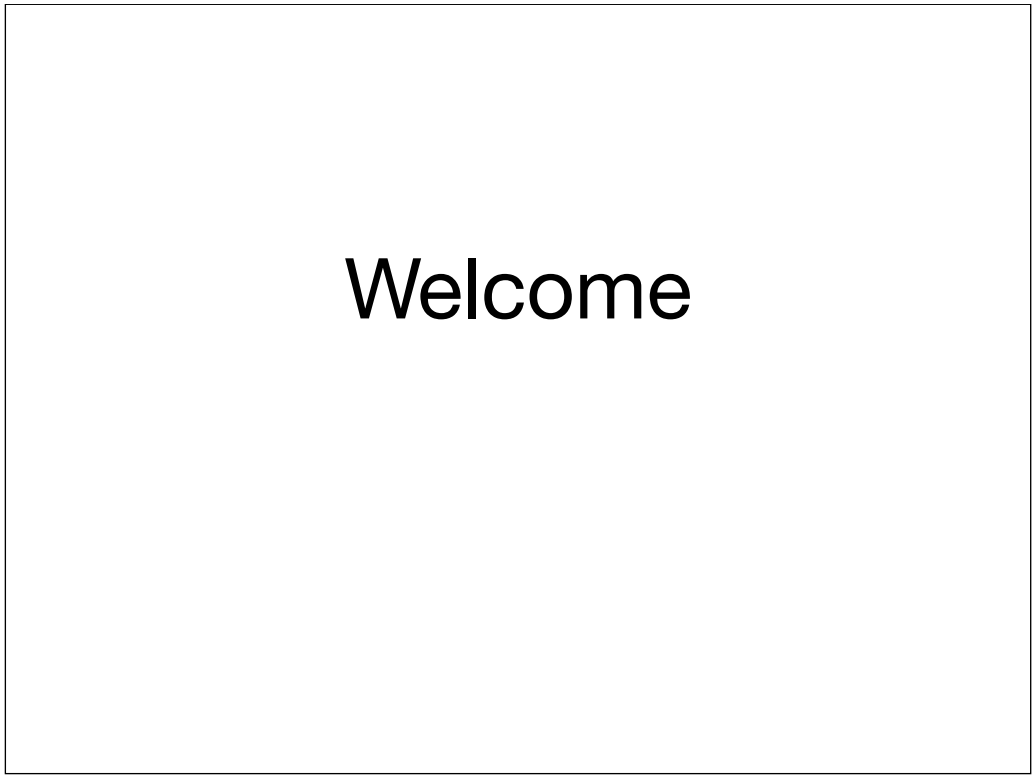
Assessment of Refinement in CASP9

Ken Dill
Justin MacCallum

Laufer Center for Physical and Quantitative Biology
Stony Brook University



Thanks: organizers

Acknowledgements

- Alberto Perez (Stony Brook)
- Yang Zheng (UCSF)
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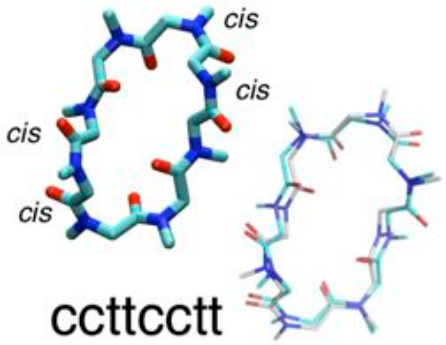
- Structure Prediction Center
- CASP Organizing Committee
- Fellow CASP9 Assessors

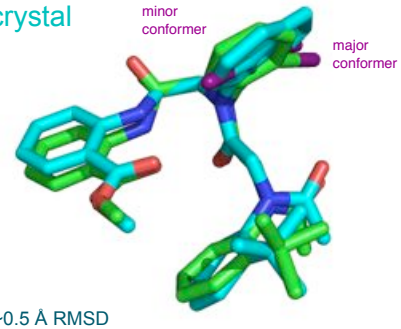
Participants

- Ken Dill
  (Stony Brook)
- Justin MacCallum
  (Stony Brook)
- Michael Feig
  (Michigan State)
- Jooyoung Lee
  (Korea Institute for Advanced Study)
- Gunnar Schröder
  (Jülich Research Center)
- Gaurav Chopra
  (Stanford, Levitt)
- Michael Tyka
  (U Washington, Baker)

