



Light-Controlled Protein Delivery Using Plasmonic Gold Nanoparticles

Name: Dorian Bruch

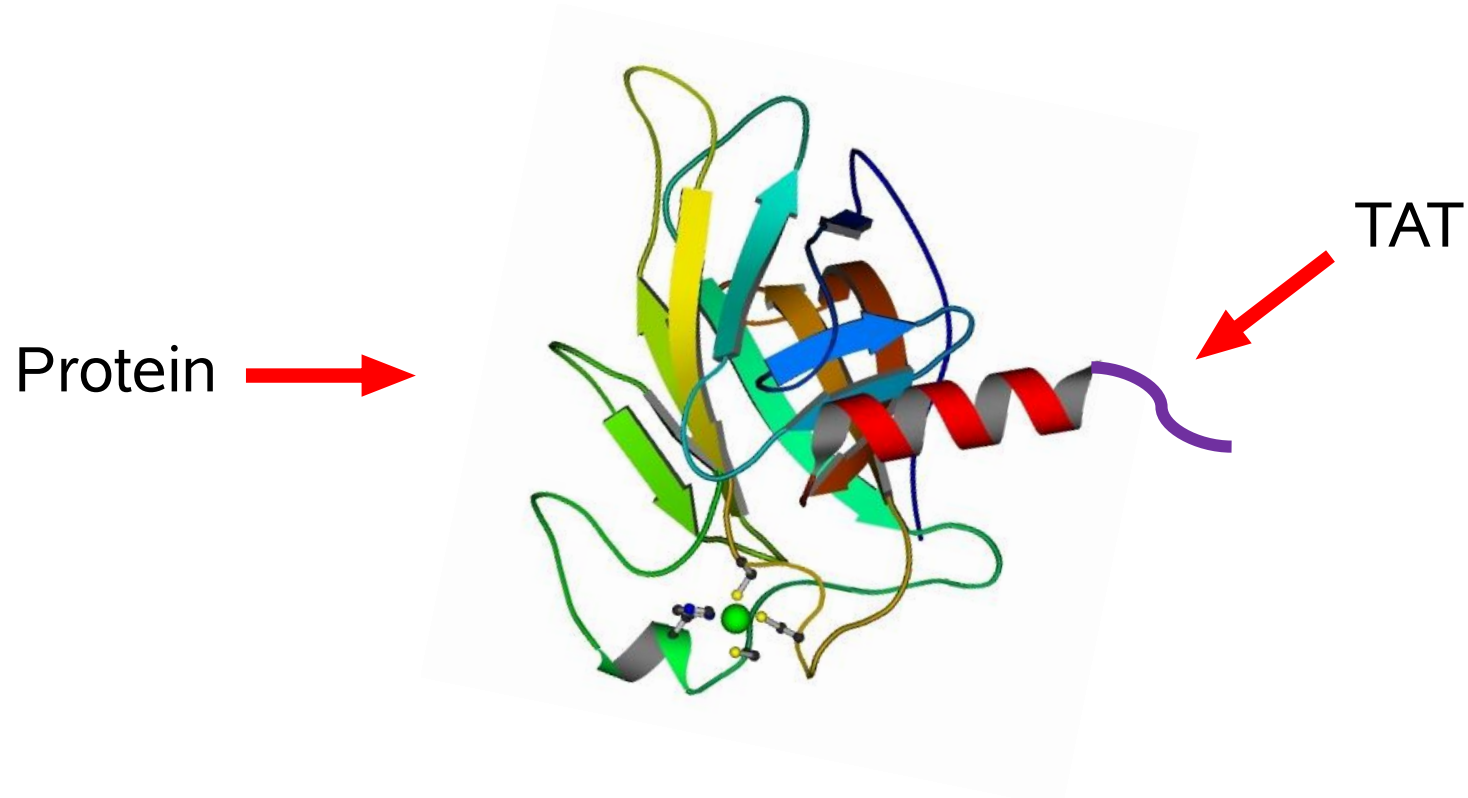
Major: Chemical Engineering

Mentor: Dean Morales

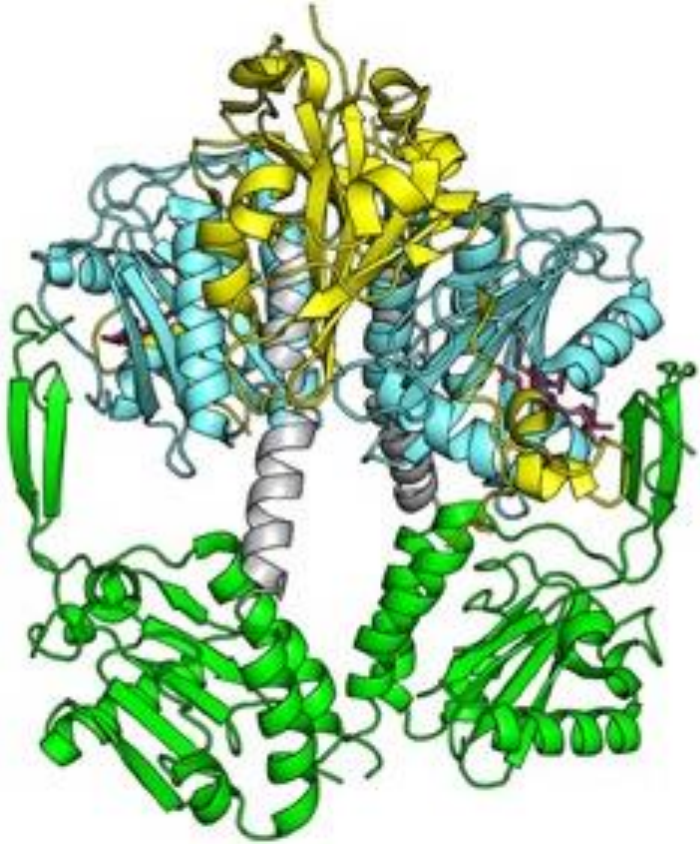
Faculty Advisor: Dr. Norbert Reich

