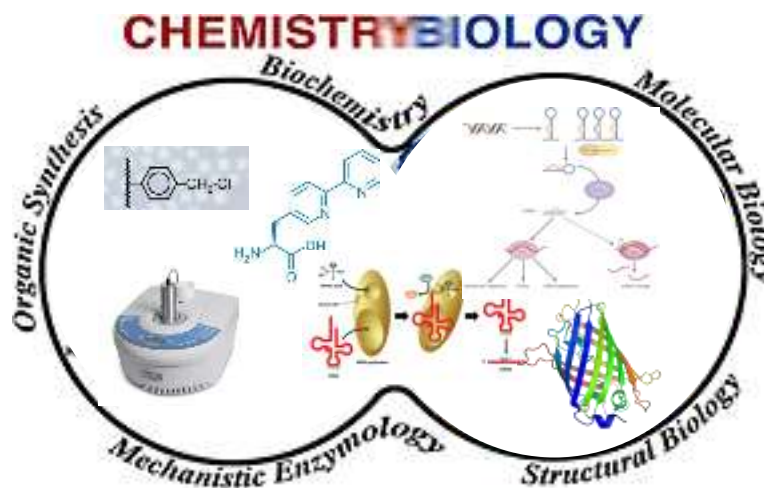




DOUGHTON ABBEY

# Research in the Young Lab

September 8, 2017



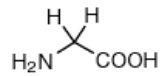
**W&M**

# Unnatural Amino Acids

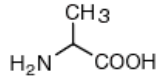
[New UAAs and Application Towards Biological Problems]

