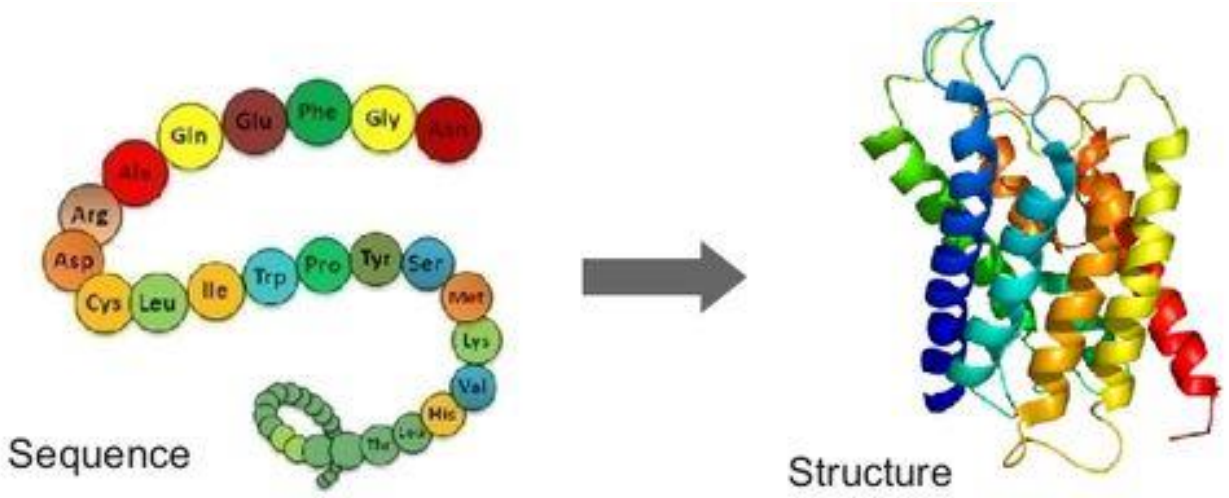
Prerequisite Knowledge

The same day I do this module, I cover:

1) Amino acid structures and groupings
2) Peptide bond formation
3) N- and C-termini