Department: Chemistry/Biochemistry

Light-control is a solution to time-resolved studies of cellular processes

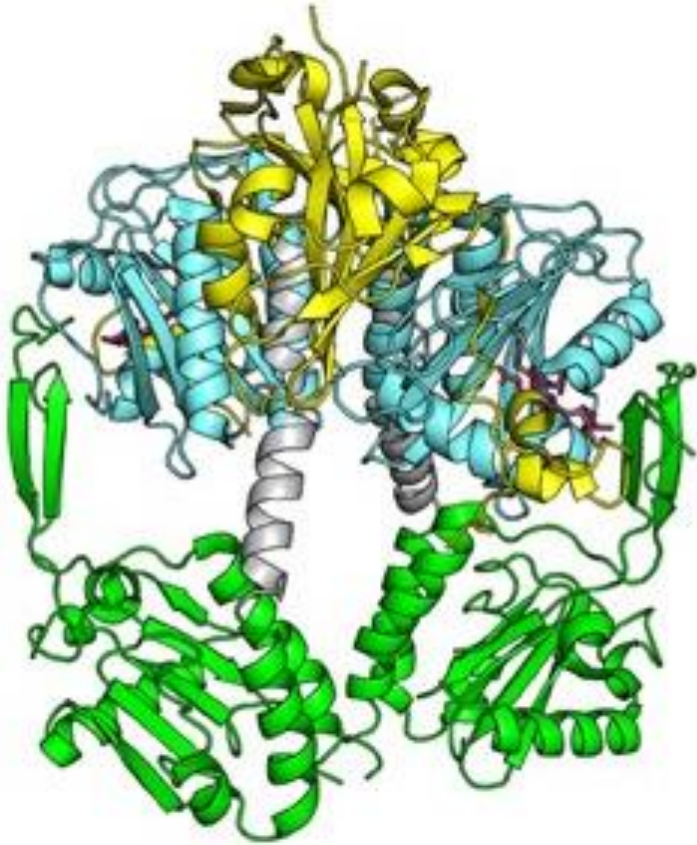


Optogenetic proteins require substantial effort to create

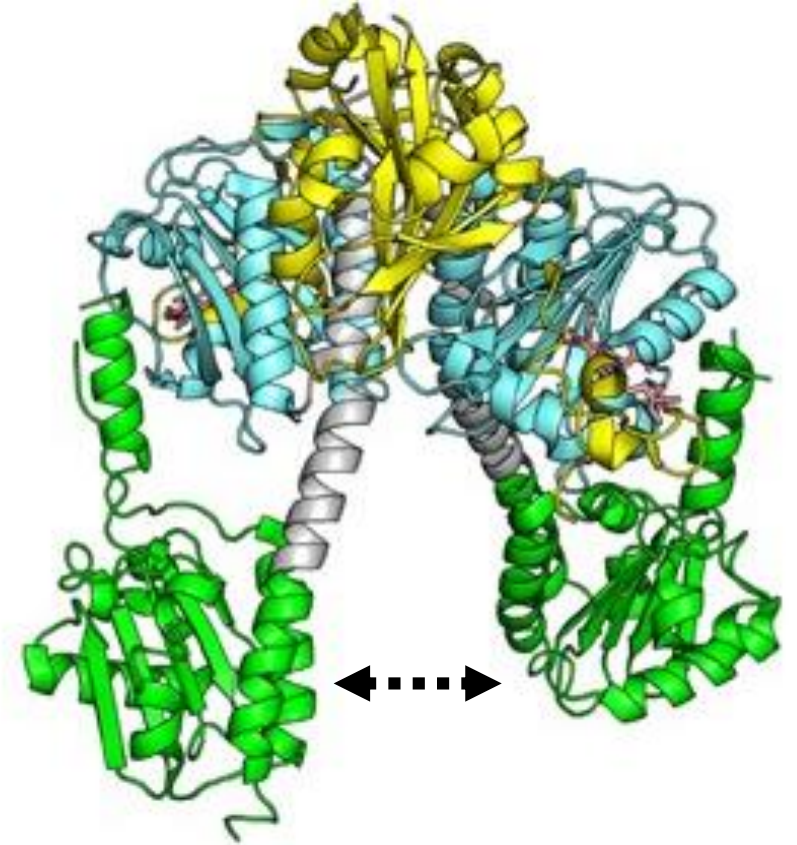


Optogenetic protein
(inactive)