# The Genetic Code

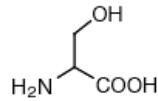
## Small



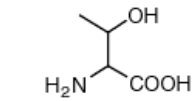
Glycine (Gly, G)  
MW: 57.05



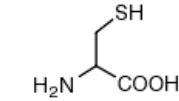
Alanine (Ala, A)  
MW: 71.09



Serine (Ser, S)  
MW: 87.08, pK<sub>a</sub> ~ 16

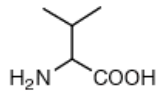


Threonine (Thr, T)  
MW: 101.11, pK<sub>a</sub> ~ 16

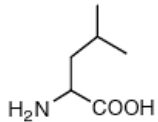


Cysteine (Cys, C)  
MW: 103.15, pK<sub>a</sub> = 8.35

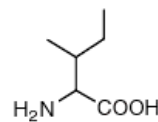
## Hydrophobic



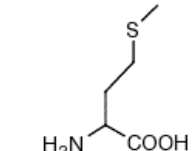
Valine (Val, V)  
MW: 99.14



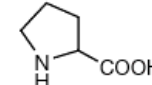
Leucine (Leu, L)  
MW: 113.16



Isoleucine (Ile, I)  
MW: 113.16

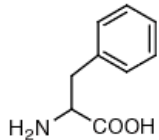


Methionine (Met, M)  
MW: 131.19

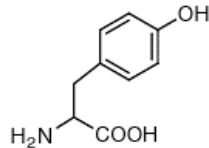


Proline (Pro, P)  
MW: 97.12

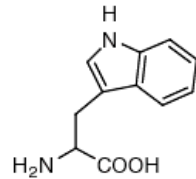
## Aromatic



Phenylalanine (Phe, F)  
MW: 147.18

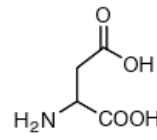


Tyrosine (Tyr, Y)  
MW: 163.18

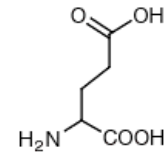


Tryptophan (Trp, W)  
MW: 186.21

## Acidic

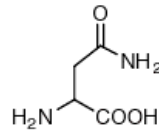


Aspartic Acid (Asp, D)  
MW: 115.09, pK<sub>a</sub> = 3.9

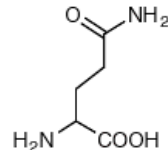


Glutamic Acid (Glu, E)  
MW: 129.12, pK<sub>a</sub> = 4.07

## Amide

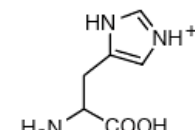


Asparagine (Asn, N)  
MW: 114.11

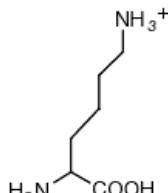


Glutamine (Gln, Q)  
MW: 128.14

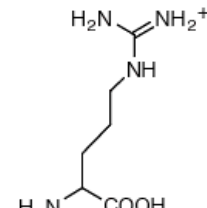
## Basic



Histidine (His, H)  
MW: 137.14, pK<sub>a</sub> = 6.04



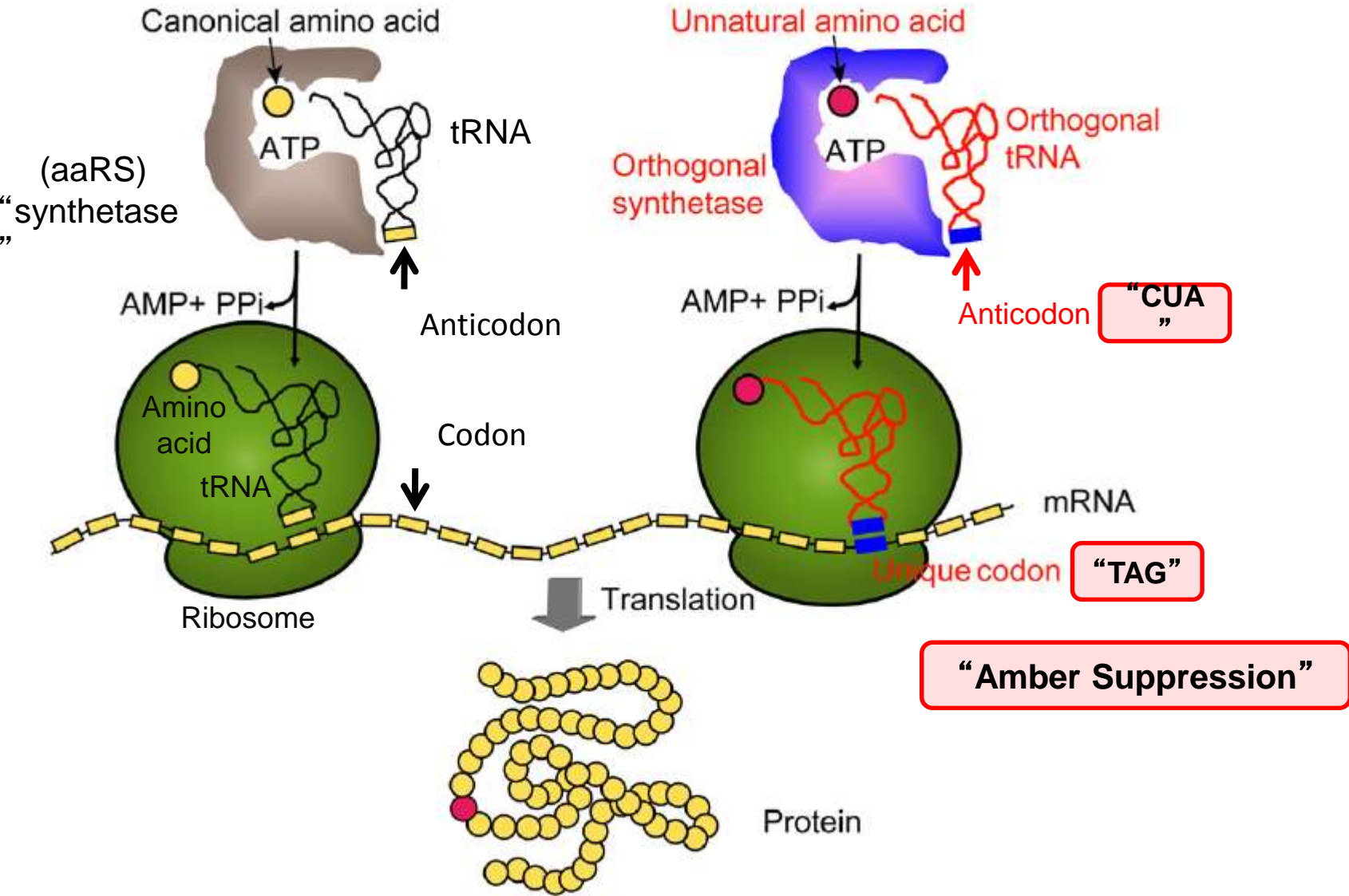
Lysine (Lys, K)  
MW: 128.17, pK<sub>a</sub> = 10.79



