A Convergent Synthetic Approach to Activity Based Sensing of Ethylene Gas

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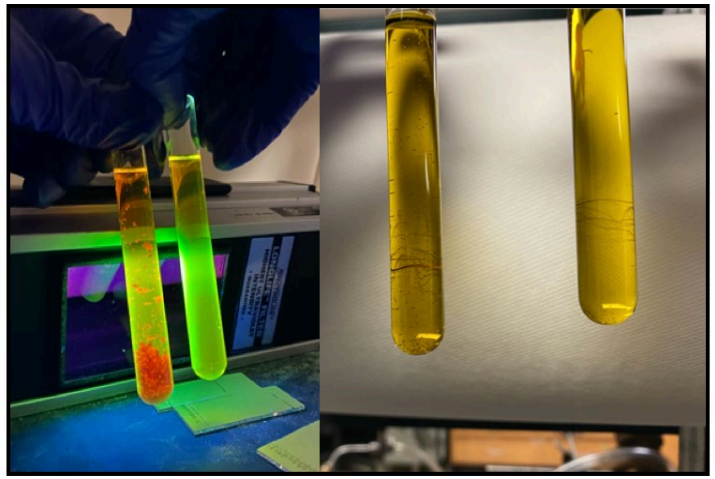
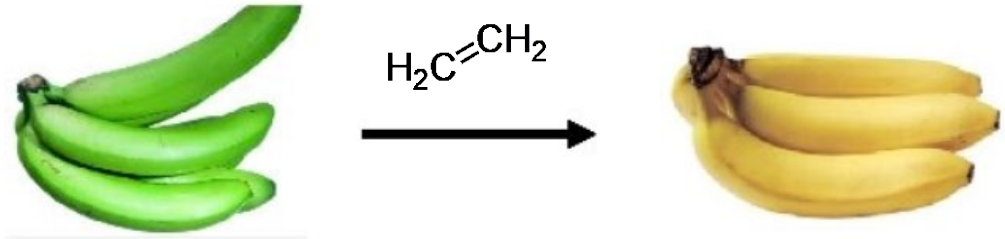


Project Background: Importance of Ethylene $H_2C{=}CH_2$

Colorless gas, naturally produced by plants
Relatively small, unreactive



Major plant hormone responsible for:

- Seed germination
- Fruit ripening
- Dormancy
- Flower production
- Root hair development

Agricultural applications require measurements to be:

- Precise
- Accurate
- Fast
- Selective
- Sensitive
- Applied *in vivo*

Project Background: Synthetic Ethylene Probes

Aim One

Rapid Access to Probe Library

1a. The Original System

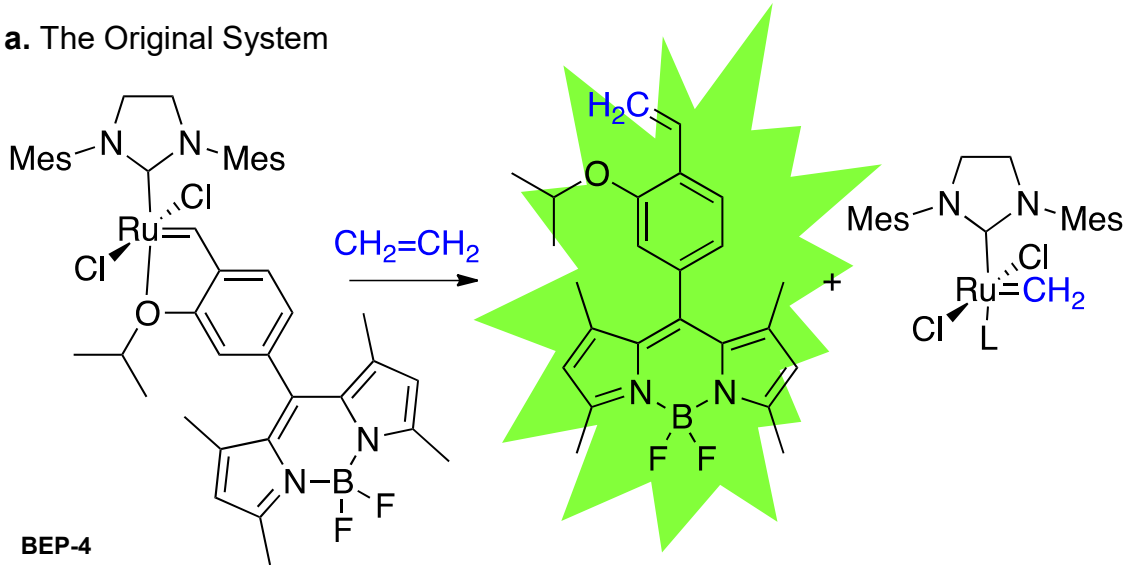
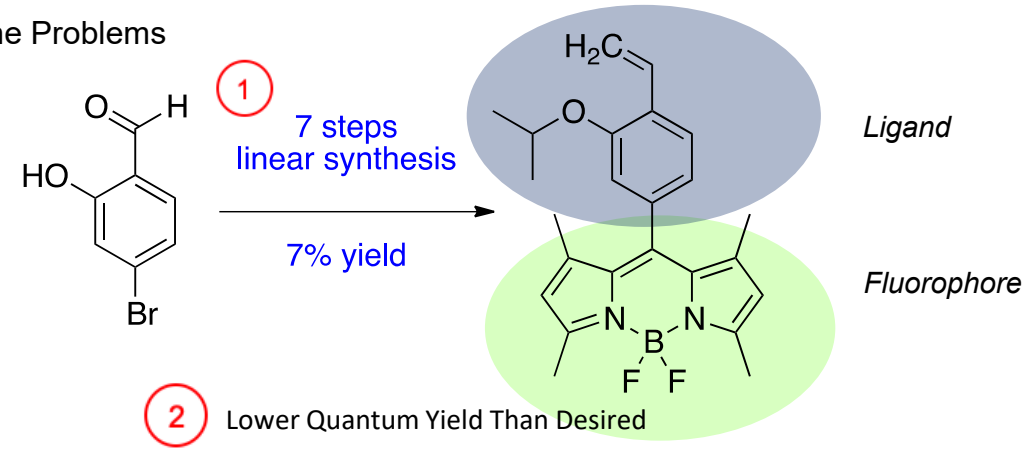
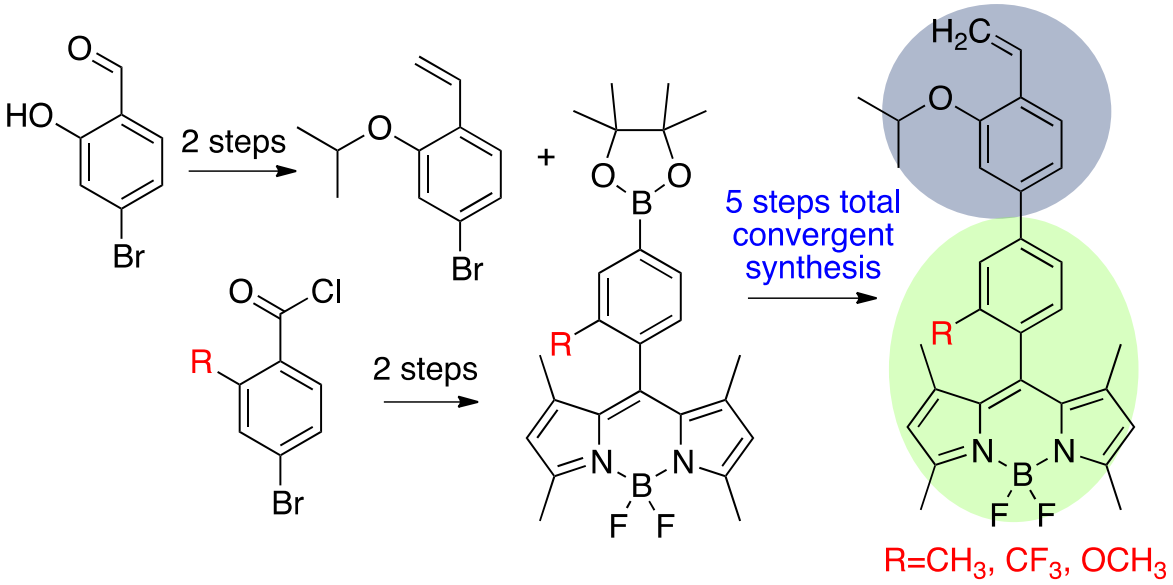


Figure 1. Modular approach to BEP synthesis.