Optogenetic proteins require substantial effort to create

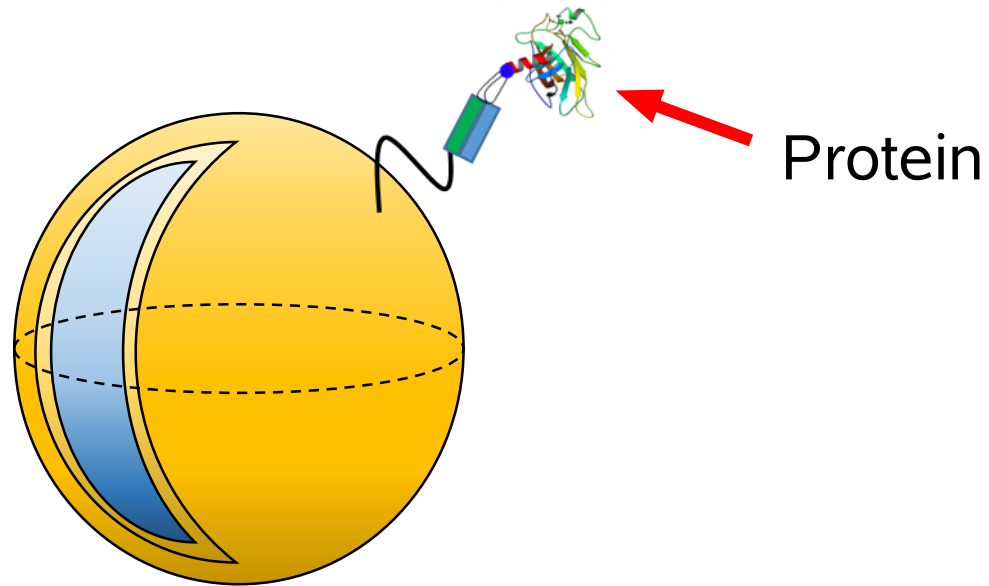


Optogenetic protein
(inactive)



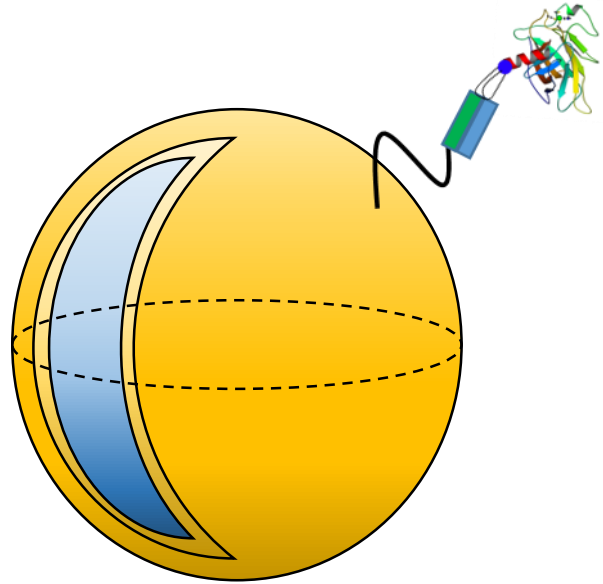
Optogenetic protein
(active)