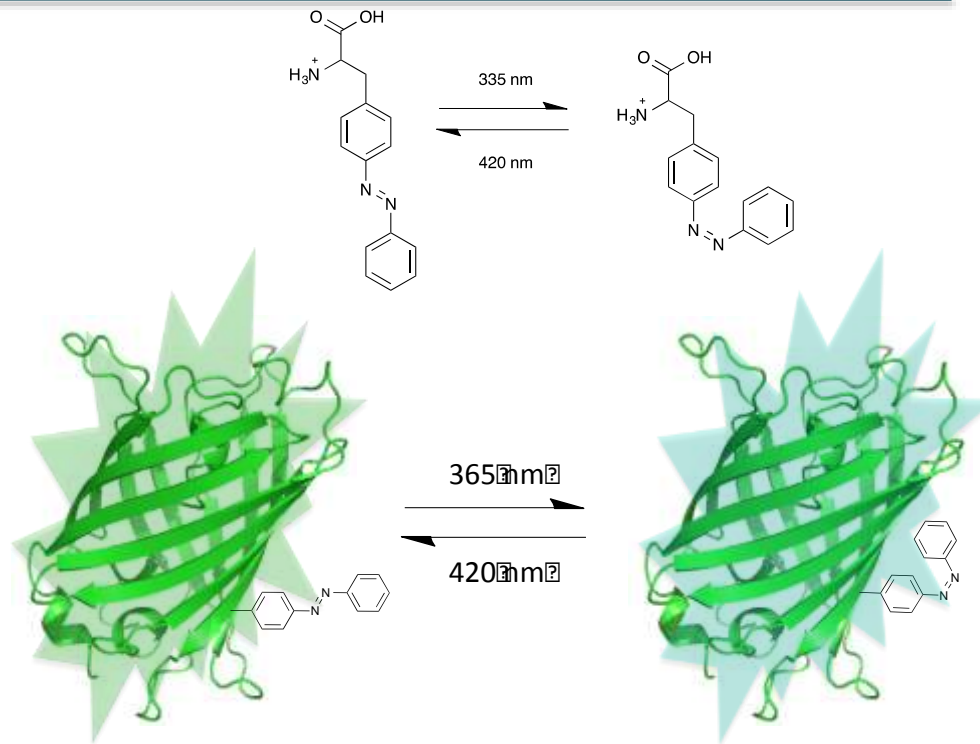
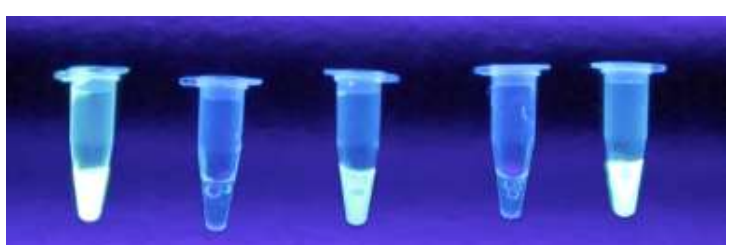
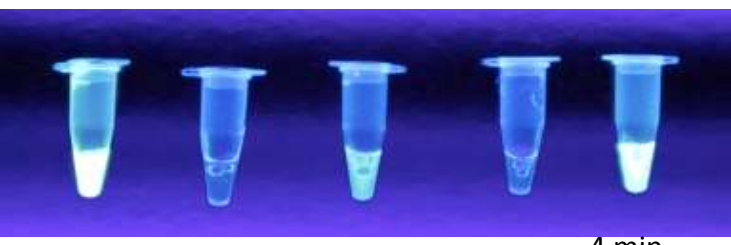
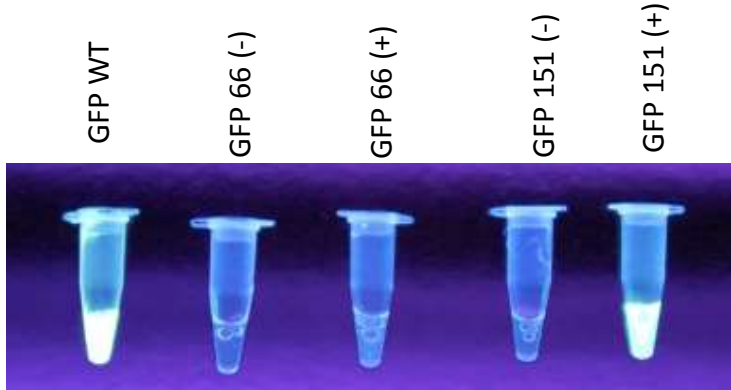
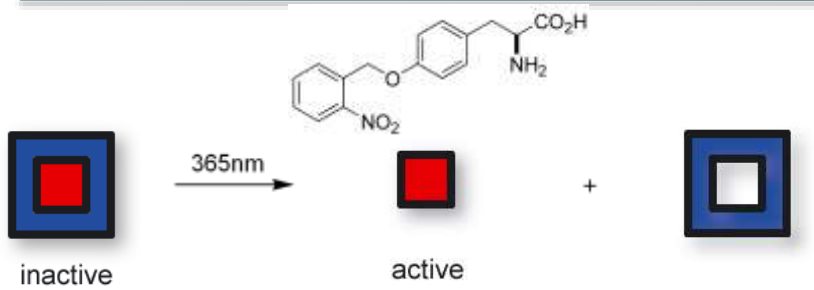
Arginine (Arg, R)  
MW: 156.19, pK<sub>a</sub> = 12.48