1b. The Problems



1c. Rapid Access to Probe Combinations



Project Background: Synthetic Ethylene Probes

Aim Two

Structural Modifications to Increase Quantum Yield

Quantum Yield is a measure of fluorophore brightness

Brighter fluorophores require less material:

- Cost effective
- Better imaging *in vivo*

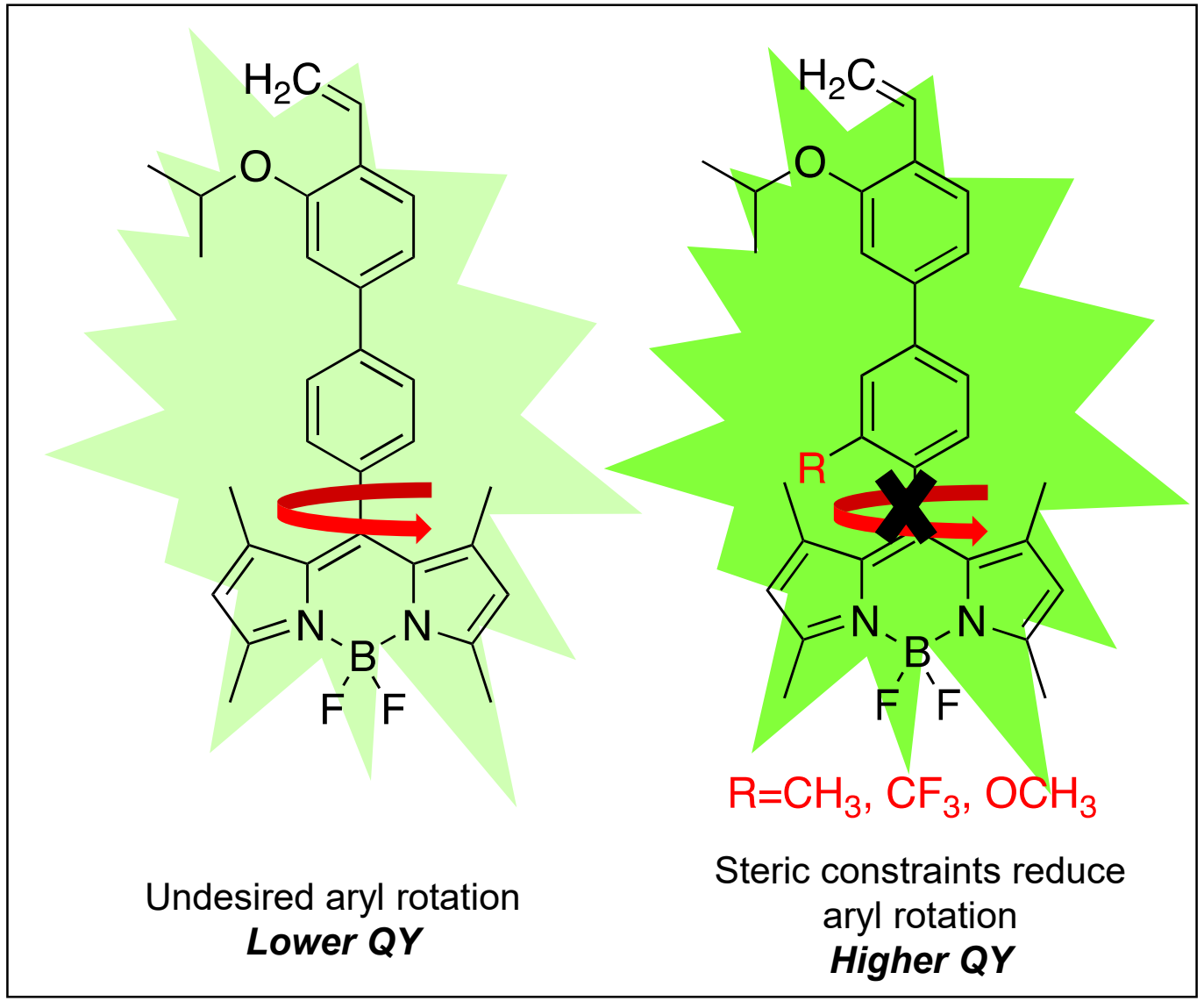
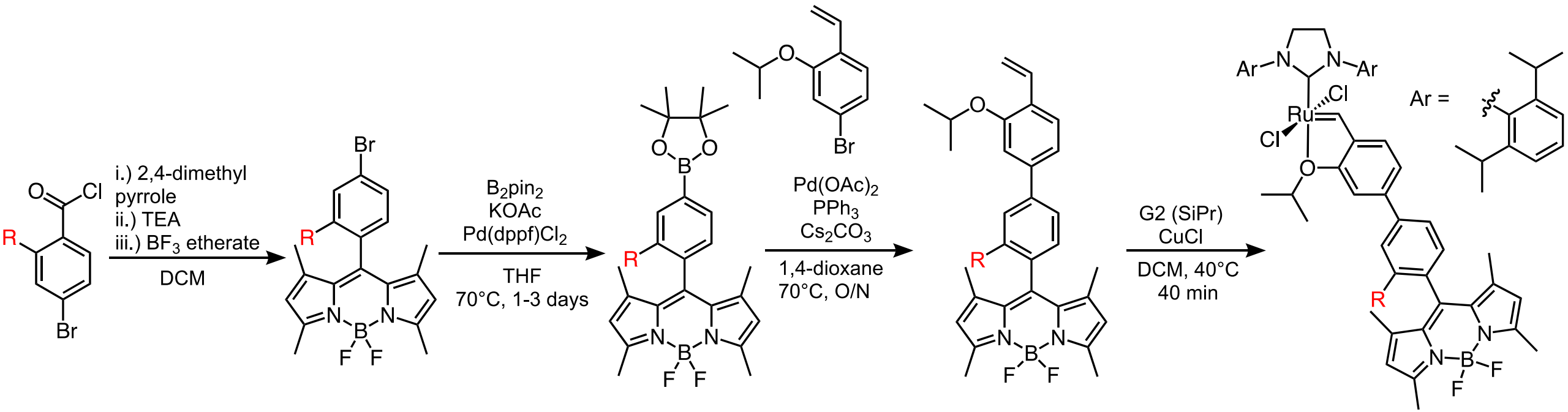