Nanoparticles can provide a light-controlled release

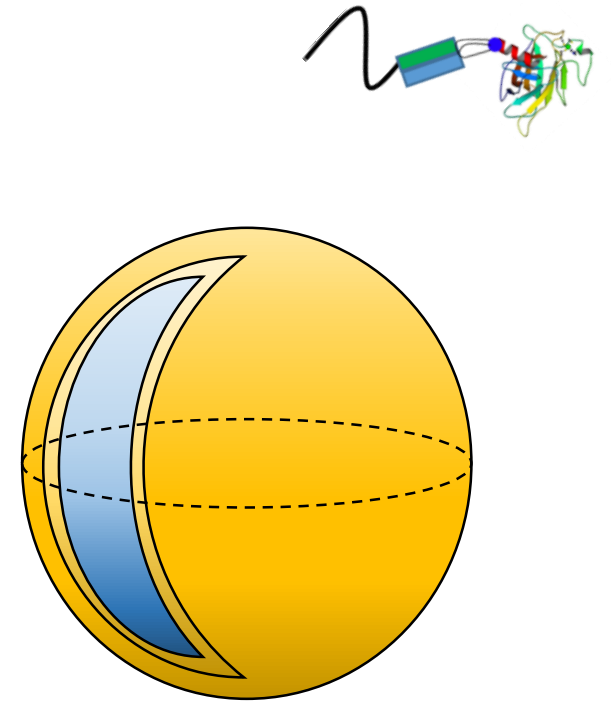


Nanoparticle with
Native Protein

Nanoparticles can provide a light-controlled release



Nanoparticle with
Native Protein



Protein Released

Protein Purification

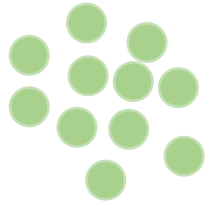
Nanoparticle Assembly

Delivery and Evaluation

Protein Purification

Nanoparticle Assembly

Delivery and Evaluation

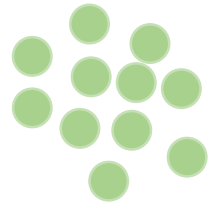


Cells

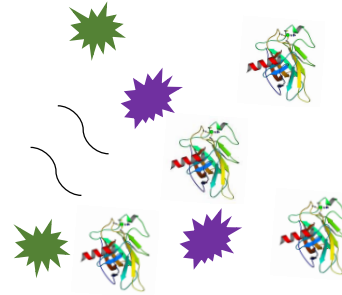
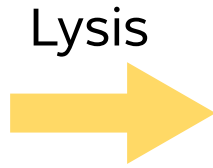
Protein Purification

Nanoparticle Assembly

Delivery and Evaluation



Cells

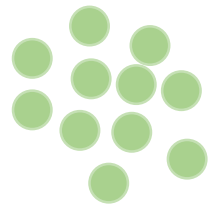


Crude Protein

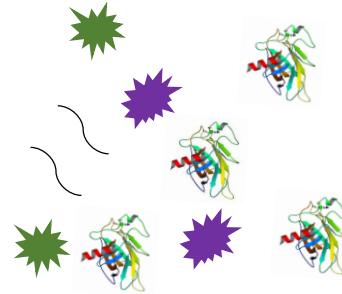
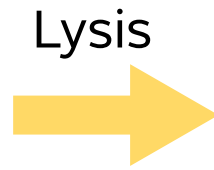
Protein Purification