		Second Letter				
		T	C	A	G	
First Letter	T	TTT } Phe TTC } TTA } Leu TTG }	TCT } Ser TCC } TCA } TCG }	TAT } Tyr TAC } TAA } Stop TAG } Stop	TGT } Cys TGC } TGA } Stop TGG } Trp	T C A G
	C	CTT } Leu CTC } CTA } CTG }	CCT } Pro CCC } CCA } CCG }	CAT } His CAC } CAA } Gln CAG }	CGT } Arg CGC } CGA } CGG }	T C A G
	A	ATT } Ile ATC } ATA } Met ATG }	ACT } Thr ACC } ACA } ACG }	AAT } Asn AAC } AAA } Lys AAG }	AGT } Ser AGC } AGA } Arg AGG }	T C A G
	G	GTT } Val GTC } GTA } GTG }	GCT } Ala GCC } GCA } GCG }	GAT } Asp GAC } GAA } Gln GAG }	GGT } Gly GGC } GGA } GGG }	T C A G

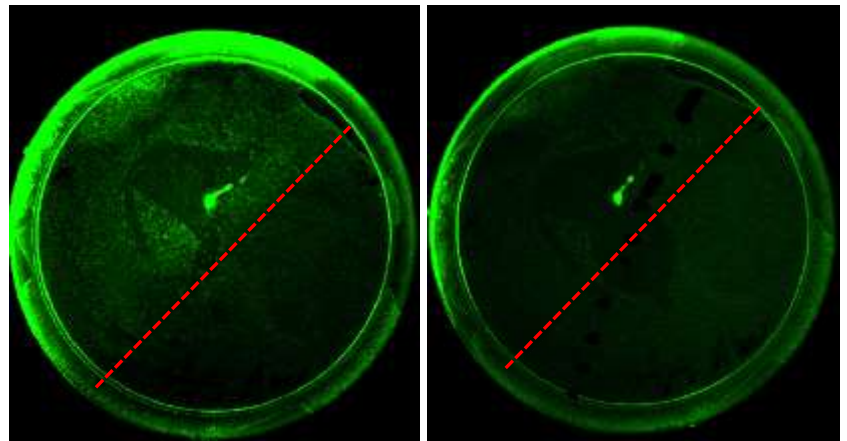
# aaRS/tRNA Pairs for Amber Suppression



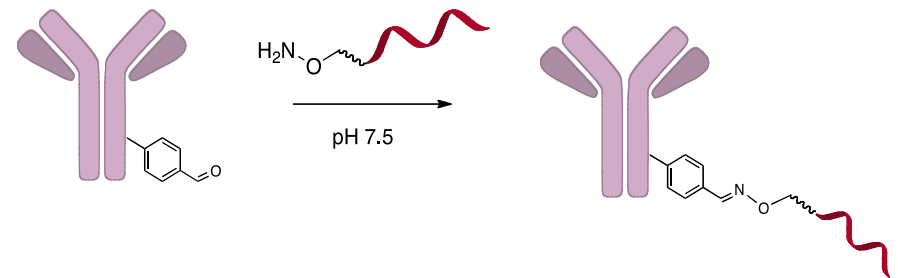
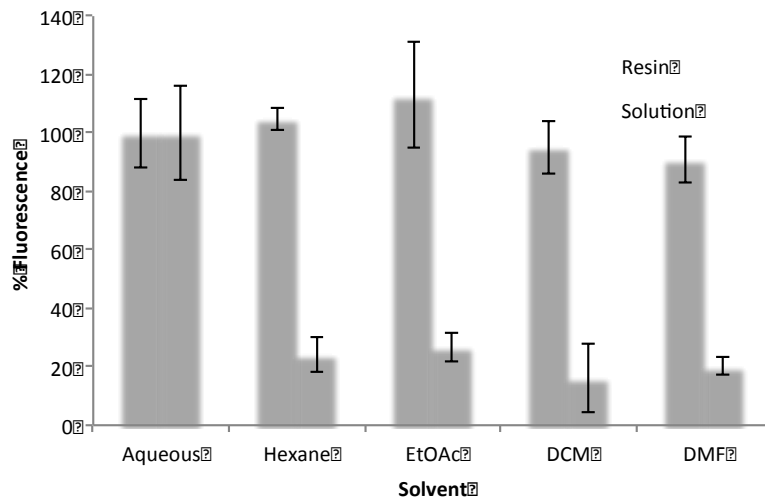
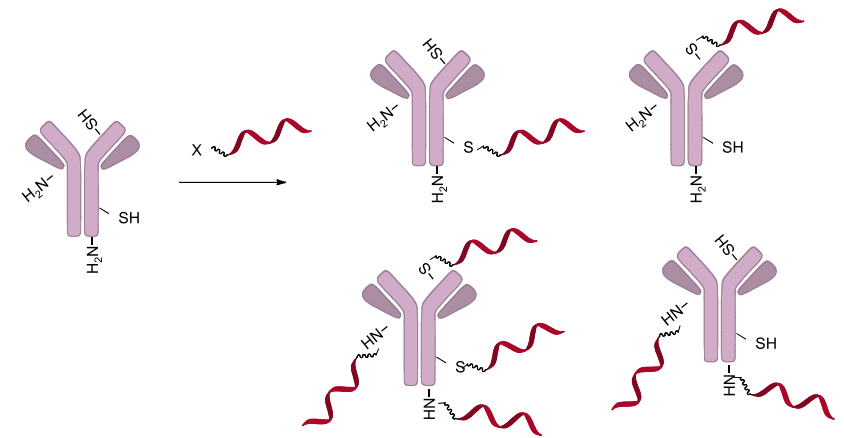
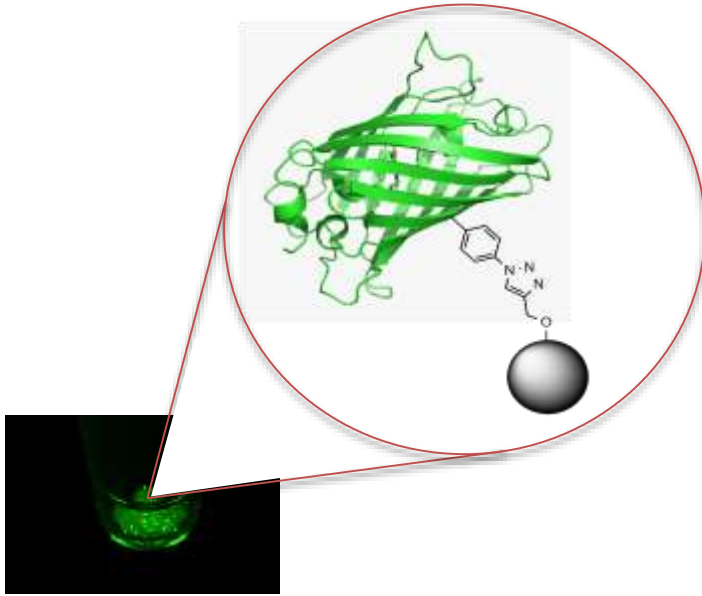
# Photoregulated Protein Function