Peptoid CASP

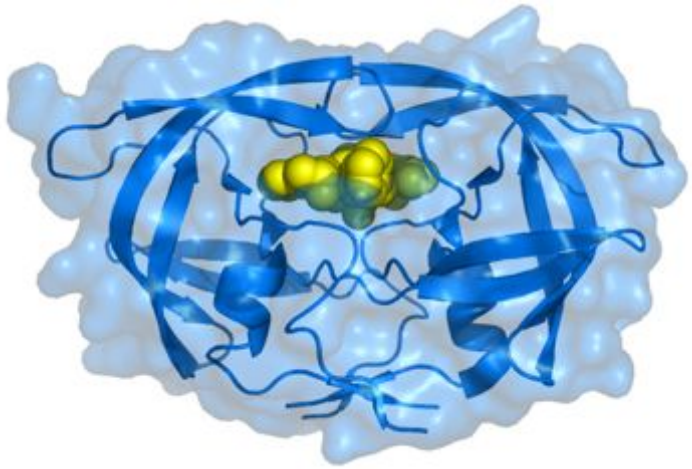


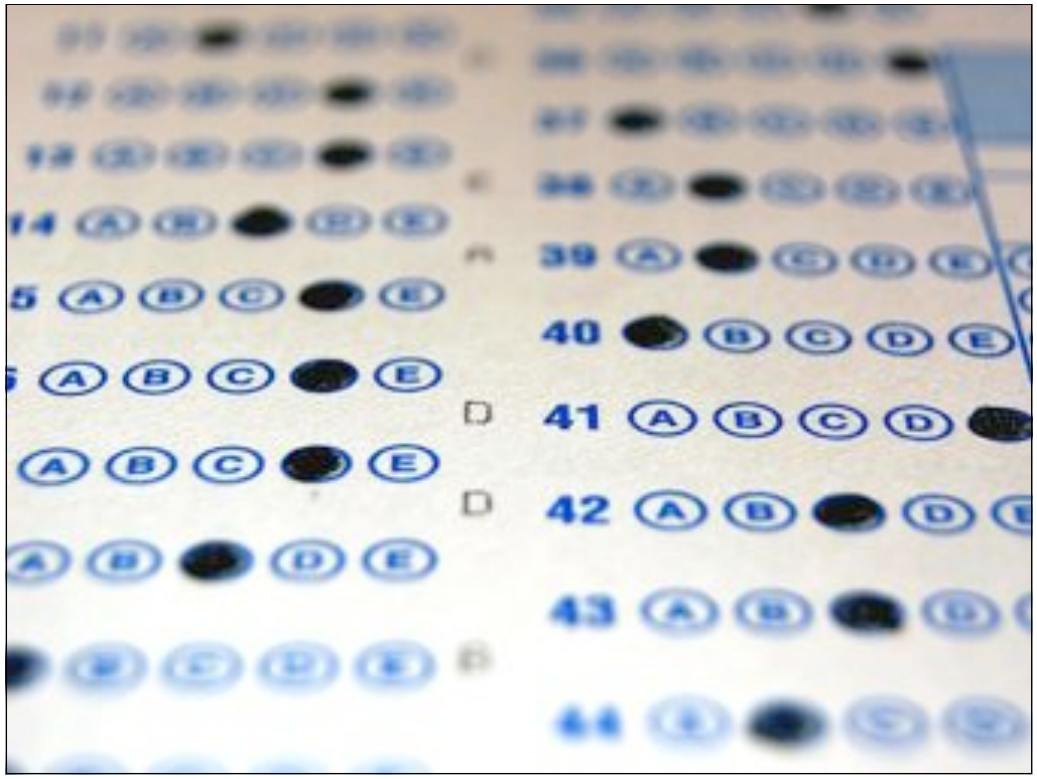
prediction
crystal

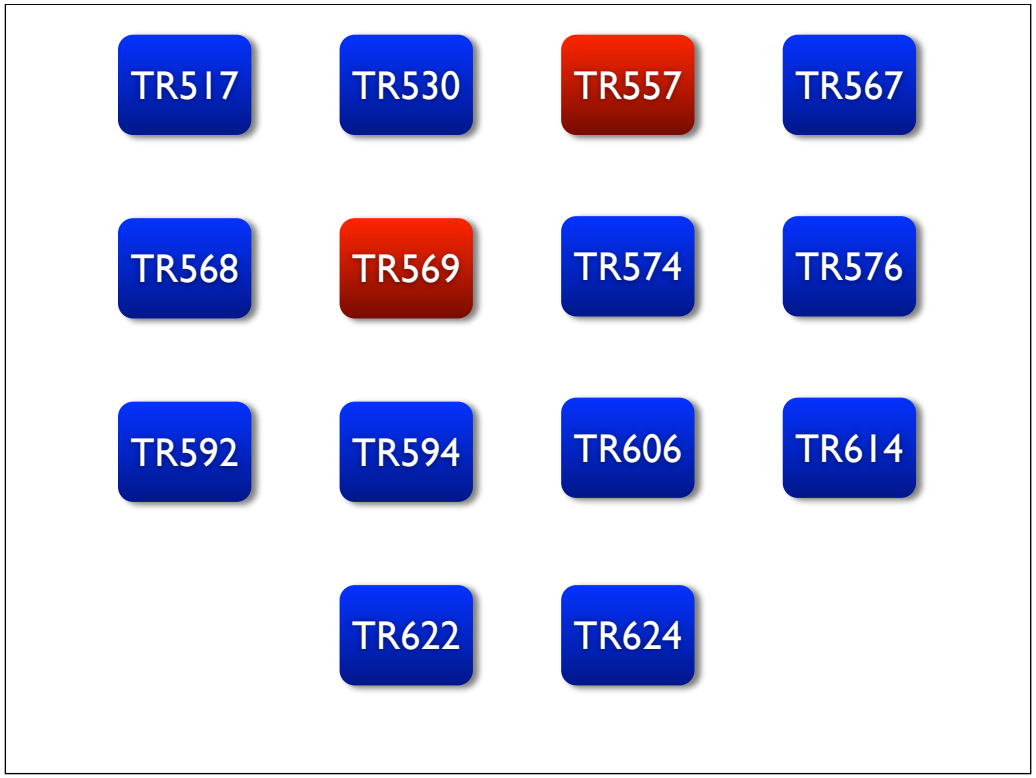


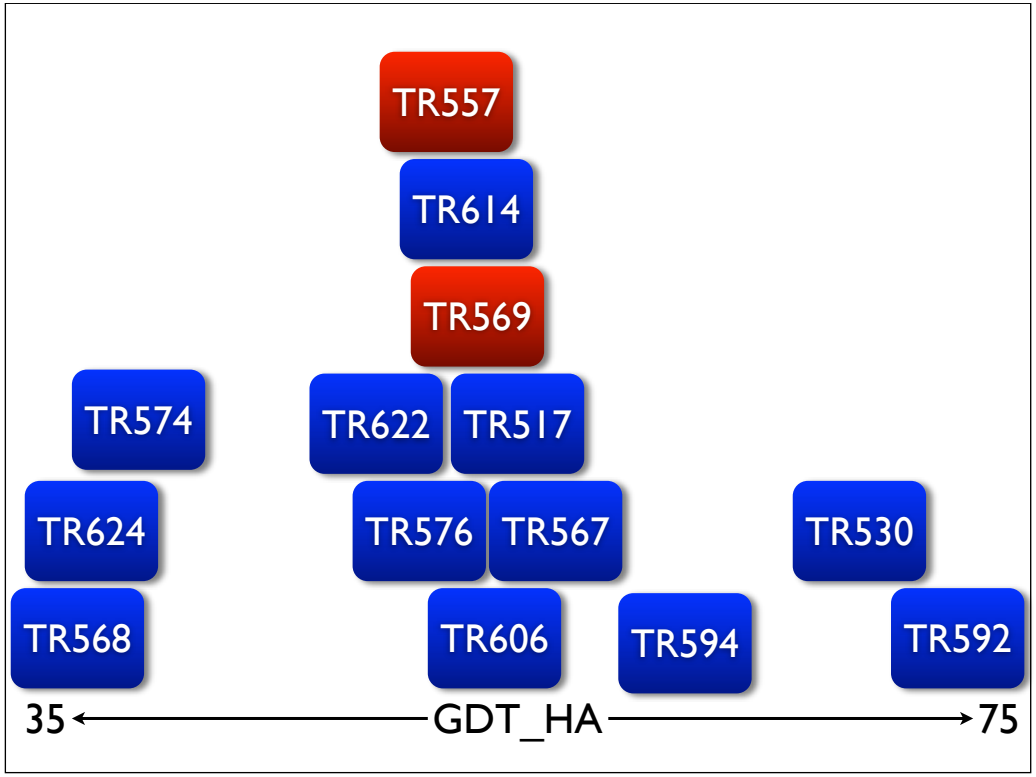
~0.5 Å RMSD

Refinement is important

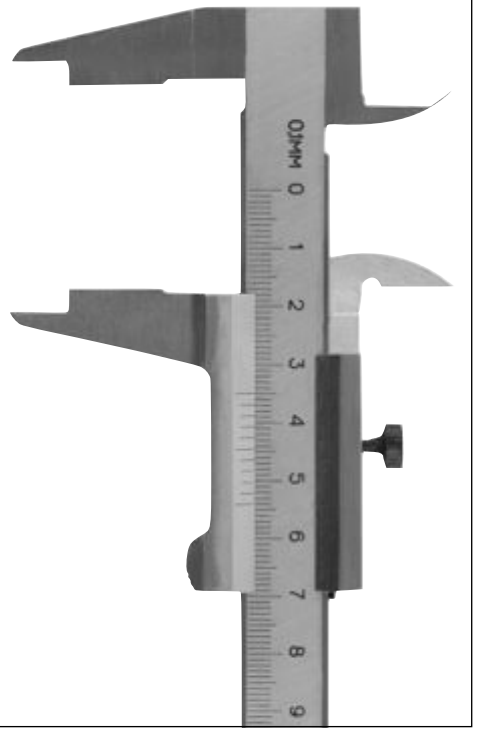


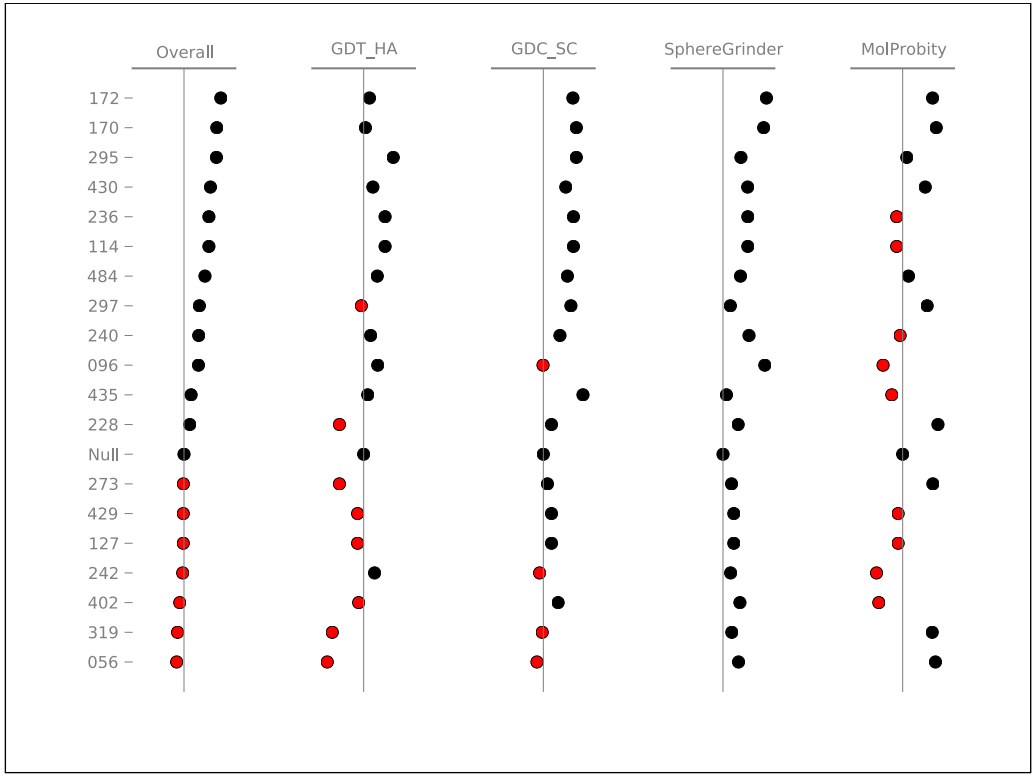

40
41
42
43
44


TR517
TR530
TR557
TR567
TR568
TR569
TR574
TR576
