

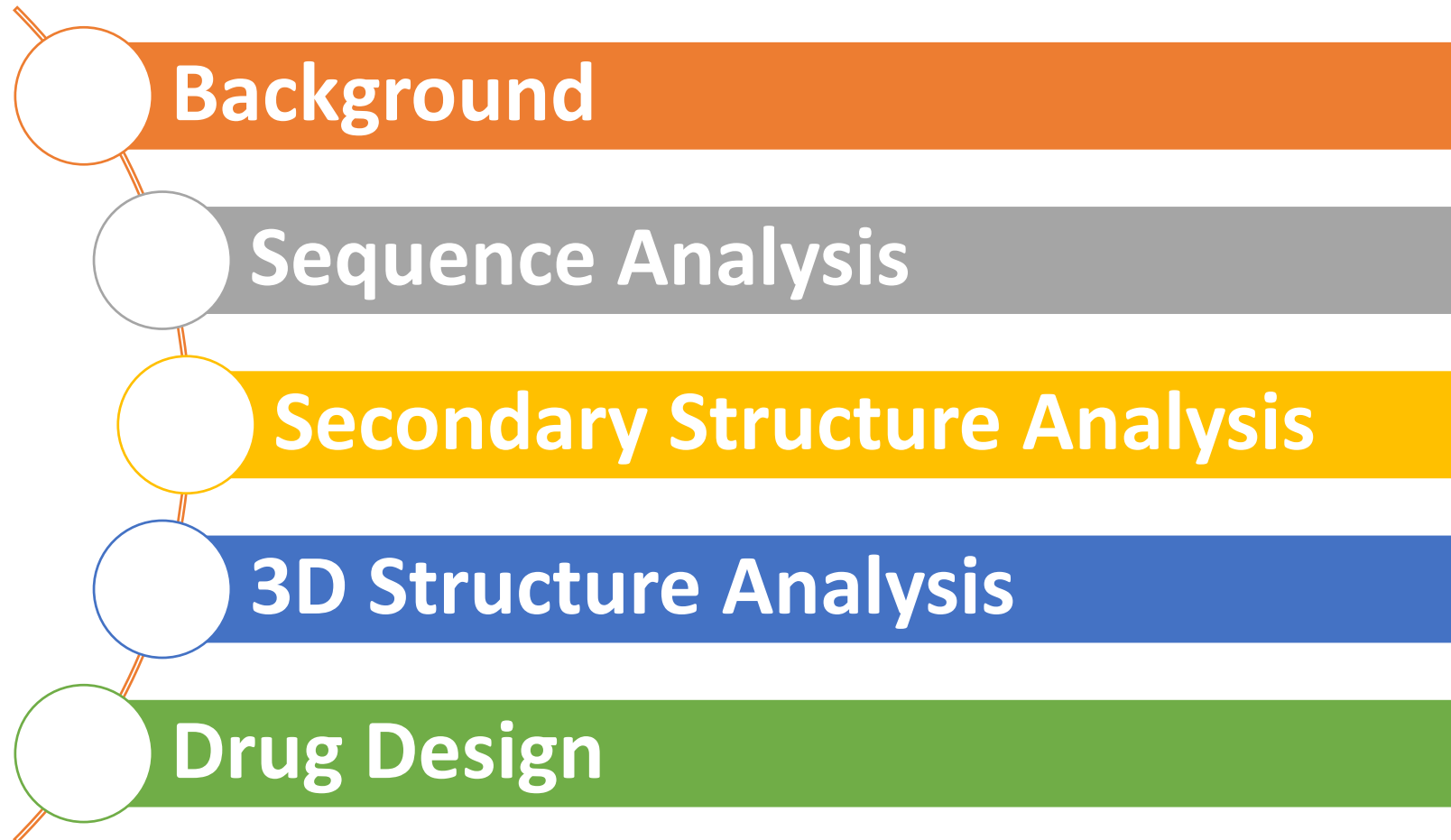


Bioinformatics Analysis of Cryptochrome

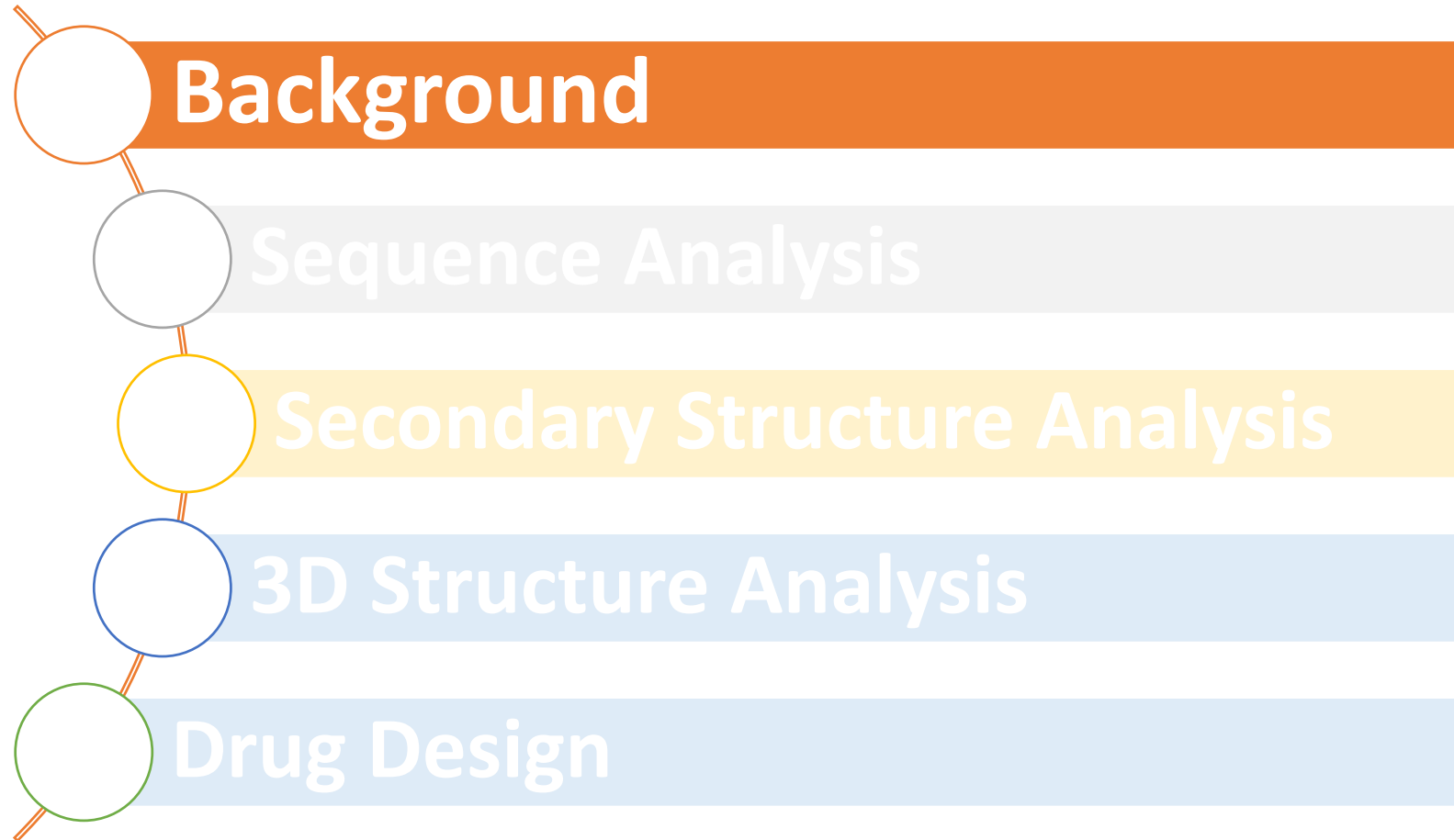
白秀珍 杨喆 徐优俊 解晓雯

2015.06.27

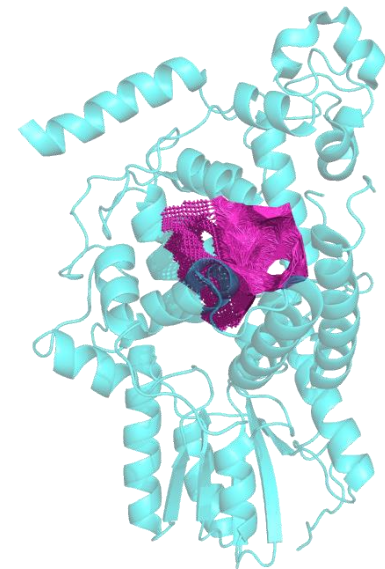
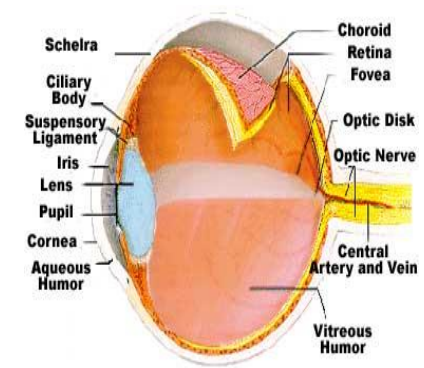
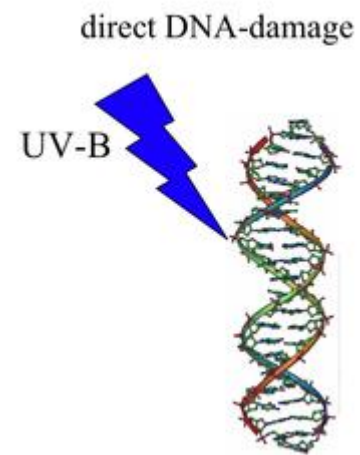
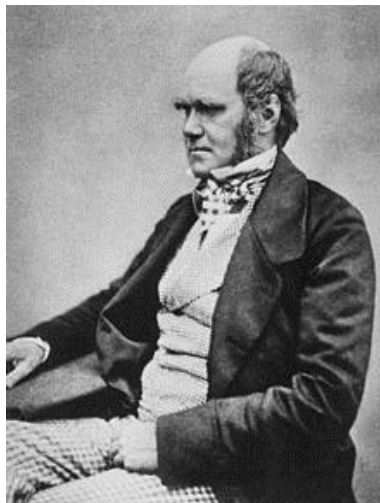
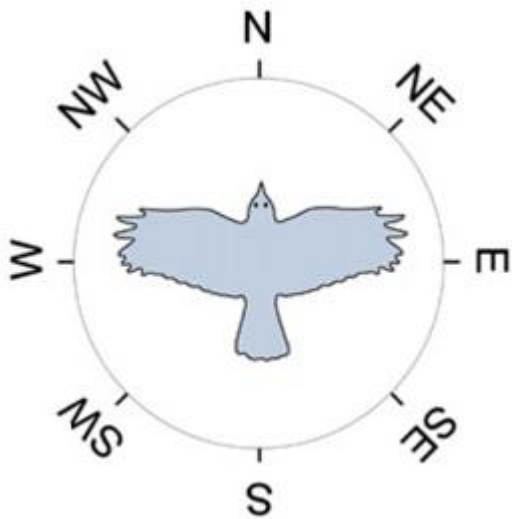
Outline



