Modern Molecular Simulations using Extended-Lagrangian Approaches

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1. Introduction and Motivation

2. Summary

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- OTFP combines enhanced sampling and free-energy-profile generation to provide deeper understanding of biomolecular mechanisms
- We recapitulate water-mediated “knock-on” transport of multiple K^+ ions in Kv1.2, but also predict reduced barriers for dry transport
- Demonstrated Markovian milestoning along minimum free-energy pathways to estimate entry and exit rates of O_2 in MSOX
- MSOX: Simulations agree with experiment that modified ping-pong mechanism is more likely than ping-pong because substrate influences O_2 entry and exit kinetics
- MSOX: Substrate-induced gatekeeper closing and active-site desolvation likely underly the substrates effect on O_2.

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- **Climbing String:** Dr. Gourav SHRIVASTAV ()
- **Other projects:**
  - Steven GOSSERT (2021): HIV-1 Entry Inhibitor Design
  - Natasha VERGARA (2022): HIV-1 Entry Inhibitor Design
  - Ming HUANG (2023): Molecular modeling of thermosets
  - Dr. Salman ZARRINI: Molecular modeling of thermoset/glass sizing fluid
  - Dr. Mohammadjavad MOHAMMADI: HIV-1 Entry Inhibitor Design
- **Collaborators**
  - Prof. Eric VANDEN-EIJNDEN (NYU; Mathematics)
  - Prof. Irwin CHAIKEN (DUCOM; Biochemistry)
  - Prof. Amos SMITH III (UPenn; Organic Chemistry)
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- **Resources:** `www.github.com/cameronabrams/cfacv`, `www.github.com/cameronabrams/pestifer`