TR592
TR594
TR606
TR614
TR622
TR624

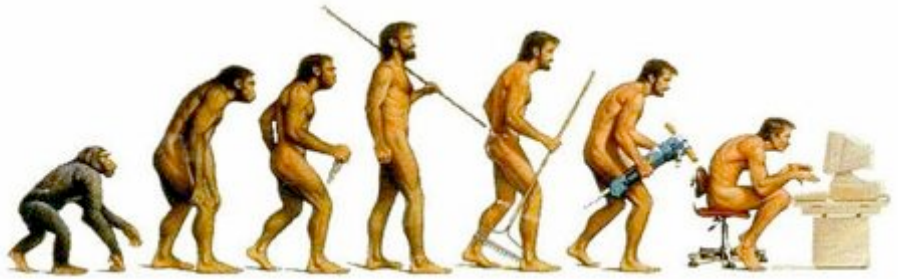

TR557
TR614
TR569
TR574
TR622
TR517
TR624
TR576
TR567
TR530
TR568
TR606
TR594
TR592
35
GDT_HA
75

GDT_HA
GDC-SC
SphereGrinder
MolProbity

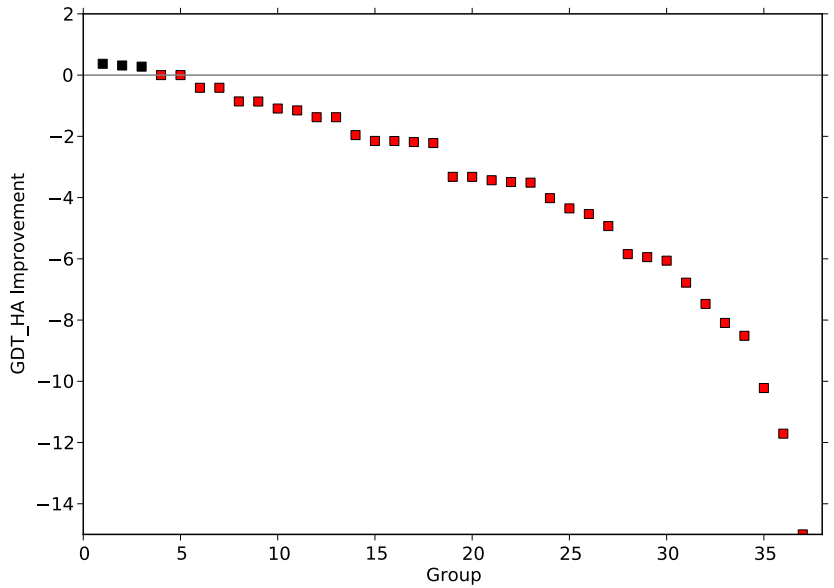



Overall
GDT_HA
GDC_SC
SphereGrinder
MolProbity
172
170
295
430
236
114
484
297
240
096
435
228
Null
273
429
127
242
402
319
056

