

Berezovsky Group
Physics and Evolution of Biological Macromolecules

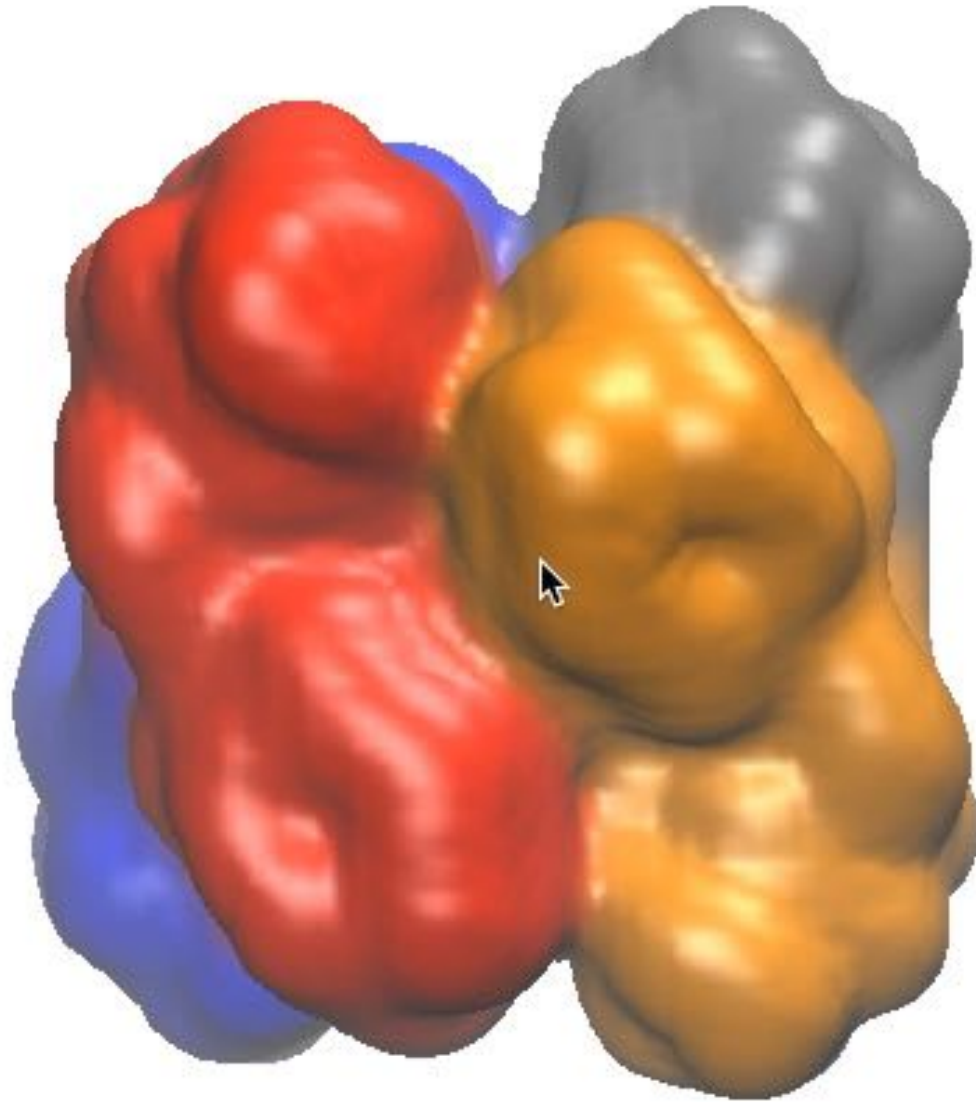
Bioinformatics Institute, A*STAR
March 29, 2022

Every problem is an opportunity in disguise

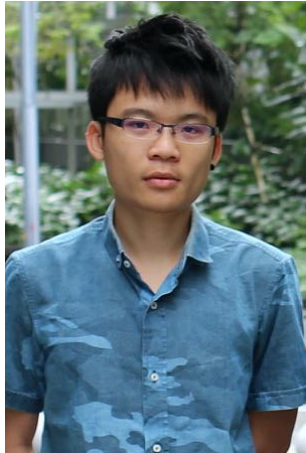
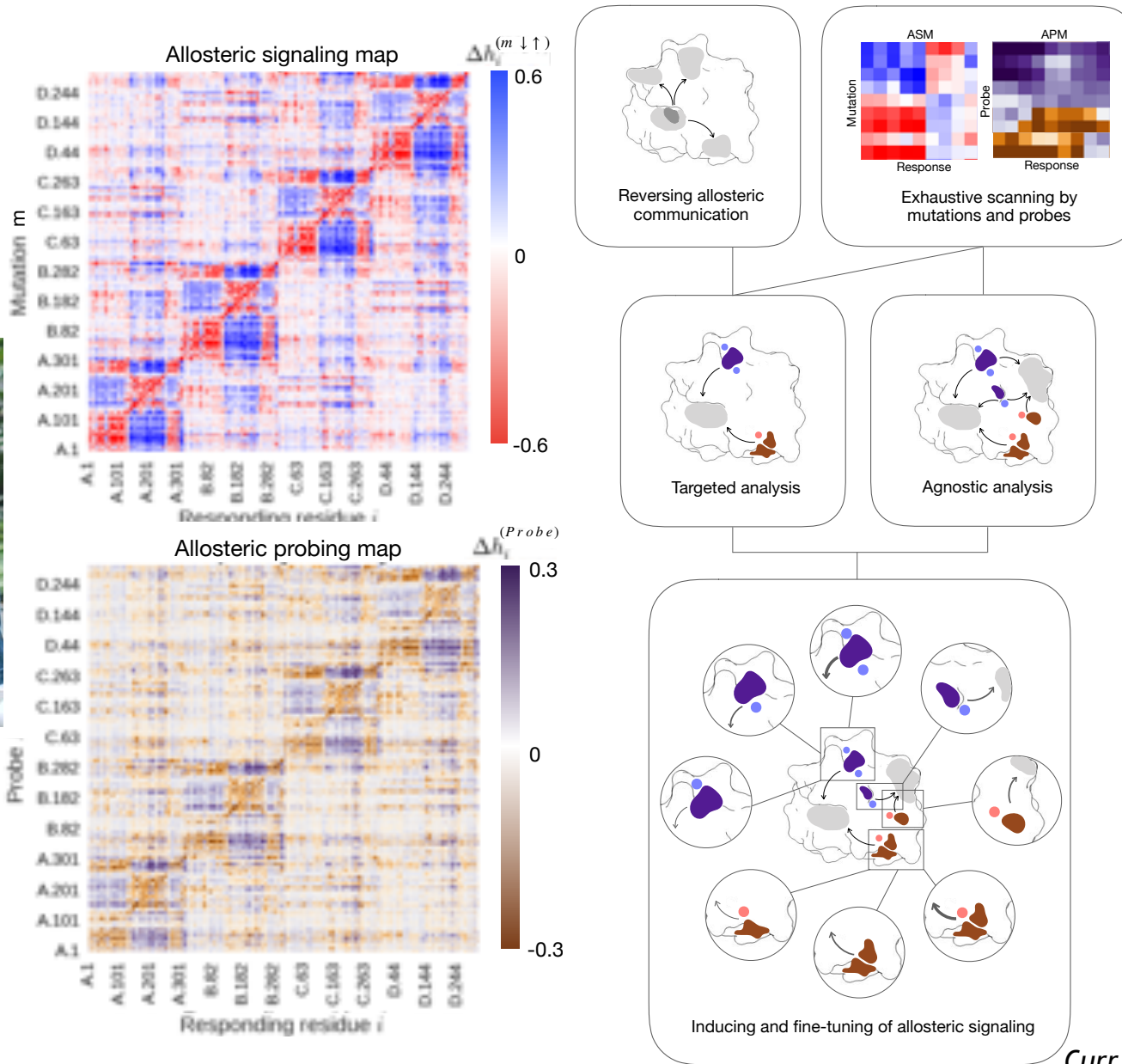
SARS-CoV-2