Amino Acids – an introduction to Proteins

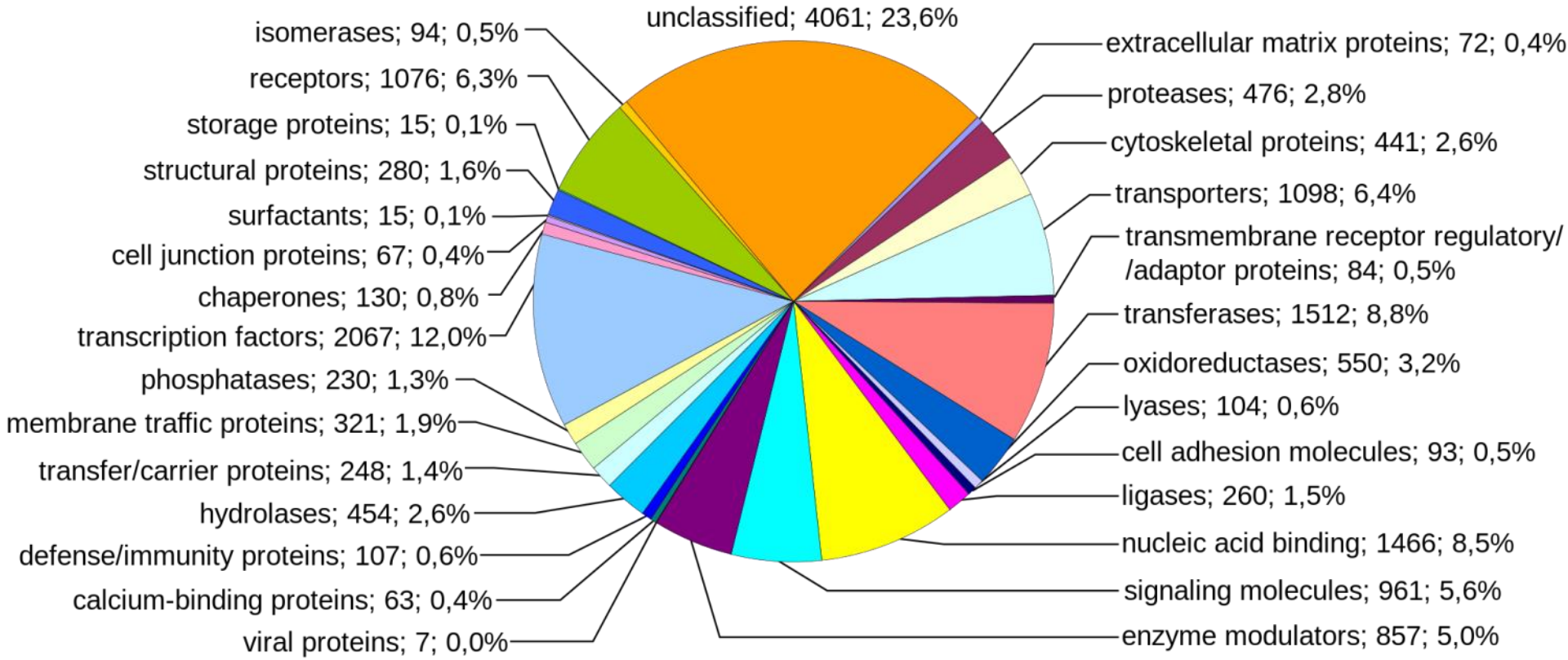


Over the next couple of weeks we will look at the how proteins are made:

- Primary structure (string of amino acids)
- Secondary structure (common, stabilized 3D features)
- Tertiary structure (entire 3D folding pattern)
- Quaternary structure (more than one amino acid chain)

What are proteins good for?

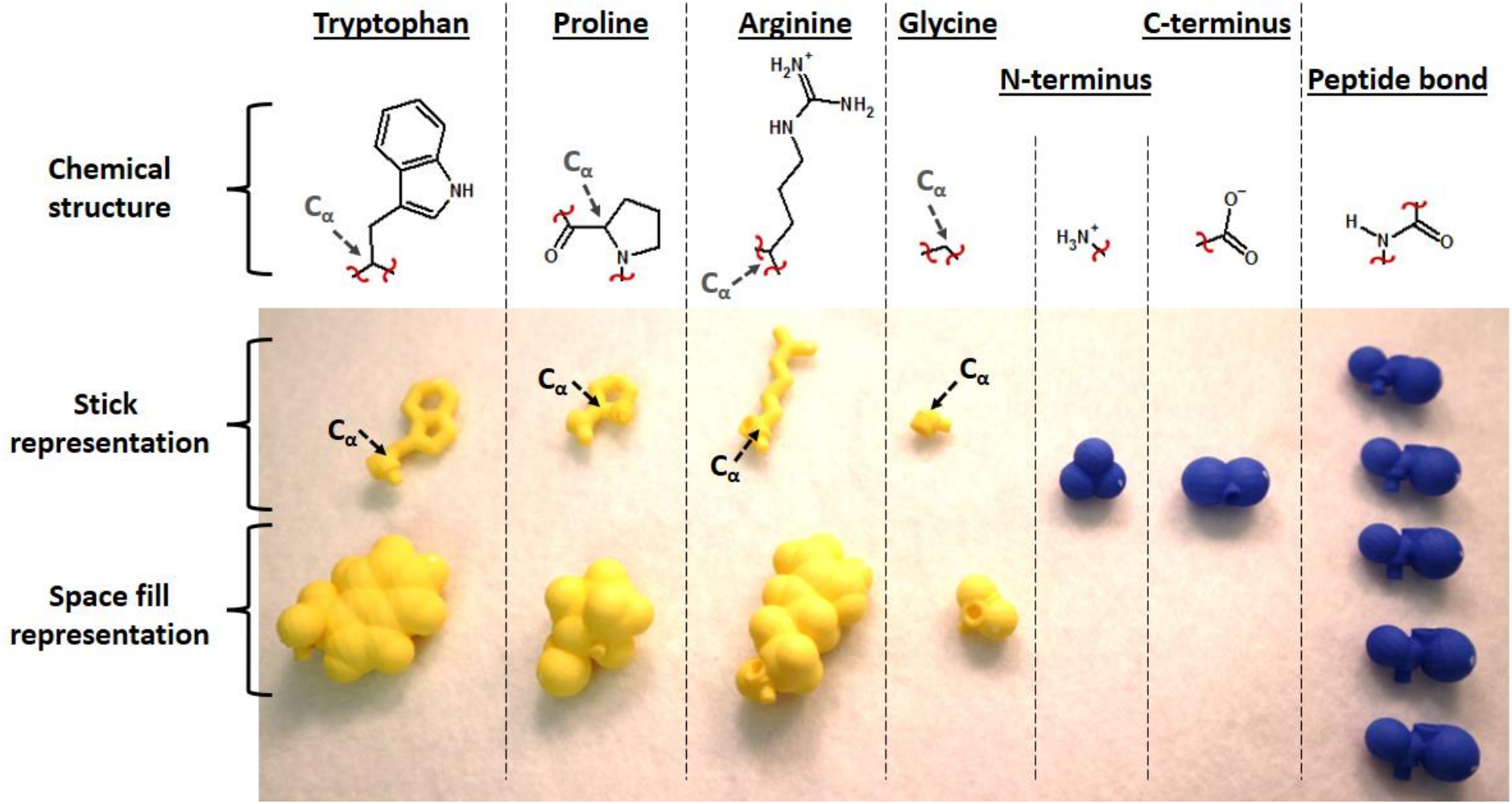
Proteins grouped by function from the Human Genome



