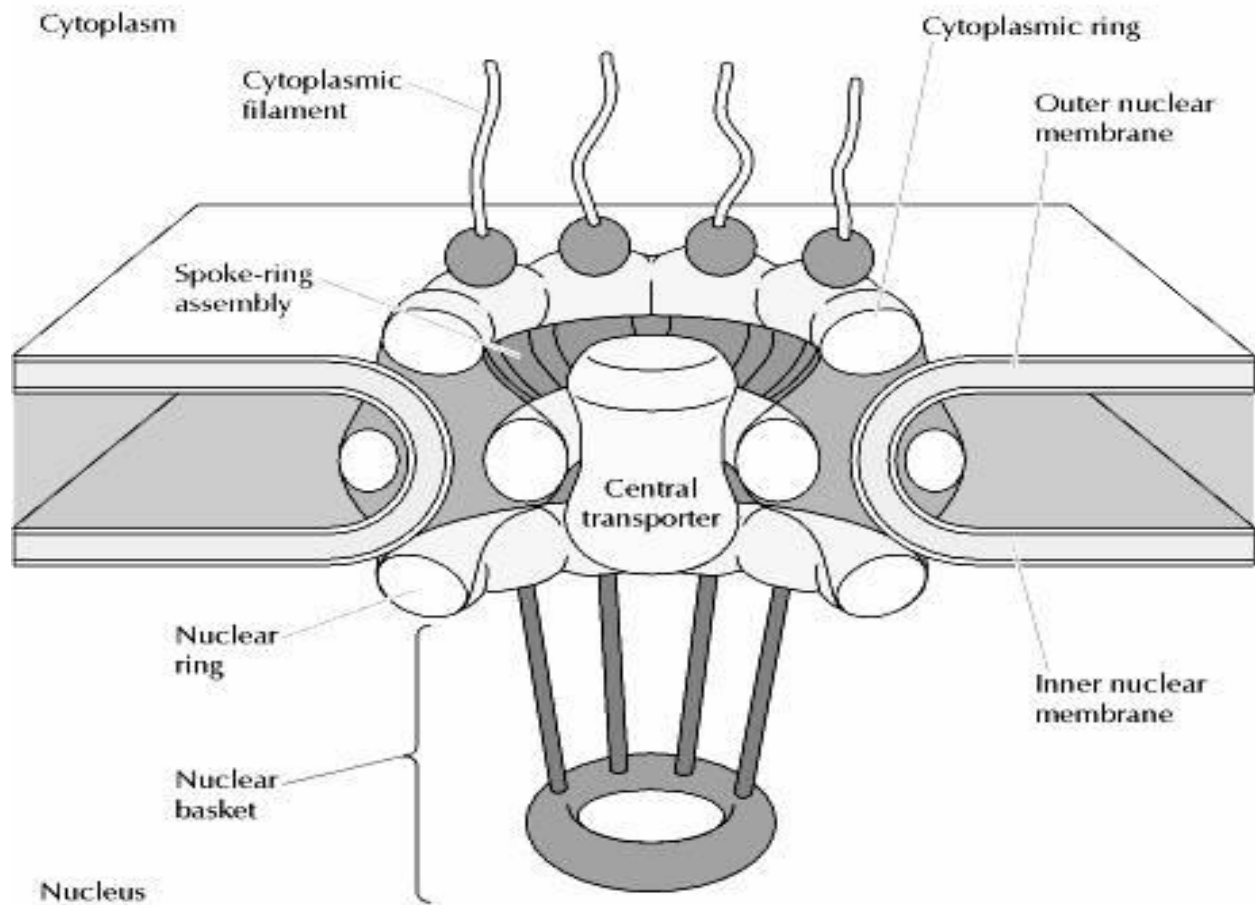
NPCs are bilateral pathways that selectively control the passage of macromolecules into and out of the nucleus.

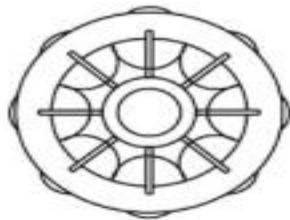
Molecules smaller than 40 kDa diffuse through the NPC passively while larger molecules require facilitated transport provided by their attachment to karyopherins.

Karyopherins are proteins involved in transporting molecules between the cytoplasm and the nucleus of a eukaryotic cell.