- Protein Allostery
- Chromatin

PROTEIN ALLOSTERY \equiv PROTEIN DYNAMICS



Paving the way to design of allosteric drugs



Wei-Ven Tee



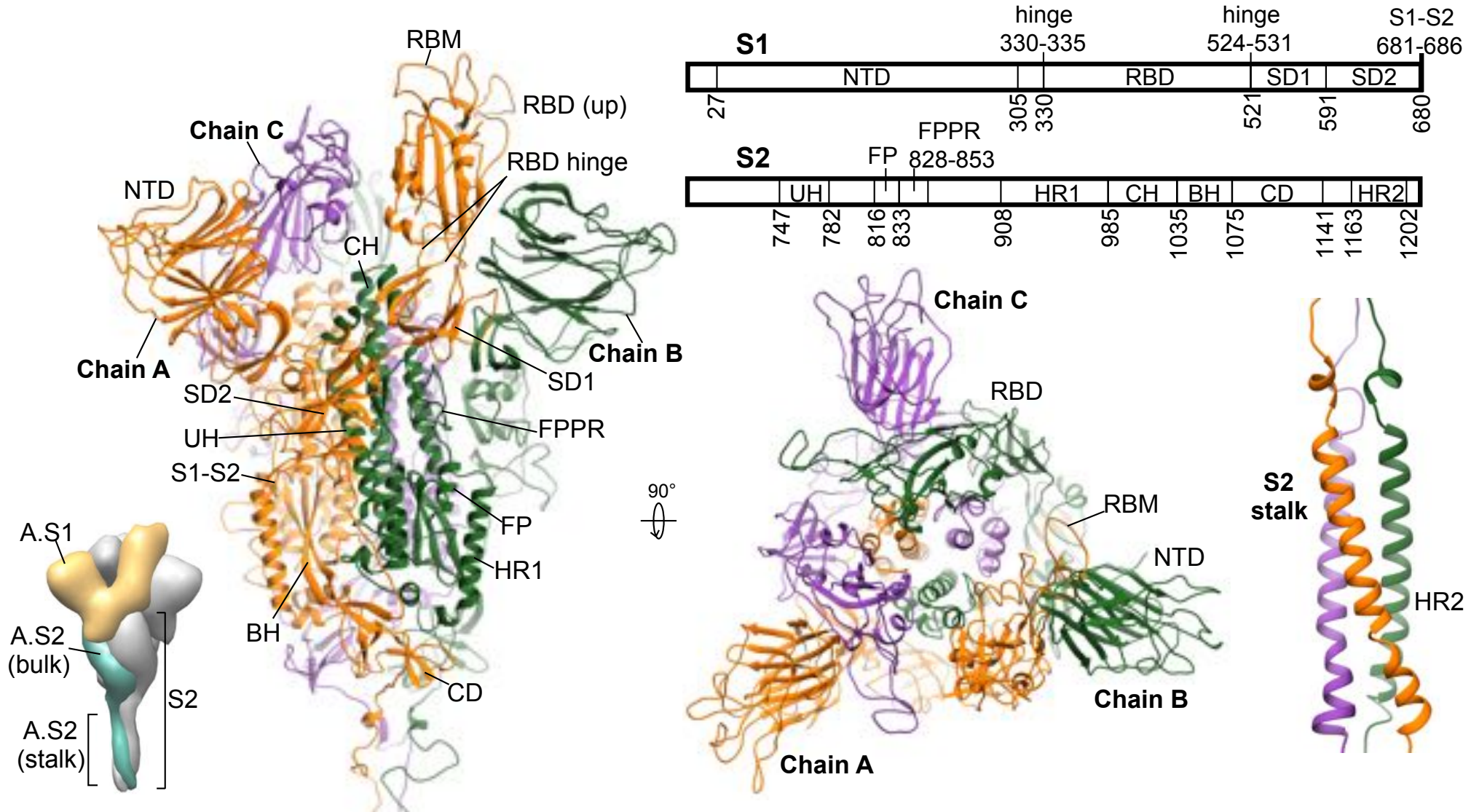
Enrico Guarnera



Zhen Wah Tan

Curr Opin Struct Biol 62, 149 (2020)
Curr Res Struct Biol 2, 191 (2020)
Biophys J 119, 1833 (2020)
J Phys Chem B 125, 3763 (2021)

PROTEIN ALLOSTERY ??? SARS-CoV-2 Spike protein

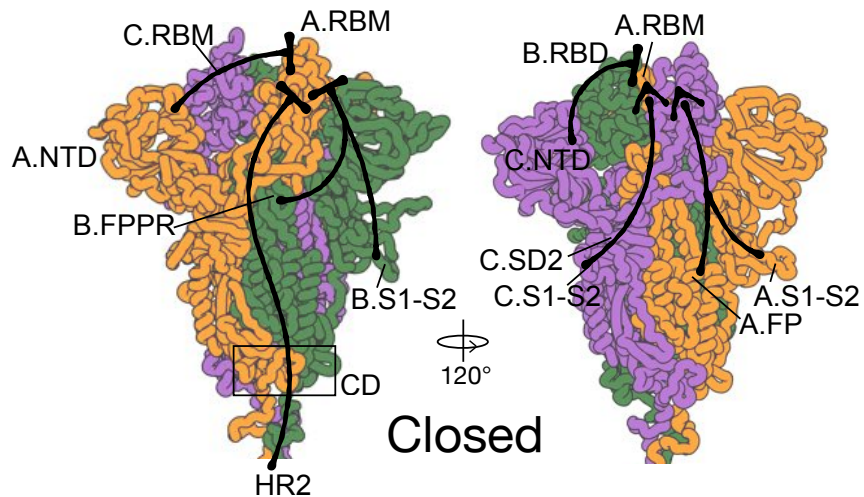
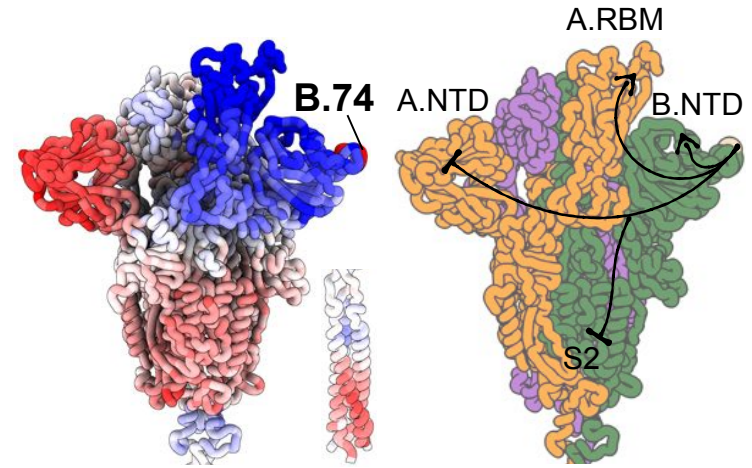
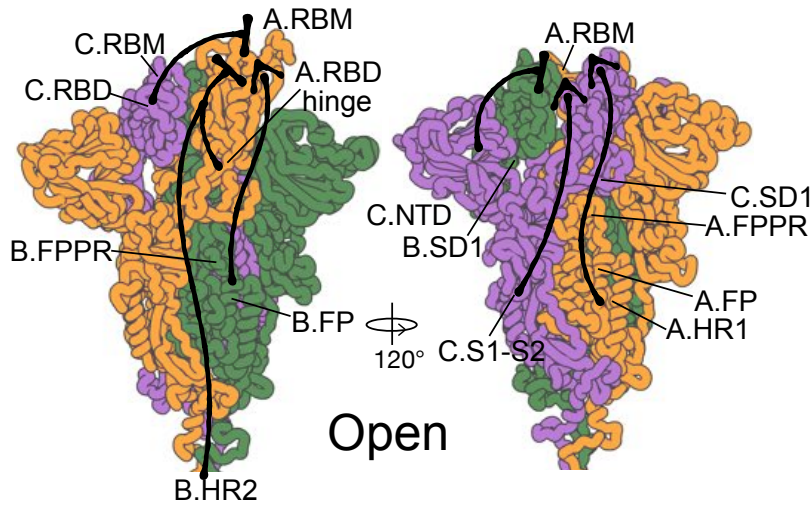