Outline

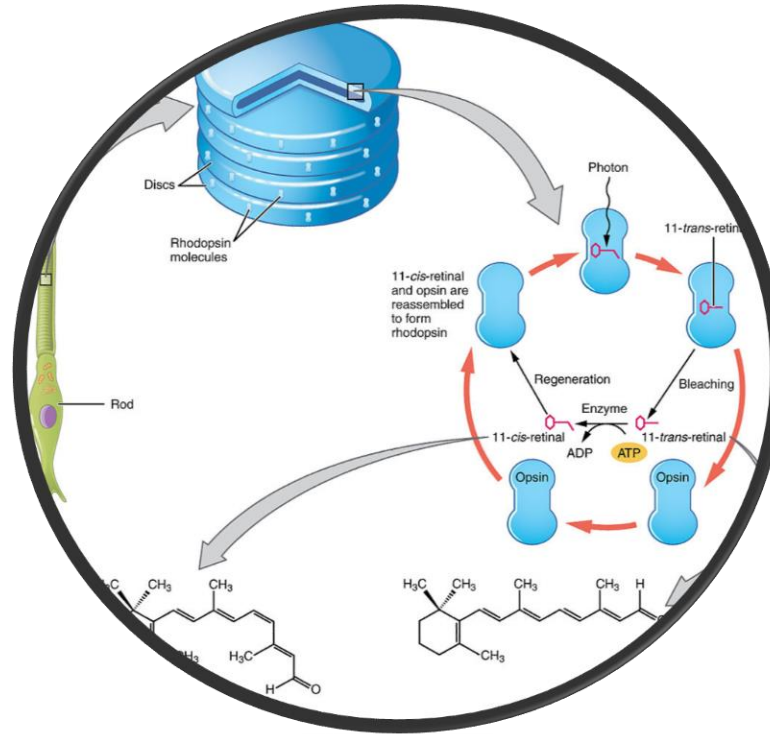
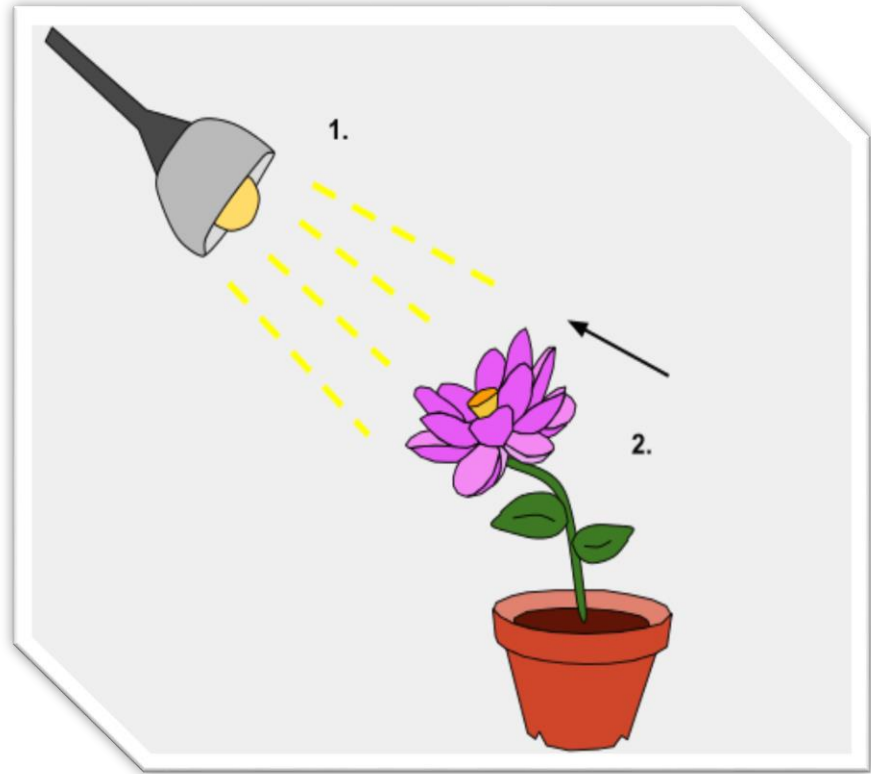


Background



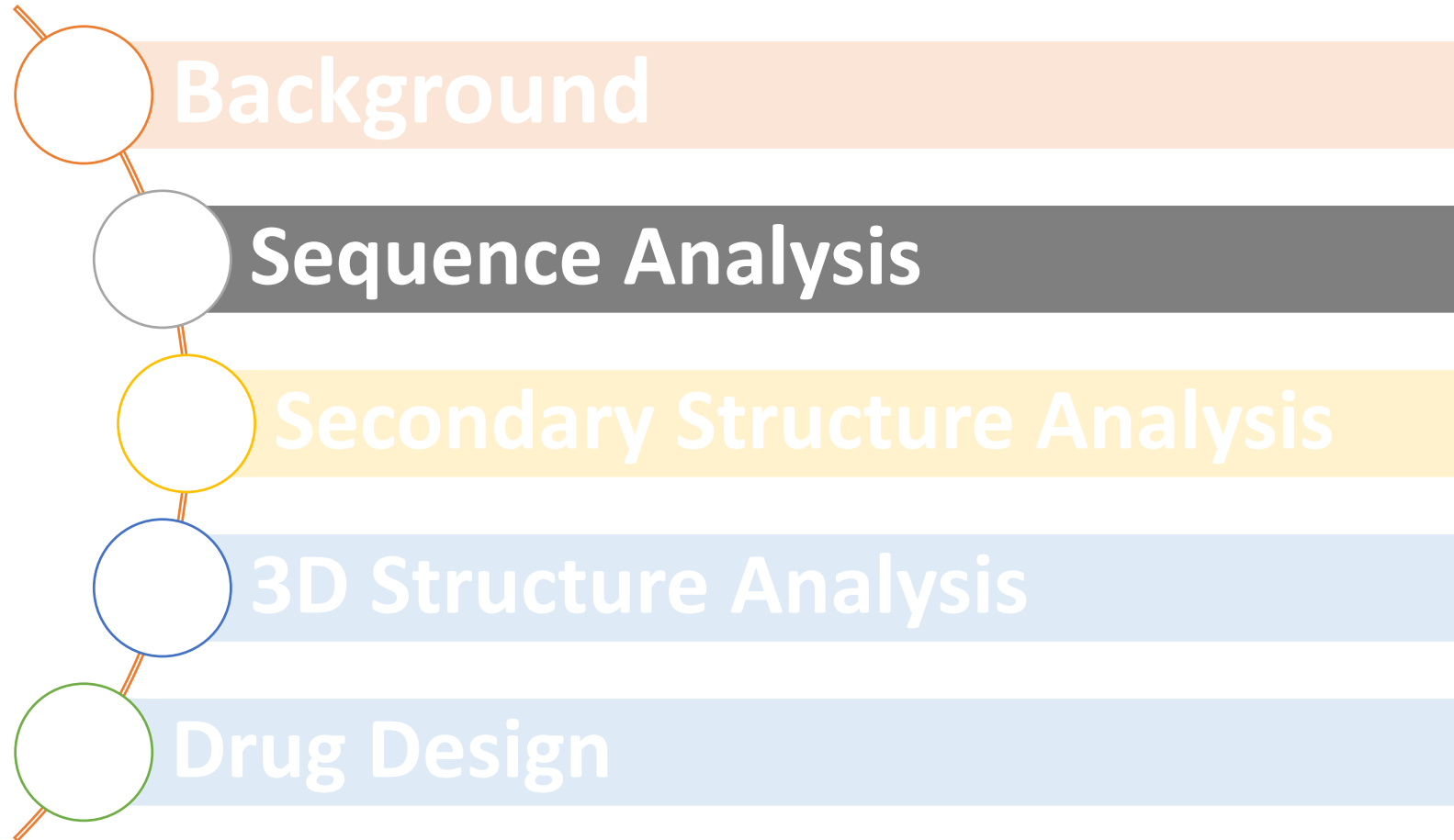
E SE S SW W

Background



The absorption of light leads to an isomeric change in the retinal molecule.