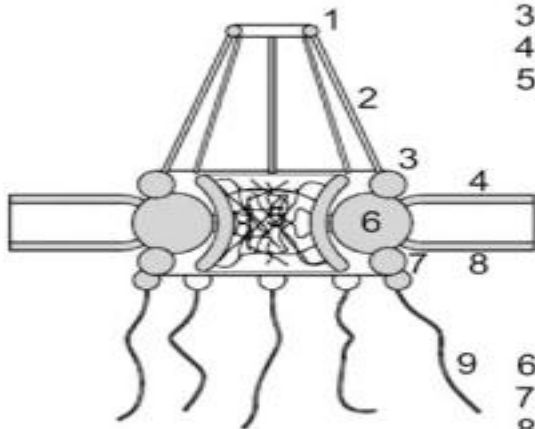
With a molecular mass of 66 MDa in yeast and 125 MDa in vertebrates , the NPC is one of the largest and most complex protein structures of eukaryotic cells.

Structure of Nuclear Pore Complex

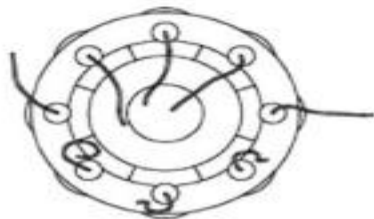
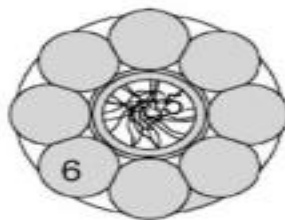




- 1 terminal ring
- 2 nuclear basket filament
- 3 nuclear ring
- 4 inner nuclear membrane
- 5 central channel filled with FG nucleoporins



- 6 spoke
- 7 cytoplasmic ring
- 8 outer nuclear membrane
- 9 cytoplasmic filament

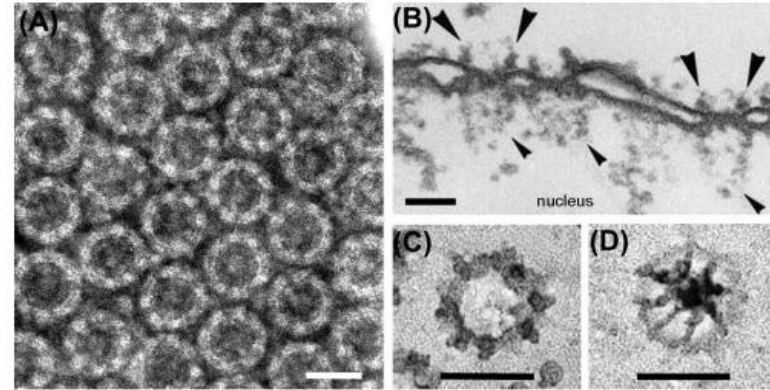


Electron microscopy of Nuclear Pore Complex

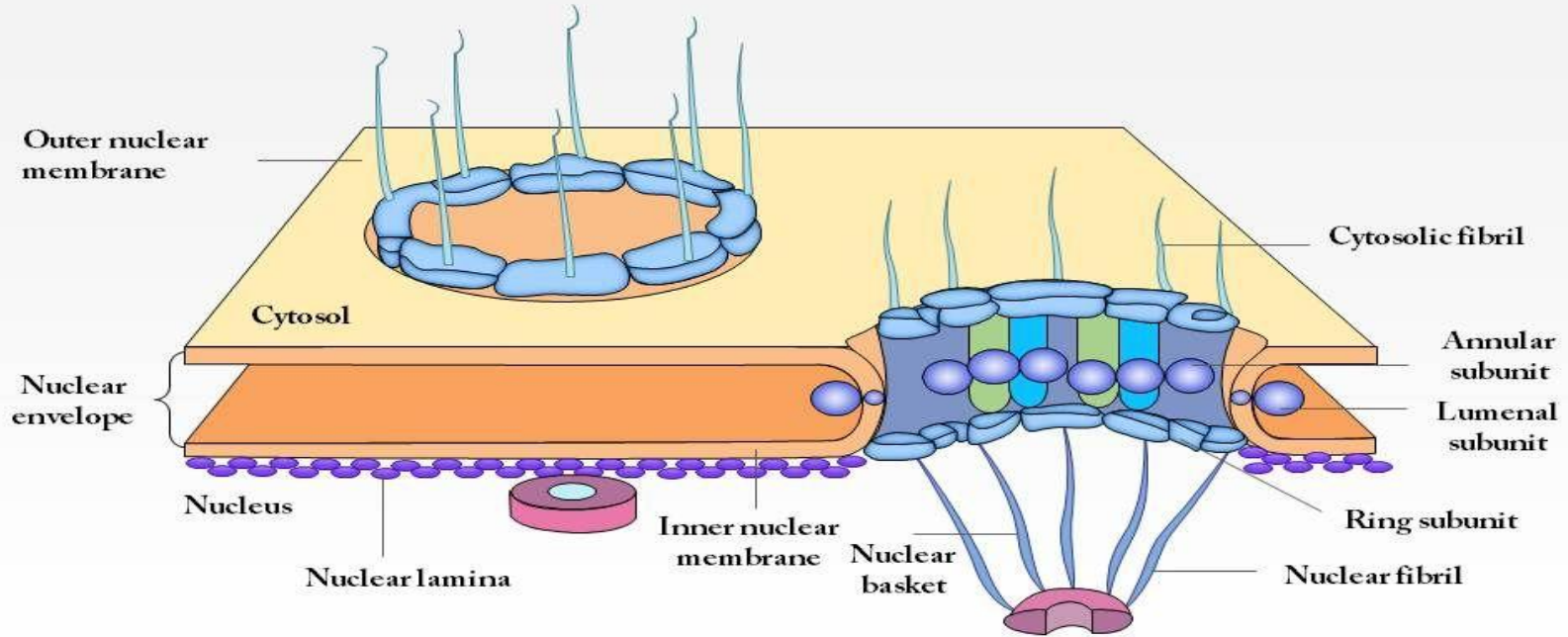
electron microscopy has been described as eight spokes symmetrically encircling a central channel.