SARS-CoV-2 Spike protein

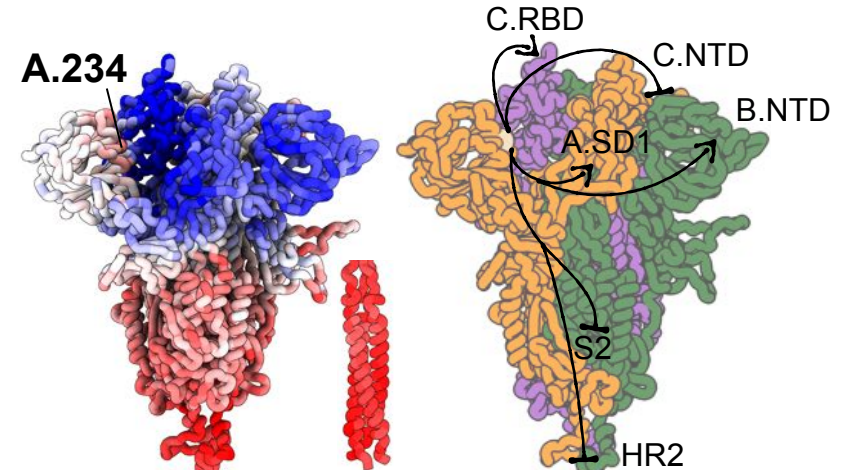
Allosteric signaling

To receptor binding domain

From glycosylated positions
Open

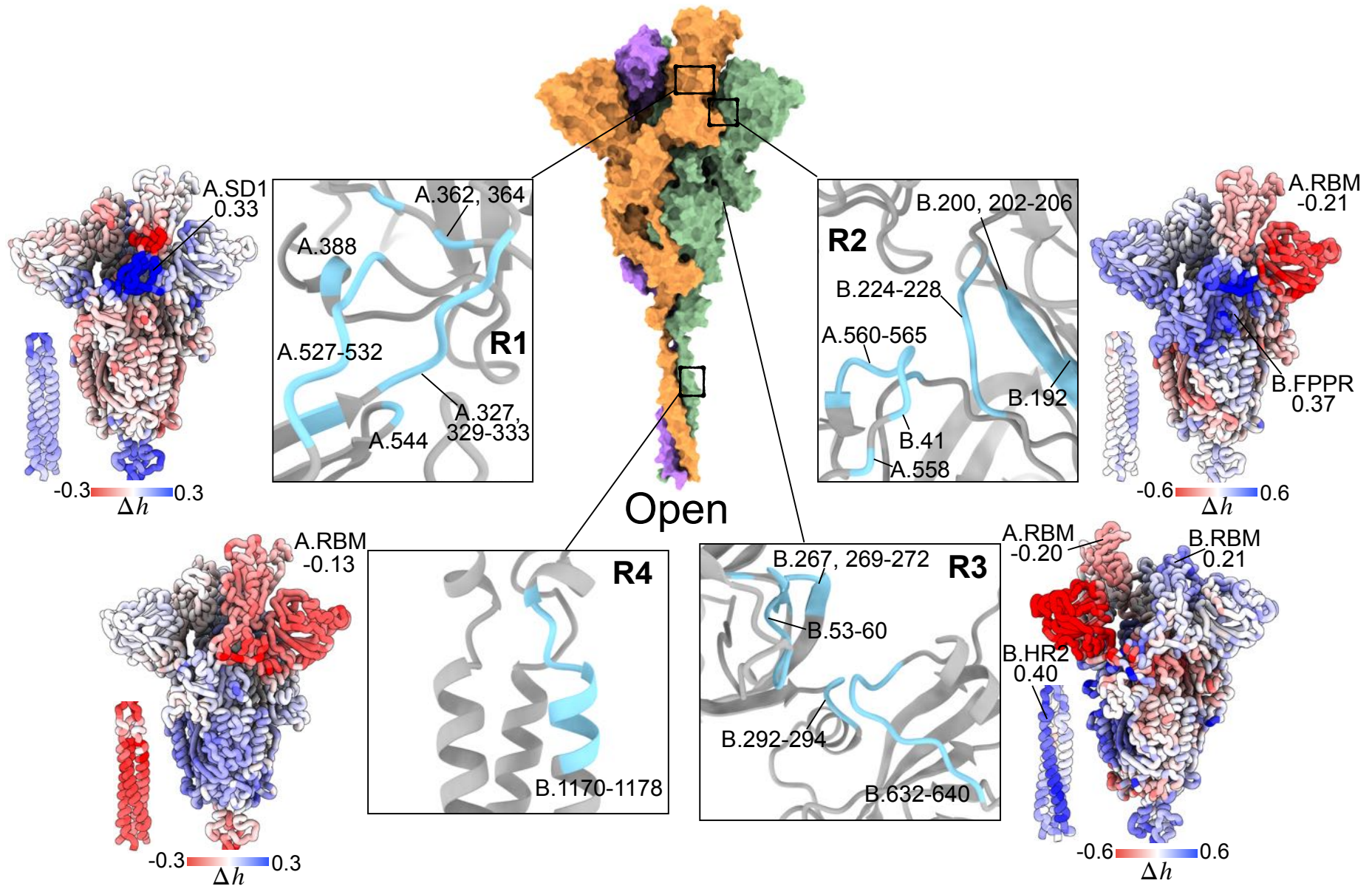


Closed



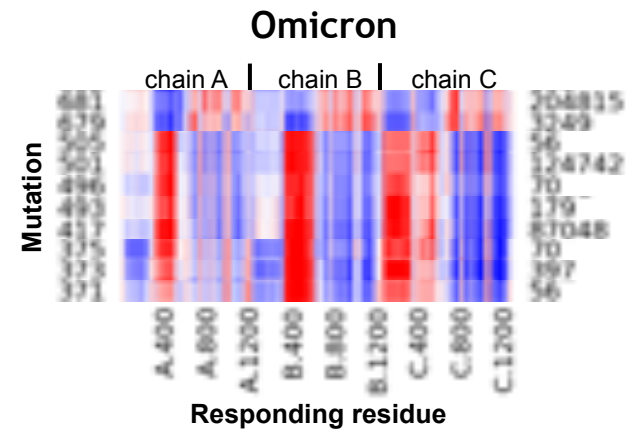
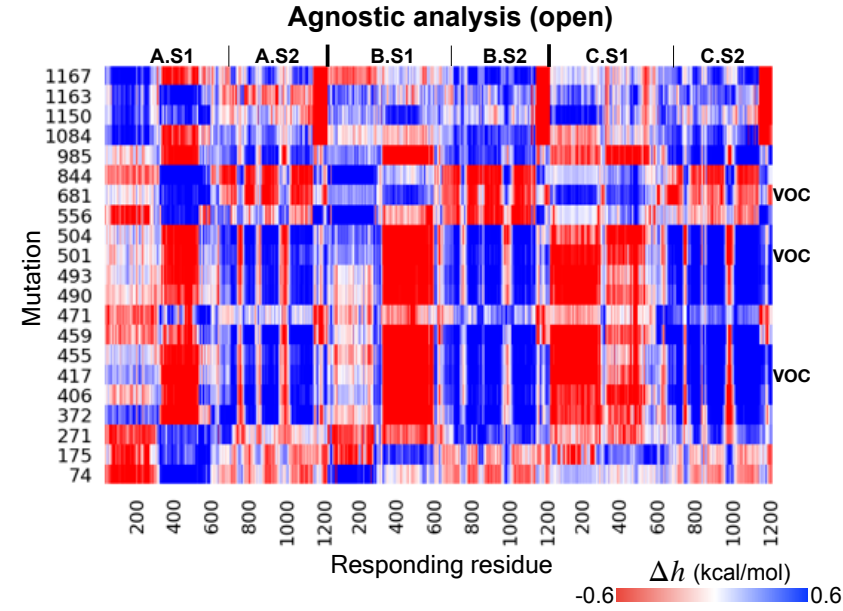
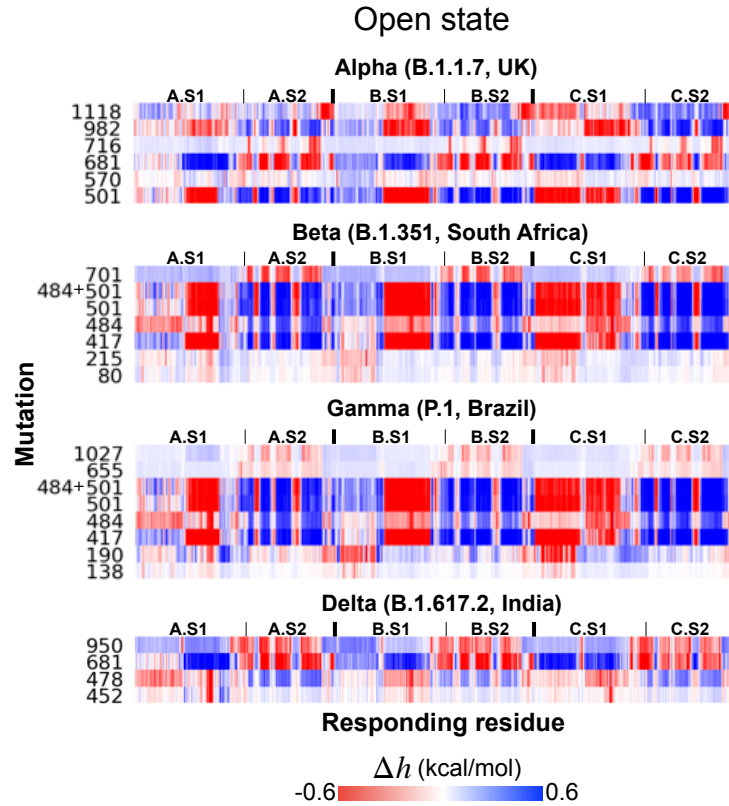
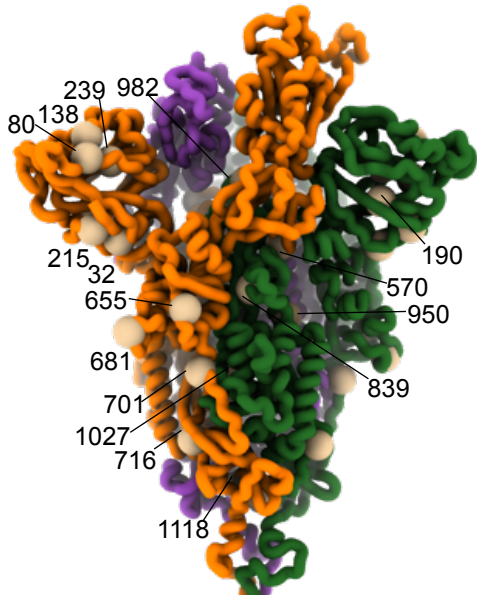
SARS-CoV-2 Spike protein