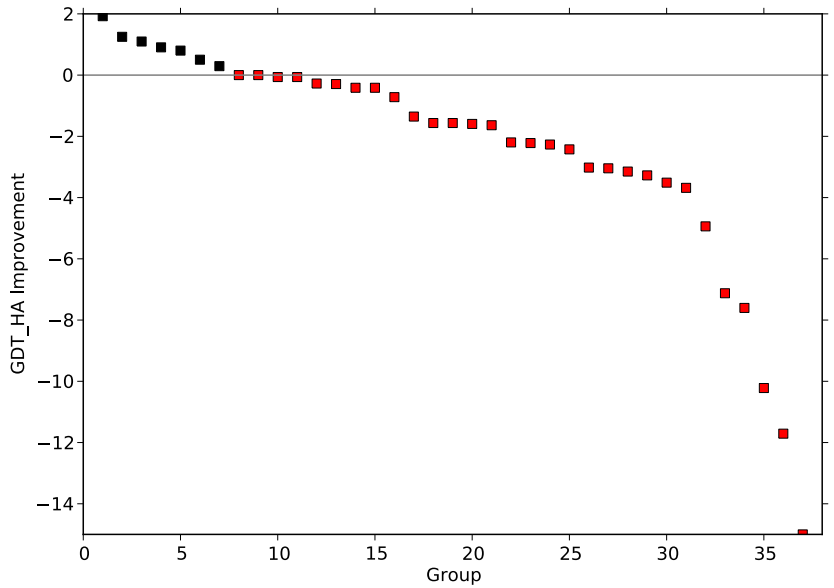
Progress

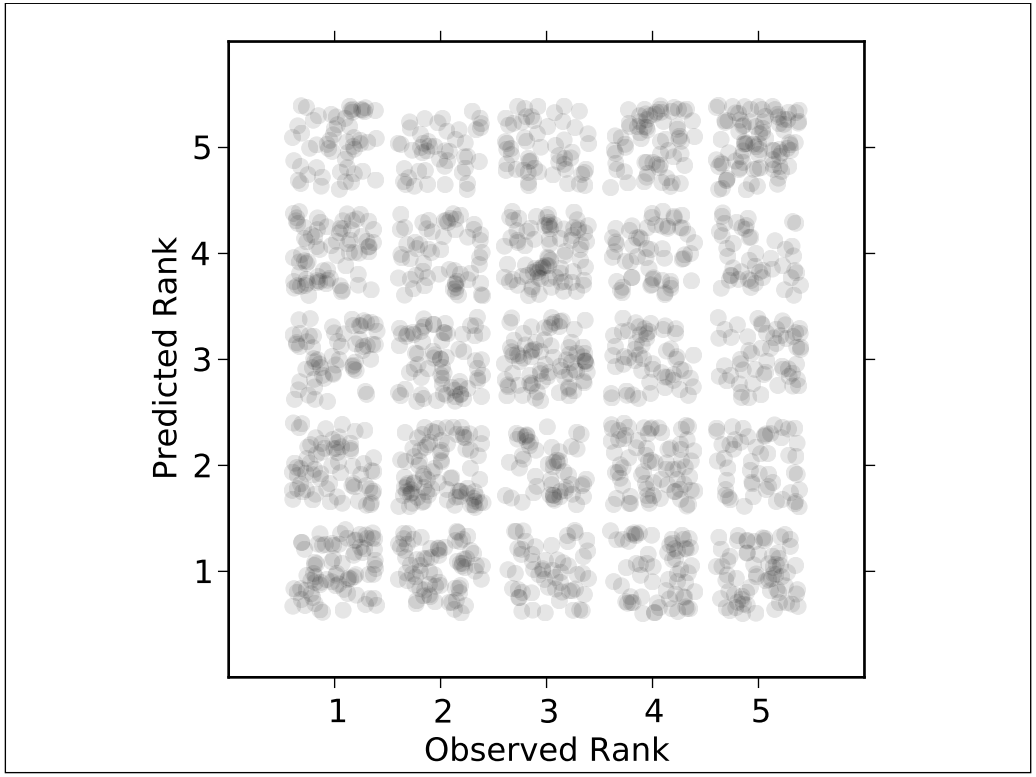


Model 1 results are poor



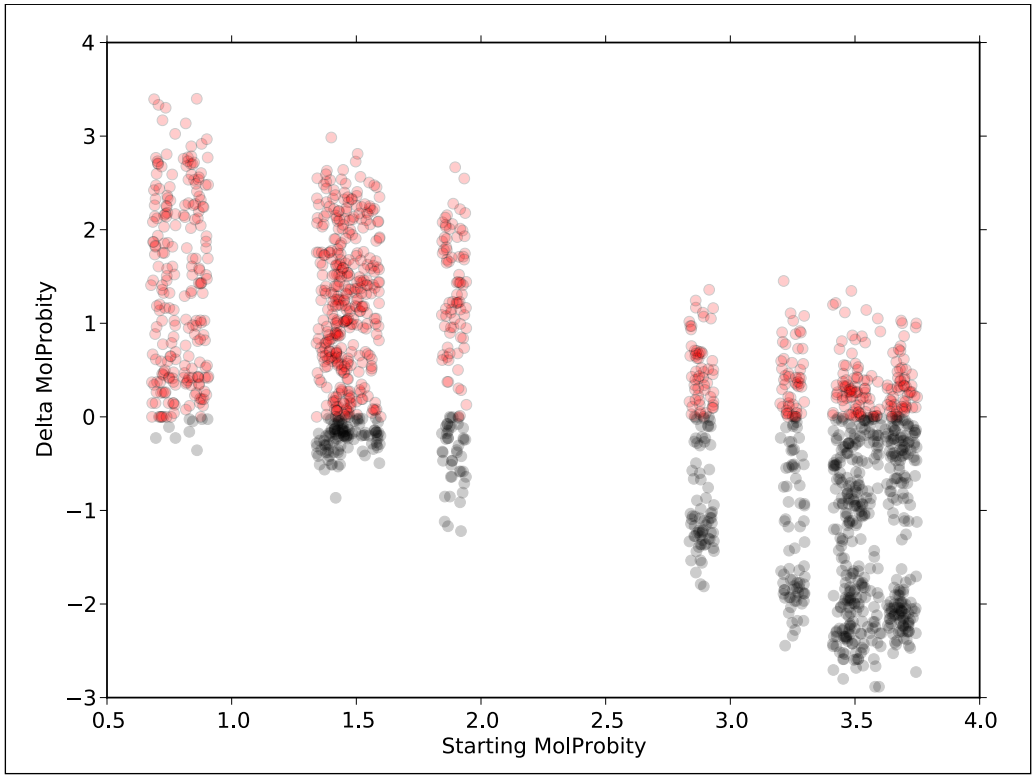
Results are better if we cherry pick

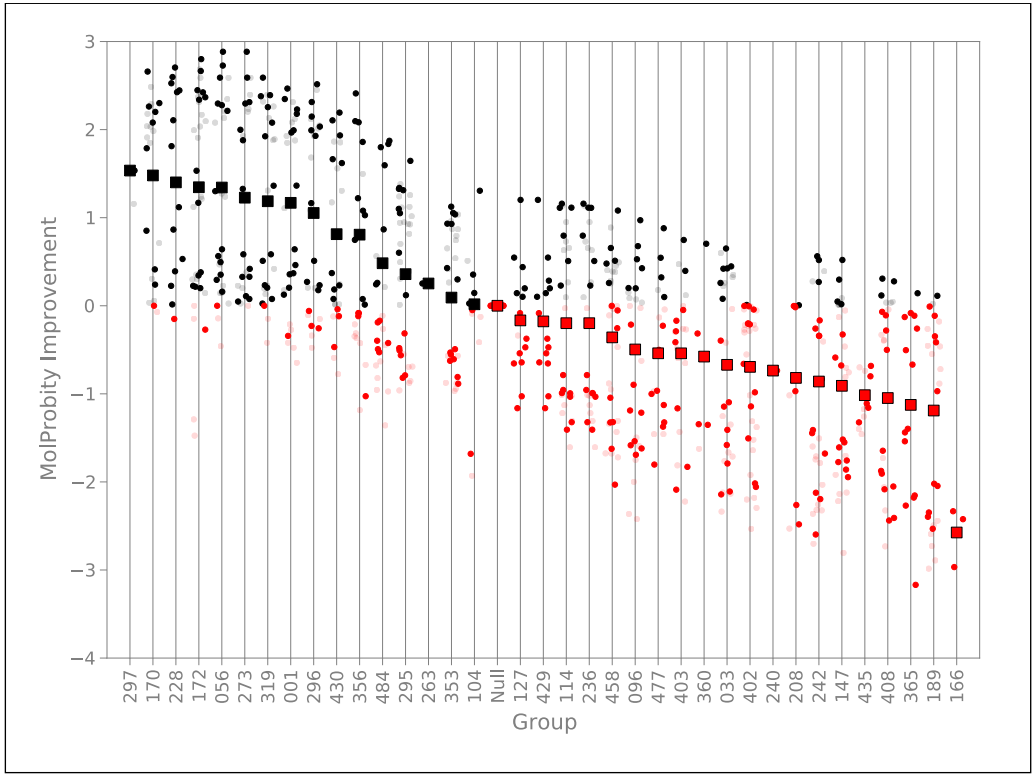


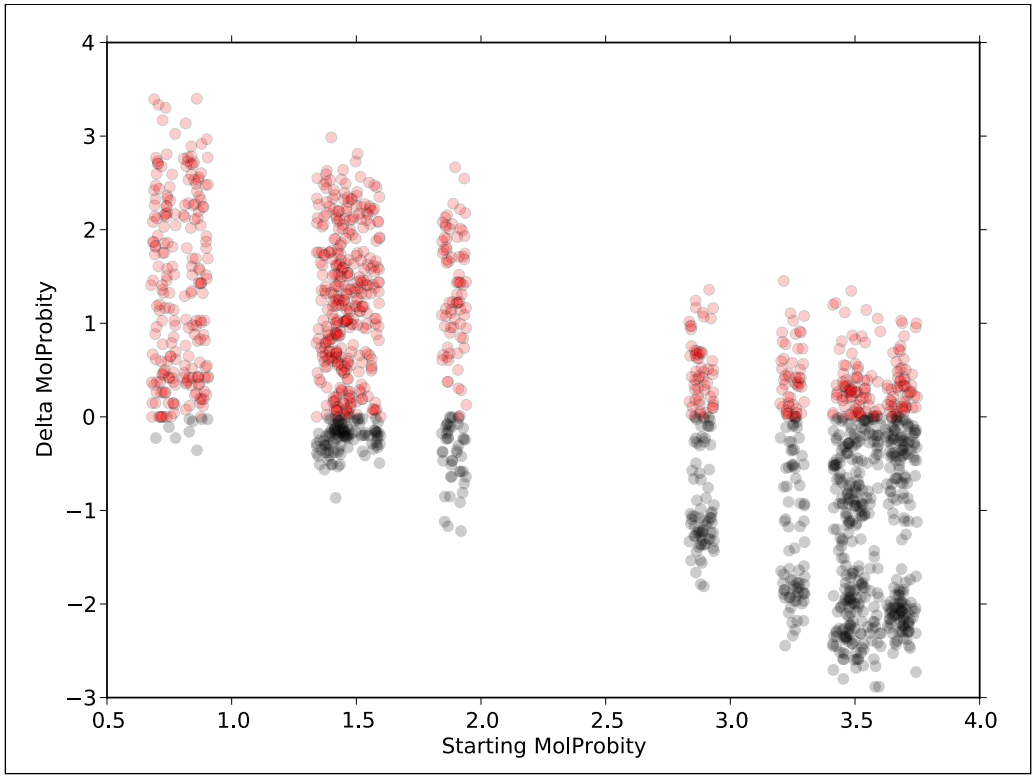

Predicted Rank
5
4
3
2
1
1
2
3
4
5
Observed Rank

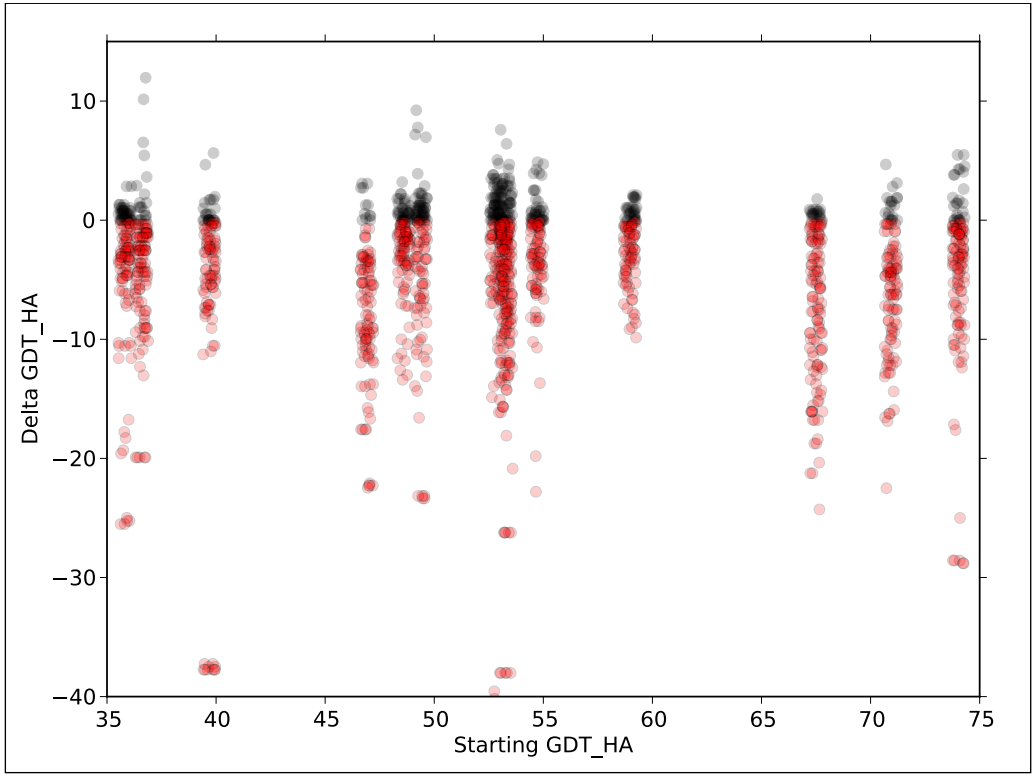
We have ranking issues


Can we predict
success?


Delta MolProbity