Outline



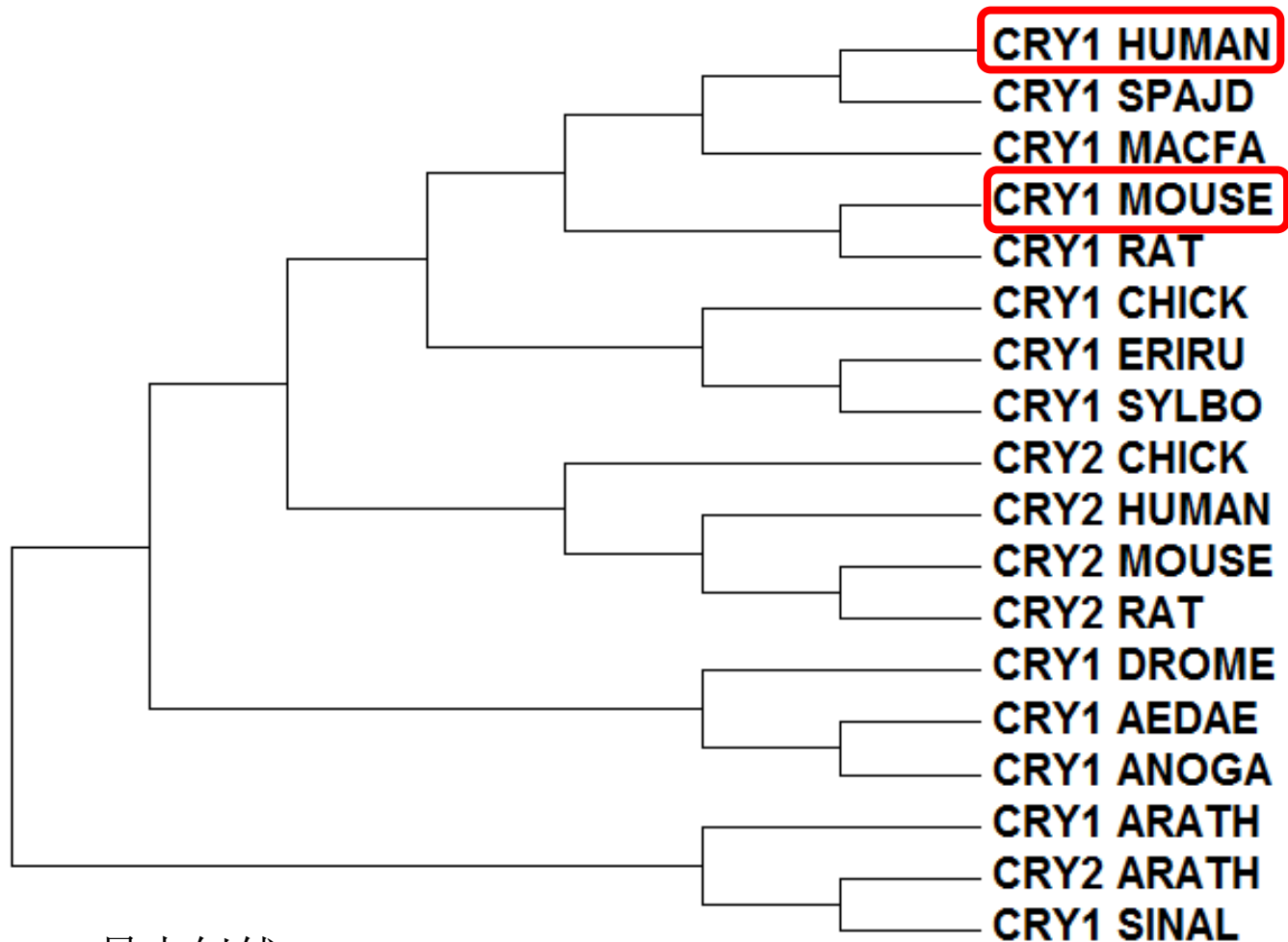
Background

Sequence Analysis

Secondary Structure Analysis

3D Structure Analysis

Drug Design



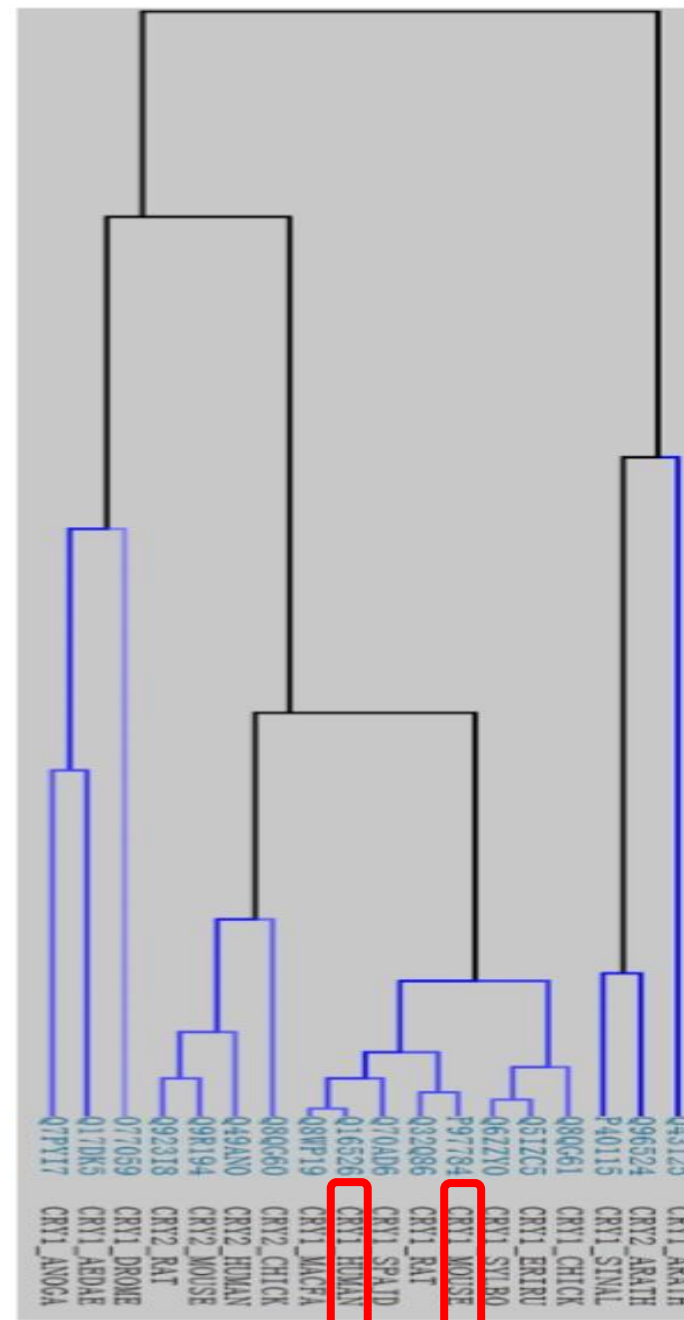
最大似然 bootstrap=1000

CRY1_HUMAN: CRY1_MACFA >
 CRY1_SPAJD > CRY1_RAT =
 CRY1_MOUSE



全序列比对

By Mega 6.0



By Uniprot

```

CRY1_HUMAN      MGVNAVHWFRKCLRLRDNFALKECIQCADTIRCVYILDPFWAGSSNVGIRNRWFLLQCLE
CRY1_MACFA      MGVNAVHWFRKCLRLRDNFALKECIQCADTIRCVYILDPFWAGSSNVGIRNRWFLLQCLE
CRY1_SPAJD      MGVNAVHWFRKCLRLRDNFALKECIQCADTIRCVYILDPFWAGSSNVGIRNRWFLLQCLE
CRY1_MOUSE      MGVNAVHWFRKCLRLRDNFALKECIQCADTIRCVYILDPFWAGSSNVGIRNRWFLLQCLE
CRY1_RAT        MGVNAVHWFRKCLRLRDNFALKECIQCADTIRCVYILDPFWAGSSNVGIRNRWFLLQCLE

CRY1_HUMAN      DLDANLRKLNRLFVIRGQPADVFPFLFKENWITKLSIEYDSEFFCKERDAAIKKLATEA
CRY1_MACFA      DLDANLRKLNRLFVIRGQPADVFPFLFKENWITKLSIEYDSEFFCKERDAAIKKLATEA
CRY1_SPAJD      DLDANLRKLNRLFVIRGQPADVFPFLFKENWITKLSIEYDSEFFCKERDAAIKKLATEA
CRY1_MOUSE      DLDANLRKLNRLFVIRGQPADVFPFLFKENWITKLSIEYDSEFFCKERDAAIKKLATEA
CRY1_RAT        DLDANLRKLNRLFVIRGQPADVFPFLFKENWITKLSIEYDSEFFCKERDAAIKKLATEA

CRY1_HUMAN      GVEVIVRISHTLYDLDKIIEELNQQPFLTYKRFOTLISKMEPLEISVEITITSEVIEKCTI
CRY1_MACFA      GVEVIVRISHTLYDLDKIIEELNQQPFLTYKRFOTLISKMEPLEISVEITITSEVIEKCTI
CRY1_SPAJD      GVEVIVRISHTLYDLDKIIEELNQQPFLTYKRFOTLISKMEPLEISVEITITSEVIEKCTI
CRY1_MOUSE      GVEVIVRISHTLYDLDKIIEELNQQPFLTYKRFOTLISKMEPLEISVEITITSEVIEKCTI
CRY1_RAT        GVEVIVRISHTLYDLDKIIEELNQQPFLTYKRFOTLISKMEPLEISVEITITSEVIEKCTI

CRY1_HUMAN      FLSDDDHDERKYGVPSELEELGFDTDGLSSAVWPGGTEALTRLERHLEKKAQVANFEPFRMN
CRY1_MACFA      FLSDDDHDERKYGVPSELEELGFDTDGLSSAVWPGGTEALTRLERHLEKKAQVANFEPFRMN
CRY1_SPAJD      FLSDDDHDERKYGVPSELEELGFDTDGLSSAVWPGGTEALTRLERHLEKKAQVANFEPFRMN
CRY1_MOUSE      FLSDDDHDERKYGVPSELEELGFDTDGLSSAVWPGGTEALTRLERHLEKKAQVANFEPFRMN
CRY1_RAT        FLSDDDHDERKYGVPSELEELGFDTDGLSSAVWPGGTEALTRLERHLEKKAQVANFEPFRMN

CRY1_HUMAN      ANSLLASPTCLSPYLRFQCLSCRLFYFKLTDLYKVKVKKNSPFLSLYQQLLWREFFYTAA
CRY1_MACFA      ANSLLASPTCLSPYLRFQCLSCRLFYFKLTDLYKVKVKKNSPFLSLYQQLLWREFFYTAA
CRY1_SPAJD      ANSLLASPTCLSPYLRFQCLSCRLFYFKLTDLYKVKVKKNSPFLSLYQQLLWREFFYTAA
CRY1_MOUSE      ANSLLASPTCLSPYLRFQCLSCRLFYFKLTDLYKVKVKKNSPFLSLYQQLLWREFFYTAA
CRY1_RAT        ANSLLASPTCLSPYLRFQCLSCRLFYFKLTDLYKVKVKKNSPFLSLYQQLLWREFFYTAA

CRY1_HUMAN      INNPFDDKMEGNPICVQIFWDEKFEALAKWAEGRGTFPHIDAIMTQLRQECWIHHLARHA
CRY1_MACFA      INNPFDDKMEGNPICVQIFWDEKFEALAKWAEGRGTFPHIDAIMTQLRQECWIHHLARHA
CRY1_SPAJD      INNPFDDKMEGNPICVQIFWDEKFEALAKWAEGRGTFPHIDAIMTQLRQECWIHHLARHA
CRY1_MOUSE      INNPFDDKMEGNPICVQIFWDEKFEALAKWAEGRGTFPHIDAIMTQLRQECWIHHLARHA
CRY1_RAT        INNPFDDKMEGNPICVQIFWDEKFEALAKWAEGRGTFPHIDAIMTQLRQECWIHHLARHA

CRY1_HUMAN      VACFLTRGDLWISWEECKMVFEEILLDADWSINAGSMWLSGSSFFQFFHCYCFVCFGR
CRY1_MACFA      VACFLTRGDLWISWEECKMVFEEILLDADWSINAGSMWLSGSSFFQFFHCYCFVCFGR
CRY1_SPAJD      VACFLTRGDLWISWEECKMVFEEILLDADWSINAGSMWLSGSSFFQFFHCYCFVCFGR
CRY1_MOUSE      VACFLTRGDLWISWEECKMVFEEILLDADWSINAGSMWLSGSSFFQFFHCYCFVCFGR
CRY1_RAT        VACFLTRGDLWISWEECKMVFEEILLDADWSINAGSMWLSGSSFFQFFHCYCFVCFGR

CRY1_HUMAN      RTDFNGDYIRRYLFLVLRGFFPARYIYDFWNAPEGIQKVAKCLIGVNYFKPMVNHAEASRLN
CRY1_MACFA      RTDFNGDYIRRYLFLVLRGFFPARYIYDFWNAPEGIQKVAKCLIGVNYFKPMVNHAEASRLN
CRY1_SPAJD      RTDFNGDYIRRYLFLVLRGFFPARYIYDFWNAPEGIQKVAKCLIGVNYFKPMVNHAEASRLN
CRY1_MOUSE      RTDFNGDYIRRYLFLVLRGFFPARYIYDFWNAPEGIQKVAKCLIGVNYFKPMVNHAEASRLN
CRY1_RAT        RTDFNGDYIRRYLFLVLRGFFPARYIYDFWNAPEGIQKVAKCLIGVNYFKPMVNHAEASRLN

CRY1_HUMAN      IERMKQIYQQLSRYRCLCLLASVPSNPNCGGLMGYS-LENIPCCSSS-----
CRY1_MACFA      IERMKQIYQQLSRYRCLCLLASVPSNPNCGGLMGYS-LENIPCCSSS-----
CRY1_SPAJD      IERMKQIYQQLSRYRCLCLLASVPSNPNCGGLMGYS-LENIPCCSSS-----
CRY1_MOUSE      IERMKQIYQQLSRYRCLCLLASVPSNPNCGGLMGYS-LENIPCCSSS-----
CRY1_RAT        IERMKQIYQQLSRYRCLCLLASVPSNPNCGGLMGYS-LENIPCCSSS-----

CRY1_HUMAN      -----KCSQCSGILHYAHGDSQTHLLKQCRSSMGTCLSGCKRFSQEEETQSIQPKVY
CRY1_MACFA      -----KCSQCSGILHYTHGDSQTHLLKQCRSSMGTCLSGCKRFSQEEETQSIQPKVY
CRY1_SPAJD      -----KCSQCSGILHYAHGDSQTHLLKQCRSSMGTCLSGCKRFSQEEETQSIQPKVY
CRY1_MOUSE      NVPSCCGNCSQCSGILHYAHGDSQTHLLKQCRSSMGTCLSGCKRFSQEEETQSIQPKVY
CRY1_RAT        -----KNSQCSGILHYAHGDSQTHLLKQCRSSMGTCLSGCKRFSQEEETQSIQPKVY

CRY1_HUMAN      CRQSTM
CRY1_MACFA      CRQSTM
CRY1_SPAJD      CRQSTM
CRY1_MOUSE      CRQSSN
CRY1_RAT        CRQSSN

