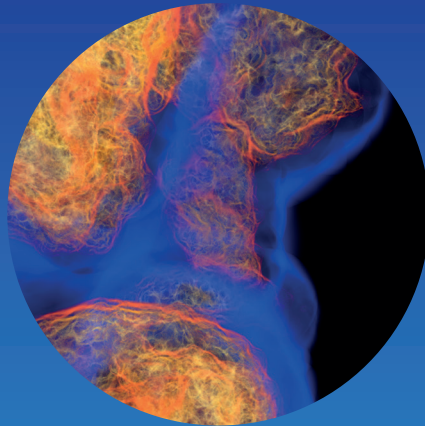
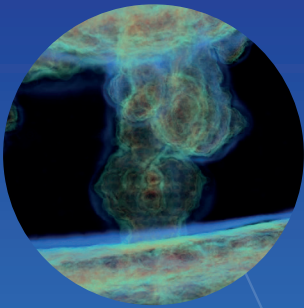


Blue Brain BioExplorer



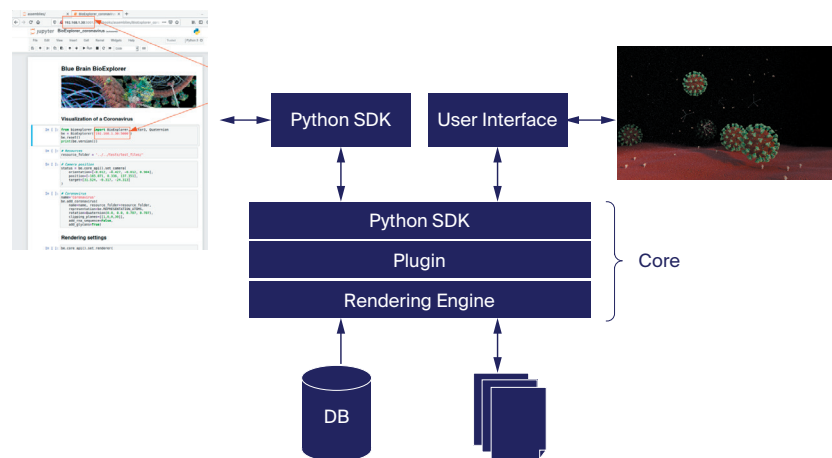
A tool for scientists to extract and analyze
scientific data from interactive exploration

The Blue Brain BioExplorer is an open source tool for scientists to extract and analyze scientific data from interactive exploration.

The Blue Brain BioExplorer application

The Blue Brain BioExplorer (BBBE) application is built on top of [Blue Brain Bravns](#), the [Blue Brain rendering platform](#). The BBBE uses the underlying technical capabilities of the rendering platform to create large scale and accurate 3D scenes from Jupyter notebooks.

The core of the system is based on the concept of assemblies. Assemblies are groups of biological elements, such as proteins, membranes, glycans, etc. As an example, a virion is made of a lipid membrane, spikes proteins, an RNA sequence, etc, and all those elements belong to the same object – the assembly. Assemblies can have different shapes: sphere, cube, etc, that are automatically generated according to parameters specific to individual components.



A user-friendly programming interface is exposed via the BBBE python software development kit (SDK). The application programming interface (API) allows scientists to easily create and modify assemblies. The BBBE programming language is not necessarily reflecting the underlying implementation, but is meant to be as simple and as close as possible to the language used by the scientists to describe biological assemblies.