Starting MolProbity
4
3
2
1
0
−1
−2
−3
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0


MolProbity Improvement
3
2
1
0
−1
−2
−3
−4
297
170
228
172
056
273
319
001
296
430
356
484
295
263
353
104
Null
127
429
114
236
458
096
477
403
360
033
402
240
208
242
147
435
408
365
189
166
Group

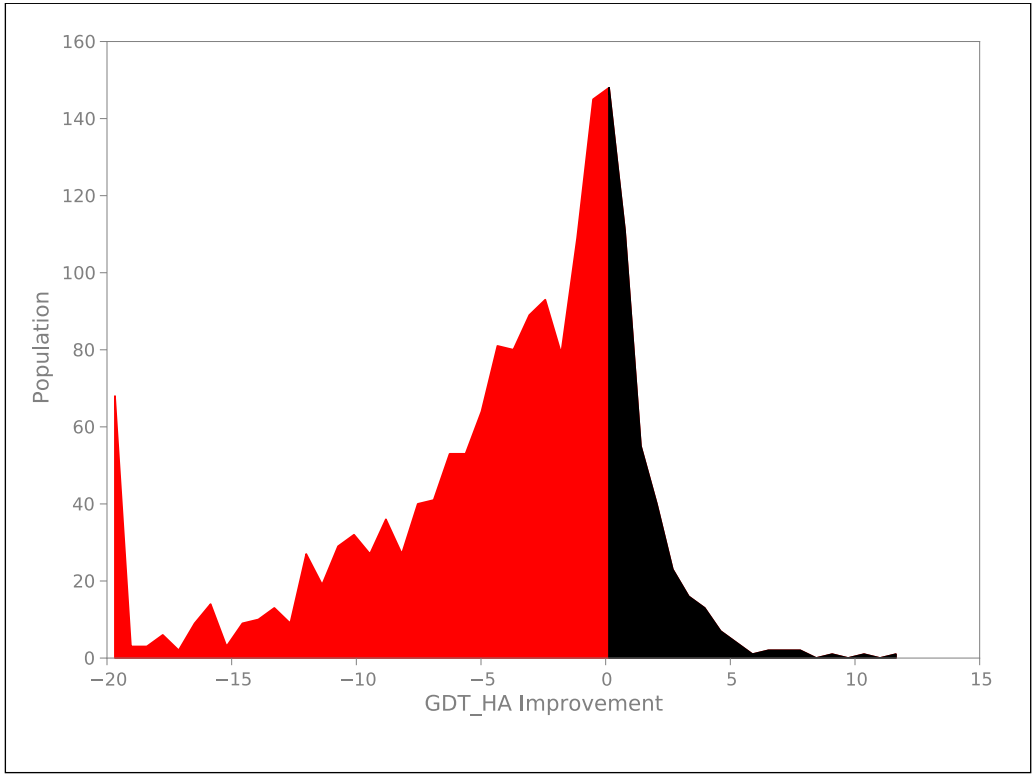

Delta MolProbity
Starting MolProbity
4
3
2
1
0
−1
−2
−3
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0