Figure 2. Structural modifications to increase quantum yield.

Synthetic Route

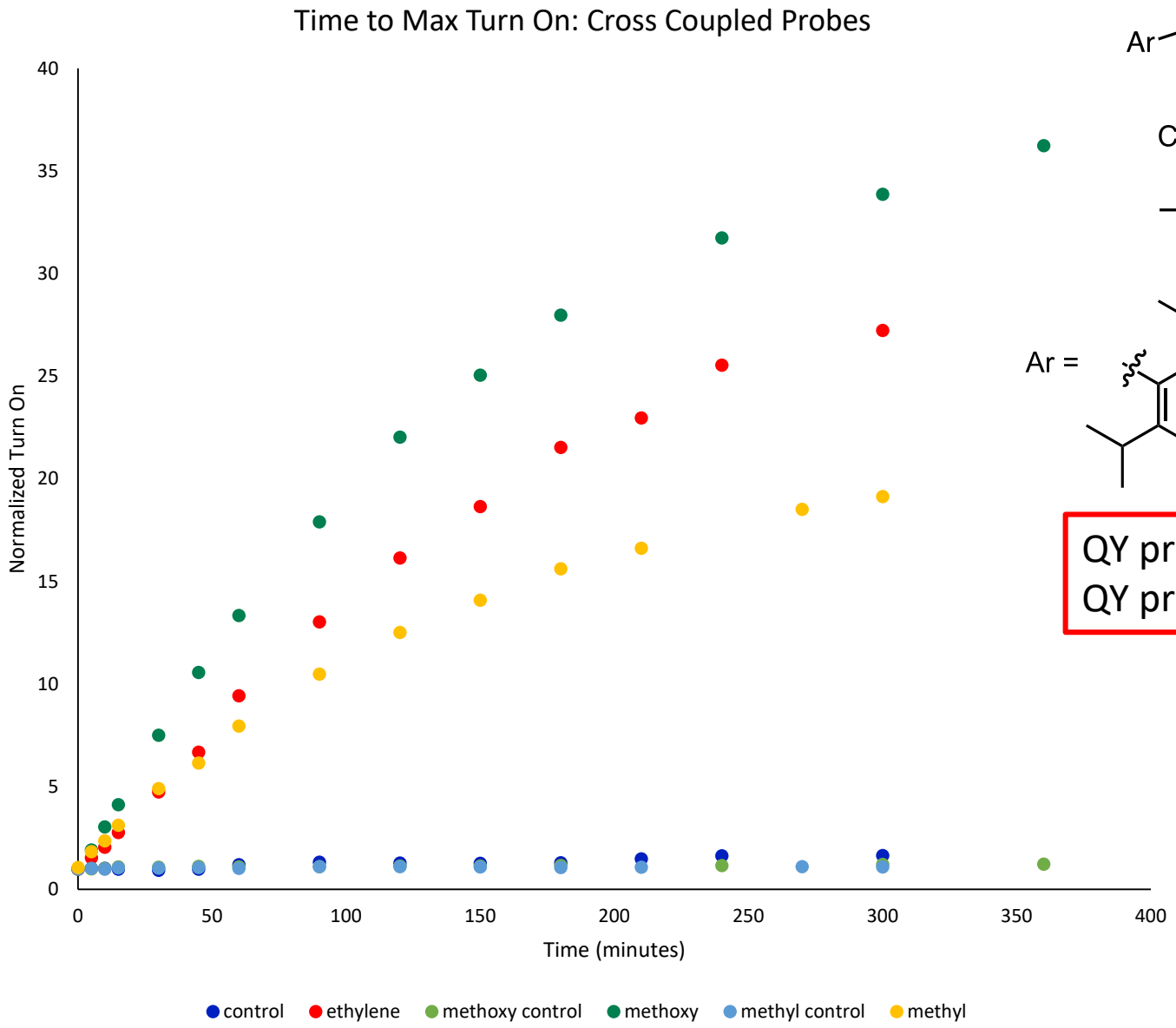


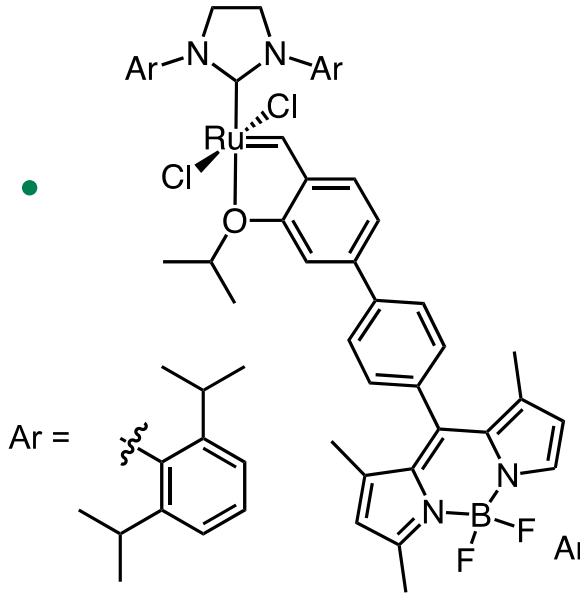
R= H, CH_3, CF_3, OCH_3

Probe Precursor

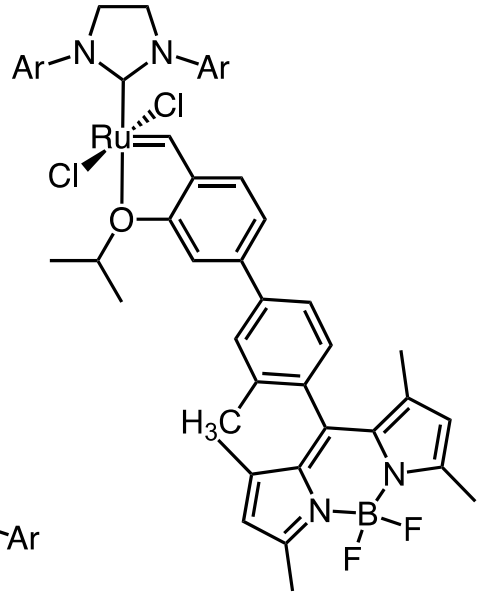
Probe

Results: Unsubstituted Probe vs Methoxy Substituted Probe

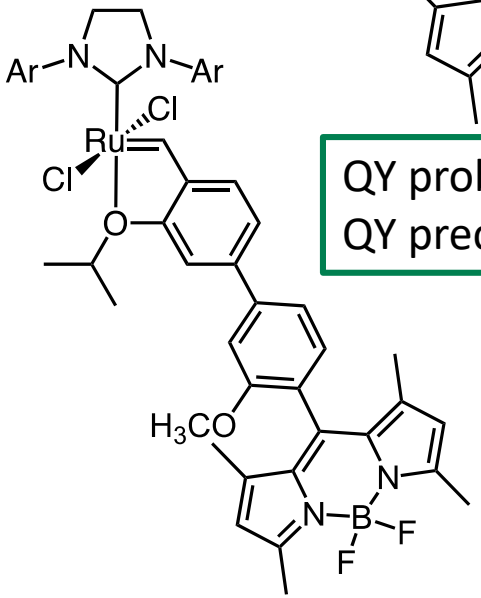




QY probe: 0.0199
QY precursor: 0.47



QY probe: 0.024
QY precursor: 0.86

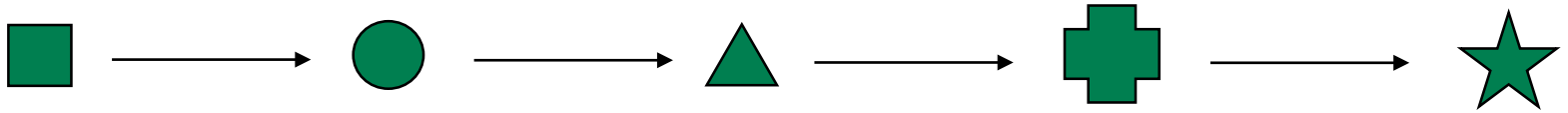


QY probe: 0.029
QY precursor: 0.87