Towards design of allosteric effectors

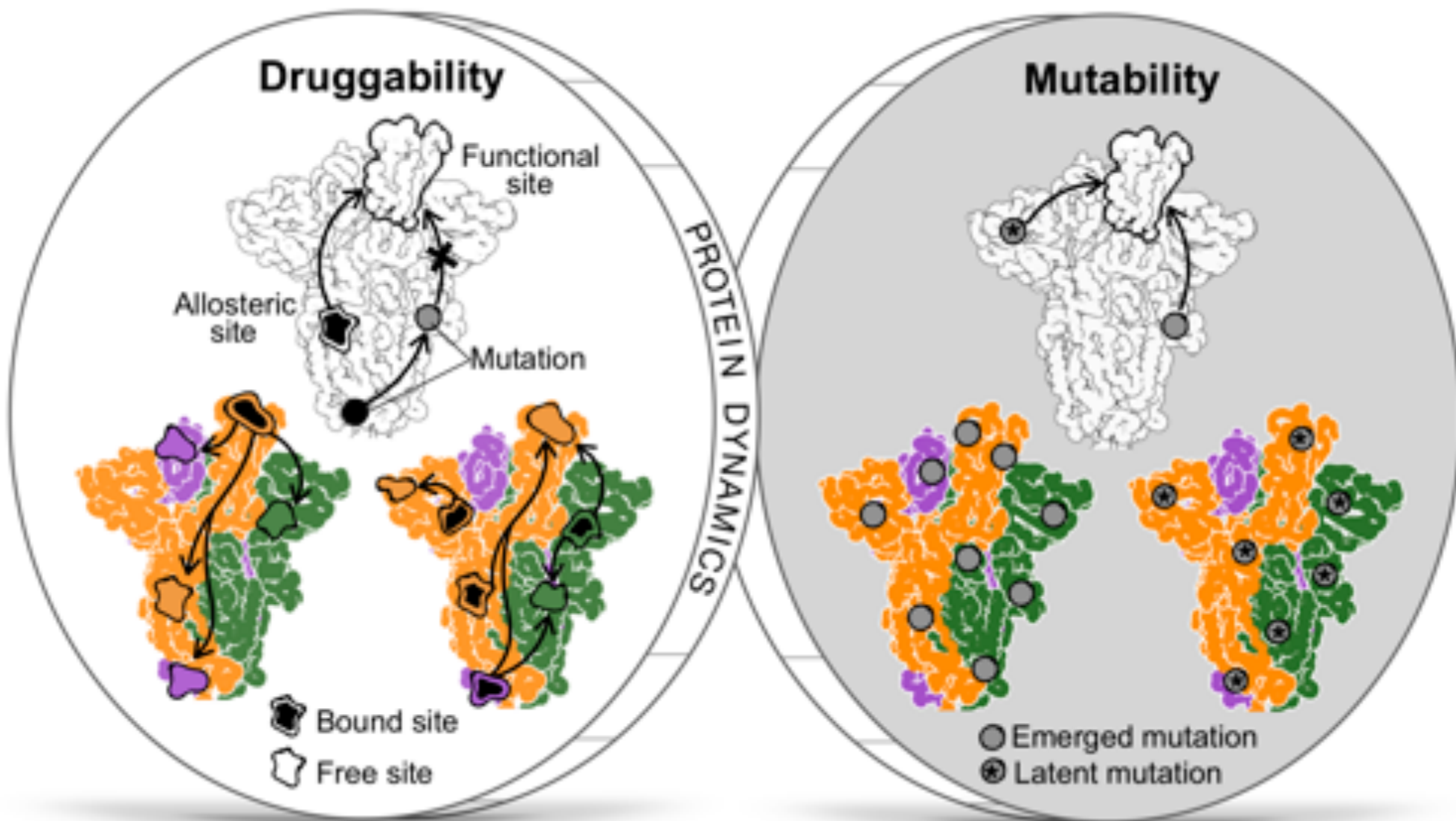


SARS-CoV-2 Spike protein

Allosteric effects of mutations



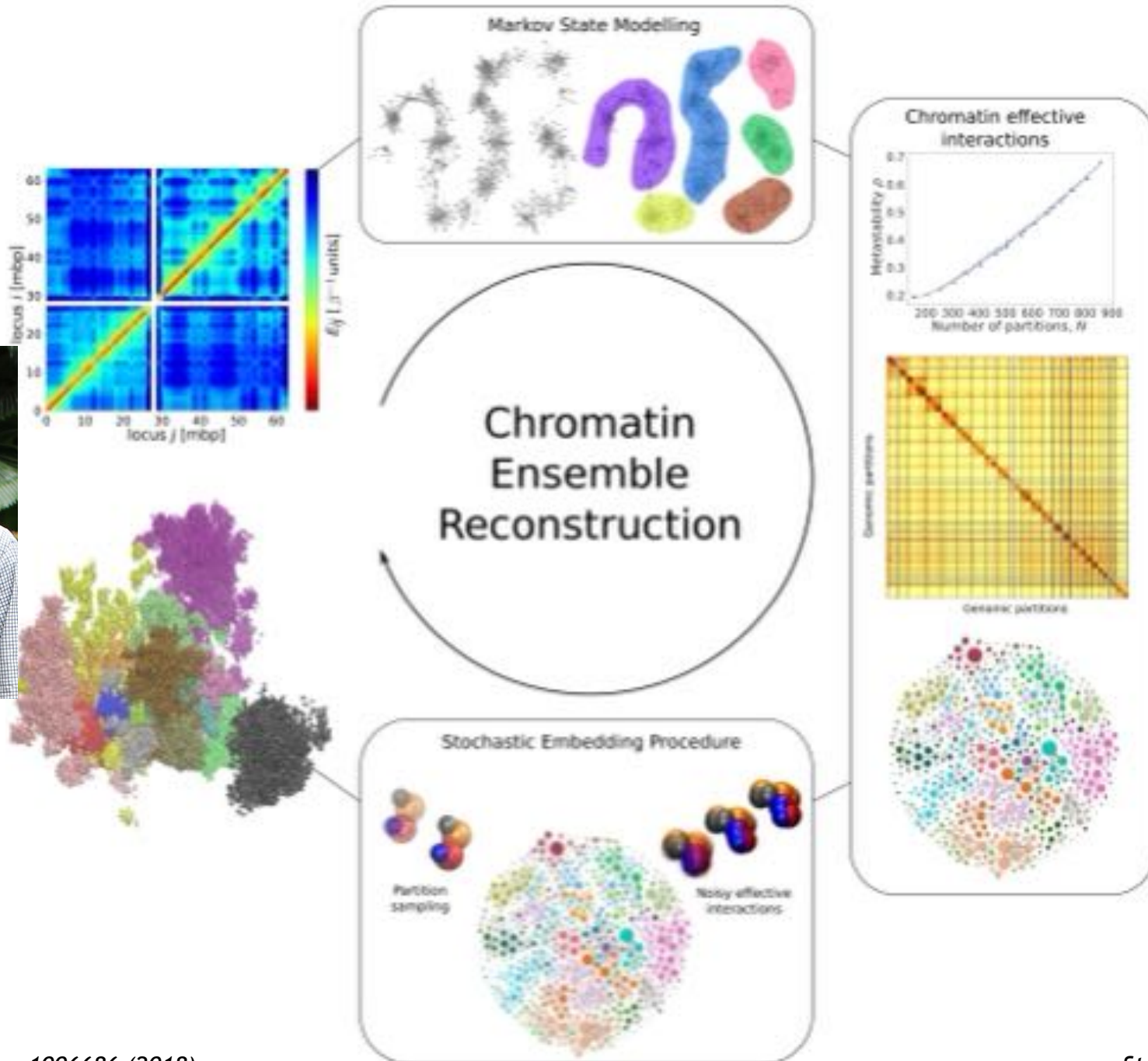
Allosteric perspective on the mutability and druggability of the SARS-CoV-2 Spike protein



Chromatin structure, function, and regulation



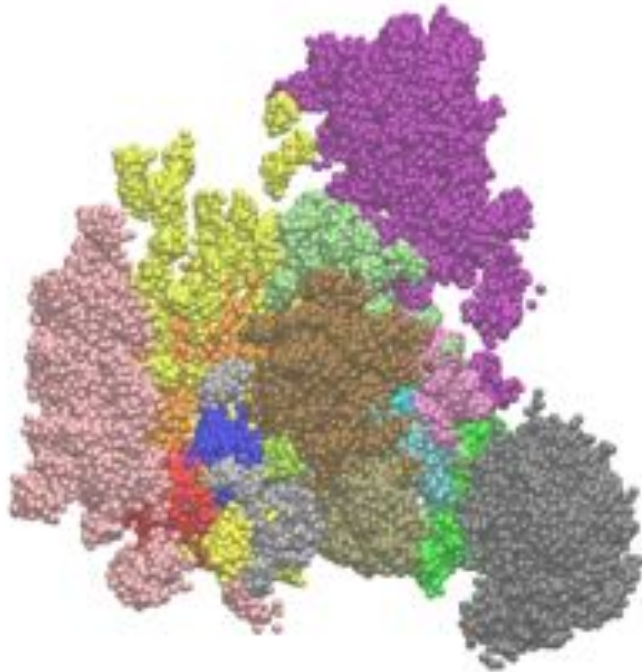
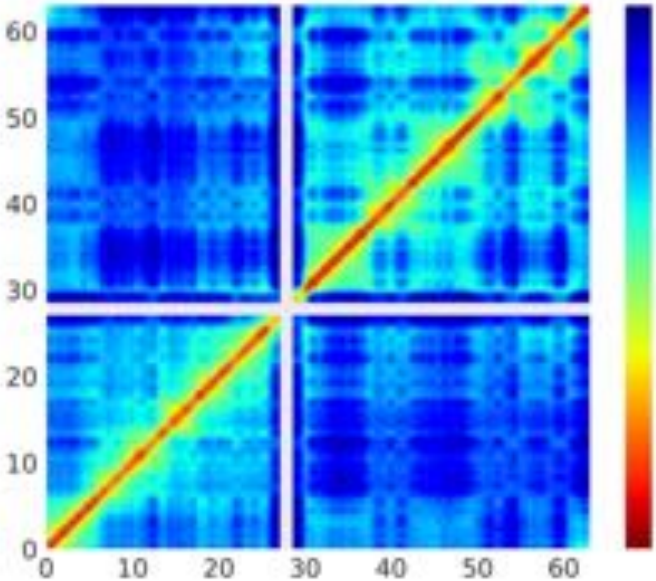
Zhen Wah Tan