Nanoparticle Assembly

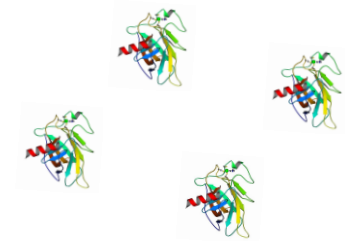
Delivery and Evaluation



Cells



Crude Protein

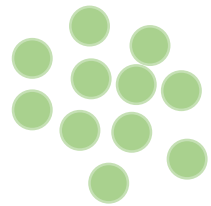


Pure Protein

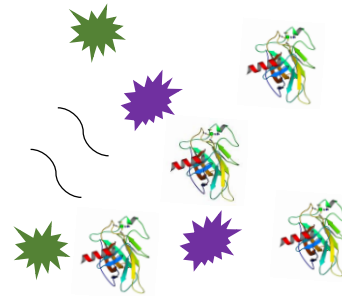
Protein Purification

Nanoparticle Assembly

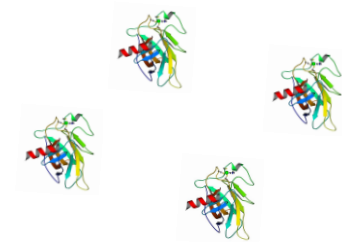
Delivery and Evaluation



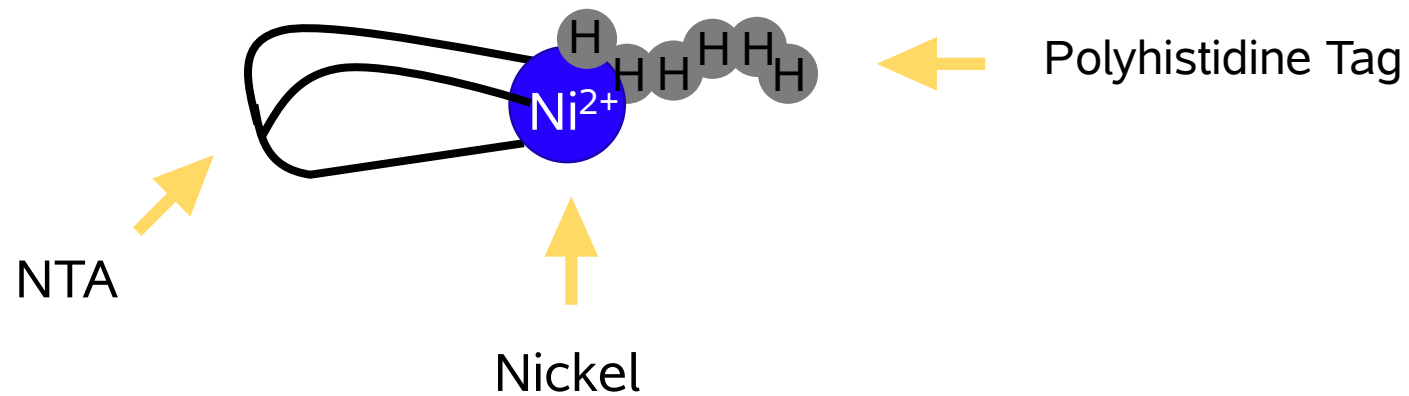