Blue Brain BioExplorer use case

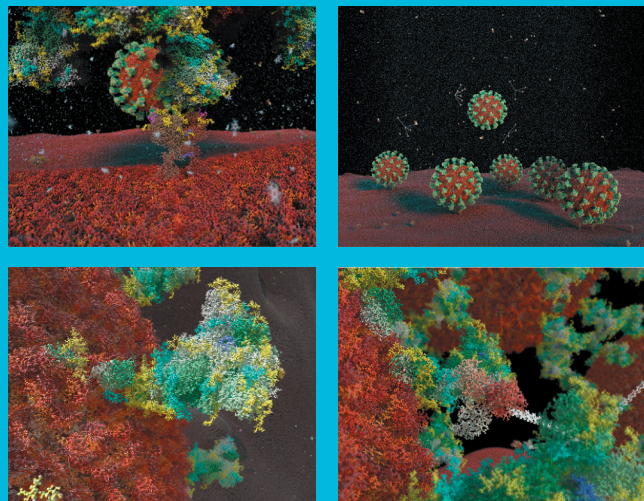
Reconstruct, visualize, explore and describe in detail the structure and function of SARS-COV-2 with the aim to answer key scientific questions related to the virus.

BBBE started as an internal project within the Blue Brain to reconstruct, visualize, explore and describe in detail the structure and function of SARS-COV-2. We have made BBBE open source for others to use to also answer key scientific questions.

Read the Blue Brain paper "A machine-generated view of the role of Blood Glucose Levels in the severity of COVID-19". was published by *Frontiers in Public Health, Clinical Diabetes*.

Watch BBBE show the main impacts of high glucose in Airway Surface Liquid on the primary step of coronavirus infections in the lung and explain the increased susceptibility to respiratory viruses in at-risk patients.

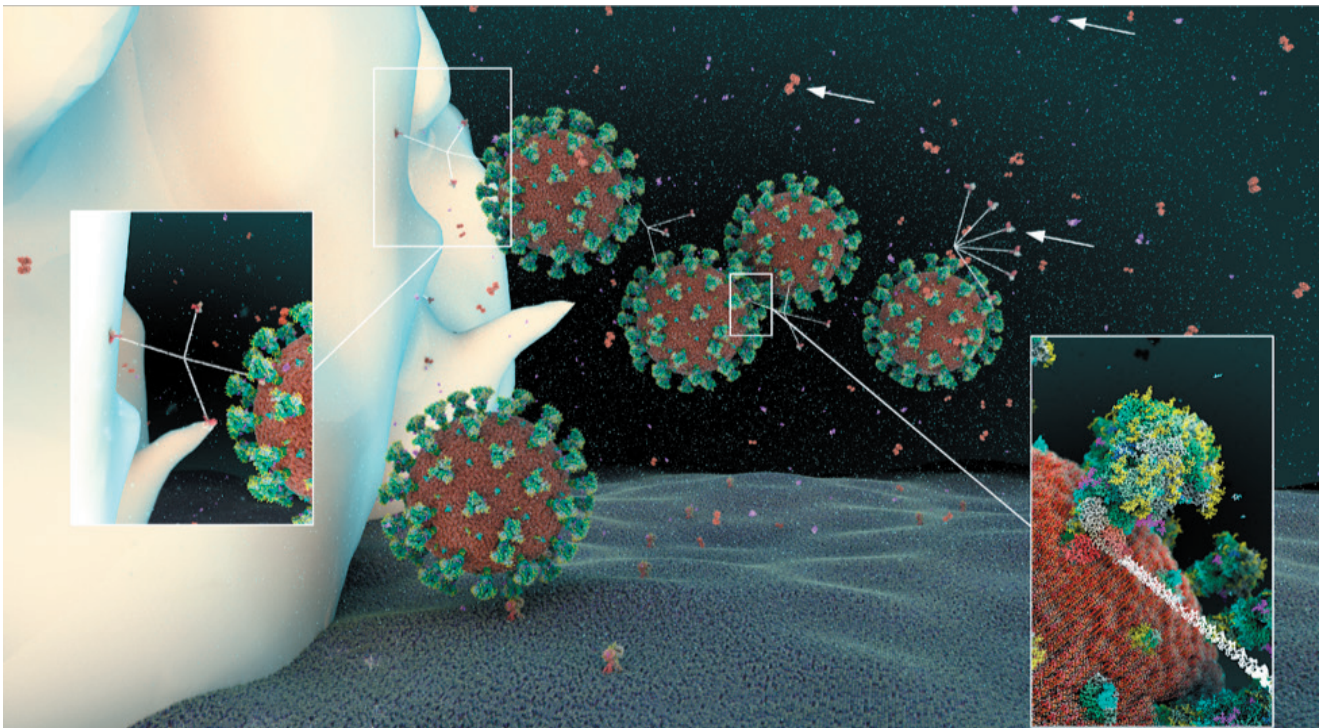
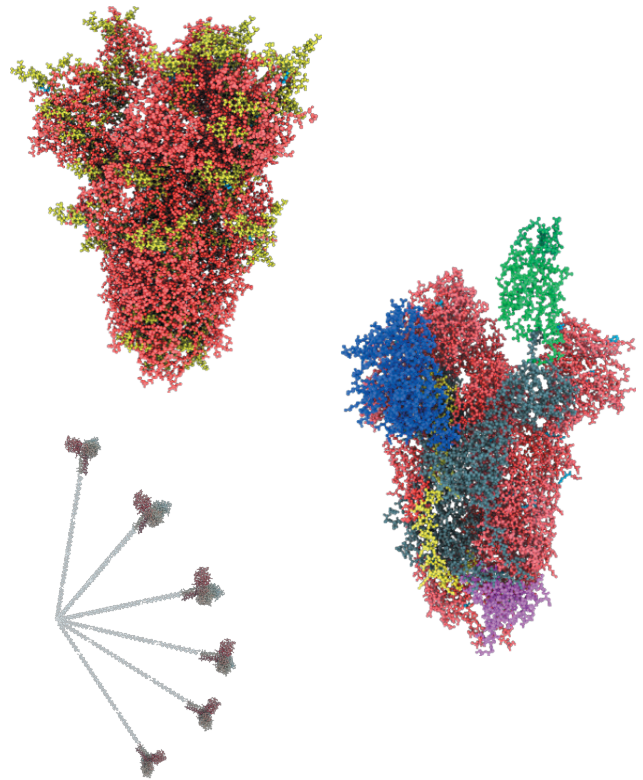
<https://www.youtube.com/watch?v=Czn-YGLGfiA>