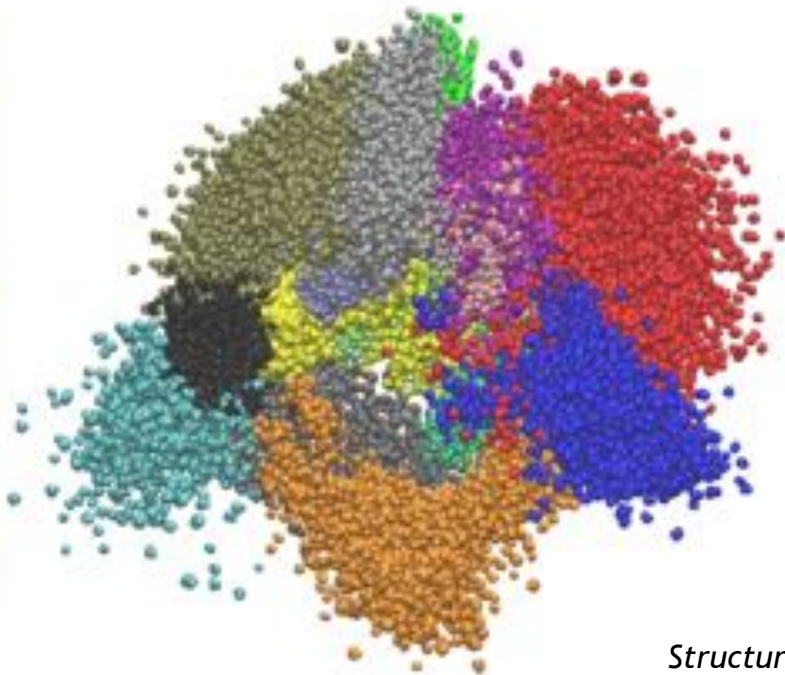
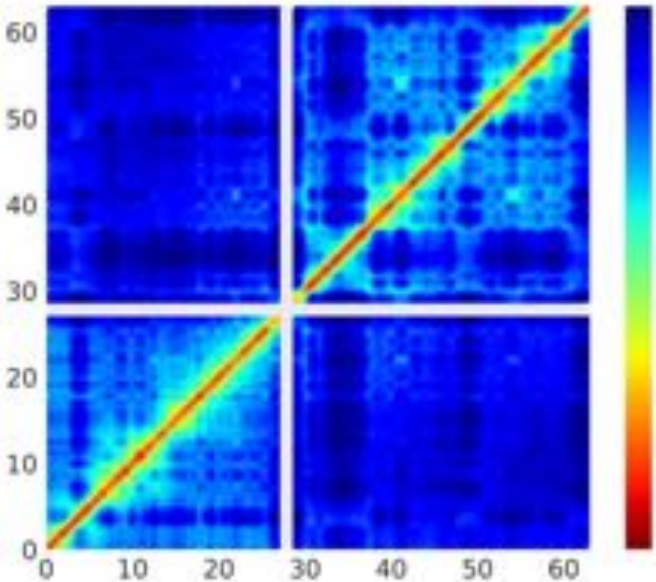
Enrico Guarnera

3D Whole-Genome Reconstruction from the Hi-C Data

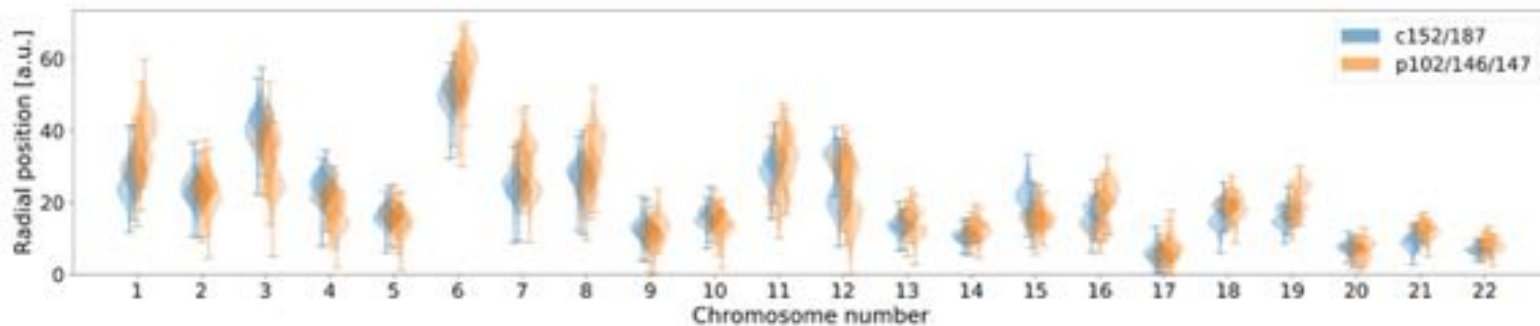
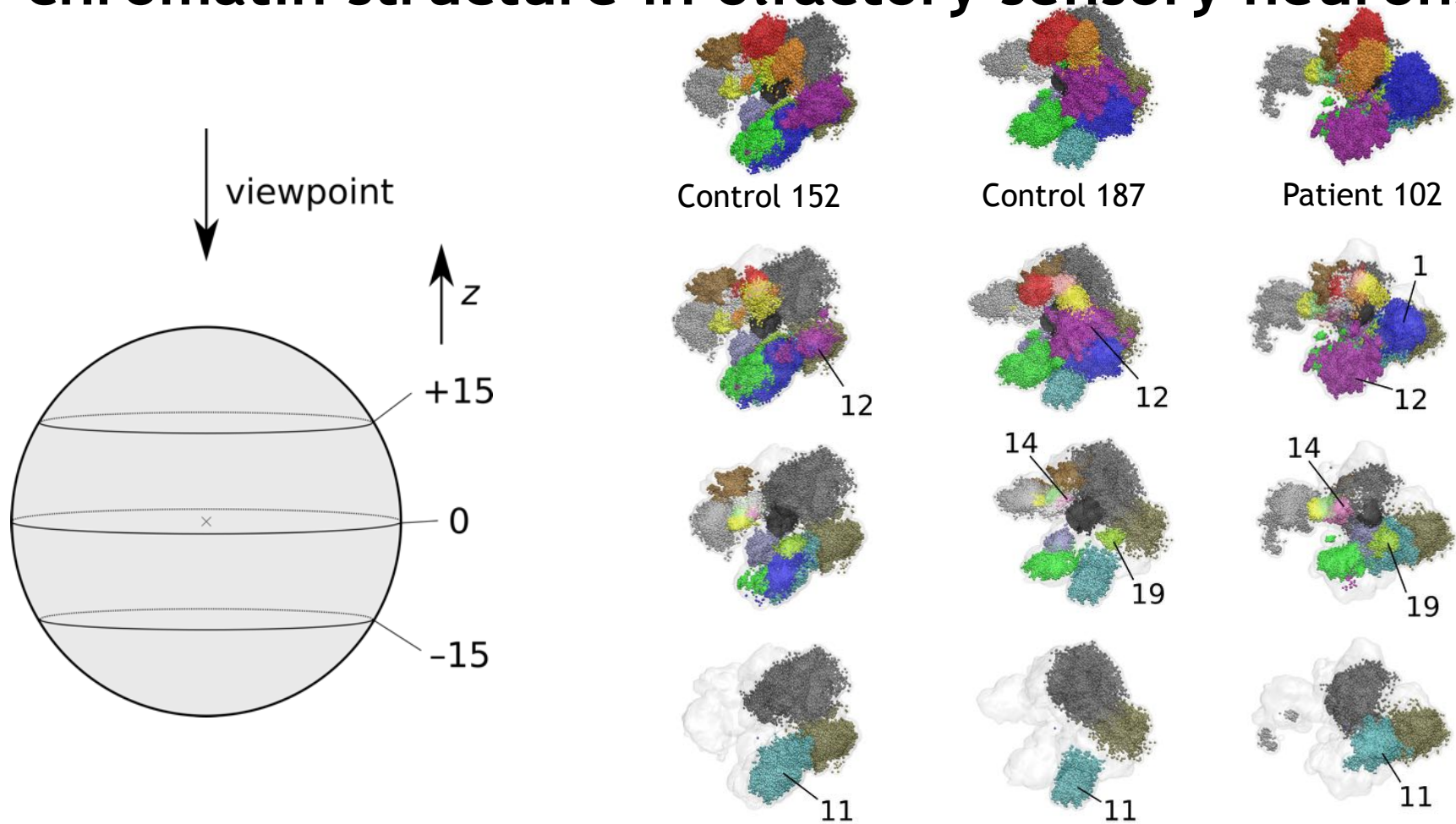
GM12878