+10 min 365 nm photo-activation 4 min recovery



# Protein Immobilization

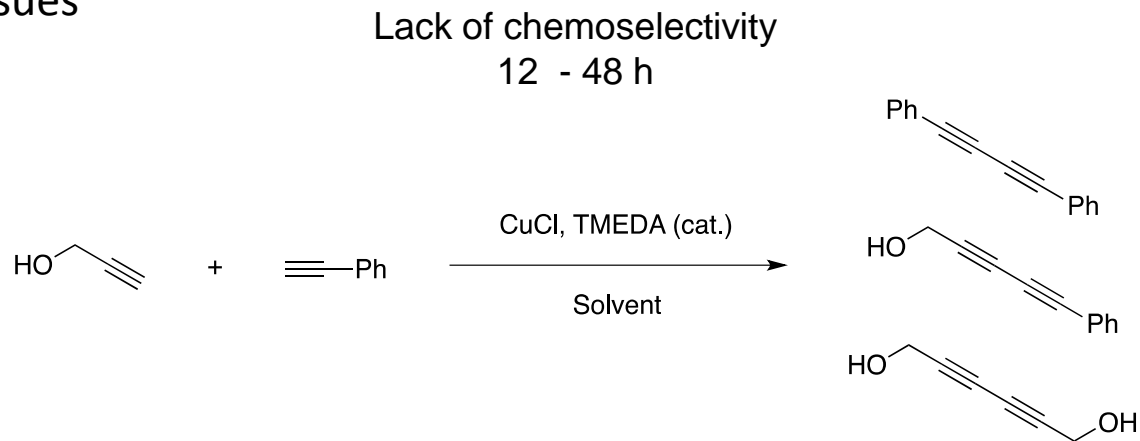


# Glaser Hay Reactions

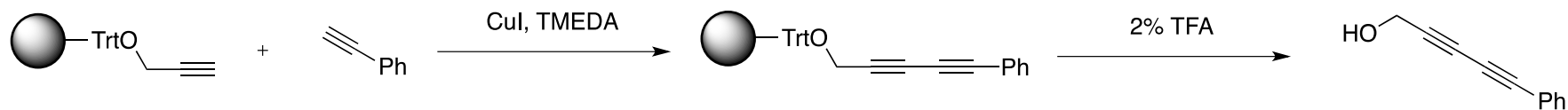
## [Developing New Methodologies]

# Development of Small Molecule Libraries

## Synthetic Issues



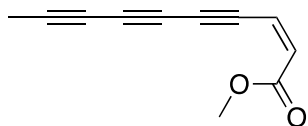
## Solution





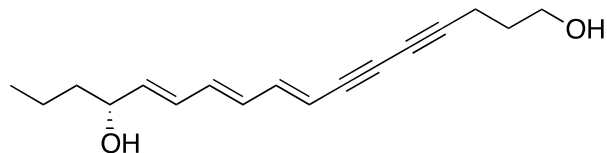
# Development of Small Molecule Libraries

## Polyyne Cores as Therapeutics



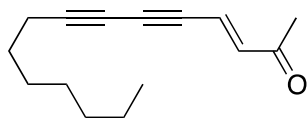
Dehydromatricaria ester

1826, *Artemisia*



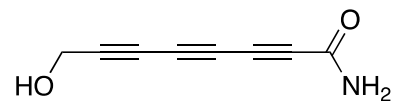
Circutoxin

Convulsions, respiratory paralysis



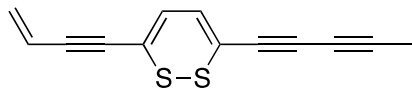
Monitporyne A

Cytotoxic to solid tumor cell lines



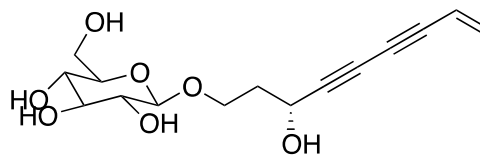
Agrocycin

Anti-fungal



Thiaurbine B

Anti-parasite

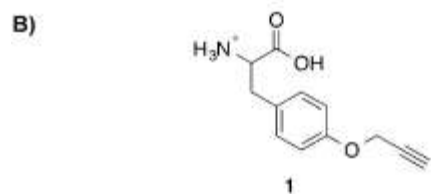
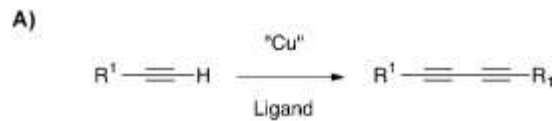


