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Calmodulin's Interaction with α -Synuclein, a Protein Implicated in Parkinson's Disease

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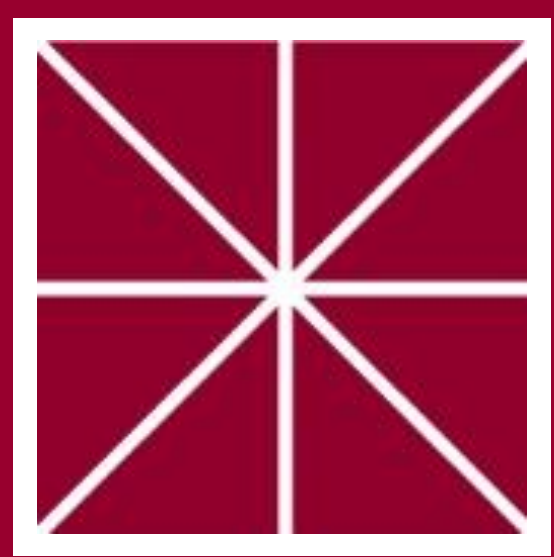
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Calmodulin's Interaction with α -Synuclein, a Protein Implicated in Parkinson's Disease

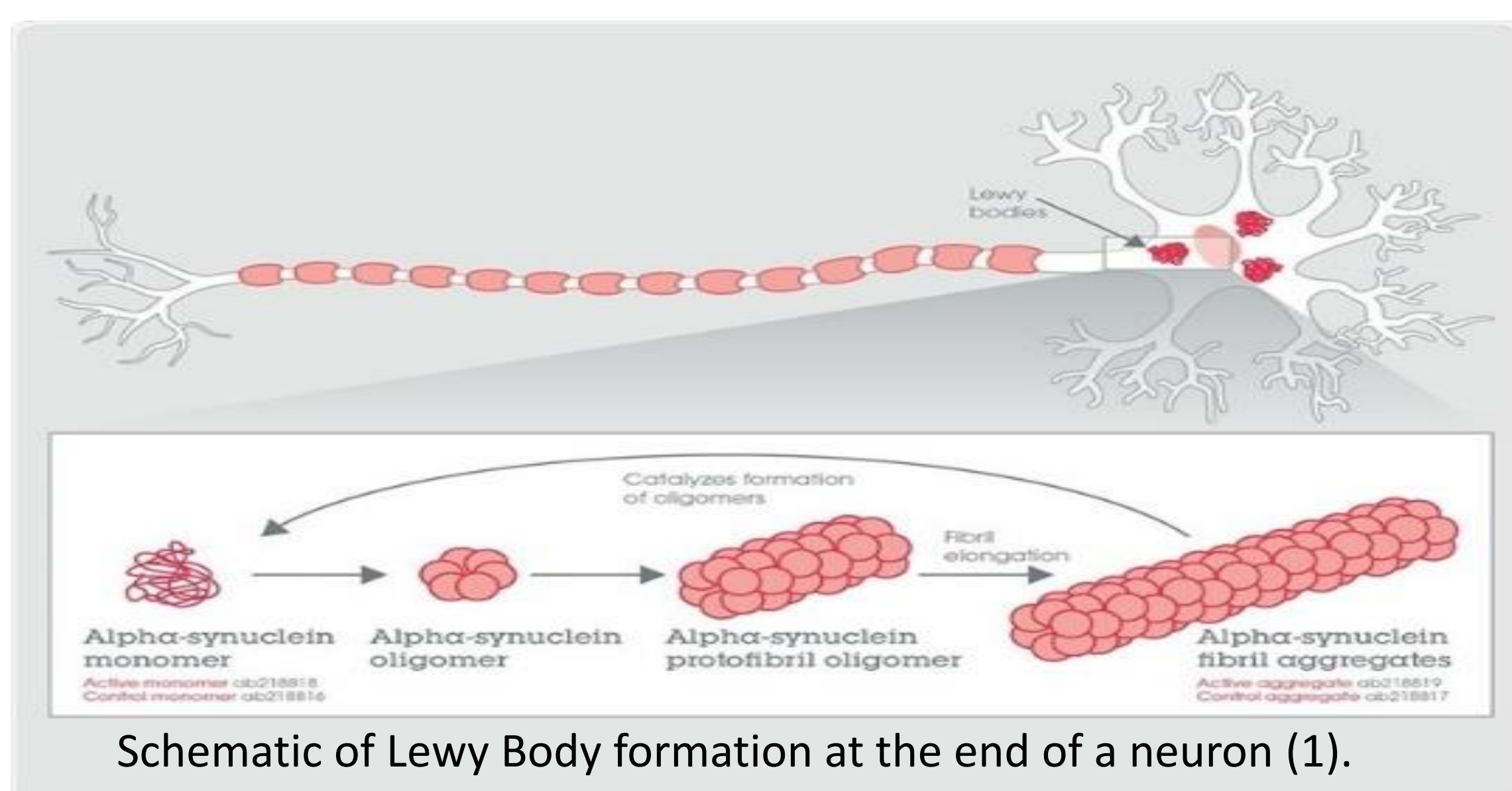
~Joeli Reim, Dr. Zeynep Akyol Ataman, Dr. Cedric Owens, and Dr. Jerry LaRue~