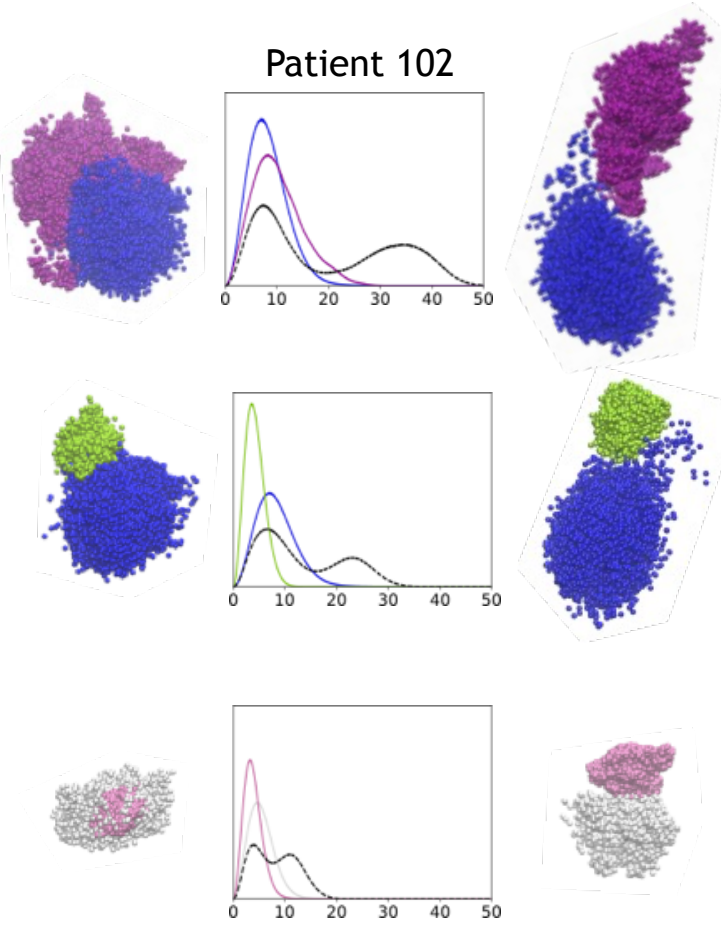
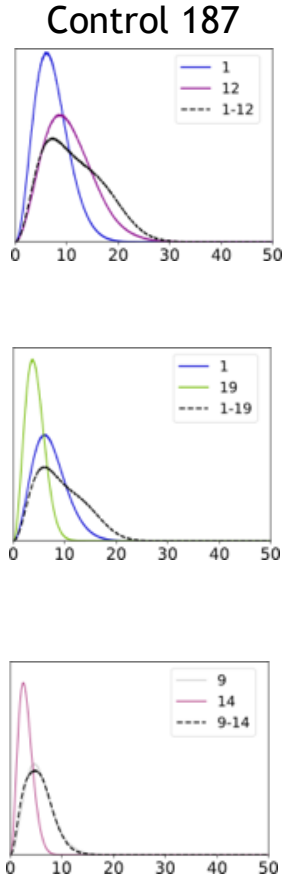
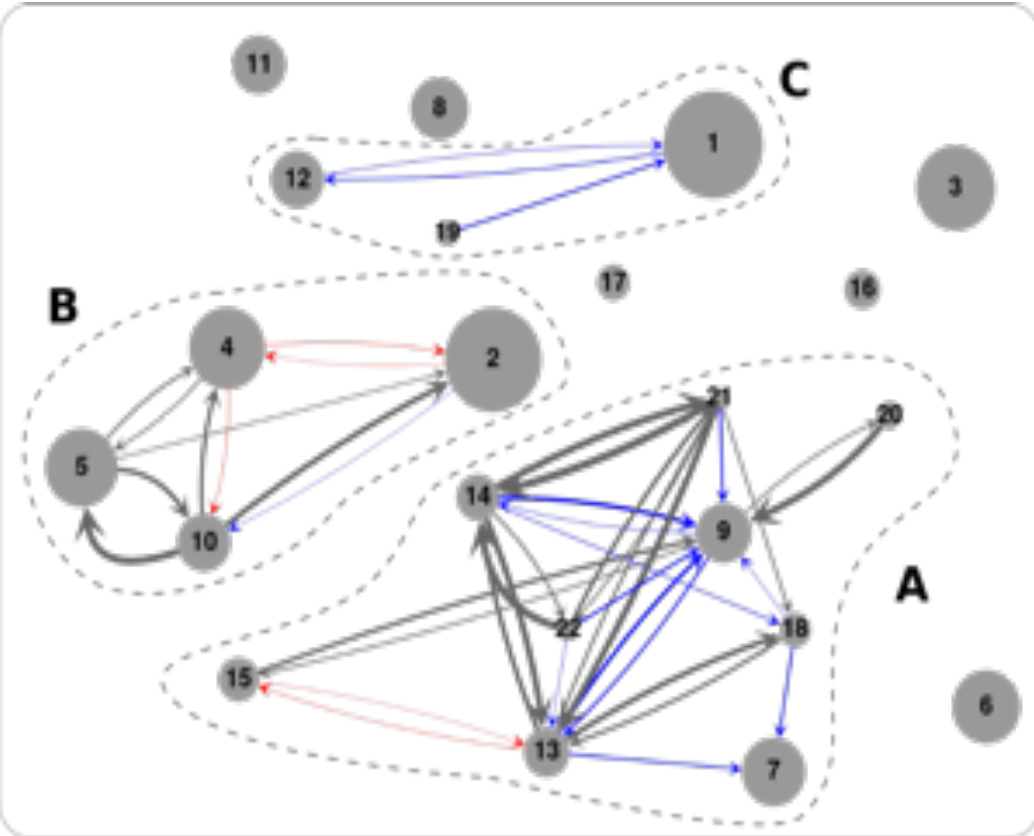
IMR90



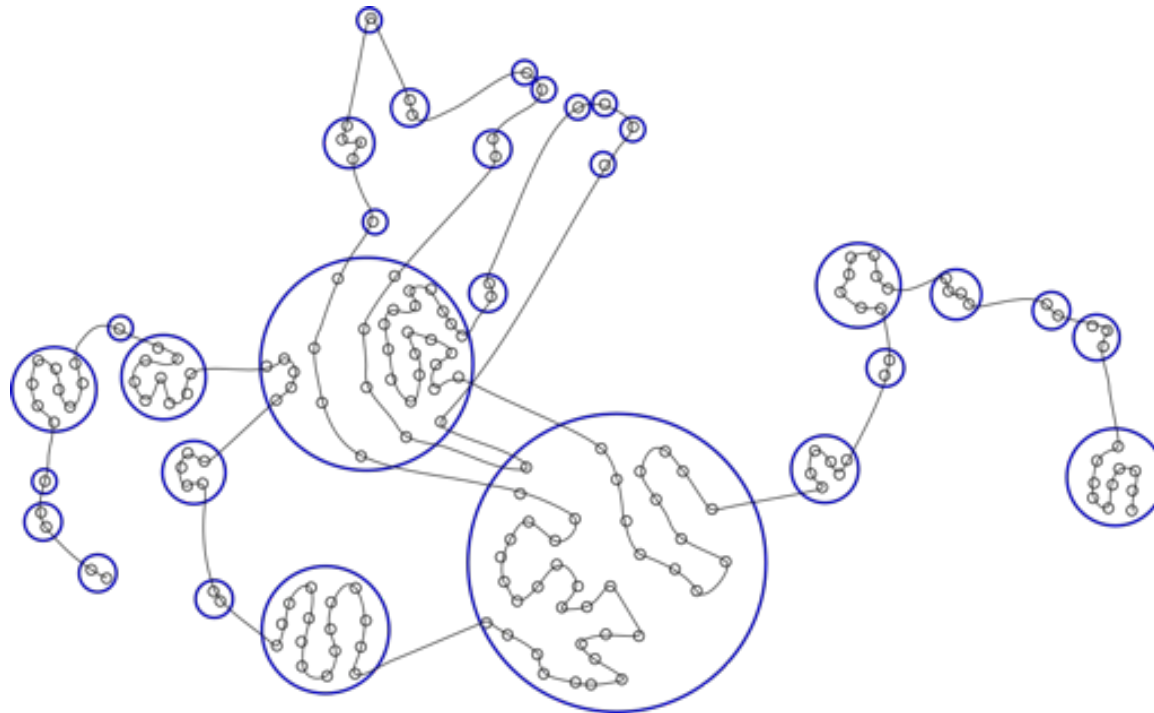
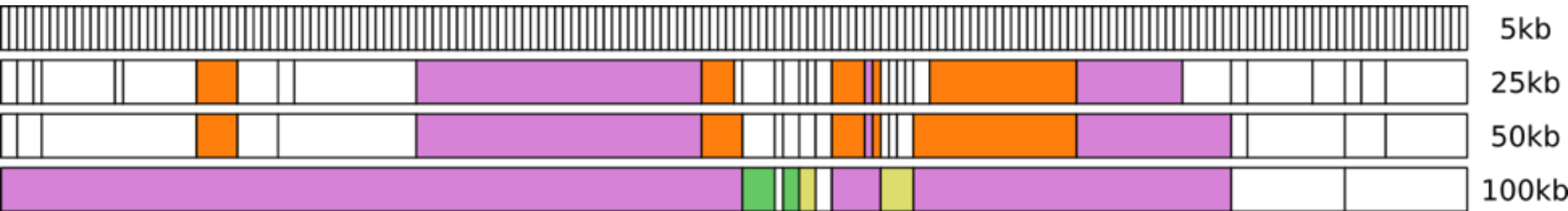
Anosmia in SARS-CoV-2. Multi-scale disruption of chromatin structure in olfactory sensory neurons