```

CRY1_HUMAN: Identity

CRY1_MACFA: 97.785%

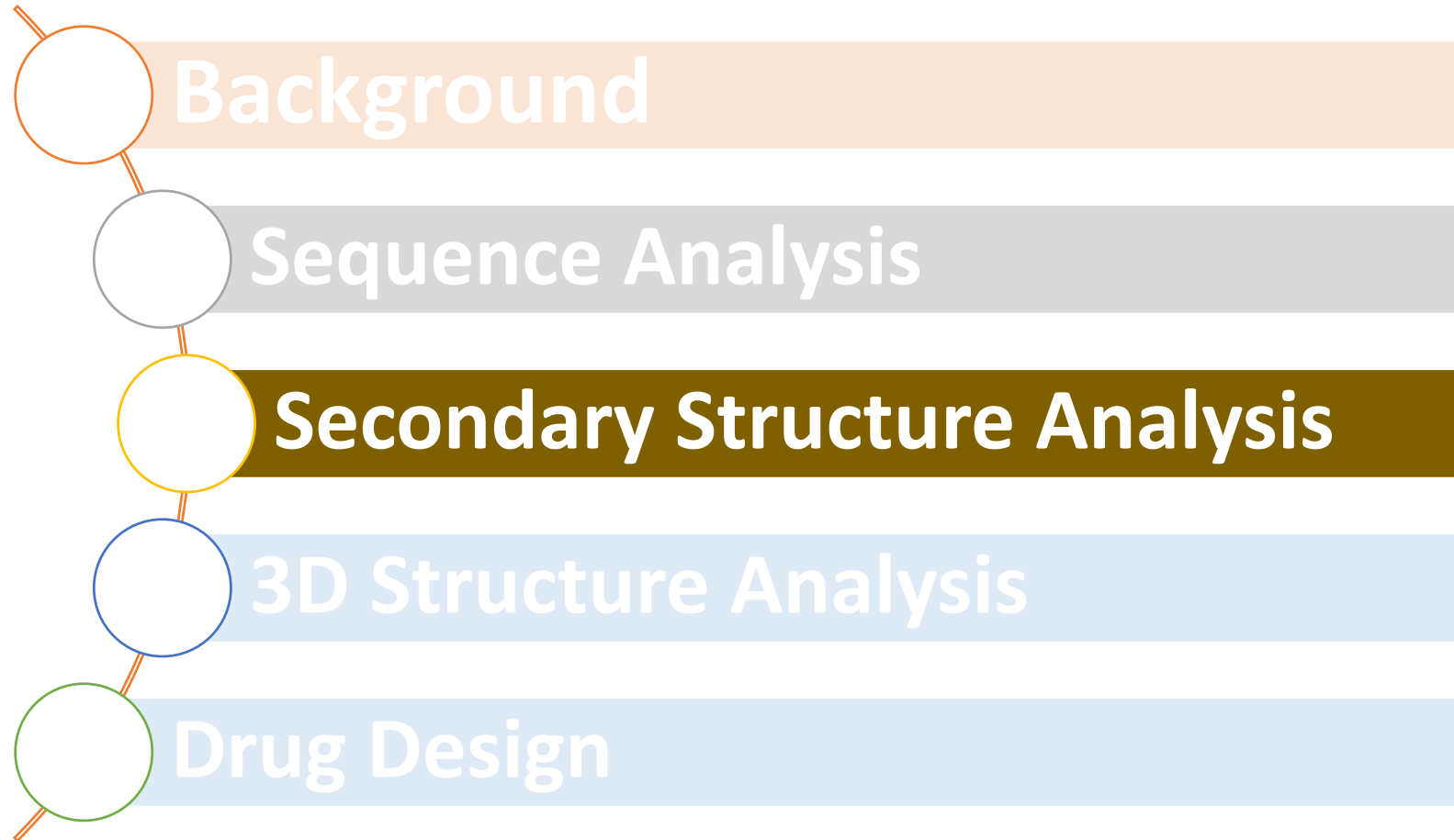
CRY1_SPAJD: 99.317%

CRY1_MOUSE: 93.324%

CRY1_RAT: 95.748%



Outline



Background

Sequence Analysis

Secondary Structure Analysis

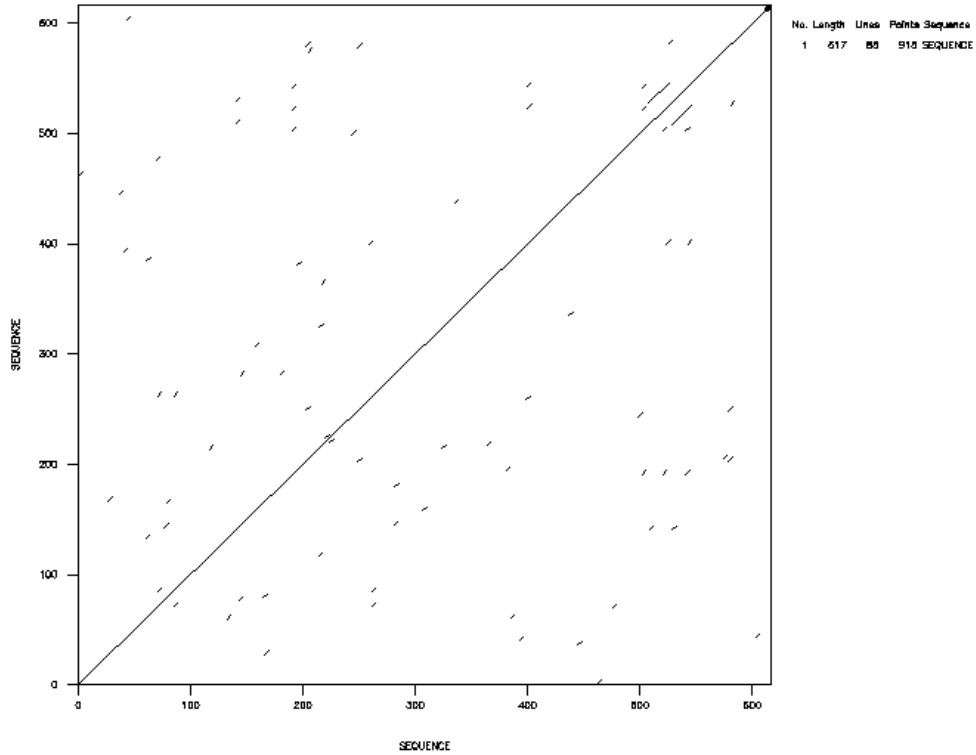
3D Structure Analysis

Drug Design

Tandem Sequence Repeats Analysis

Poly dotplot of 855450

Fri 26 Jun 2015 21:47:35

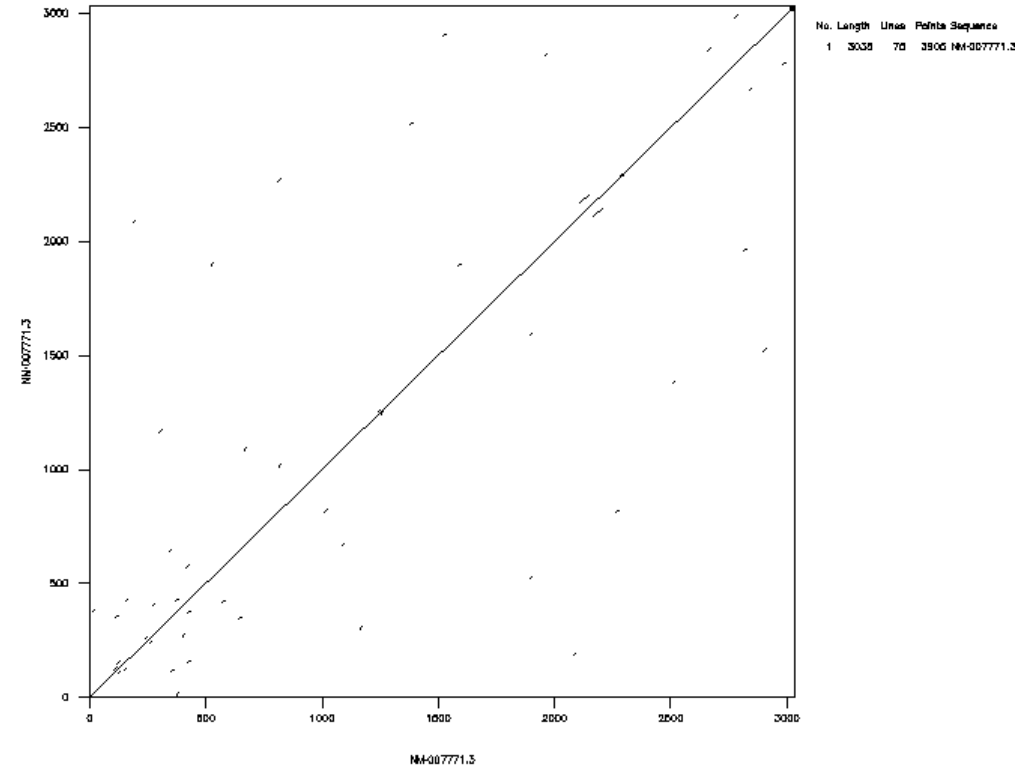


Protein

Word size = 3

Poly dotplot of 855562

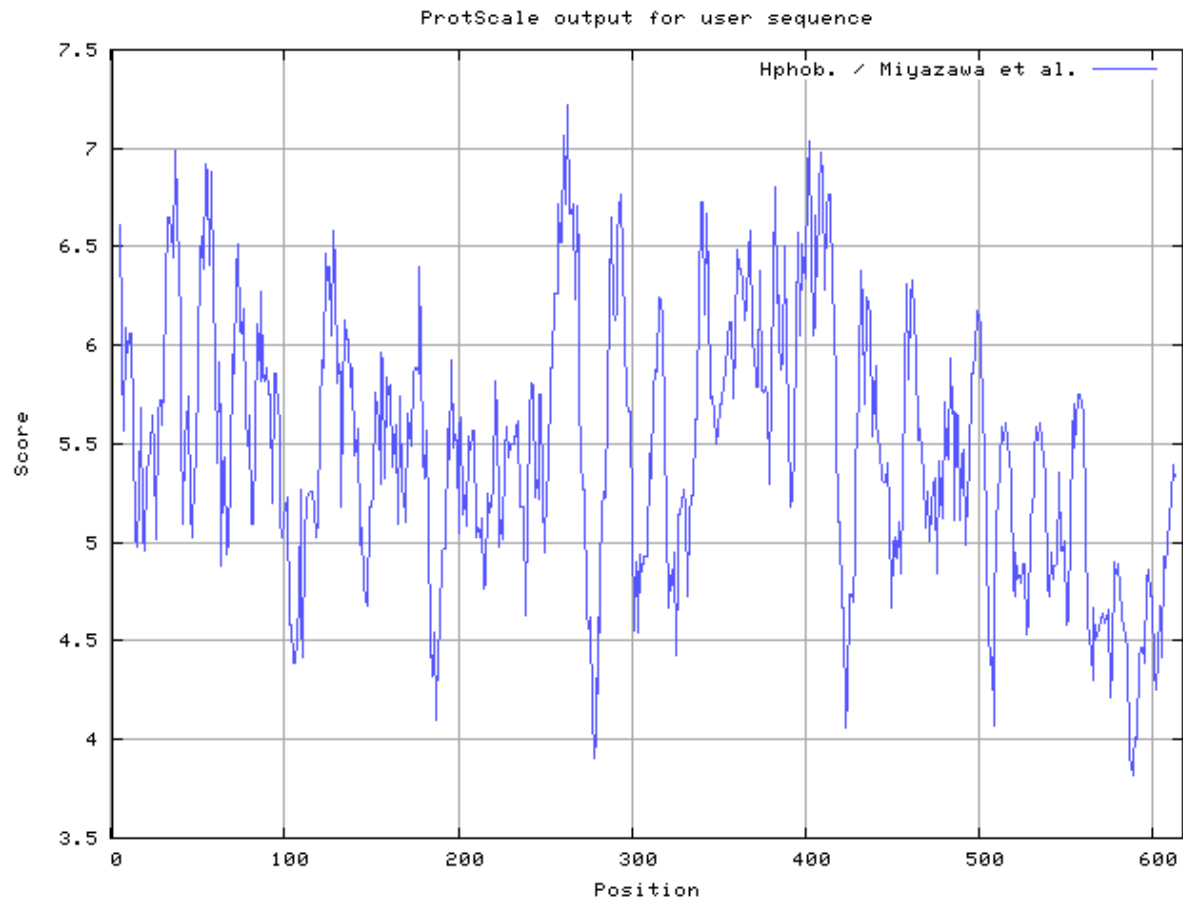
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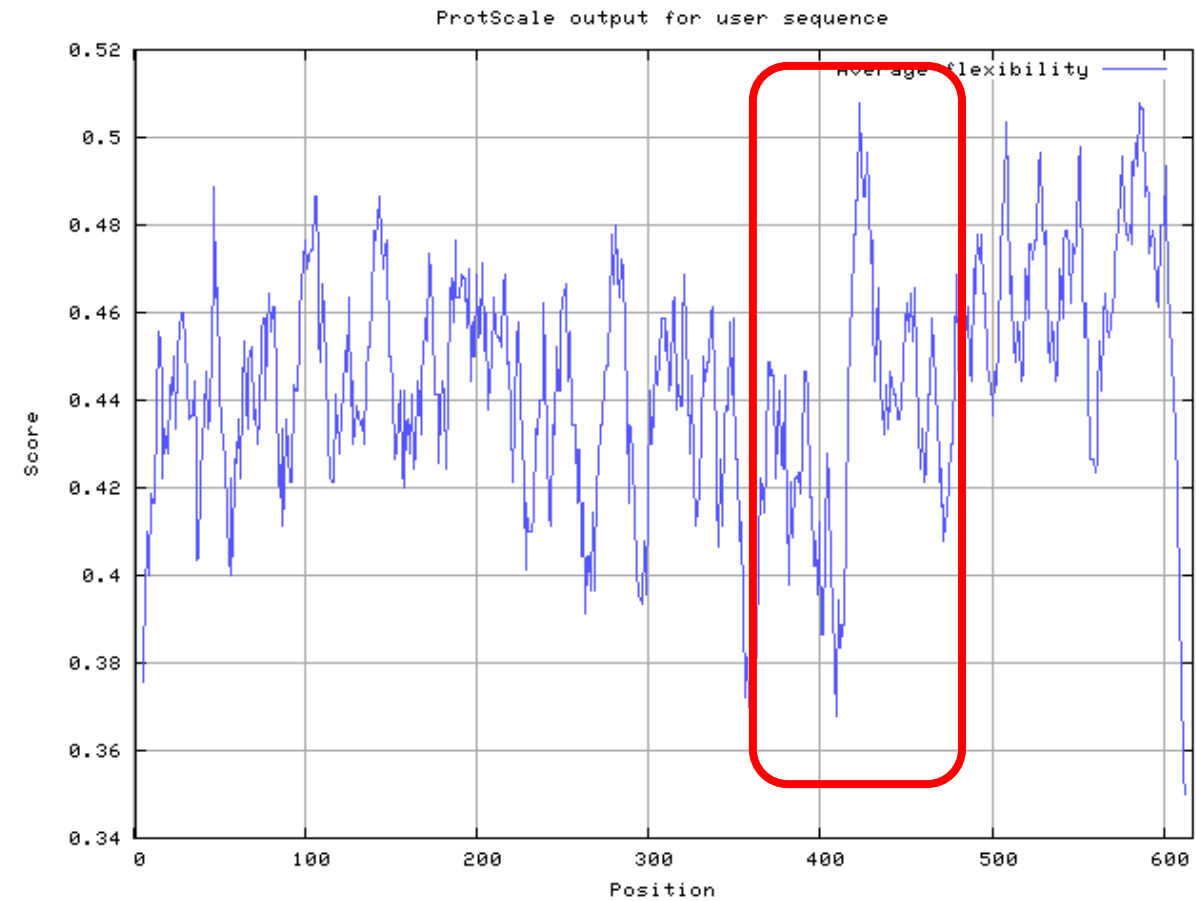
mRNA

