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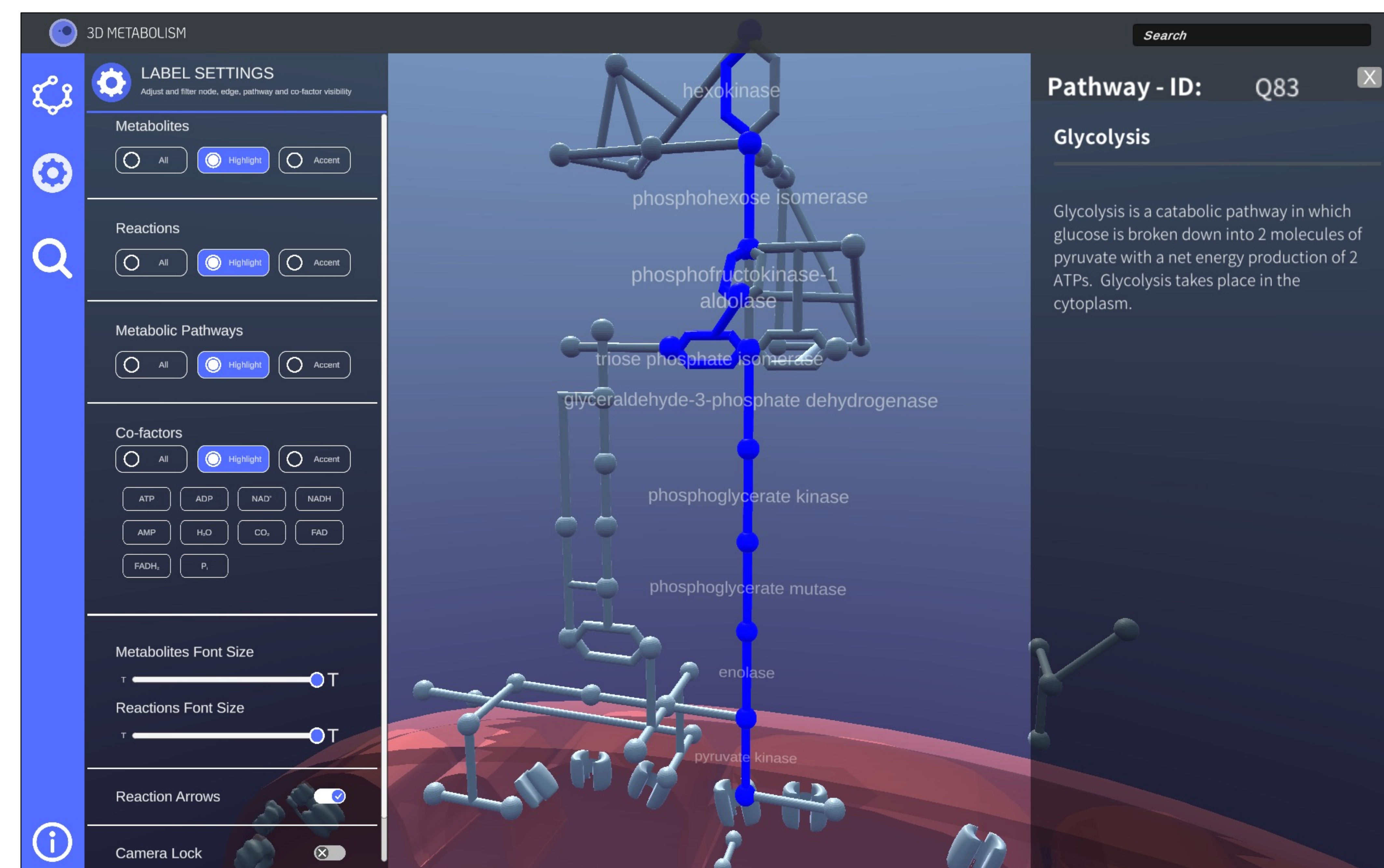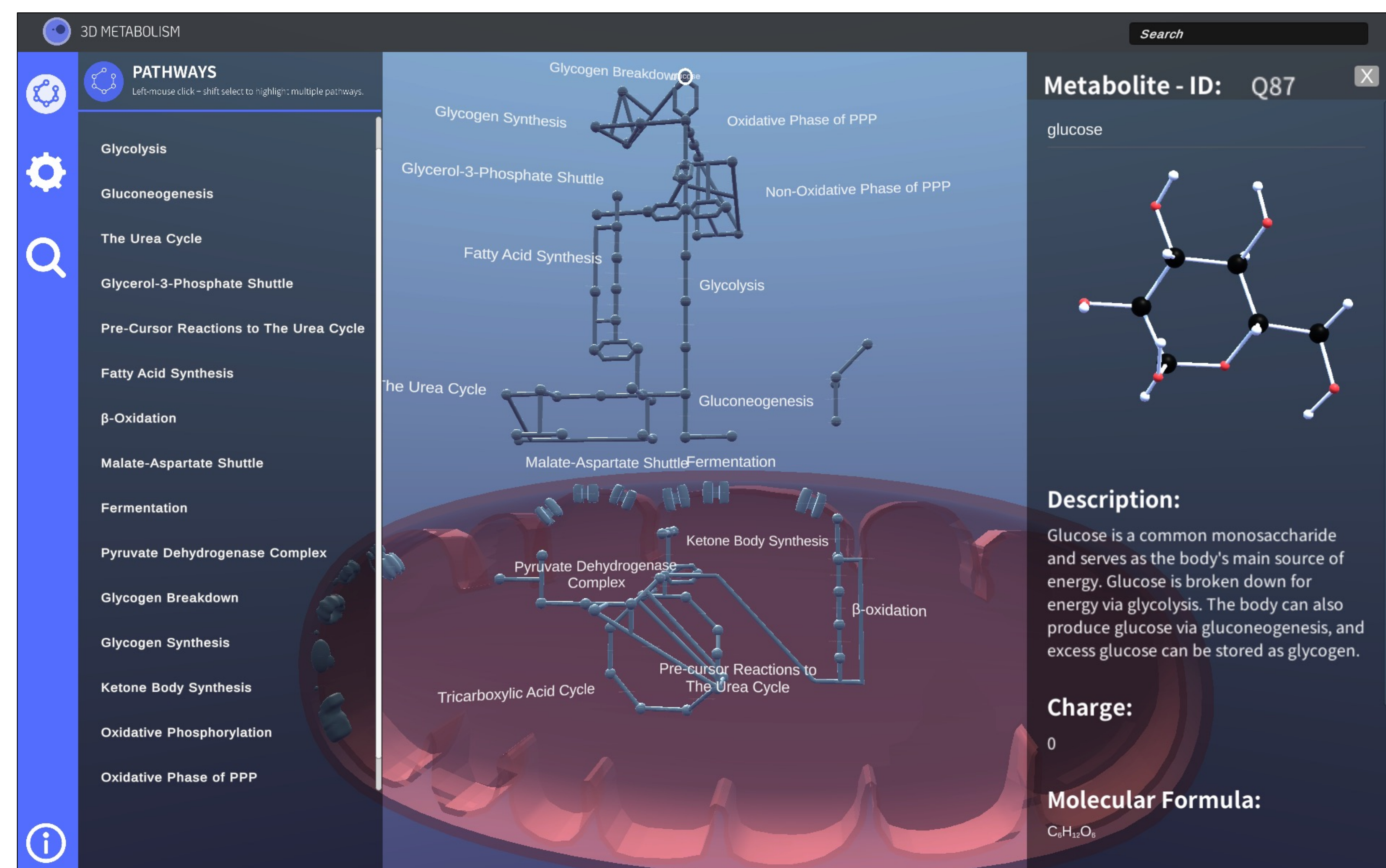
A Dynamic and Integrated Metabolic Map for Teaching Metabolism

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Objective

Cellular metabolism is a network of chemical reactions that facilitates all biological processes. Metabolic networks are complex and dynamic and this makes them difficult to visualize using static 2D images. **We are developing an integrated and interactive 3D metabolic network within the context of a human hepatocyte**. We hope this open educational resource will support learning and communicating metabolic processes at many levels of education.

Key Features

1) 3D representation of metabolic pathways visualized within the context of a human cell
2) The user interface enables the user to manage complexity through highlighting and labeling specific pathways and metabolites
3) A settings tab allows the user to change font size and customize which labels are shown
4) User defined animations visualize metabolic flux
5) Up-to-date biochemical data is continually made available within the network through a Wikibase

Future Directions

This open educational resource is currently used within biochemistry undergraduate courses at UBC. We are continuing to expand the network and develop new features. Our team is also designing learning resources and a website to support sharing and adoption by others.

Acknowledgements

Visualizing Cellular Metabolism

Images of a Dynamic and Integrated 3D Metabolic Map
Left: Metabolic pathways are visualized as nodes and edges. Selecting a node (glucose) links to a 3D molecular visualization and to data within the Wikibase.
Right: Features within the user interface support flexibility in network visualization
Bottom: Additional features within the user interface enable visualization of cofactors and sub-reactants