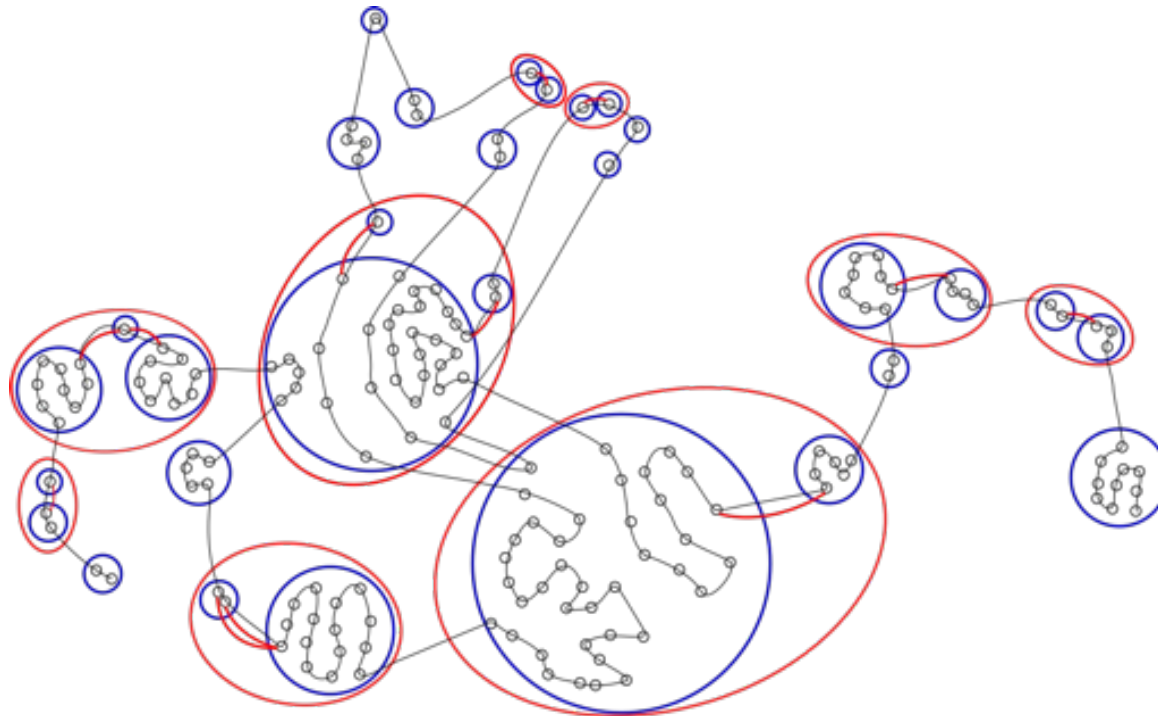
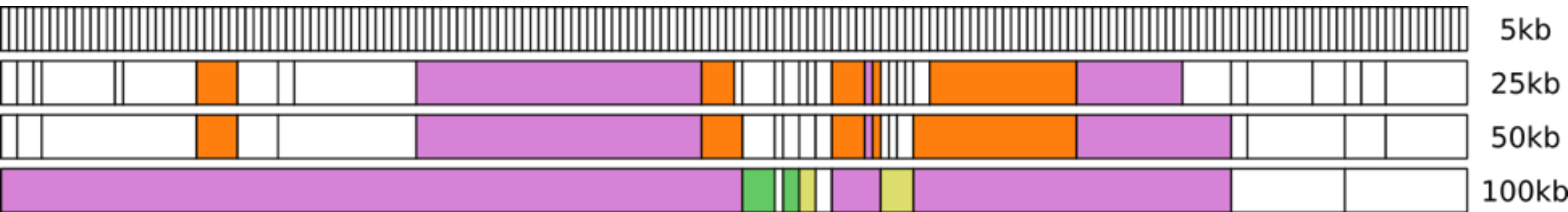
Chromosomal interactions and their alterations



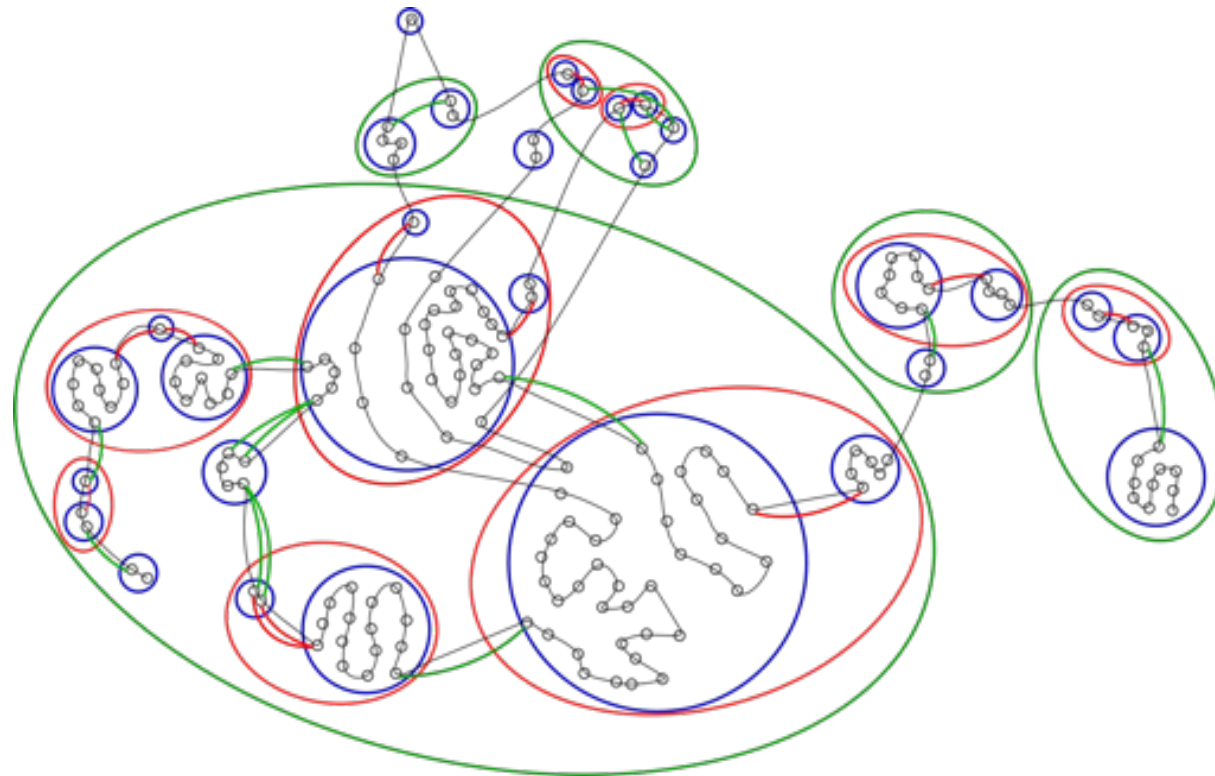
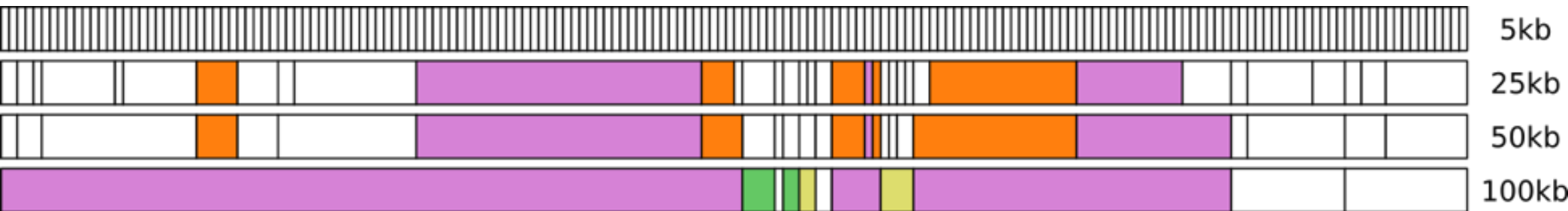
Local packing of chromatin: 25kb



Local packing of chromatin: 50kb

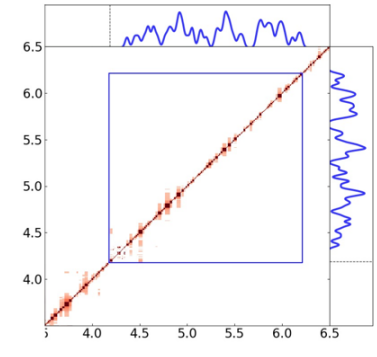
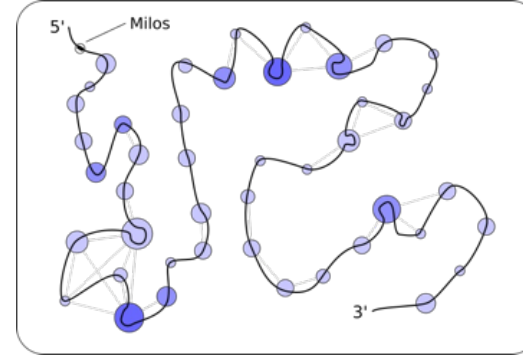
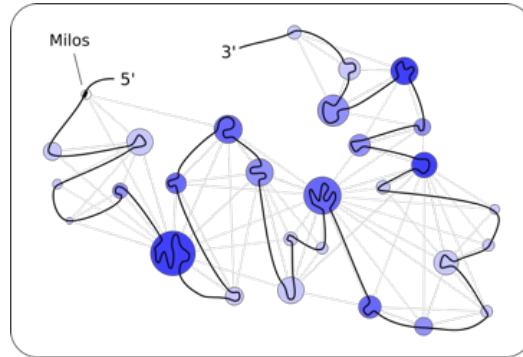
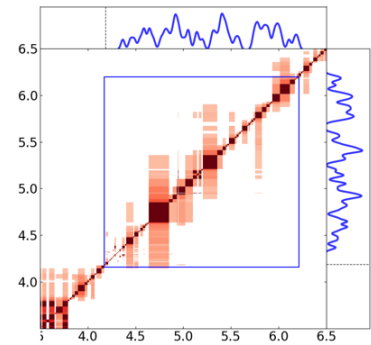