Word size = 9

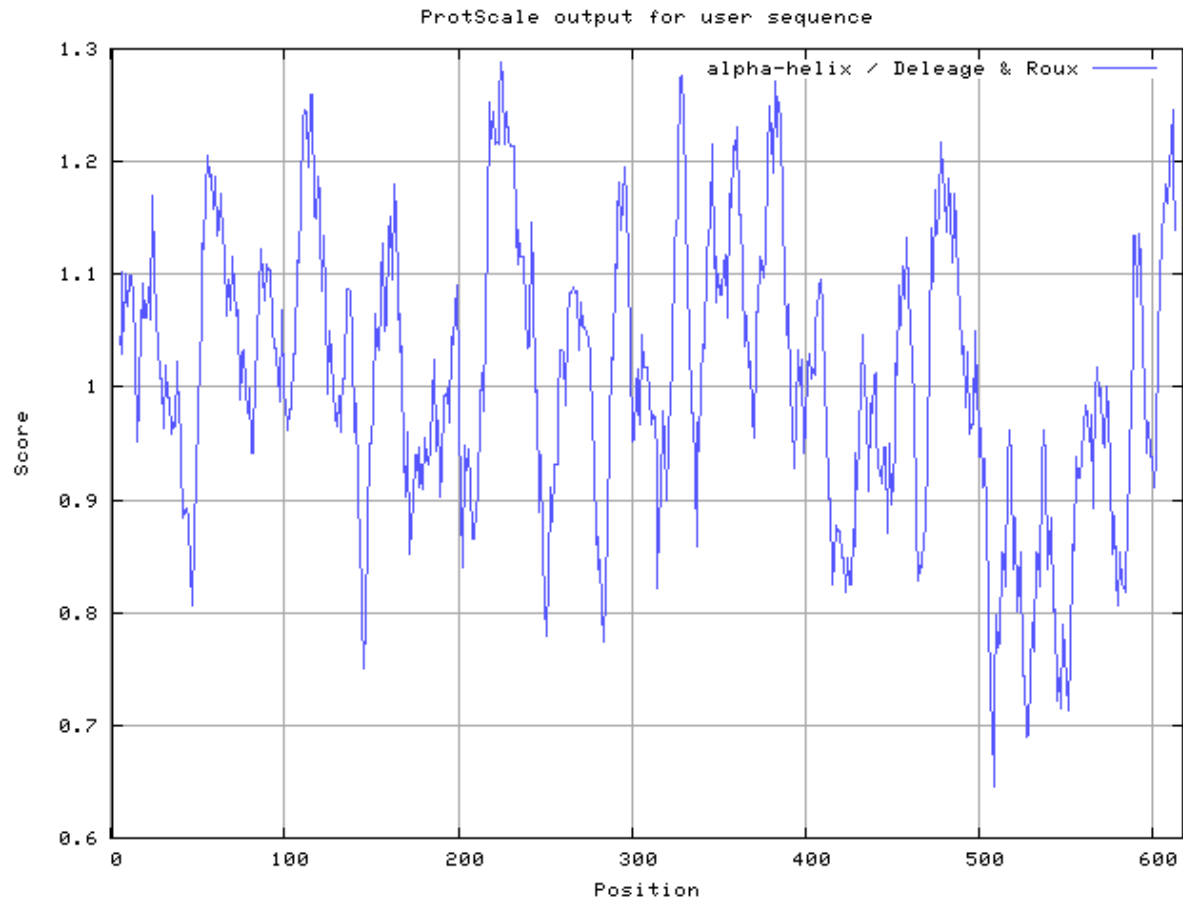
Hydrophilic and Hydrophobic Analysis



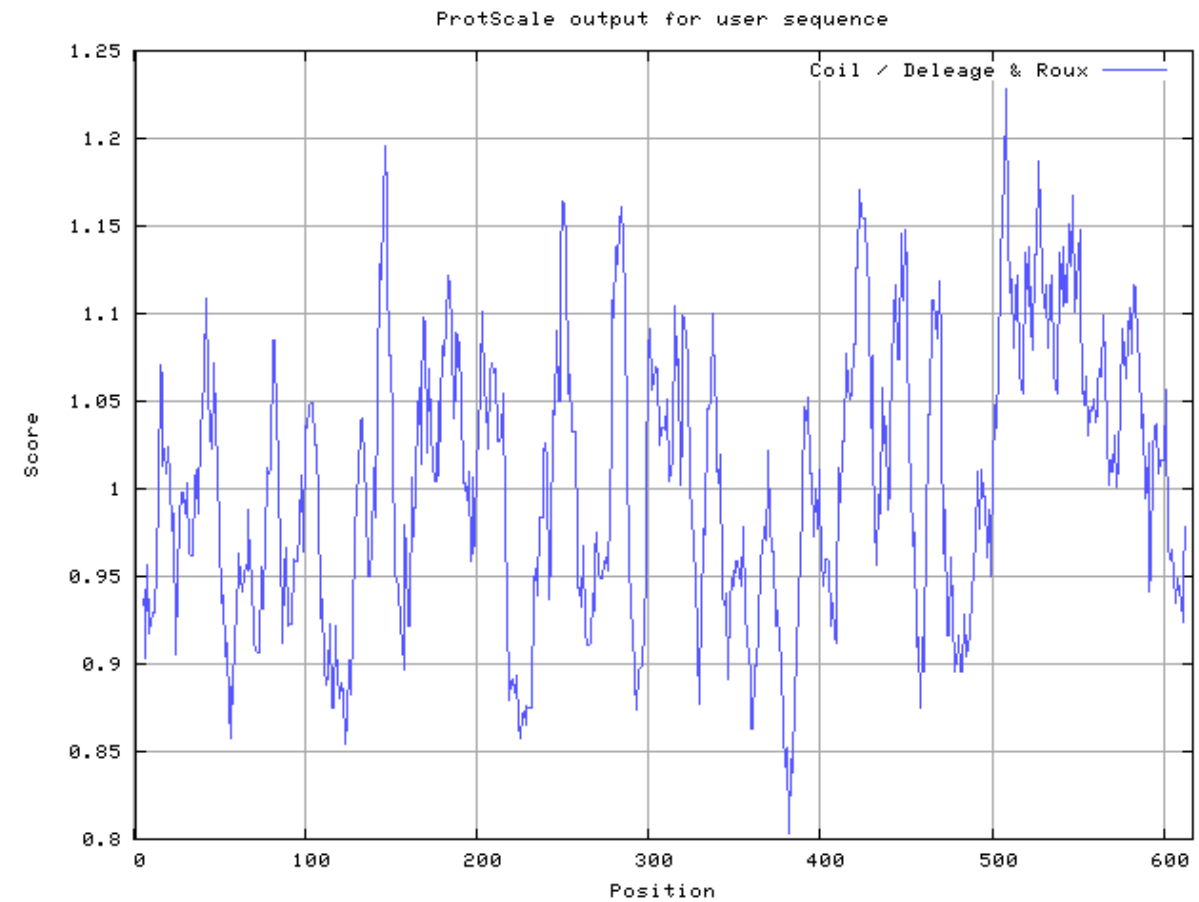
Average Flexibility



Alpha-helix

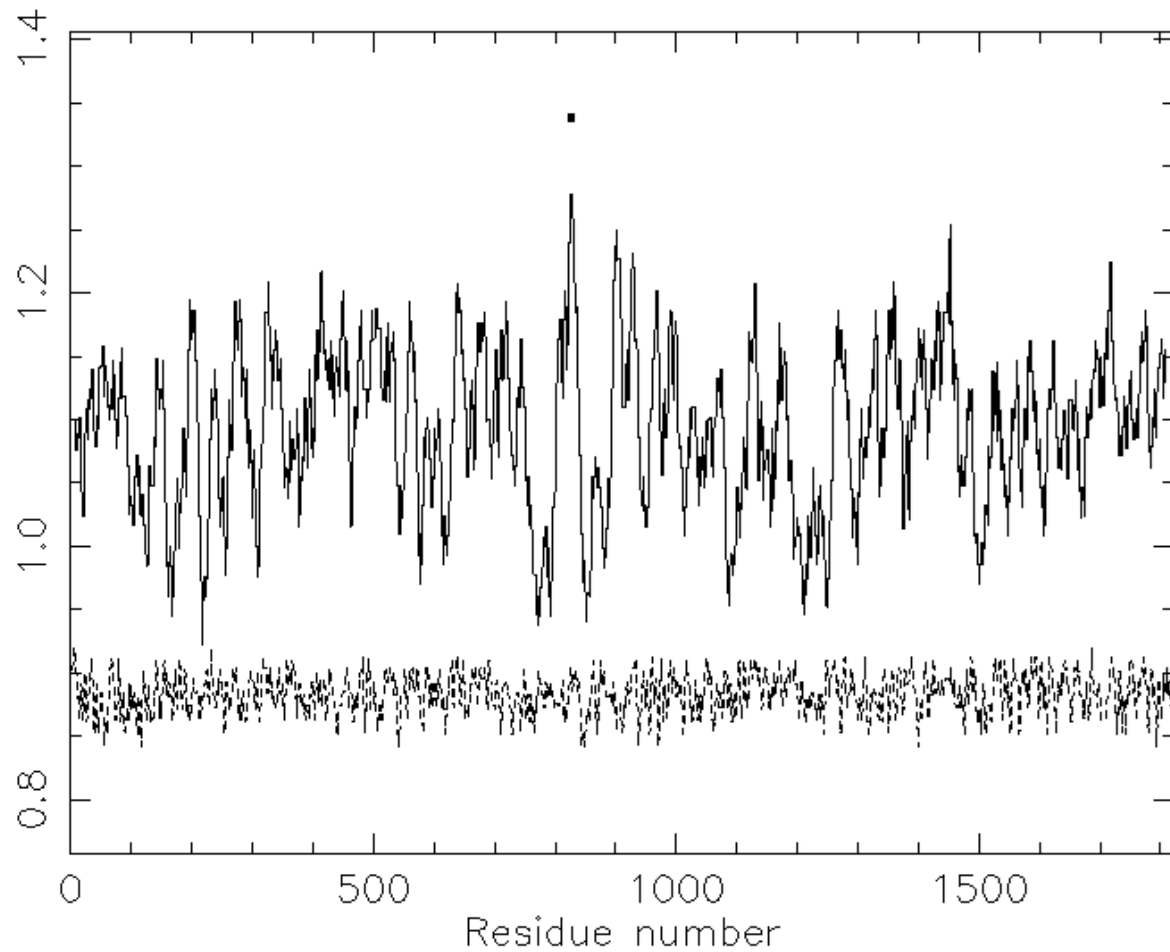


Coil



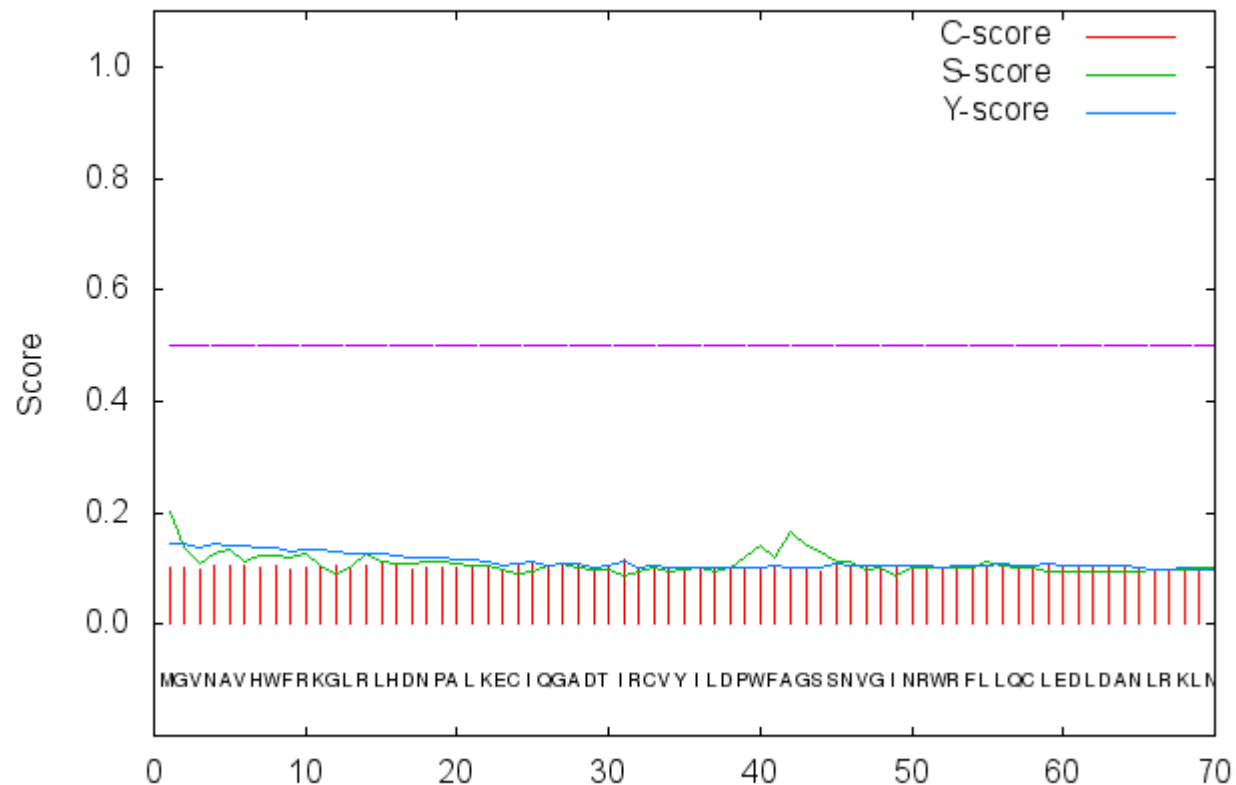
Transmembrane Tendency

Tmap



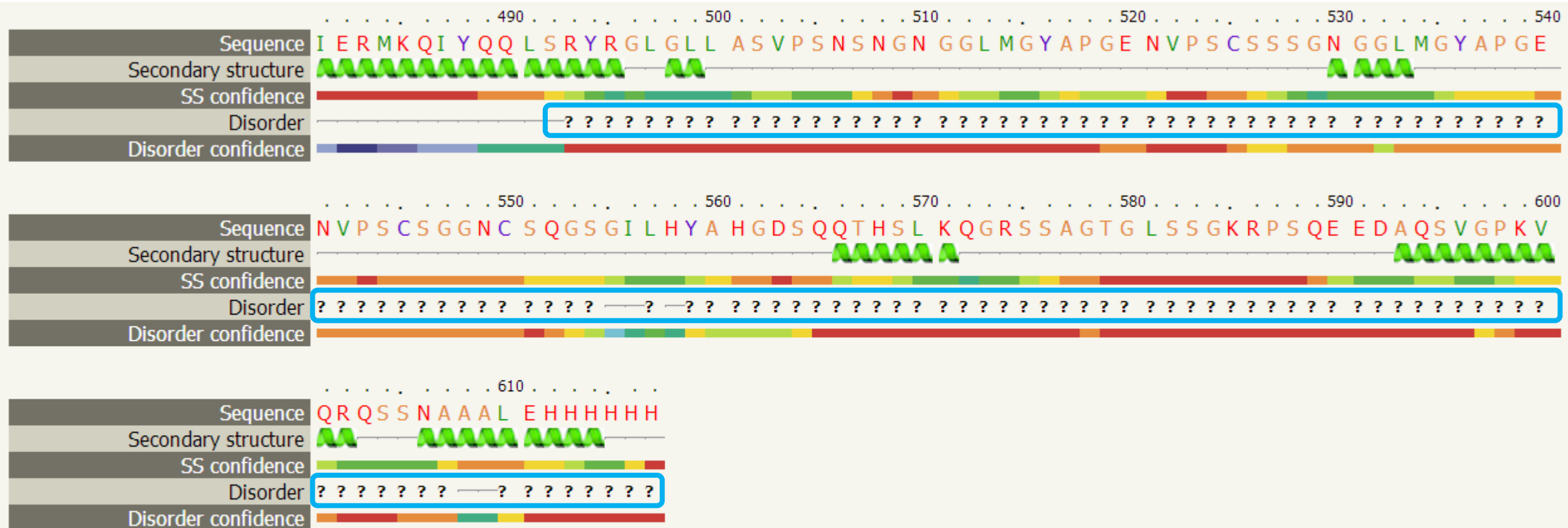
Signal Protein