Just about everything!

Proteins control almost every action and reaction—including thought!

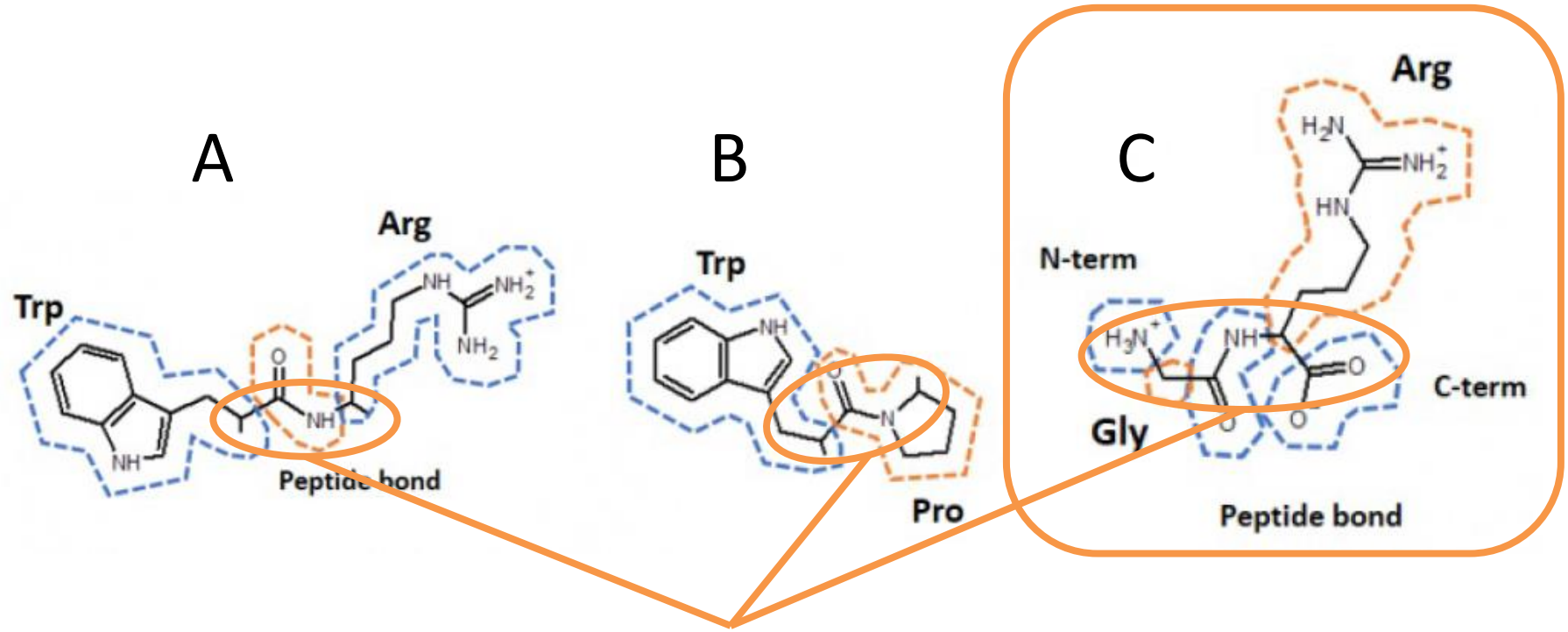
Connecting Amino Acids Activity



If doing an electronic version of the activity, provide link here

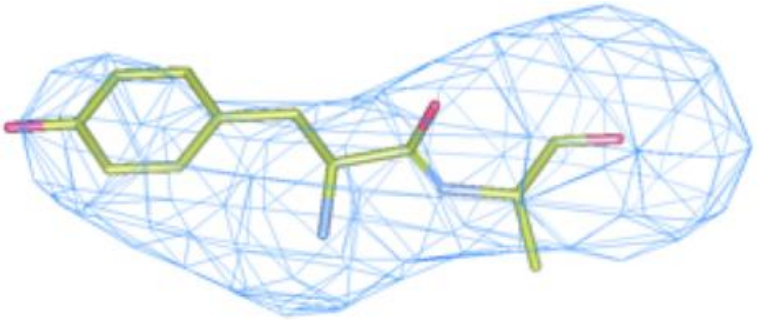
Amino Acid Clicker Question:

Which one of these dipeptides will have the greatest rotation around the C_αs?

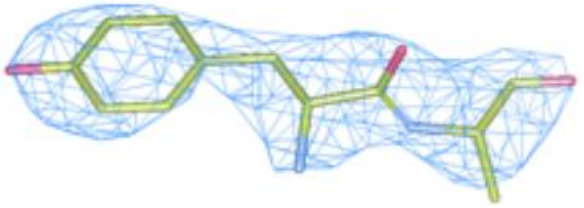


"Peptide backbone"