Local packing of chromatin: 100kb



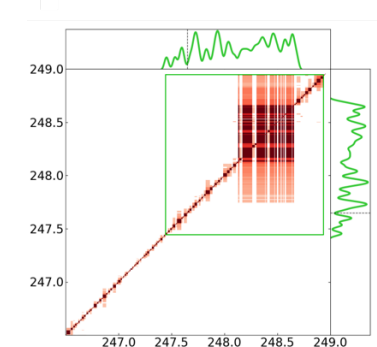
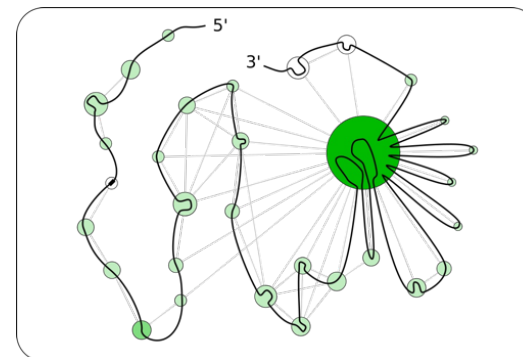
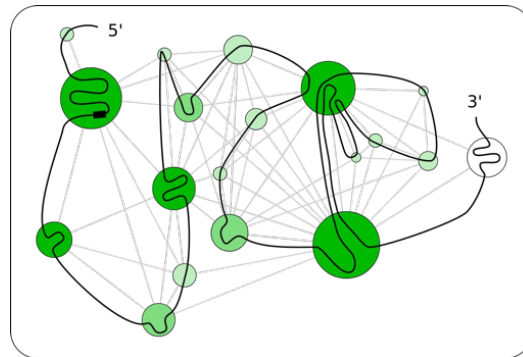
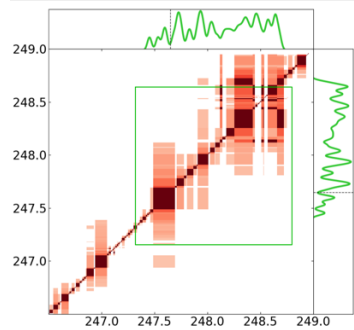
Fine chromatin structure and regulation of olfactory receptor clusters

Chromosome 11

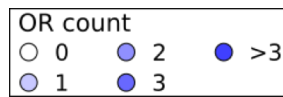


Control 187

Patient 146



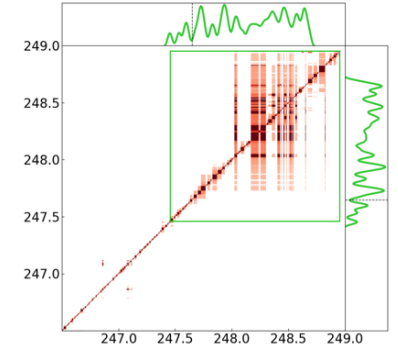
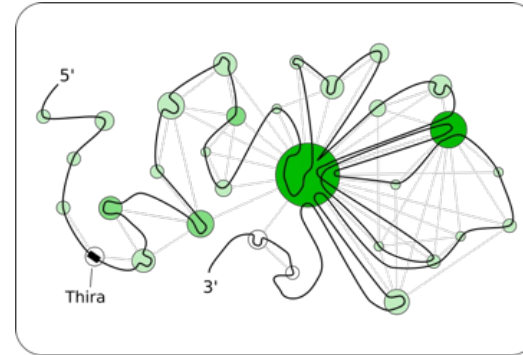
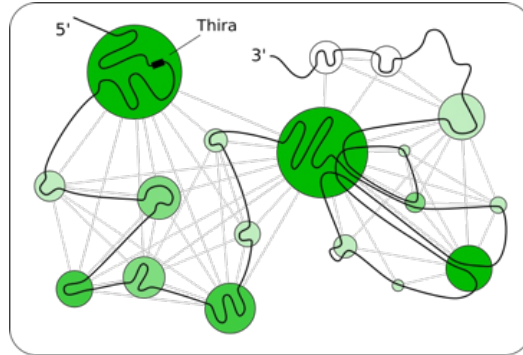
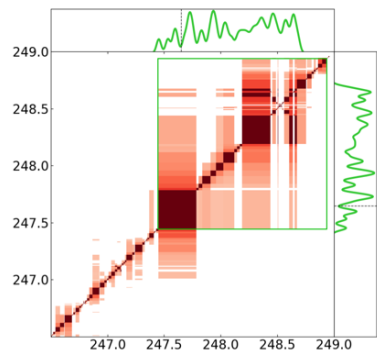
Interaction strength



Chromosome 1

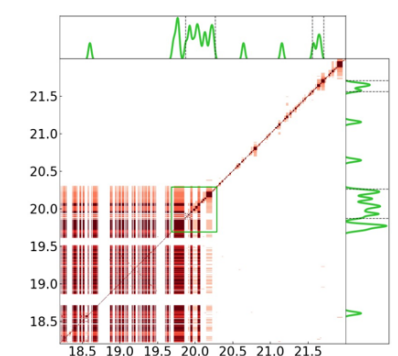
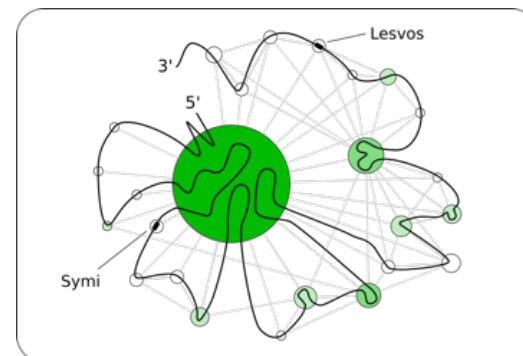
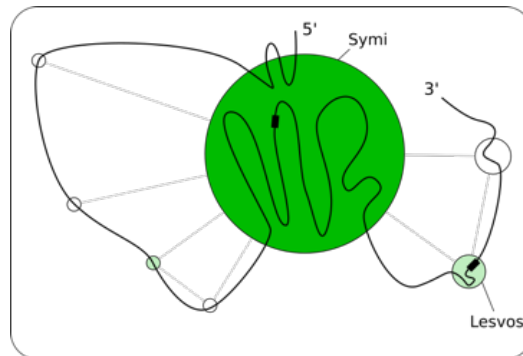
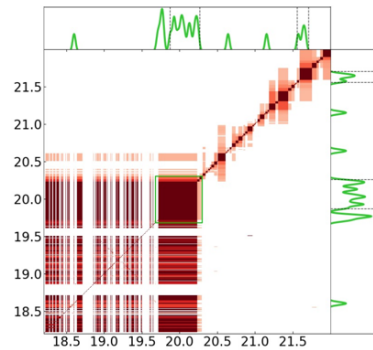
Fine chromatin structure and regulation of olfactory receptor clusters

Chromosome 1

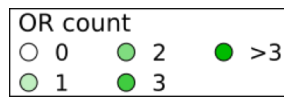


Control 152

Patient 102



Interaction strength



Chromosome 14

Berezovsky Group

Physics and Evolution of Biological Macromolecules



Aidana Amangeldina



Wei-Ven Tee
PhD 2020
CFD 2021

joined in 2022

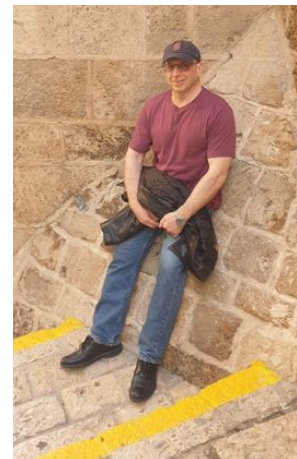


Sylvester Lim

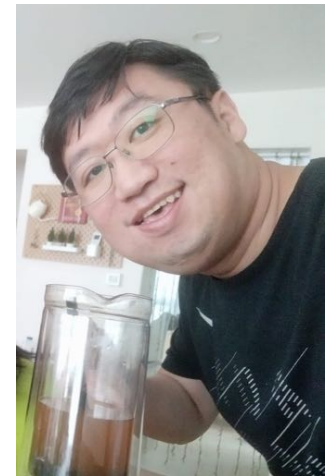
external collaborator



Enrico Guarnera



Igor Berezovsky



Zhen Wah Tan