SignalP-4.1 prediction (euk networks): 4K0R_A_PDBID_CHAIN_SEQUENCE



#	Measure	Position	Value	Cutoff	signal peptide?
	max. C	31	0.116		
	max. Y	11	0.134		
	max. S	1	0.201		
	mean S	1-10	0.131		
	D	1-10	0.133	0.450	NO

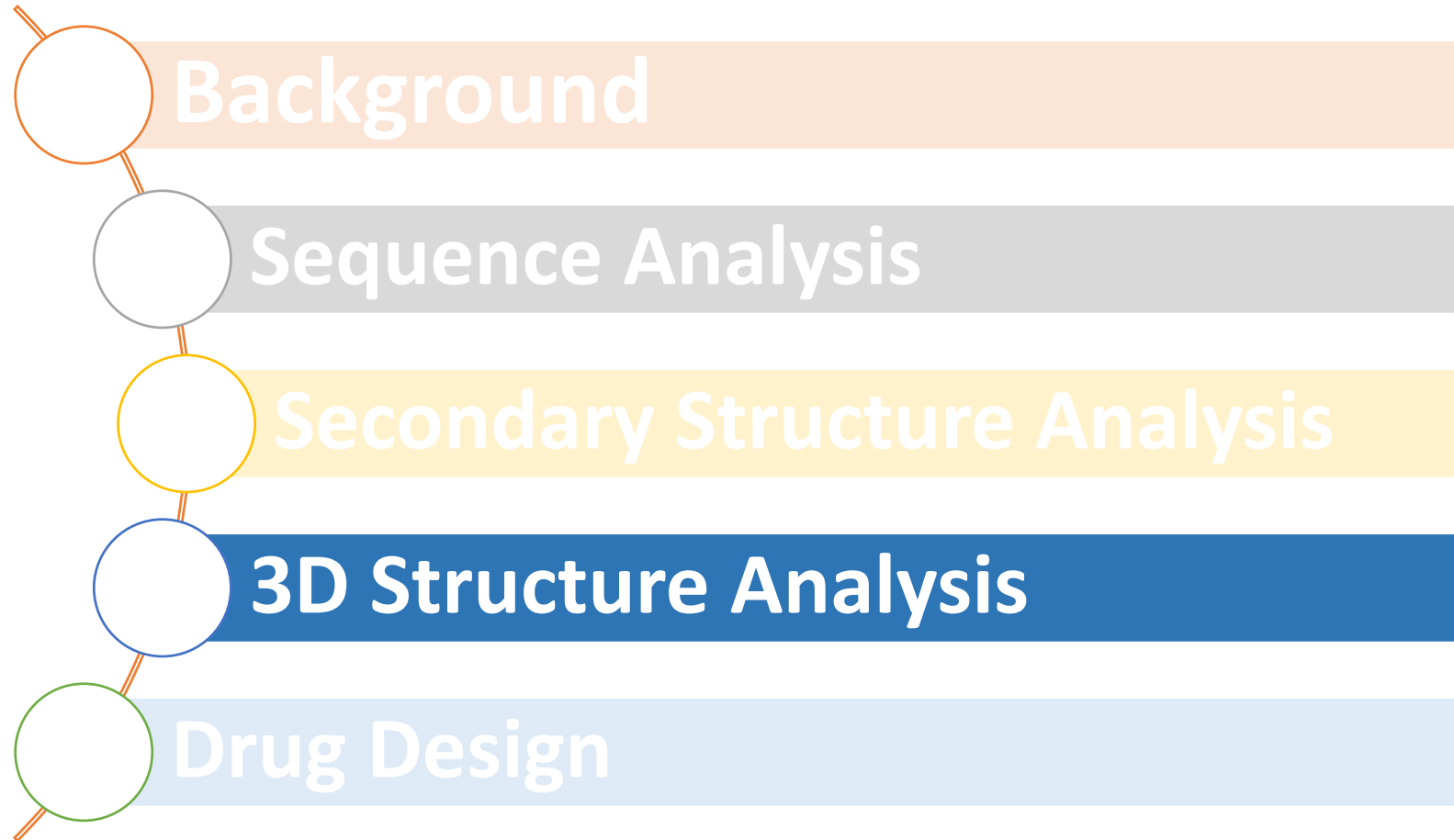
Secondary Structure and Disorder Prediction



Confidence Key
 High(9) Low (0)

? Disordered (24%)
 Alpha helix (44%)
 Beta strand (5%)