Benefits and Features of Blue Brain BioExplorer

The BBBE offers a simple way to create and explore complex molecular systems without having to worry about the technical challenges of manipulating large datasets. The BBBE also reduces the complexity of biological assemblies, such as virions, by providing high-level functions already created and validated by Blue Brain Scientists. For example, the BBBE can automatically:

- Place glycans on a protein using the amino acid sequence to identify the location of glycosylation sites.
- Create a complete coronavirus with the correct number of spikes, glycans and structural proteins.
- Create surfactants A and D.
- Merge a coronavirus with a cell membrane.
- Modify amino acid sequences and visualize protein variants.
- Visualize protein functional regions.



The BBBE makes it easy for the scientists to create production-ready images and movies of complex molecular processes. A number of examples, such as the movie explaining the impact of glucose in the COVID-19 contamination process, are provided as Python notebooks and scripts.

About EPFL's Blue Brain Project

The aim of the EPFL Blue Brain Project, a Swiss brain research initiative founded and directed by Professor Henry Markram, is to establish simulation neuroscience as a complementary approach alongside experimental, theoretical and clinical neuroscience to understanding the brain, by building the world's first biologically detailed digital reconstructions and simulations of the mouse brain.

Blue Brain BioExplorer is downloadable from GitHub, at: <https://github.com/BlueBrain/BioExplorer>

The home page contains information on how to build and use the software (Server, SDK and Web UI).

Basic Python skills are required to interact with the BBBE.

BBBE binaries are publicly available as docker images from:
<https://hub.docker.com/r/bluebrain/bioexplorer>

For technical information on Blue Brain BioExplorer or to request a trial or demonstration, please contact:

Cyrille Favreau
Senior Scientific Visualization Engineer
Blue Brain Project
cyrille.favreau@epfl.ch