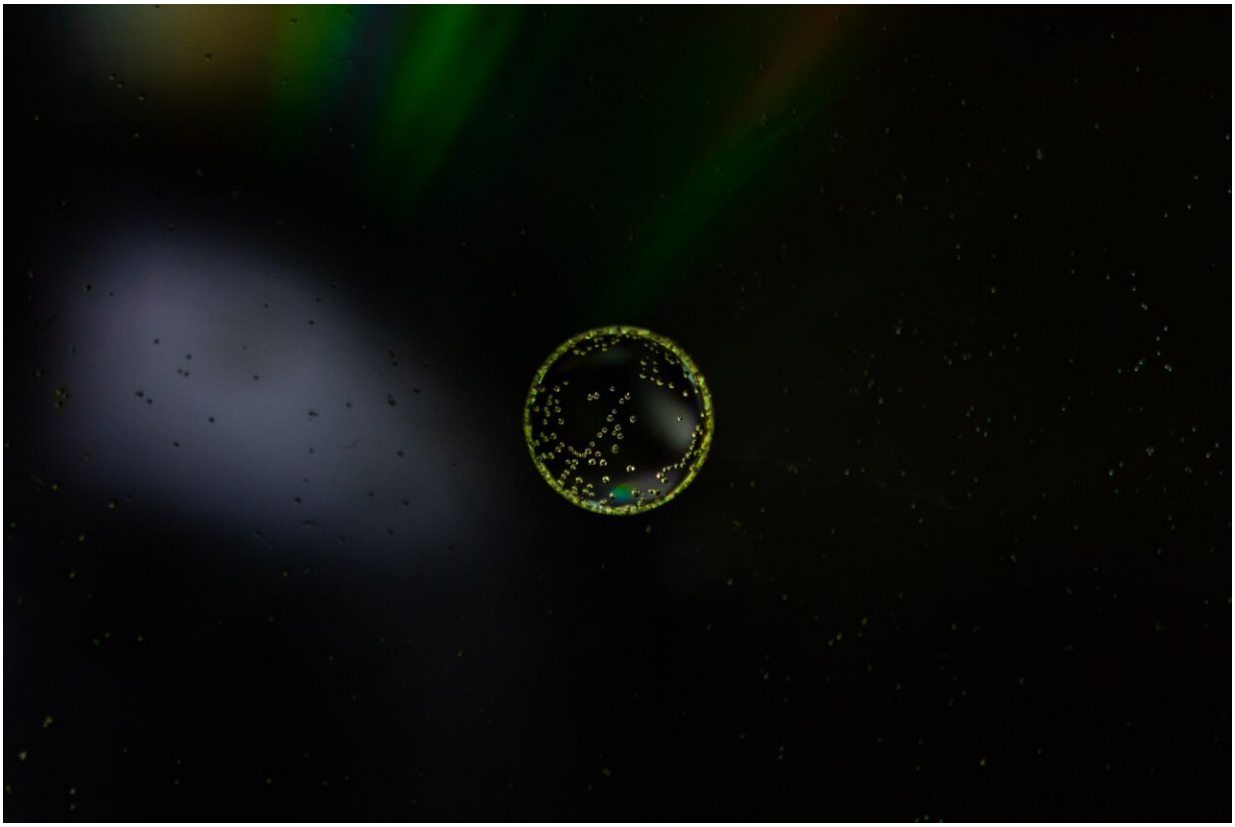
Researchers develop a model of yeast nuclear pore complex

January 3 2022



Credit: Unsplash/CC0 Public Domain

Nuclear pore complexes (NPCs) are massive multi-protein complexes that act as passageways for the transport of molecules into and out of the nucleus. Given their central role in gene expression, growth and

development, it is not surprising that NPC defects are linked to many diseases such as viral infections, cancers and certain neurodegenerative diseases, and that nuclear transport is a target for possible therapeutics.

Using rapid plunge freezing and cryo-EM (electron microscopy) with computational methods, researchers from Boston University School of Medicine (BUSM) have produced a comprehensive model of the yeast NPC which reveals the interconnected architecture of its core scaffold, This work provides molecular models for two configurations: one that is easier to study in isolated samples to provide a more detailed overview of a radially-compact form and a second expanded form in the living yeast cell, albeit this "in situ" form is currently visualized with a lower level of detail.

"This research significantly extends our understanding of the architecture of the NPC from brewers' yeast, a model organism that is used to study the biology of cells that contain a nucleus and thus provides new insights on multiple levels into the functions of this transport machine," explains corresponding author Christopher W. Akey, Ph.D., professor of physiology and biophysics at BUSM.

According to researchers, this model will provide a better understanding of how these large mega-channels assemble and how they can flex and adapt to changes in transport by expansion of their central passageway. "Moreover, we have observed multiple types of NPC in the same cell for the first time, which reflects the lego-like ability of this assembly to use interchangeable parts to modify its architecture on the nuclear side. This adaptability may play a role in tailoring the functions of these machines for different local environments at the periphery of the nucleus," says Akey.

The researchers believe that these findings now set the table for studies of how viruses may usurp this important pathway to infect cells and alter

their physiology to cause disease.

These finding appear online in the journal *Cell*.

More information: Michael P. Rout, Comprehensive Structure and Functional Adaptations of the Yeast Nuclear Pore Complex, *Cell* (2022). DOI: 10.1016/j.cell.2021.12.015