Bidensyneoside A<sub>2</sub>

Anti-histamine  
Inhibit NO formation

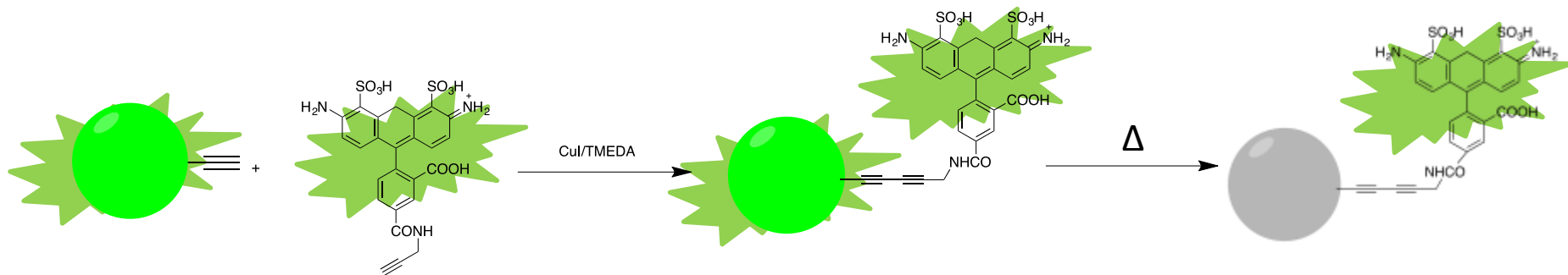
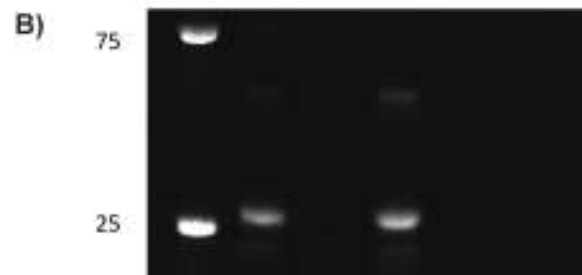
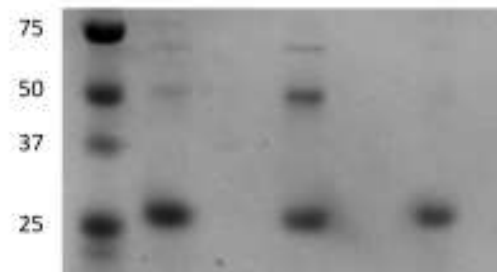
# Translation to Biological Systems