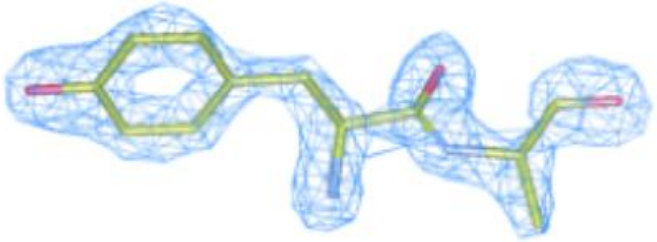
X-ray crystallography



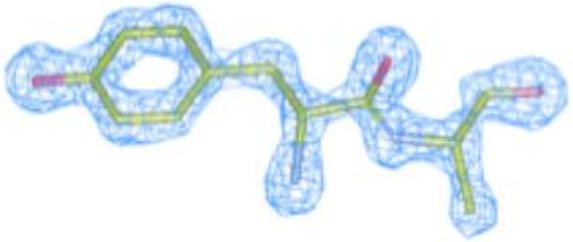
5.0 Å resolution, 2.5σ



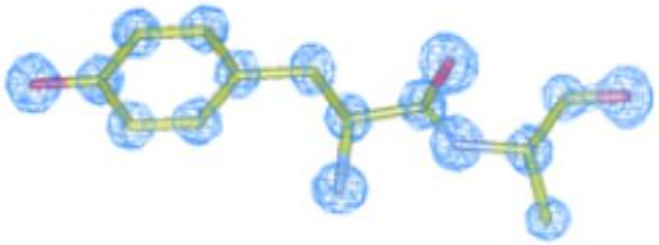
3.0 Å resolution, 6.5σ



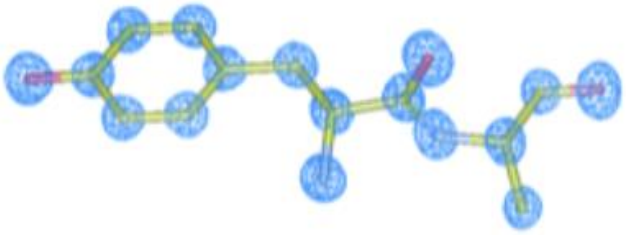
2.0 Å resolution, 8.5σ



1.5 Å resolution, 10σ

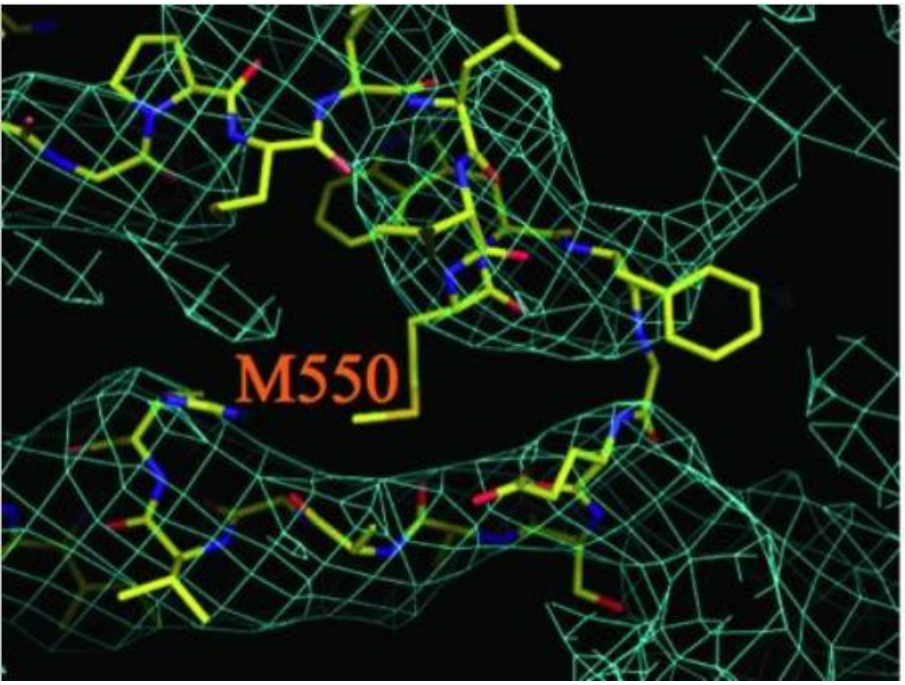


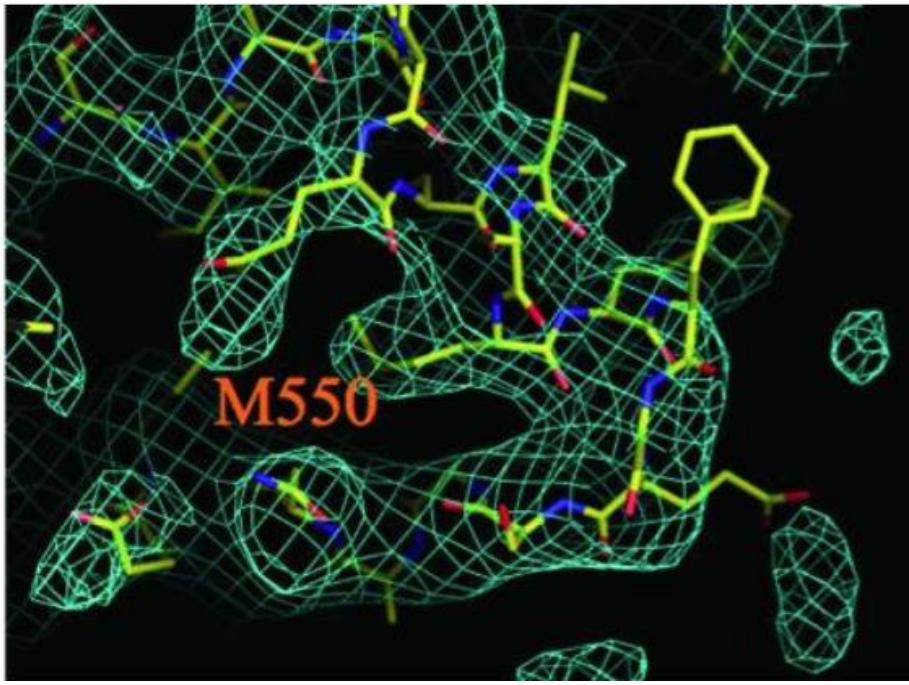
1.0 Å resolution, 14σ



0.6 Å resolution, 12σ

Evaluating our trust of crystal structures





1308B (Code to continue)

Brunger AT, DeLaBarre B, Davies JM, Weis WI. X-ray structure determination at low resolution. *Acta Crystallographica Section D: Biological Crystallography*. 2009;65(Pt 2):128-133. doi:10.1107/S0907444908043795.

Amino Acid Summary

- There are **20 amino acids used in proteins.**

- **Shared features**:
  - All are L-isomers (except glycine)
  - Amphoteric (can act as acid or base)
  - Each has an **amino**, **carboxylic acid**, and **side chain group** (except proline)
  - Each amino acid can be represented multiple ways, but the **space its electrons take up is always the same**.

- **Unique features**:
  - Cysteine can form **disulfide** bonds
  - Tyrosine and Tryptophan **absorb light** at 280 nm well
  - Serine, Threonine, Tyrosine have hydroxyl groups which **can be modified** to activate/inactivate protein function
  - Glycine and proline each have **unique flexibility or lack of it**.

- Amino acids can be titrated, and their charge state is important.
- **Amino acid shapes constrain bond angles**.

Next Lecture:

- See how amino acids joined in peptides form repeated elements in protein structure.
- Look at determinants of a protein's final structure.