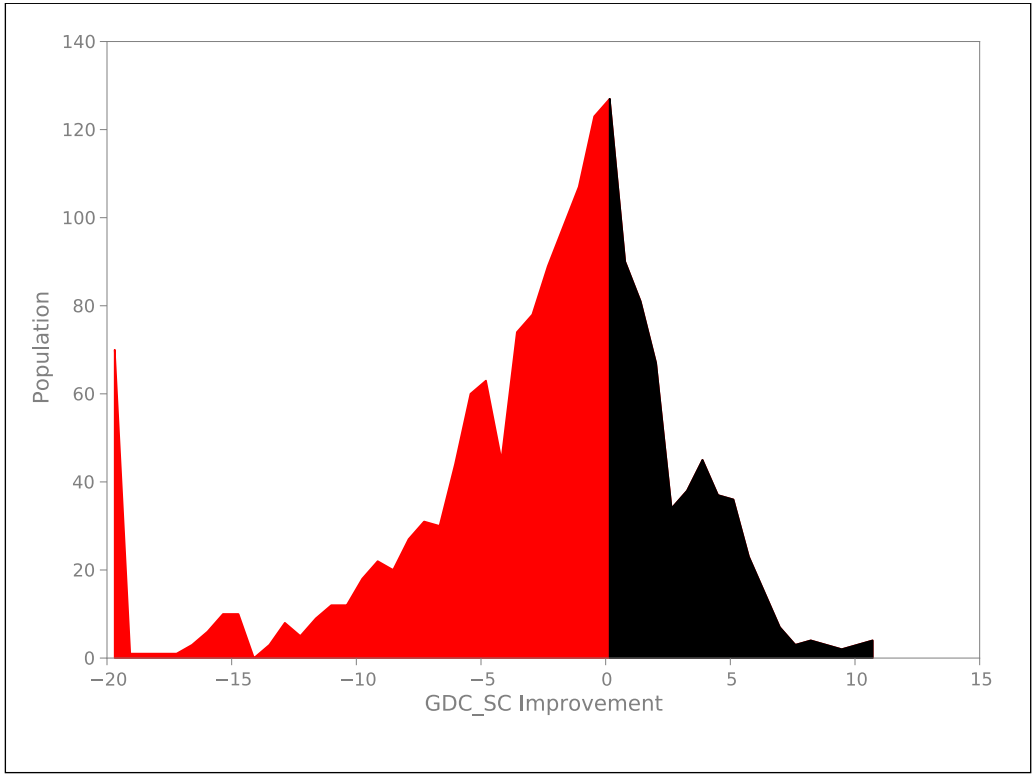

Delta GDT_HA
Starting GDT_HA
10
0
−10
−20
−30
−40
35
40
45
50
55
60
65
70
75


Can we predict
success?

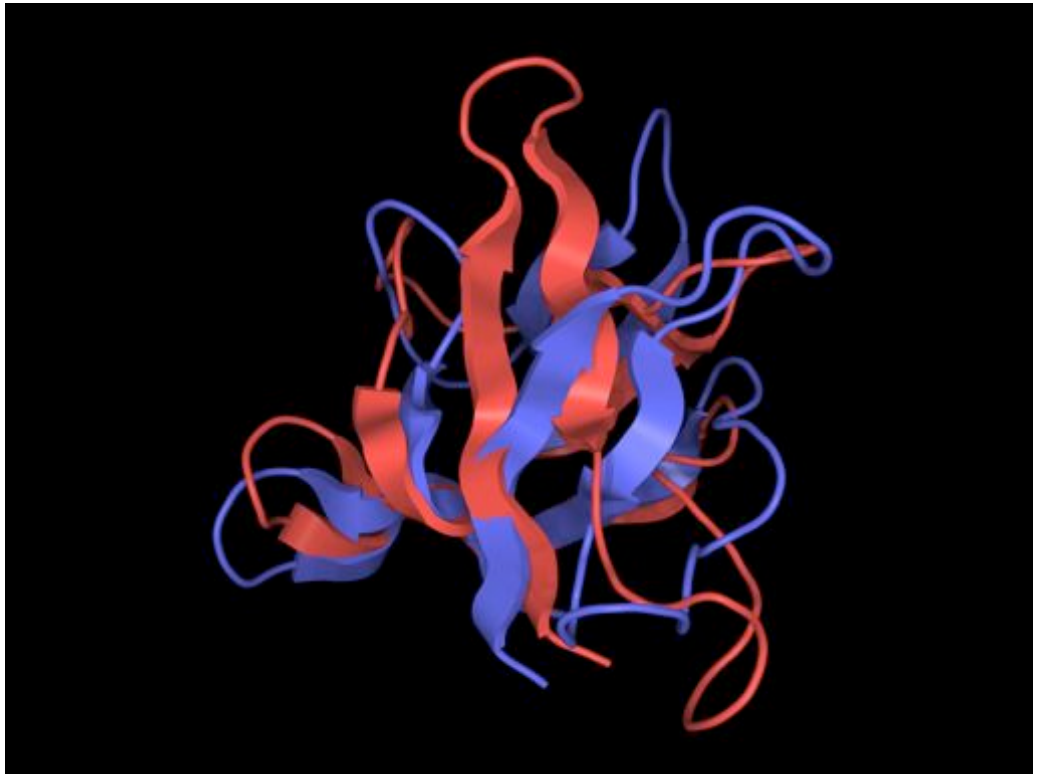

Can we predict success?
STOP
CITY OF CHICAGO

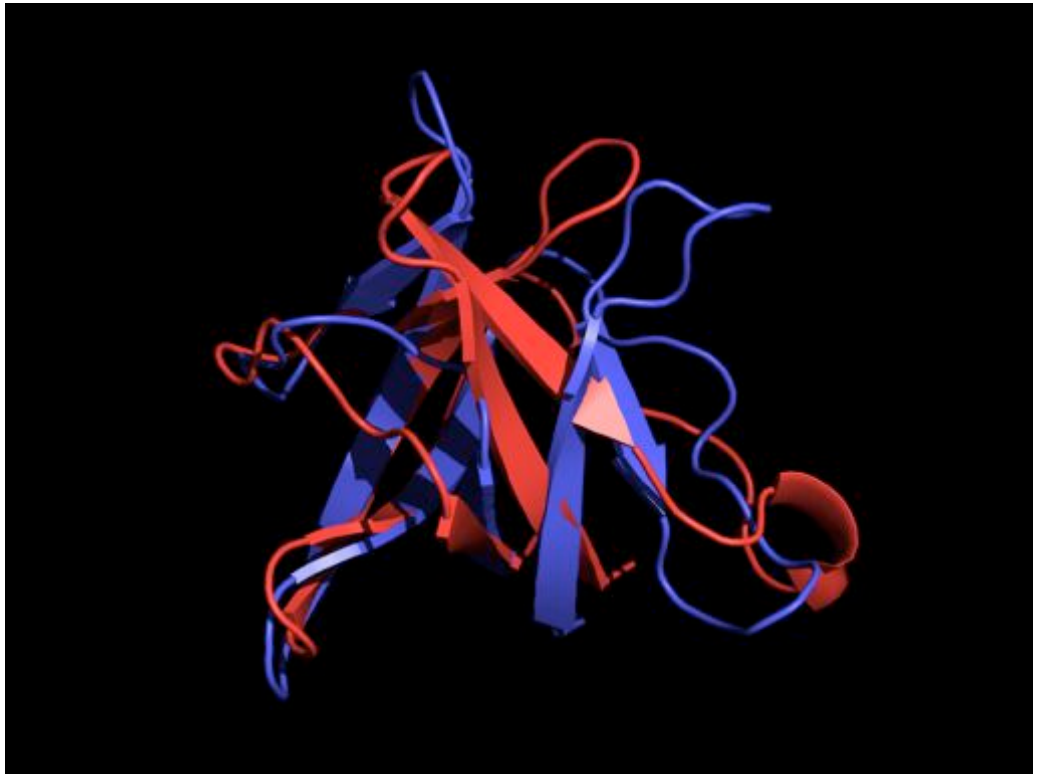
Where are the bottlenecks?