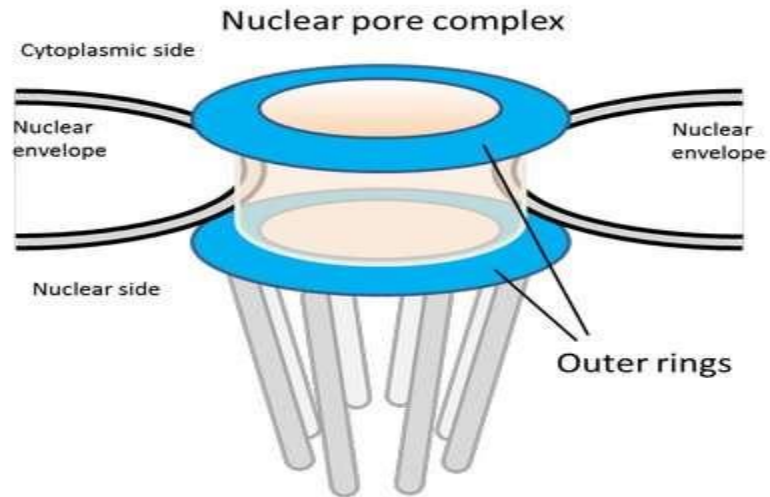
This assembly of spokes has a diameter of 120 nm and a height of 70 nm, and constitutes the central NPC framework or scaffold.

The spoke substructure is sandwiched between a cytoplasmic and a nuclear ring. Attached to these peripheral rings are eight cytoplasmic filaments and a basket-like structure on the nuclear ring



Nuclear Pore Complexes Scanning Electron Micrograph





Functions of Nuclear Pore Complex

The nuclear pore complex (NPC) mediates transport of all macromolecules between the nucleus and the cytoplasm. The structure of the NPC — a cylindrical ring-like structure lined with nucleoporins capable of binding to transport factors — governs its transport function.

Recent research has revealed that the NPC plays an important part in cellular functions taking place on either side of the nuclear envelope.

The nuclear basket is a distinct structure extending from the NPC into the nucleus. It is thought to have a role in many different functions, such as transcriptional control, small ubiquitin-related modifier (SUMO) homeostasis, cell cycle progression, chromatin organization and RNA biogenesis.

Functions of Nuclear Pore Complex

The basket seems to recruit and retain actively transcribed genes to the pore while excluding silenced heterochromatin from the transport channel. This mechanism would ensure efficient transport of messenger ribonucleoproteins (mRNPs) into the cytoplasm.

Multiple components involved in the recruitment of active genes to the NPC also have a role in the proper processing, surveillance and export of mRNPs.

The cytoplasmic filaments of the NPC interact with the protein synthesis machinery and the cytoskeleton. They are thought to be involved in mediating the release of shuttling proteins from mRNPs, terminating transport and readying the cargo for further engagement in the cytoplasm.

Most nuclear and cytoplasmic functions of the NPC seem to increase the efficiency and integration of transport into the broader milieu of the cell.