Introduction:

Calmodulin (CaM) is a protein found in the brain of healthy patients and is an intermediate calcium binding messenger with over 100 different targets in eukaryotic cells. α -Synuclein (α -Syn) is a protein found mainly at the ends of neurons in the pre-synaptic terminals in healthy patients, suggesting involvement with neurotransmitter signaling, however the exact function of α -Synuclein is still being investigated.

Recent studies have shown α -Syn and CaM interact, resulting in protein aggregation. Calcium binding to CaM enhances this aggregation, which functions as the structural center of Lewy bodies. Lewy bodies are known to develop in cranial nerve cells of Parkinson's disease patients and interrupts neuronal function. By using fluorescence spectroscopy, we studied the interaction between α -Syn and CaM, and explored calcium's role in the interaction that promotes the degenerateness of Parkinson's disease.

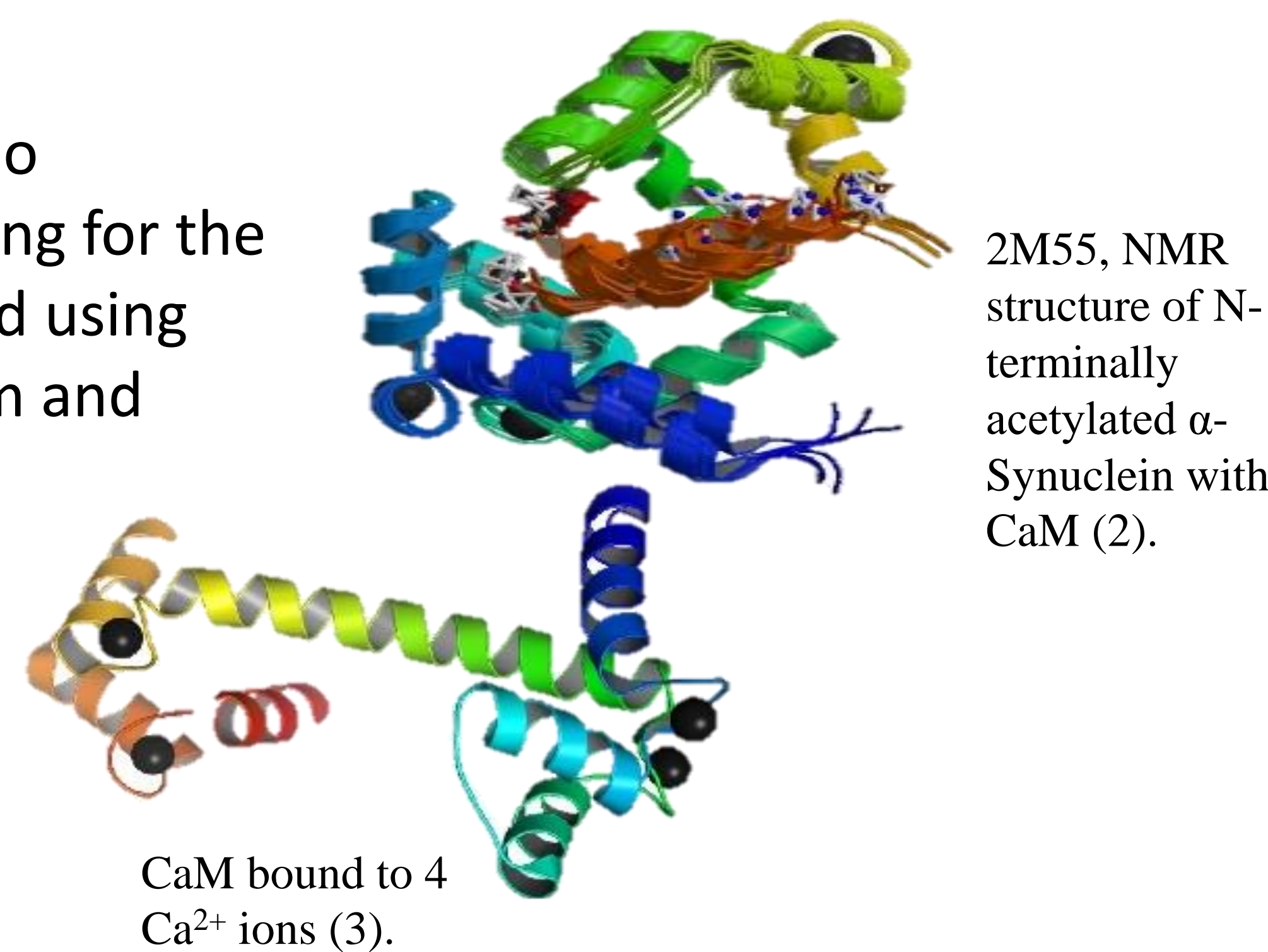


α -Synuclein:

α -Syn does not contain fluorescently active amino acids, but was tagged with Fluorescein (FITC) allowing for the interactions of α -Synuclein and CaM to be observed using fluorescence spectroscopy. FITC is excited at 490 nm and emits light at 525 nm.

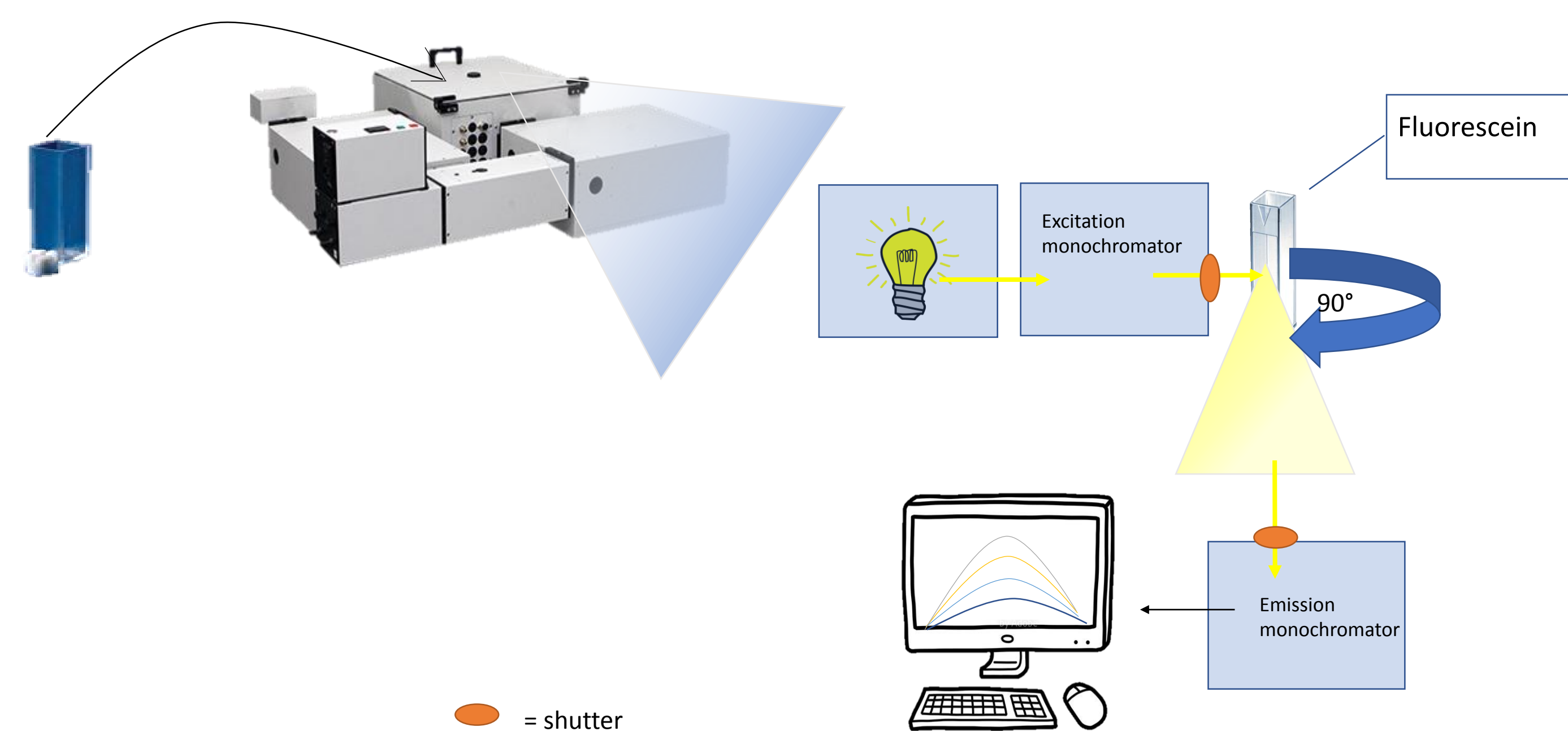
Calmodulin:

CaM consists of four calcium binding domains. Hydrophobic residues in these domains coordinate binding of CaM to the target molecule.