Outline



Background

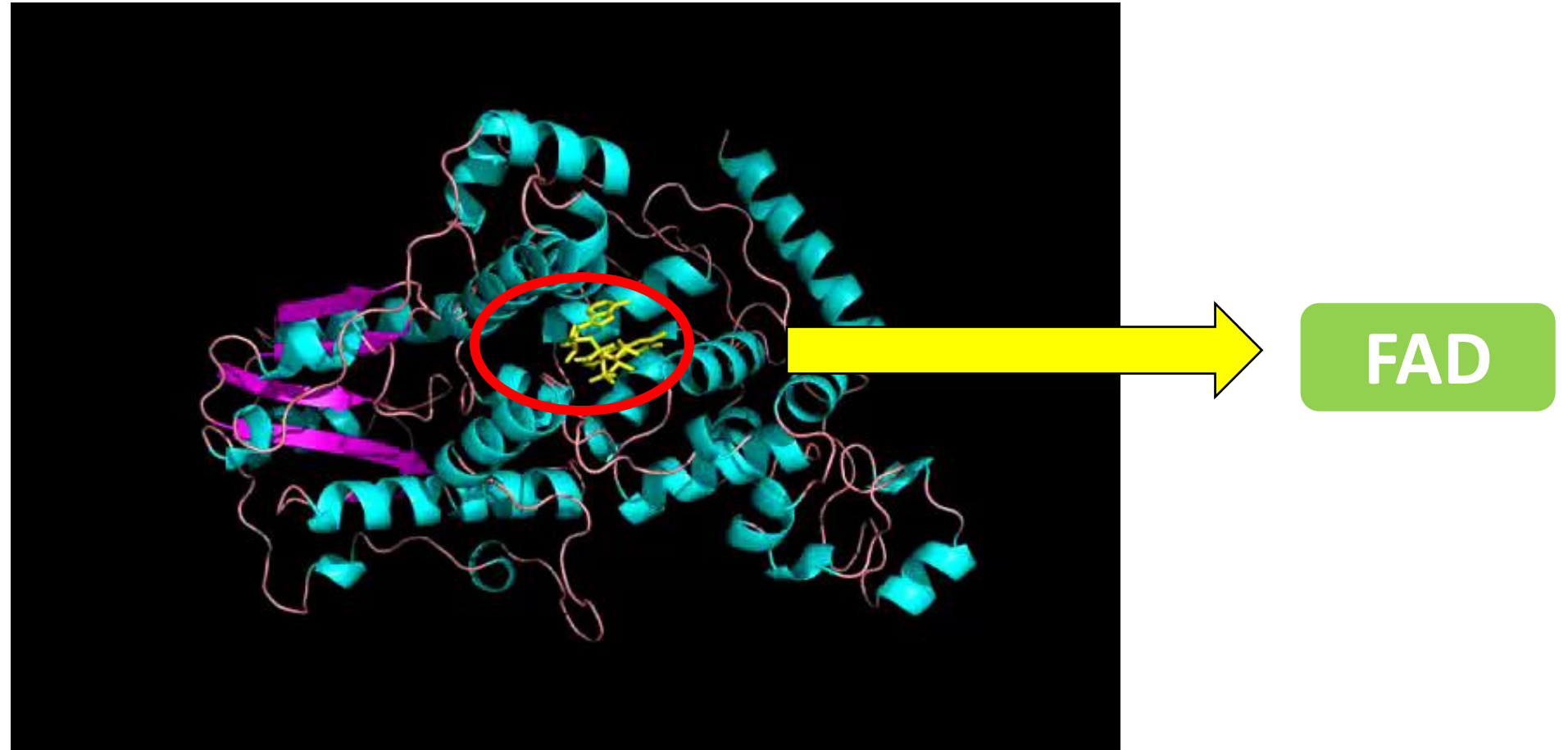
Sequence Analysis

Secondary Structure Analysis

3D Structure Analysis

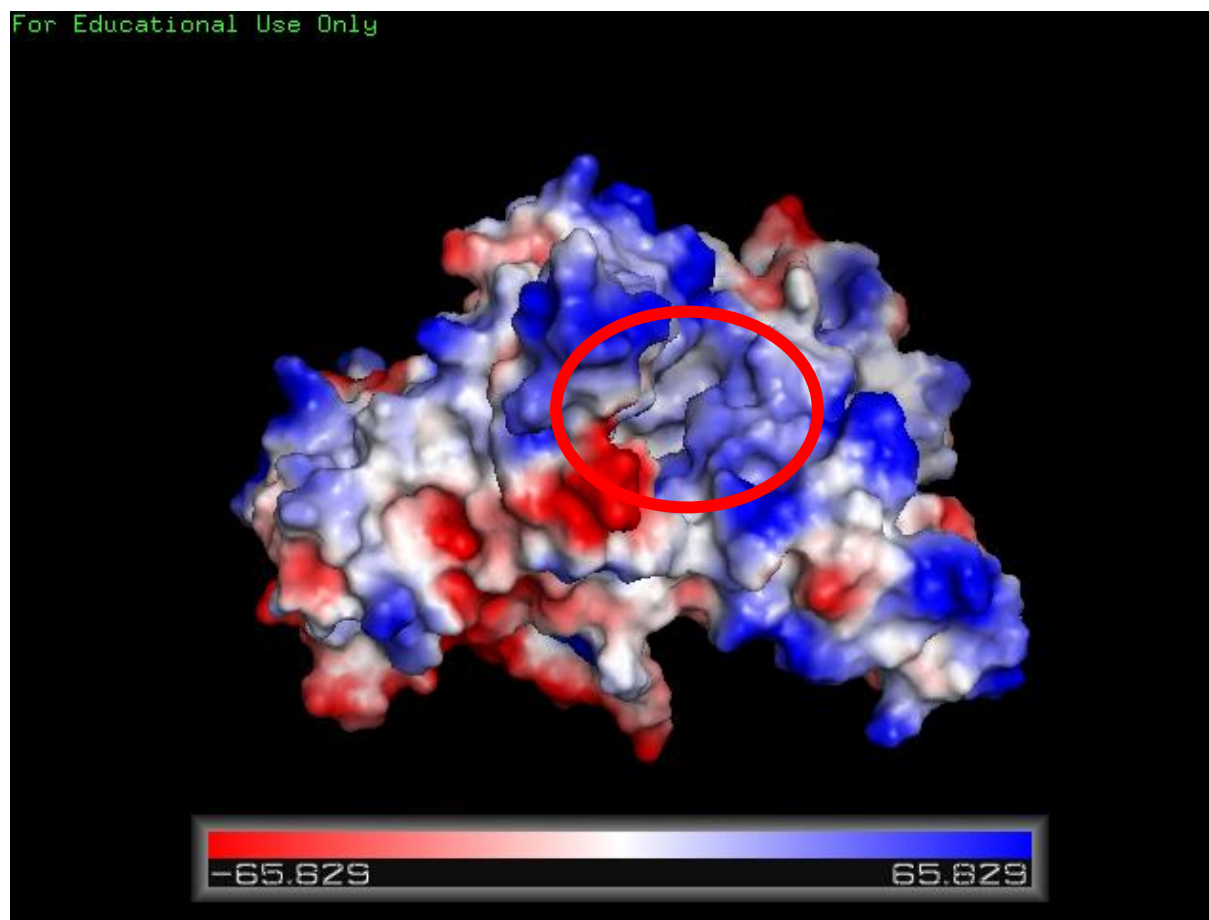
Drug Design

3D structure of Cryptochrome(4I6G)

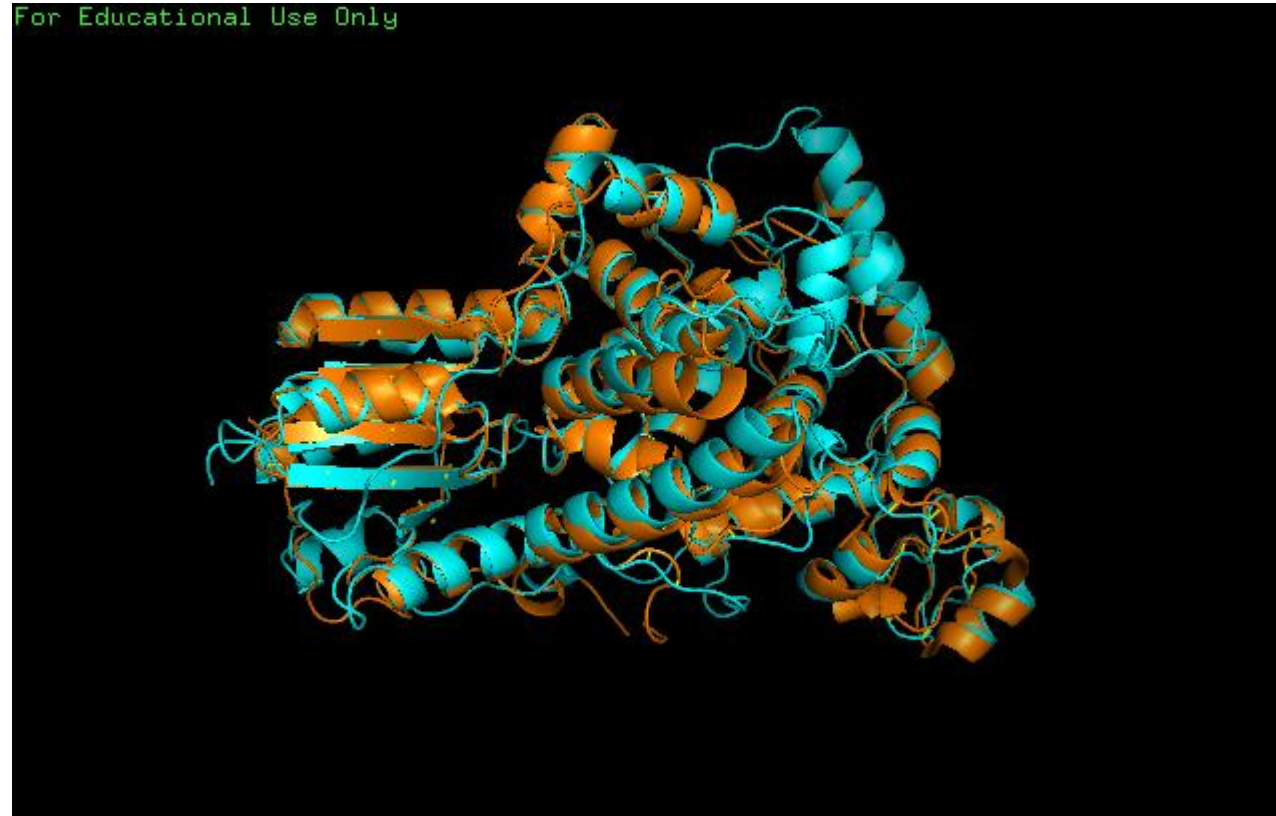


Cry2 monomer with FAD ligand

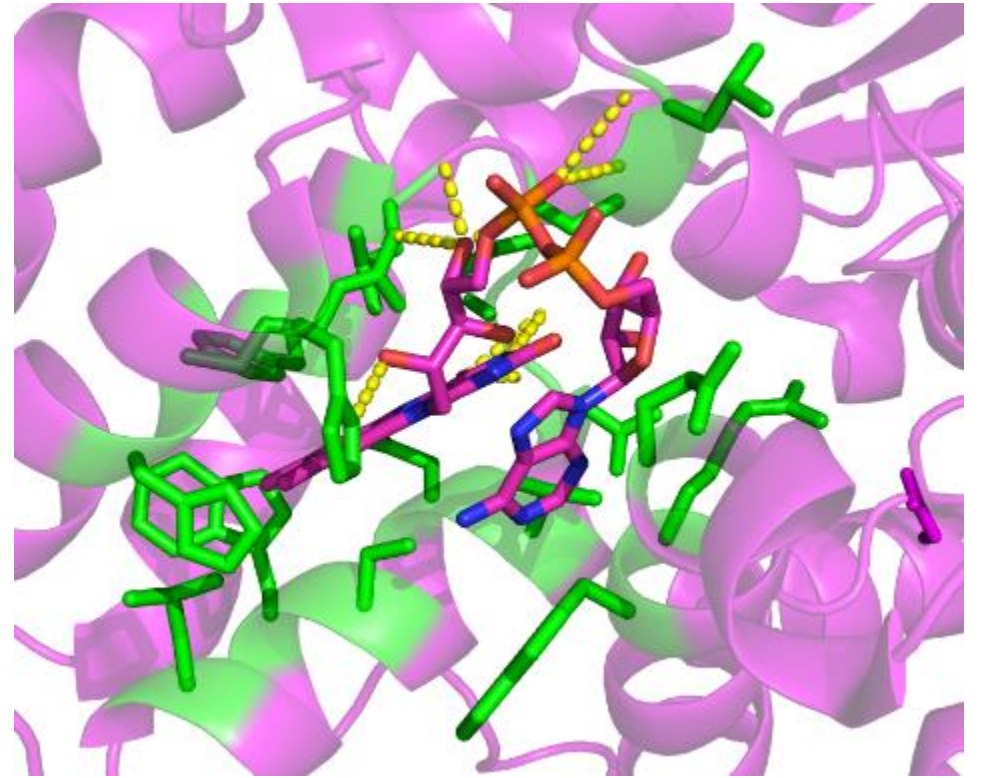
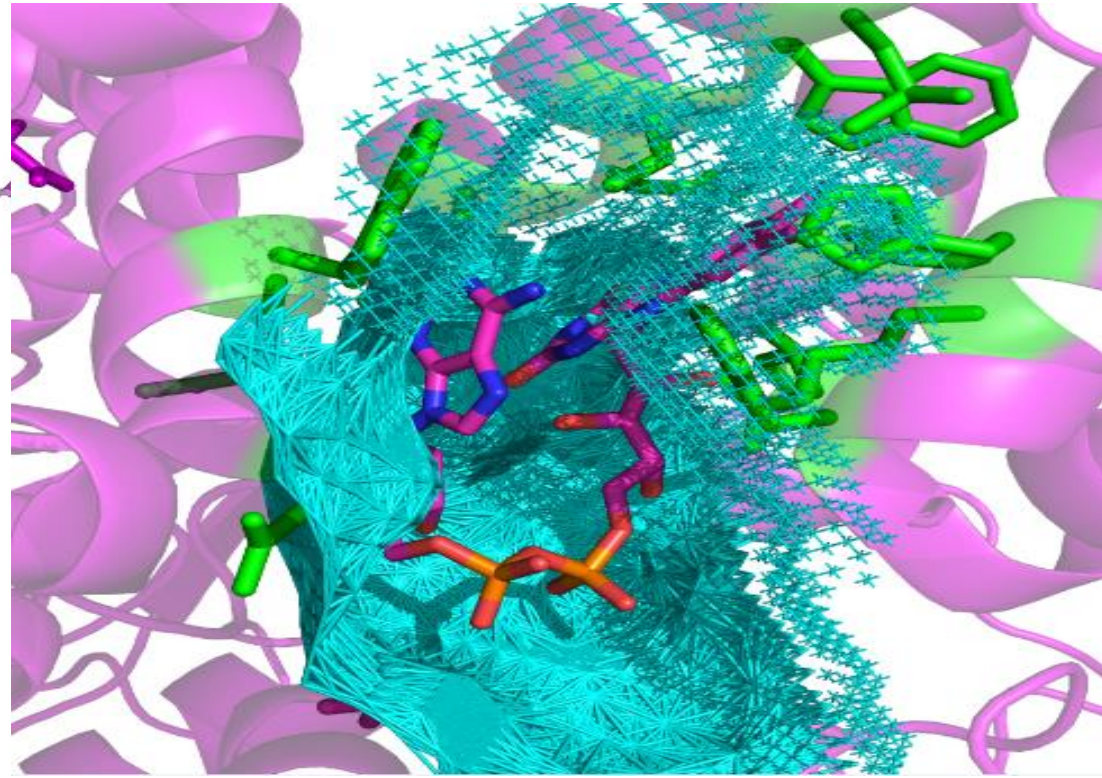
Vacuum Electrostatics (4I6G)