Cells



Crude Protein



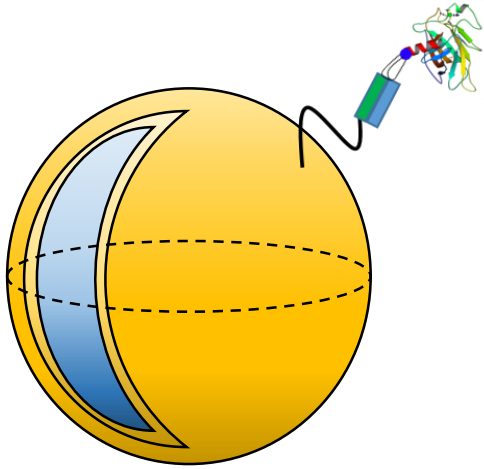
Pure Protein



Protein Purification

Nanoparticle Assembly

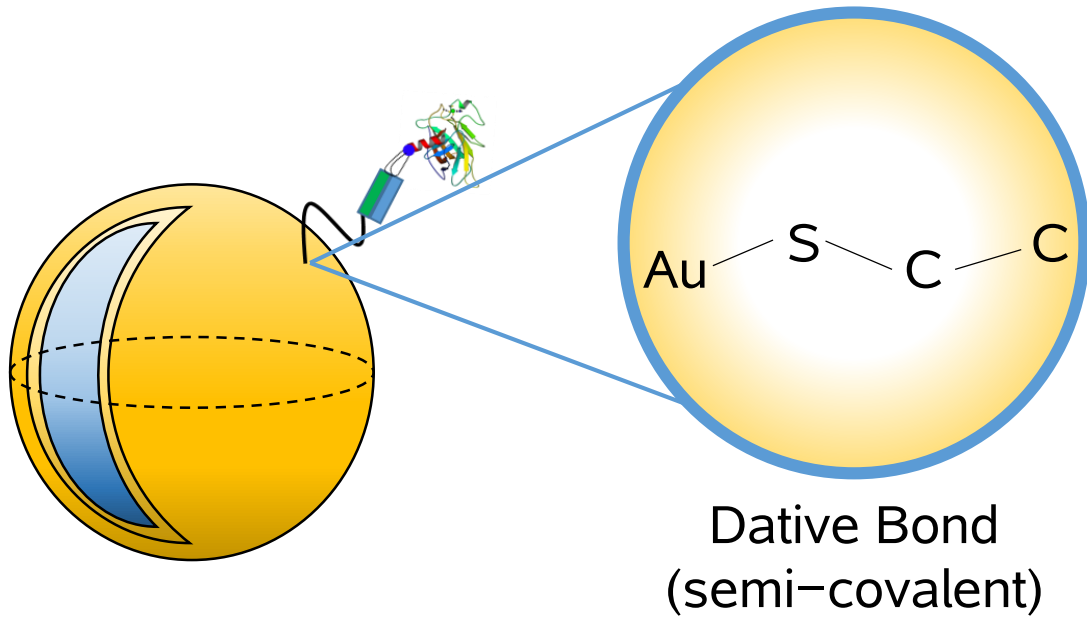
Delivery and Evaluation



Protein Purification

Nanoparticle Assembly

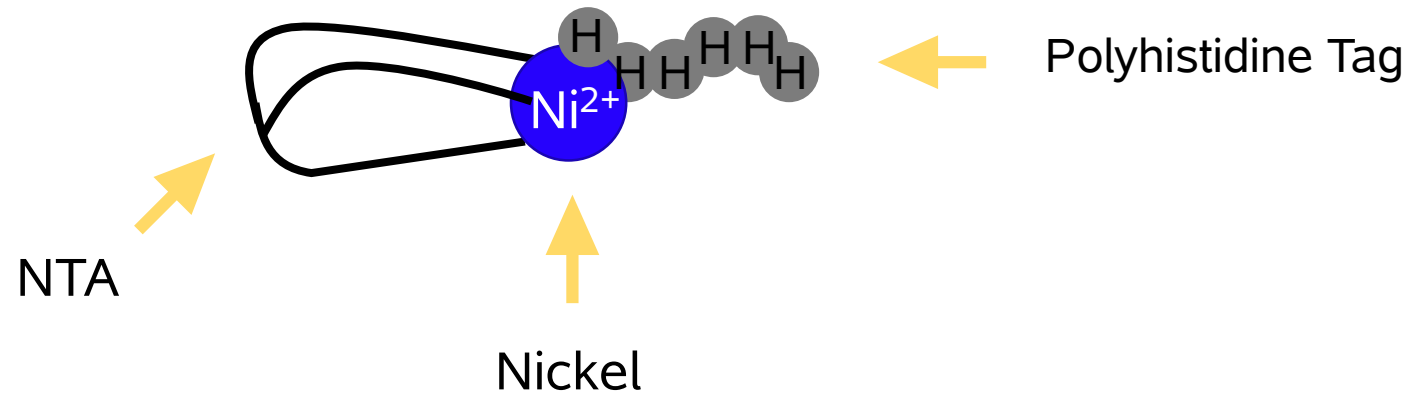
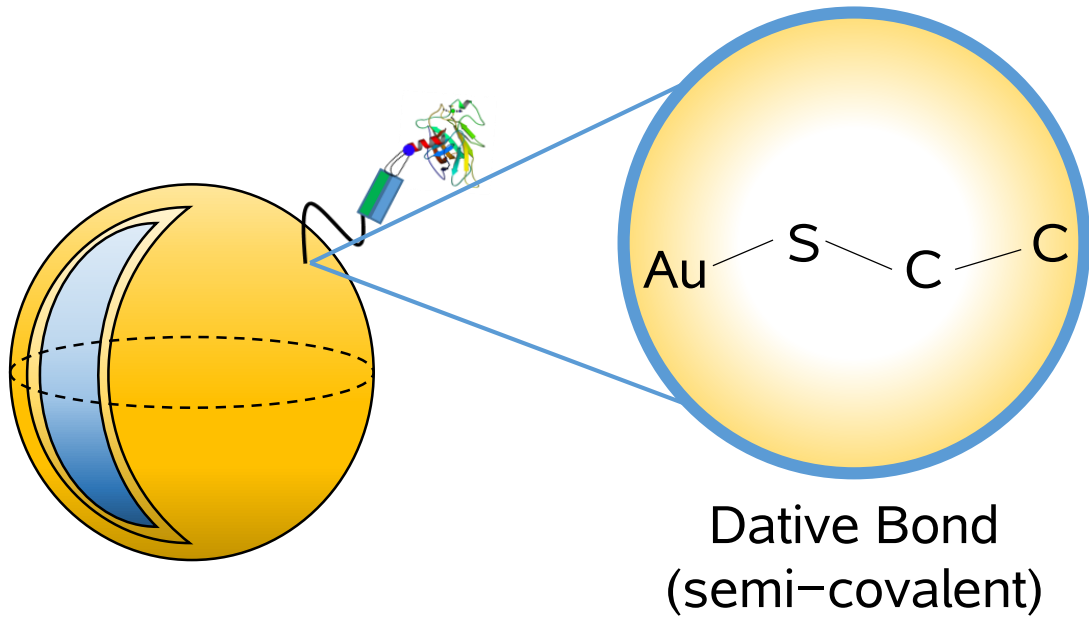
Delivery and Evaluation