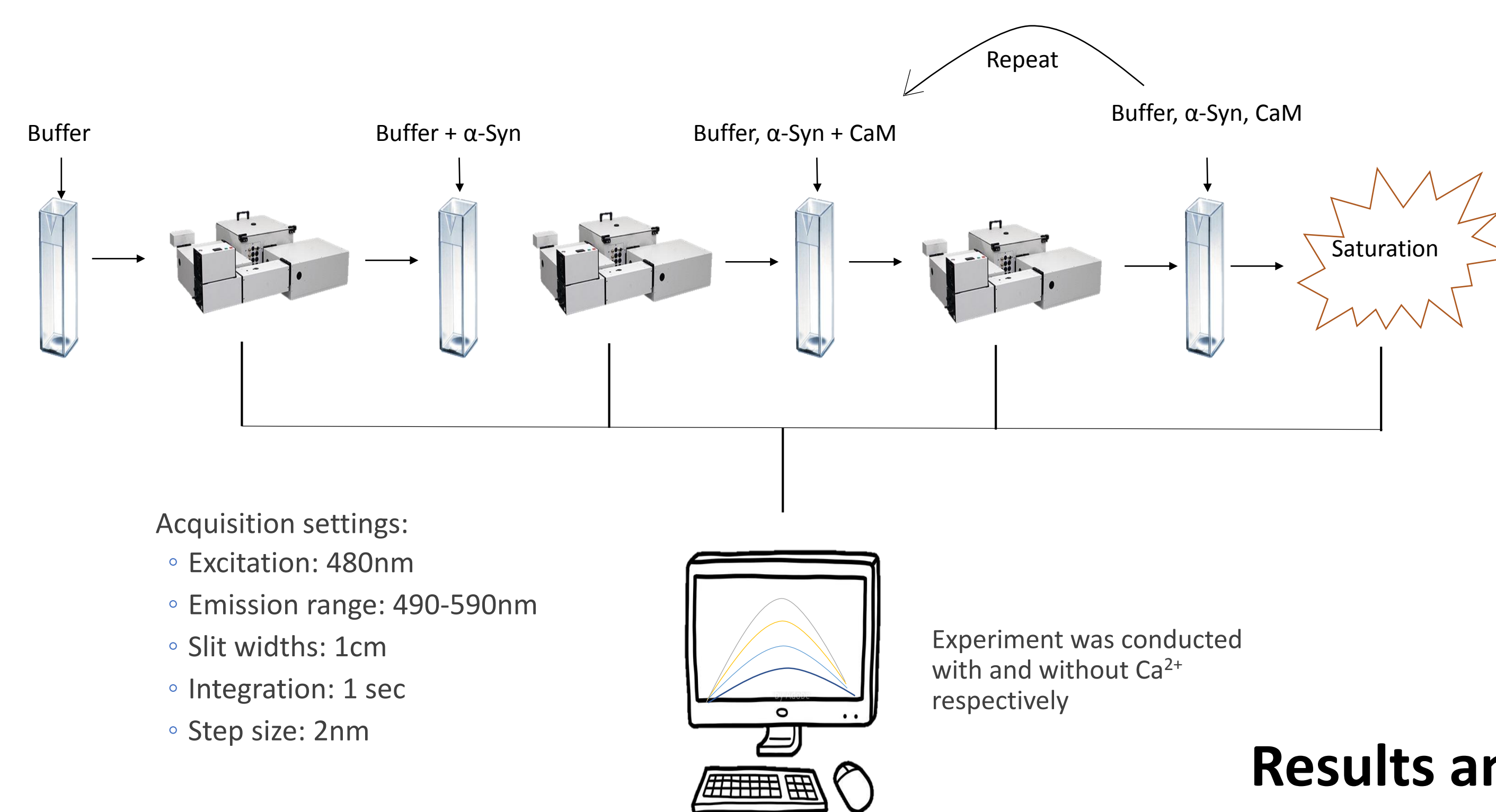


CaM bound to 4 Ca^{2+} ions (3).