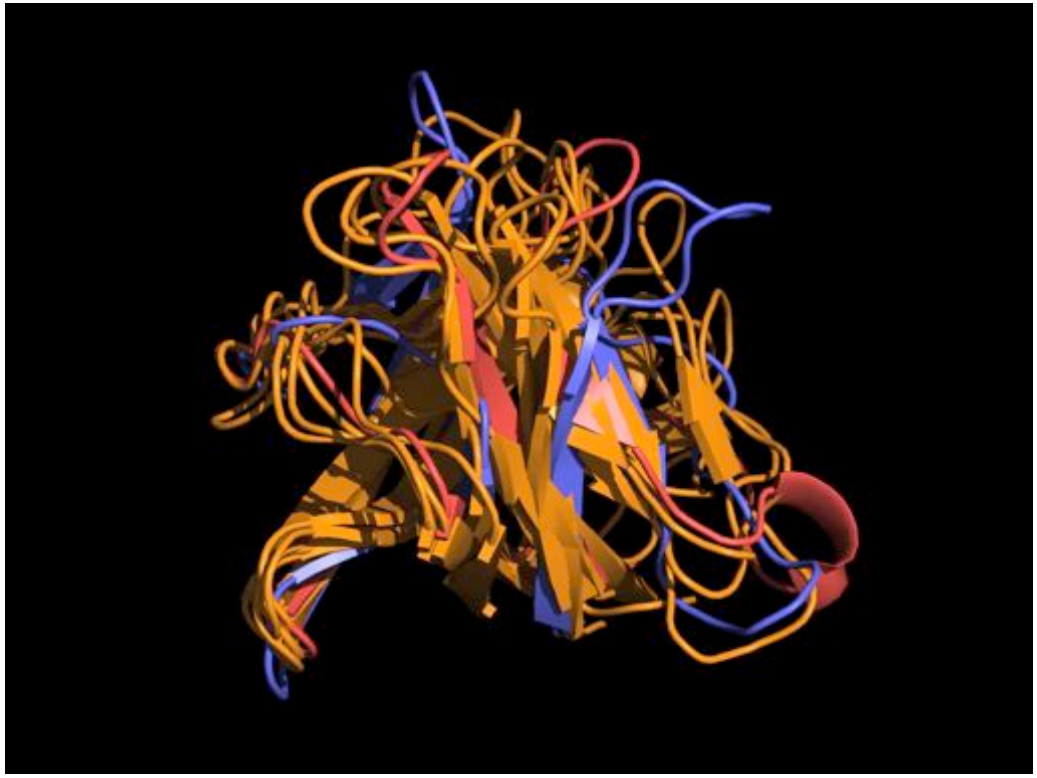

160
140
120
100
80
60
40
20
0
Population
−20
−15
−10
−5
0
5
10
15
GDT_HA Improvement