Using UAAs as for a bioorthogonal reaction

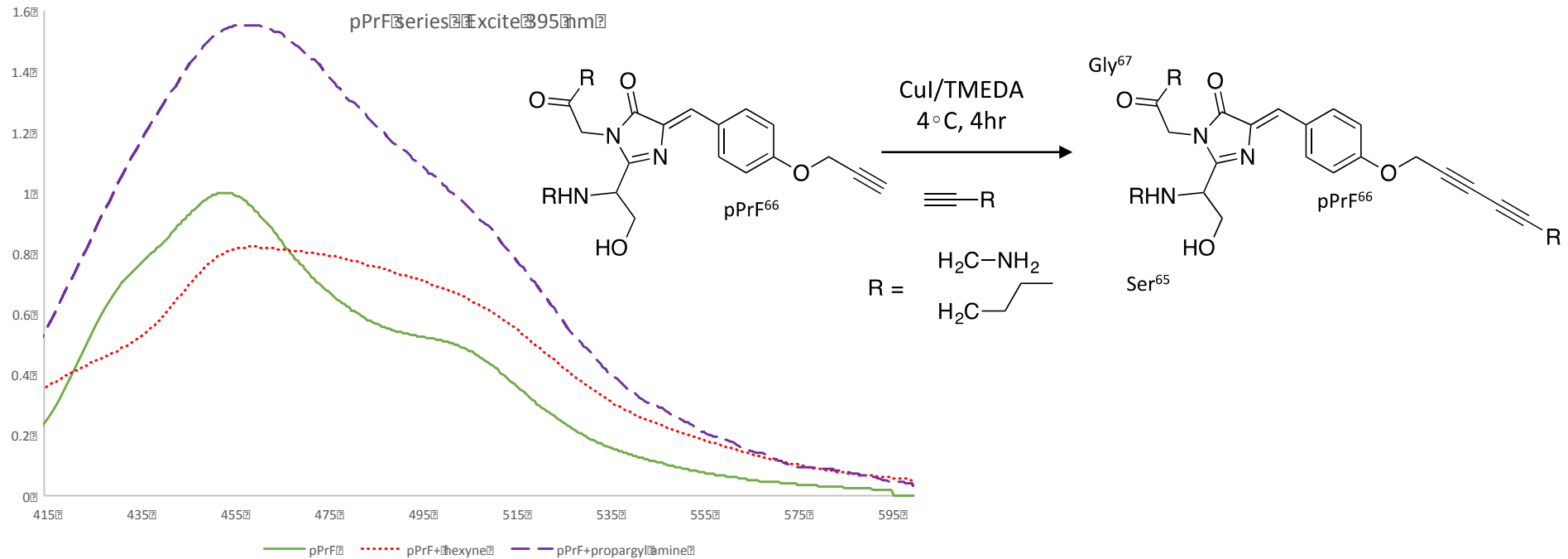
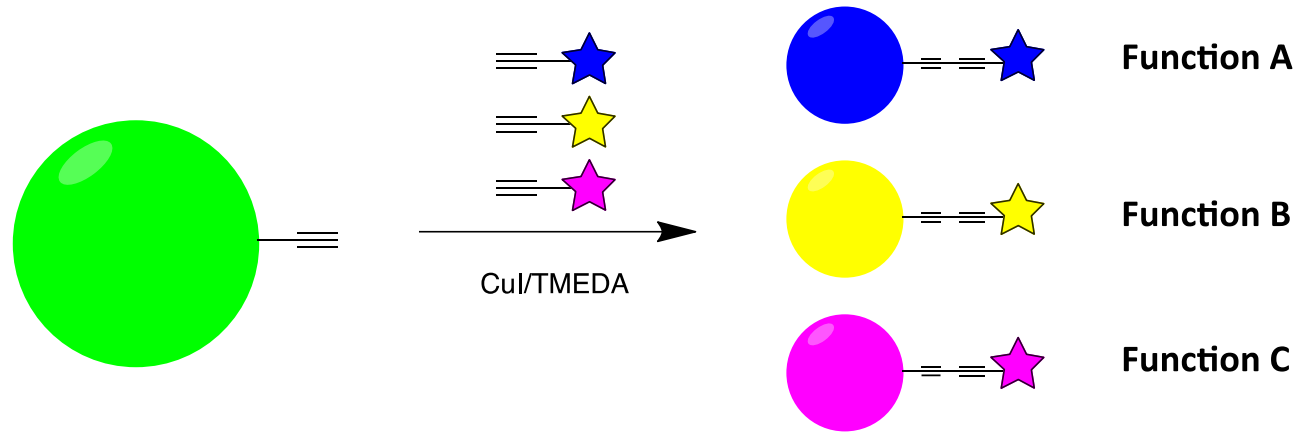


A)

	1	2	3	4	5	6	7
Temp (°C)	L	37	37	4	4	37	37
CuI/TMEDA		+	+	+	+	-	-
pPrF		+	-	+	-	+	-



# Chemically Programmed Protein Function



# The Lab

- Current Students
  - Graduate Student : John Halonski
  - Seniors: Zack Nimmo, Ryan Kelley, Melanie Becher, Somya Sankar
  - Juniors: Chris Travis, Anna Martin, Brent Russell, Srijan Bhasin
  - Sophomores: Becca Deitch
- Interested in taking:
  - Sophomores (1-2)
  - Freshmen (1-2)