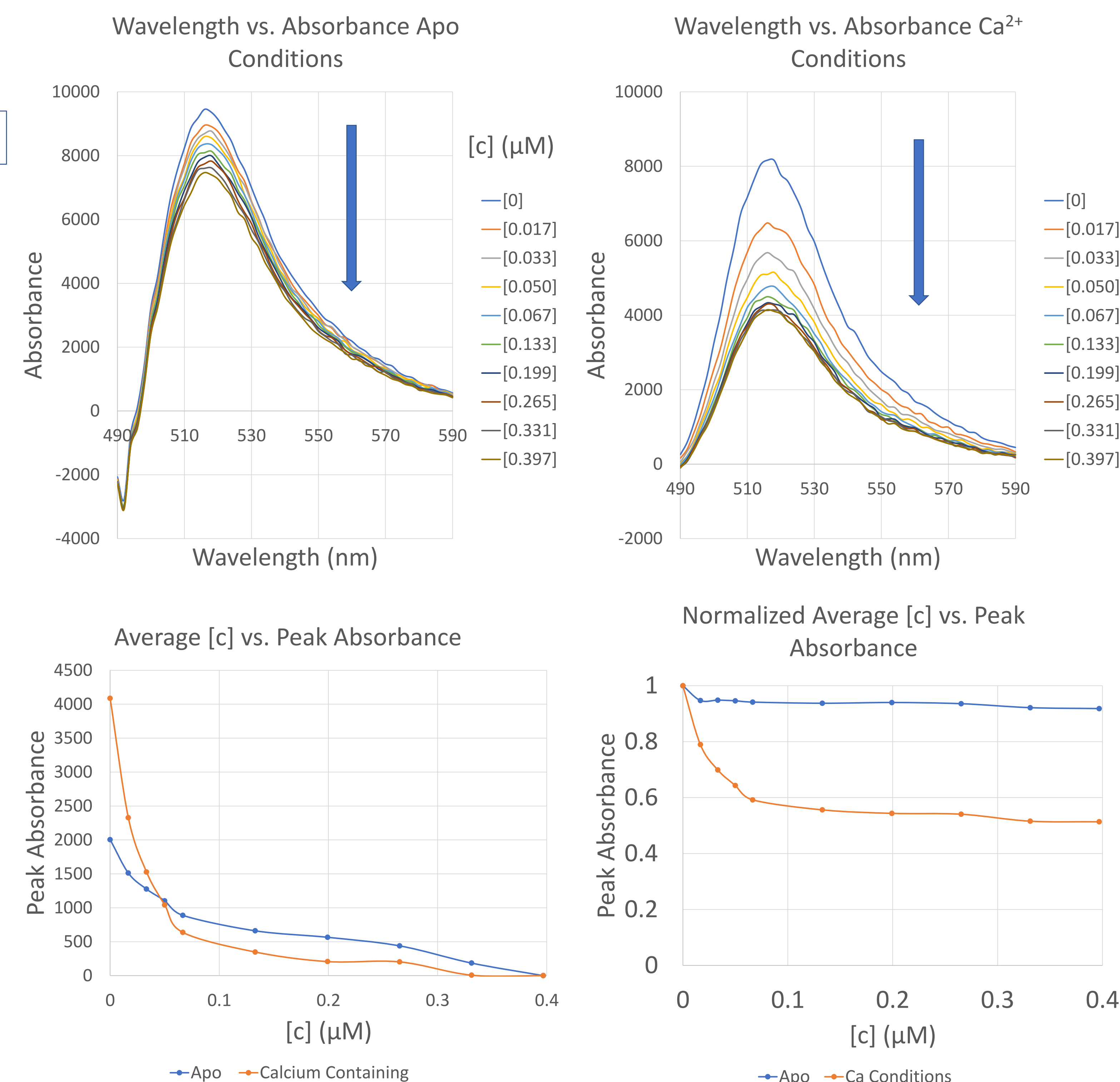
Fluorescence Spectroscopy:



Procedure:



Fluorescence Spectroscopy Results:



Results and Discussion:

Novel findings:

Both conditions showed a decrease in fluorescence as the concentration increased

1. CaM binding to α -Syn in the presence or absence of Ca^{2+} changes the fluorescent environment

2. α -Syn and CaM are aggregating and precipitating out

Detergent (triton-x) may break apart the aggregation

Comparing the initial absorption to final absorption, the fluorescent signal was more quenched in the presence of Ca^{2+}

Concluding that Ca^{2+} strengthens the interaction between α -Syn and CaM

References:

1. Abcam. *News Medical Life Sciences*2017.
2. Gruschus, J.; Yap, T.; Pistolesi, S.; Maltsev, A.; Lee, J. *Protein Data Bank*2013.
3. Editors. Calmodulin - Definition, Function and Structure, <https://biologydictionary.net/calmodulin/> (accessed Apr 22, 2018).