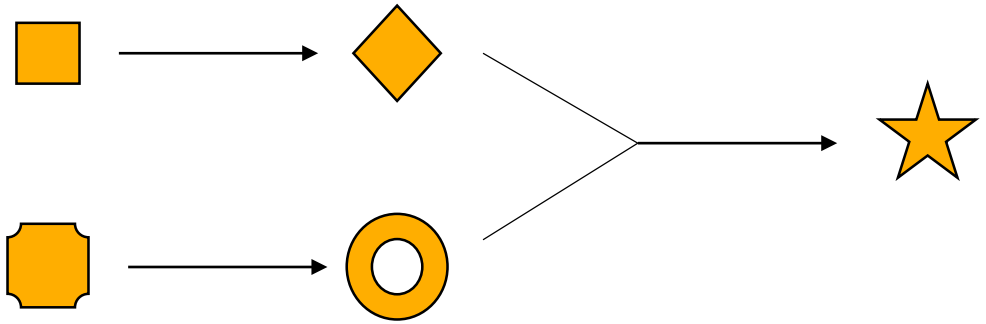
Summary

Aim One

Linear Synthesis:
Lower yielding, difficult to change



Convergent Synthesis:
Higher yielding, more modular
More desirable

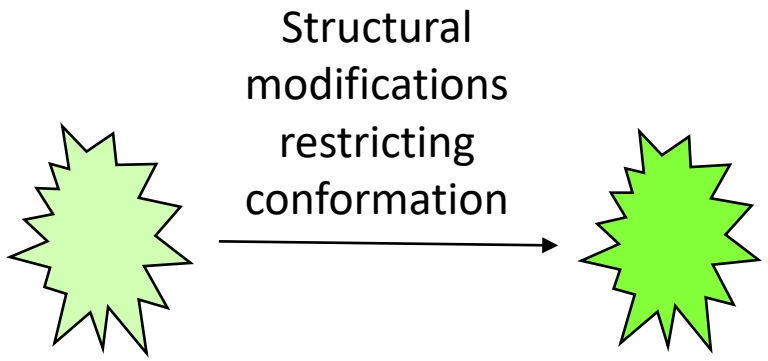


Aim Two

Structural modifications result in greater fluorescence due to steric constraints

- Greater fluorescence = increased quantum yield
- Higher QY results in more precise measurements in imaging experiments

More desirable



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