140
120
100
80
60
40
20
0
Population
−20
−15
−10
−5
0
5
10
15
GDC_SC Improvement

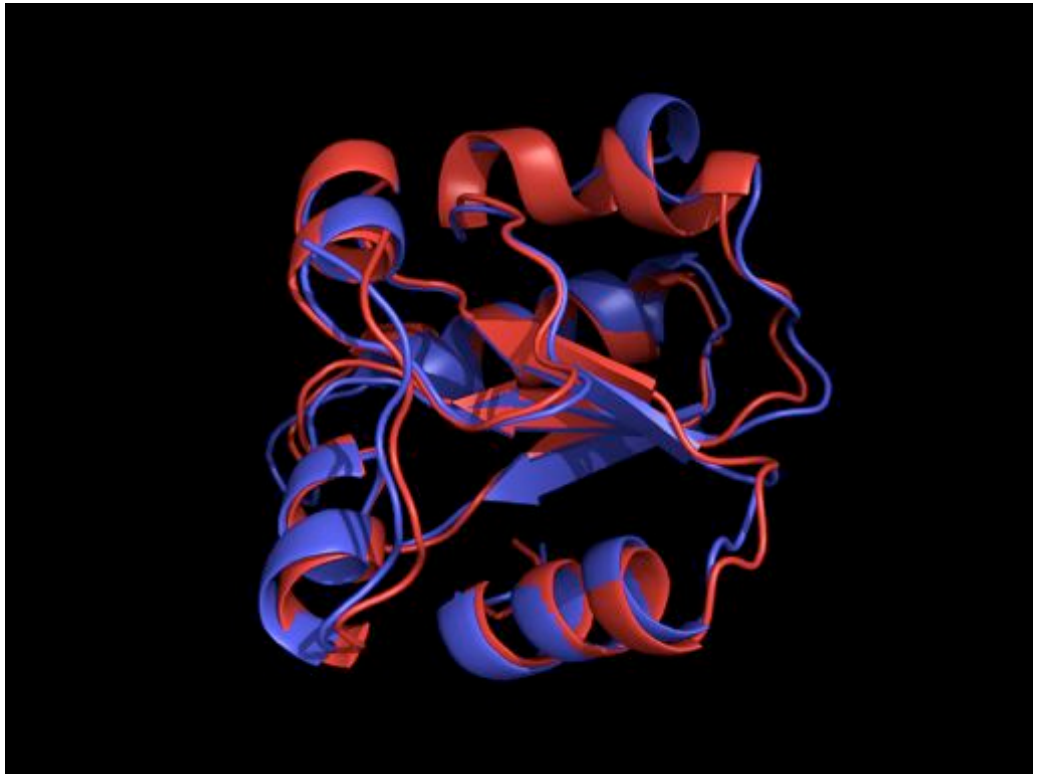
TBM side chains can be improved today

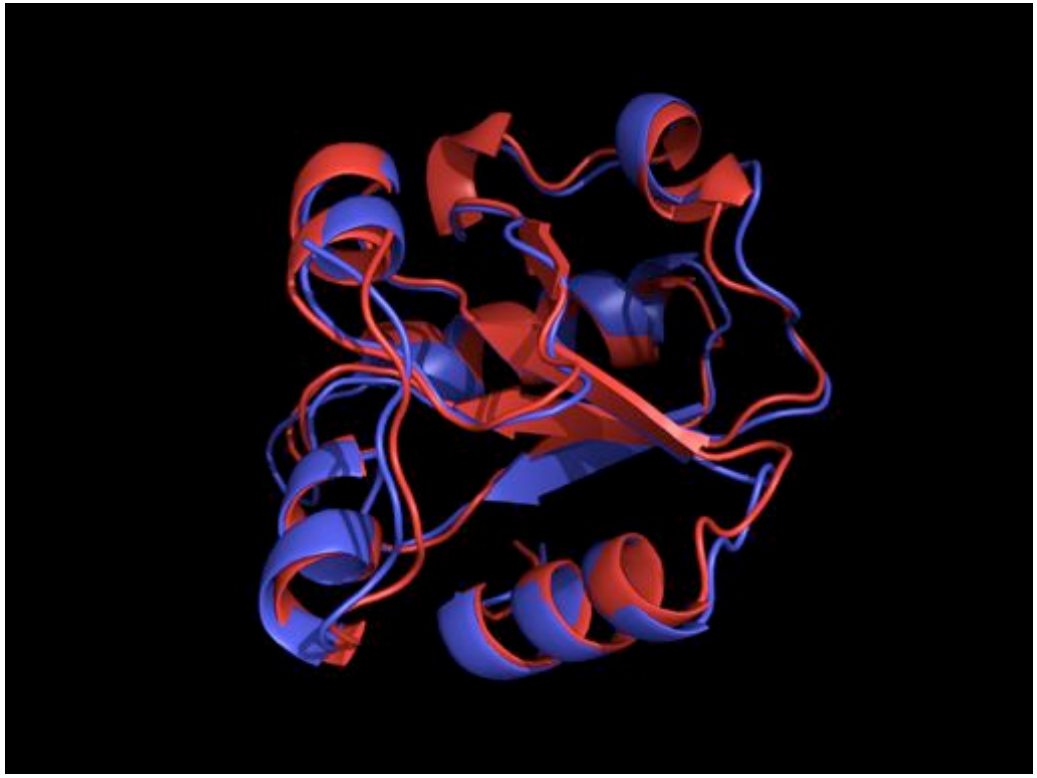


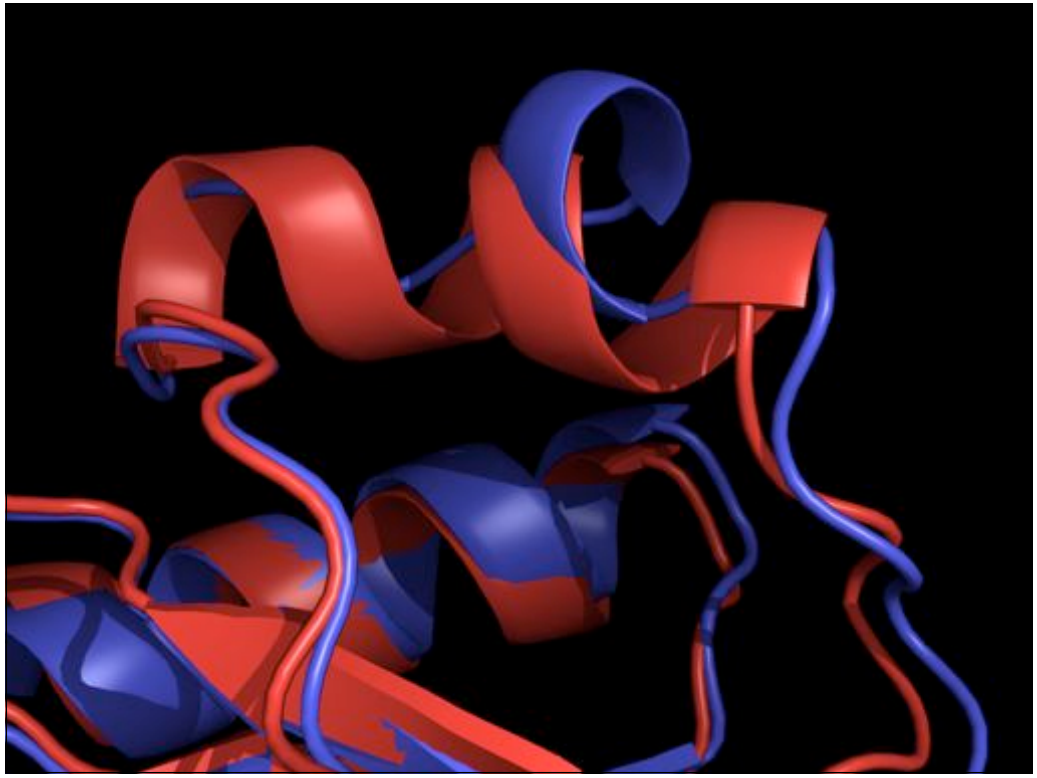


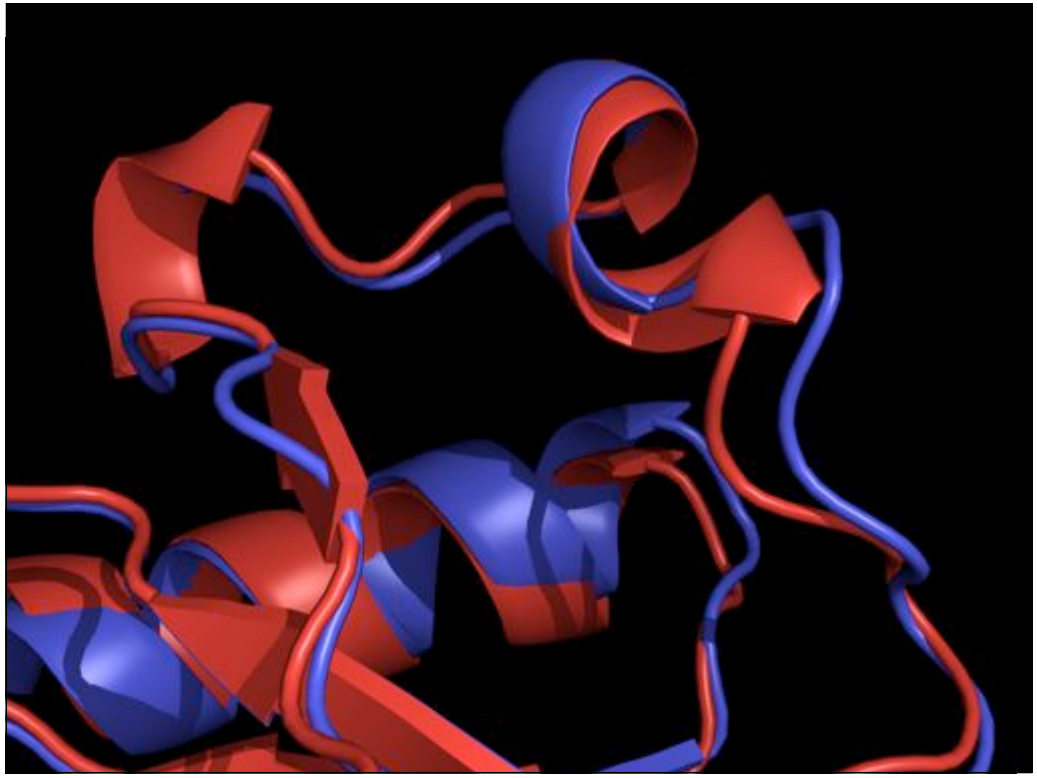



5
20
18










THIS WAY UP
THIS WAY UP

More refinement targets

“Physics” in CASP

“Physics” in CASP

- What scoring functions work?
- When do they fail?
- We can develop an objective test of energy functions and sampling strategies

Let's design an **experiment**

- Community based effort
- Change one variable (eg. force field) at a time
- Let's learn something and advance physical models

Conclusions

- Little or no progress
- Flashes of brilliance but lack of consistency
- Largely untapped resource
- TBM predictors should be able to improve side chains today

Participants

- Ken Dill
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- Michael Feig
  (Michigan State)
- Jooyoung Lee
  (Korea Institute for Advanced Study)
- Gunnar Schröder
  (Jülich Research Center)
- Gaurav Chopra
  (Stanford, Levitt)
- Michael Tyka
  (U Washington, Baker)