Protein Purification

Nanoparticle Assembly

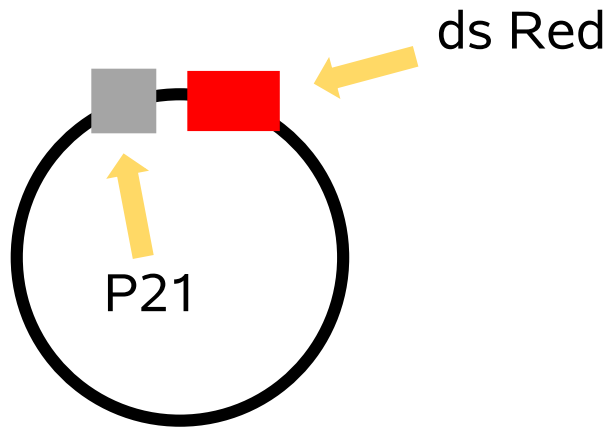
Delivery and Evaluation



Protein Purification

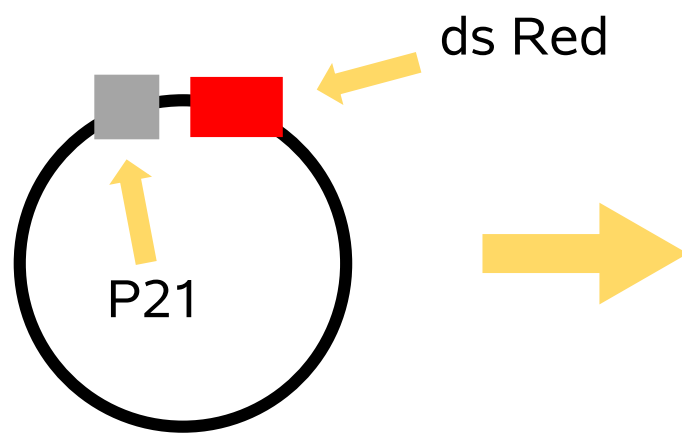
Nanoparticle Assembly

Delivery and Evaluation



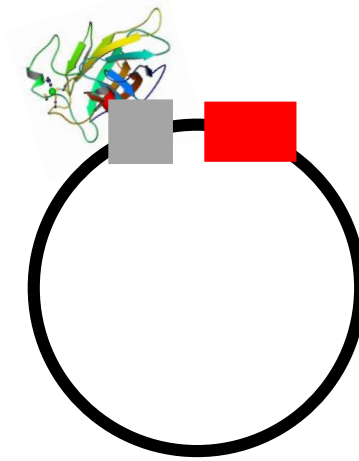
P53 Promoter Plasmid

Protein Purification



P53 Promoter Plasmid

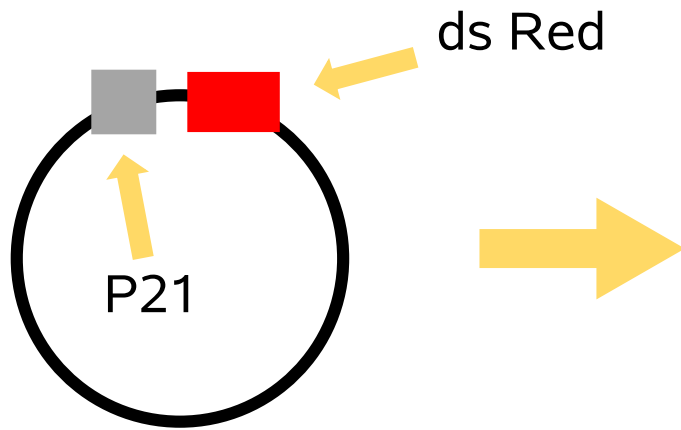