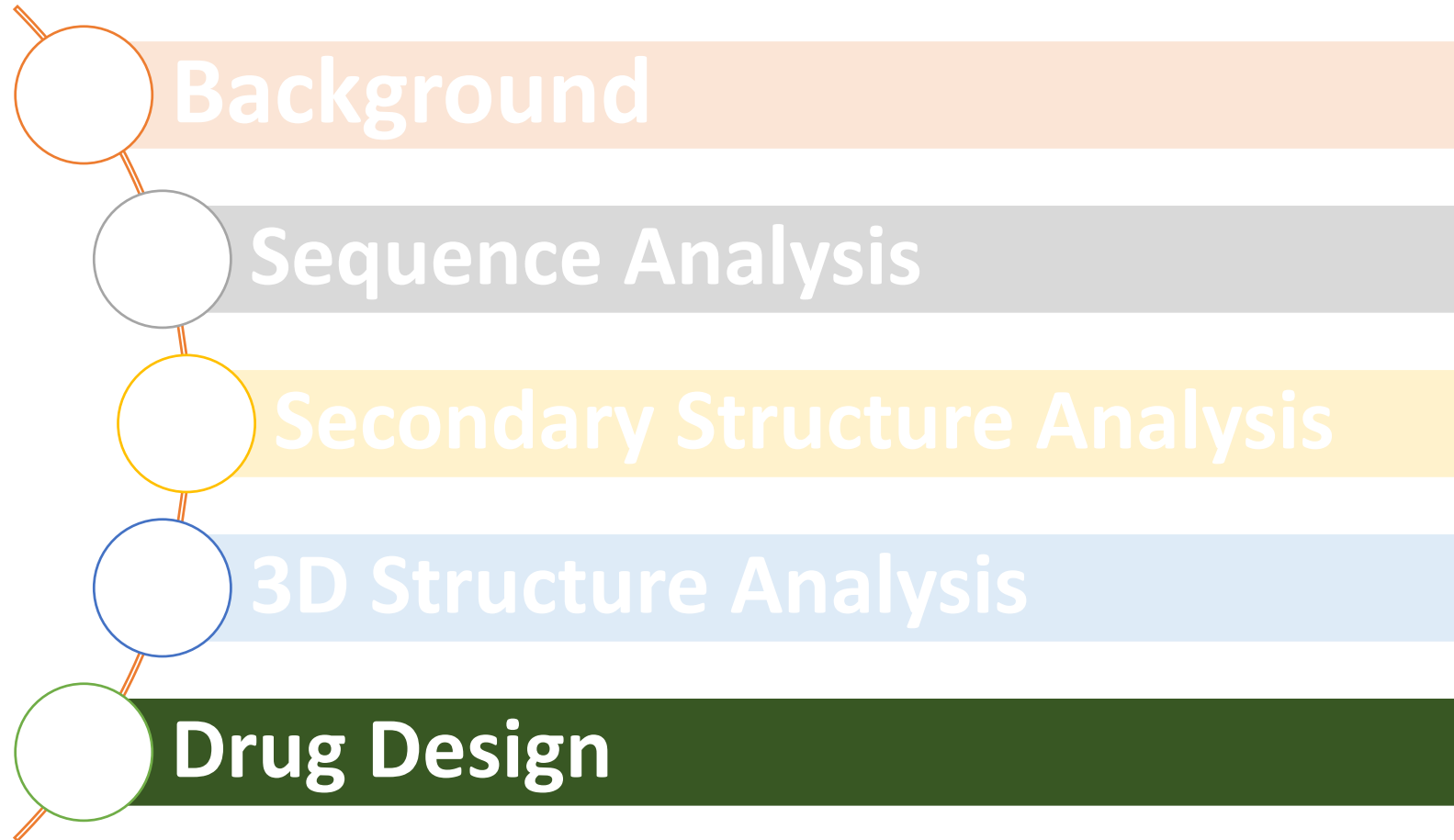
Align Cry1_mouse with Cry1_Droso



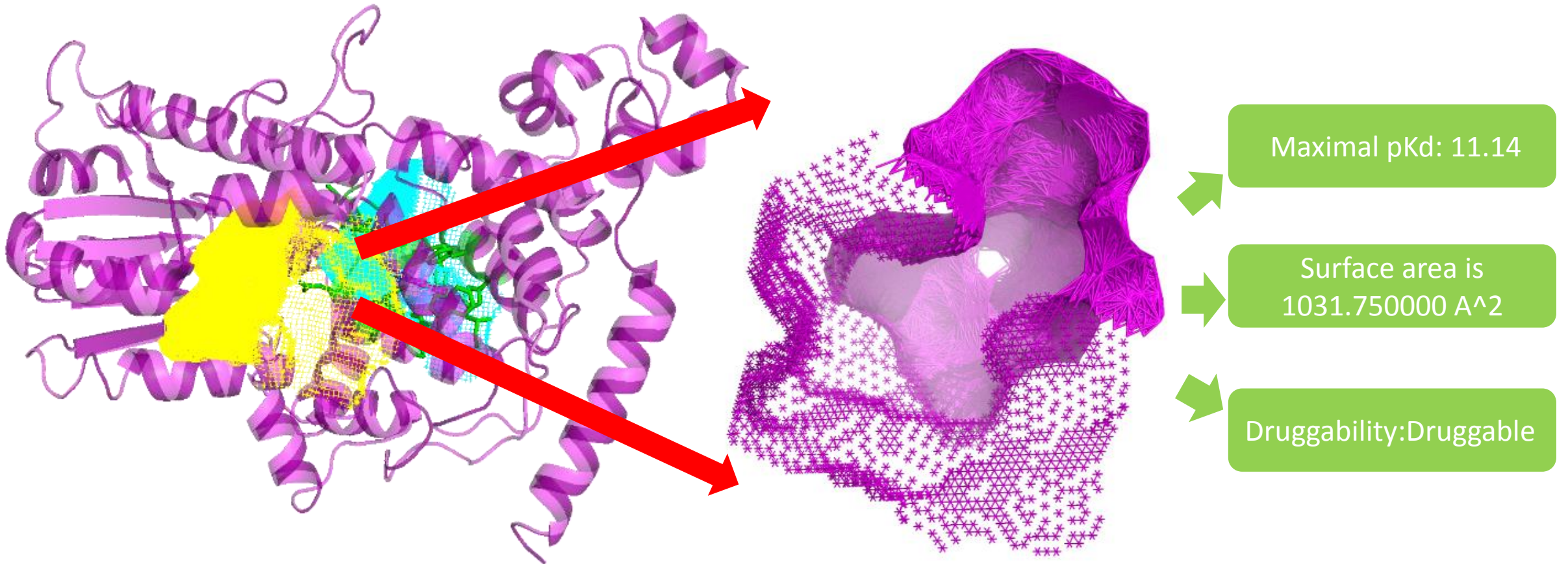
FAD Binding Site Analysis



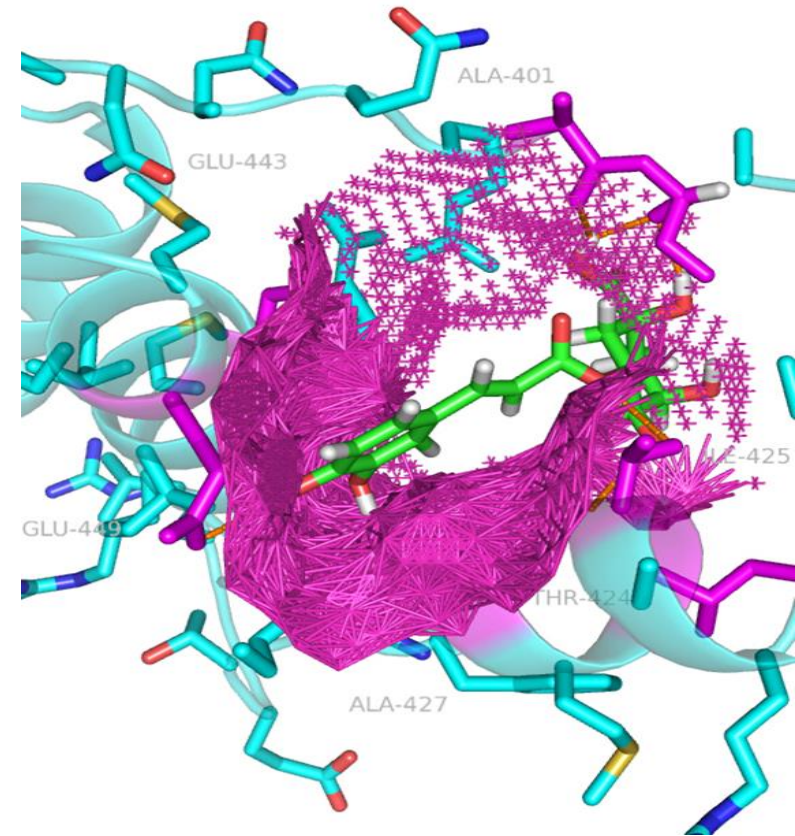
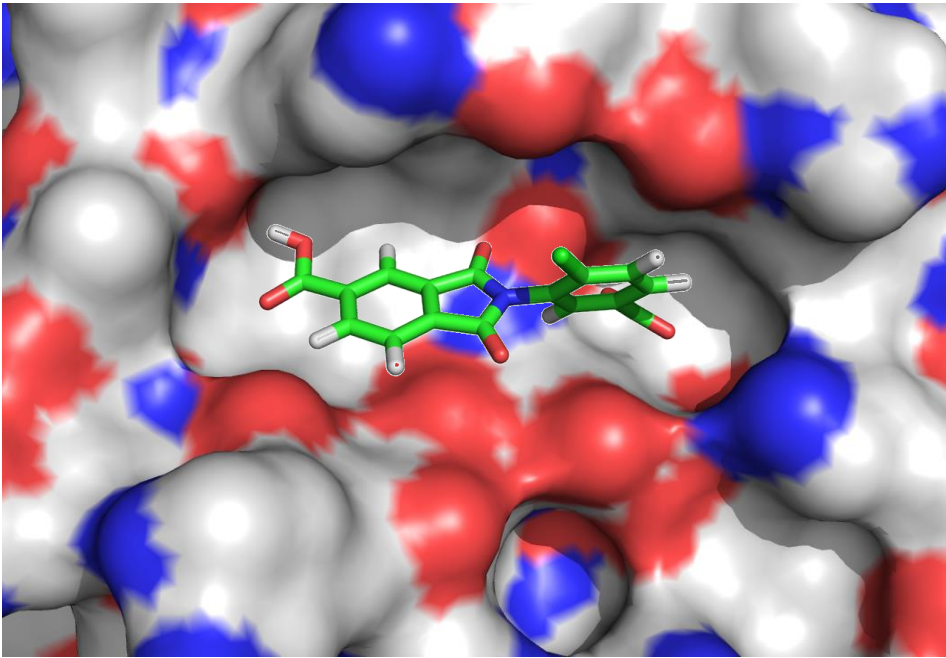
Outline



Another Druggable Pocket by *CAVITY*



Future work



Acknowledgement

Prof. Jingchu Luo

Prof. Luhua Lai

Xiuzhen Bai

Zhe Yang

Youjun Xu



THANK YOU