Nanoparticle Assembly



P53 Introduced

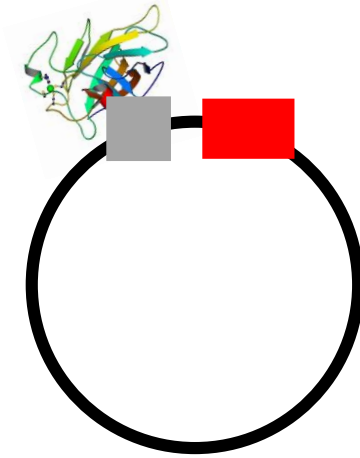
Delivery and Evaluation

Protein Purification



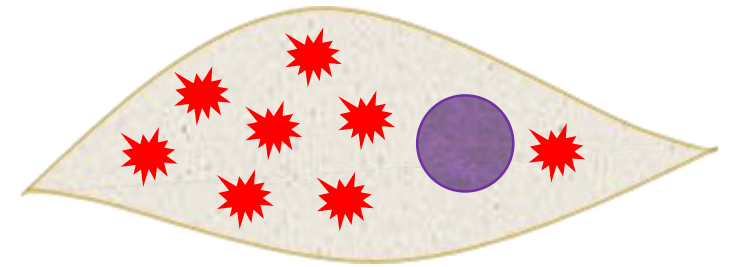
P53 Promoter Plasmid

Nanoparticle Assembly



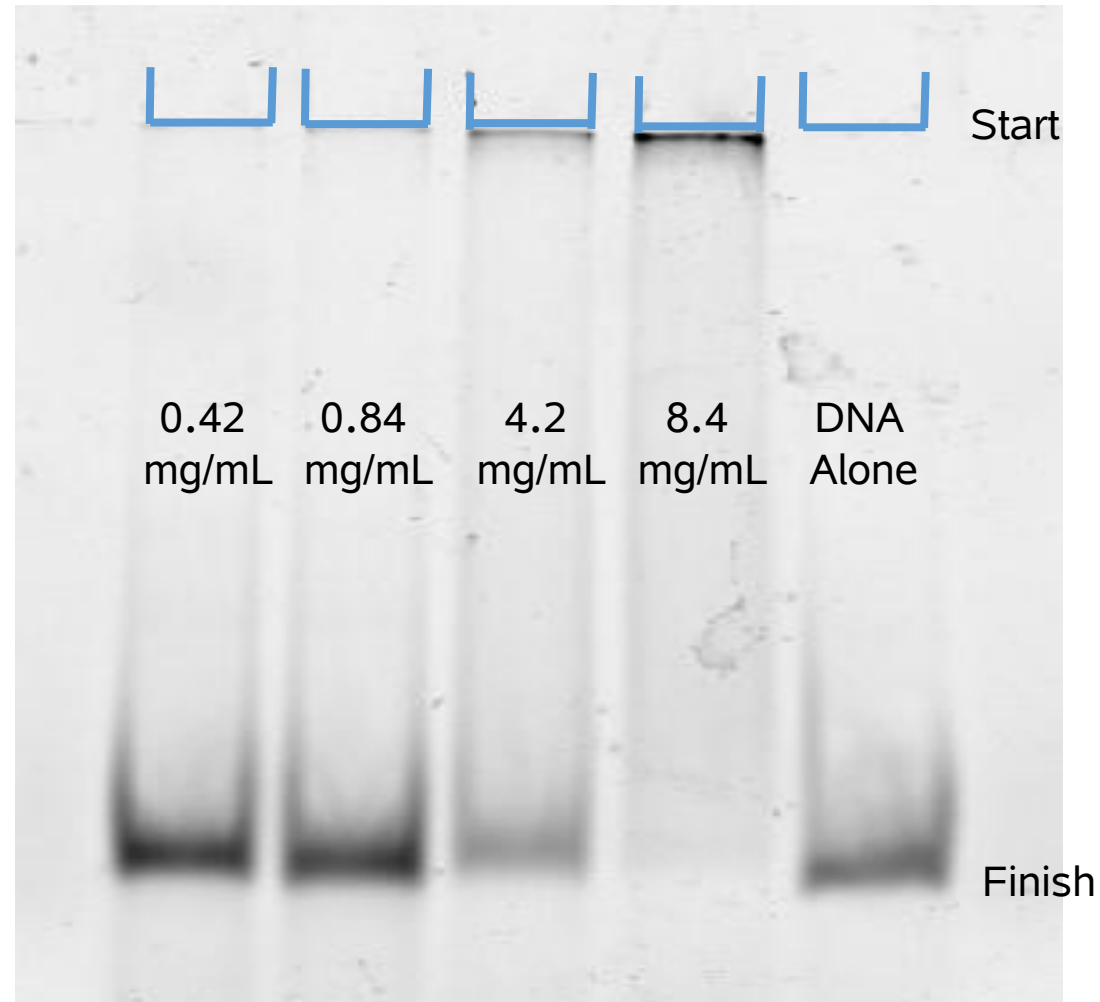
P53 Introduced

Delivery and Evaluation



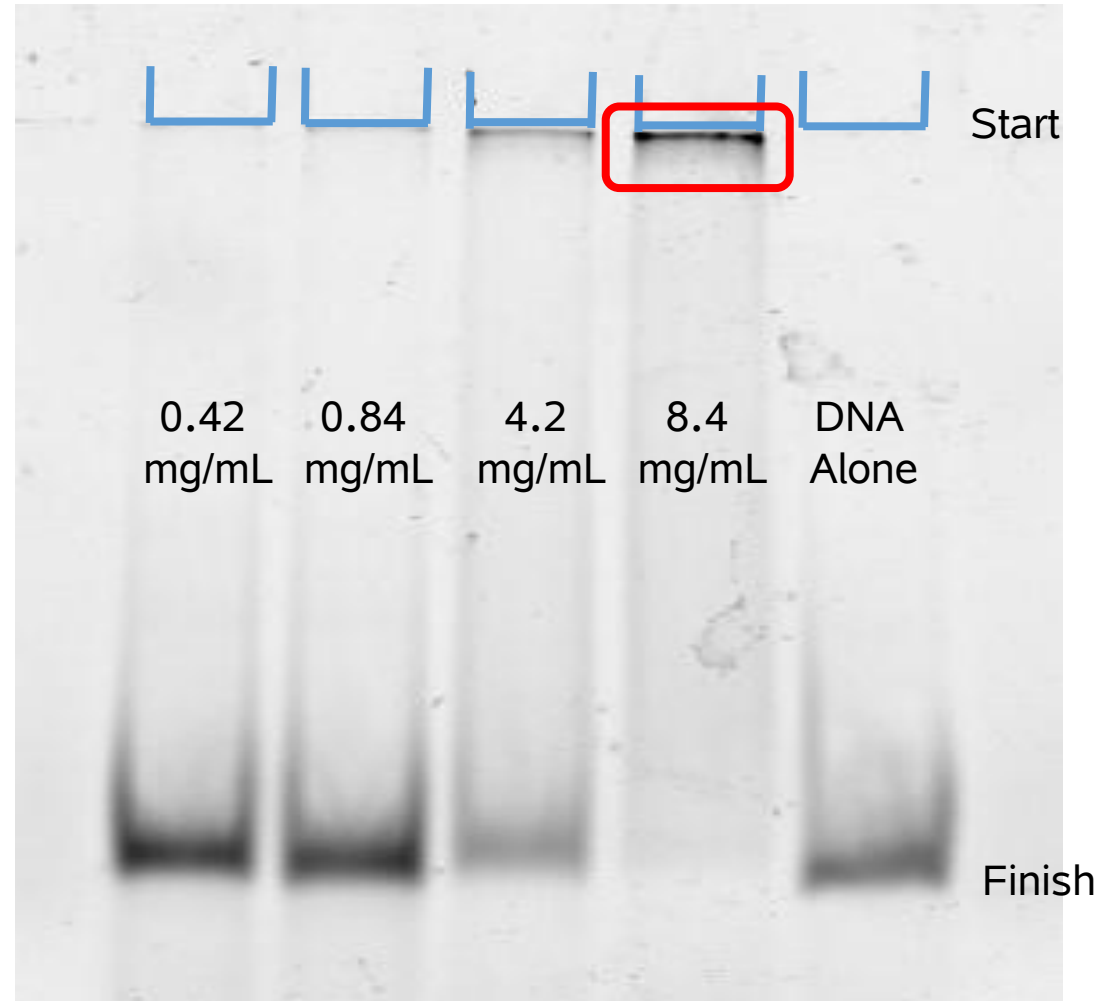
Red Fluorescent Protein Produced

P53 EMSA



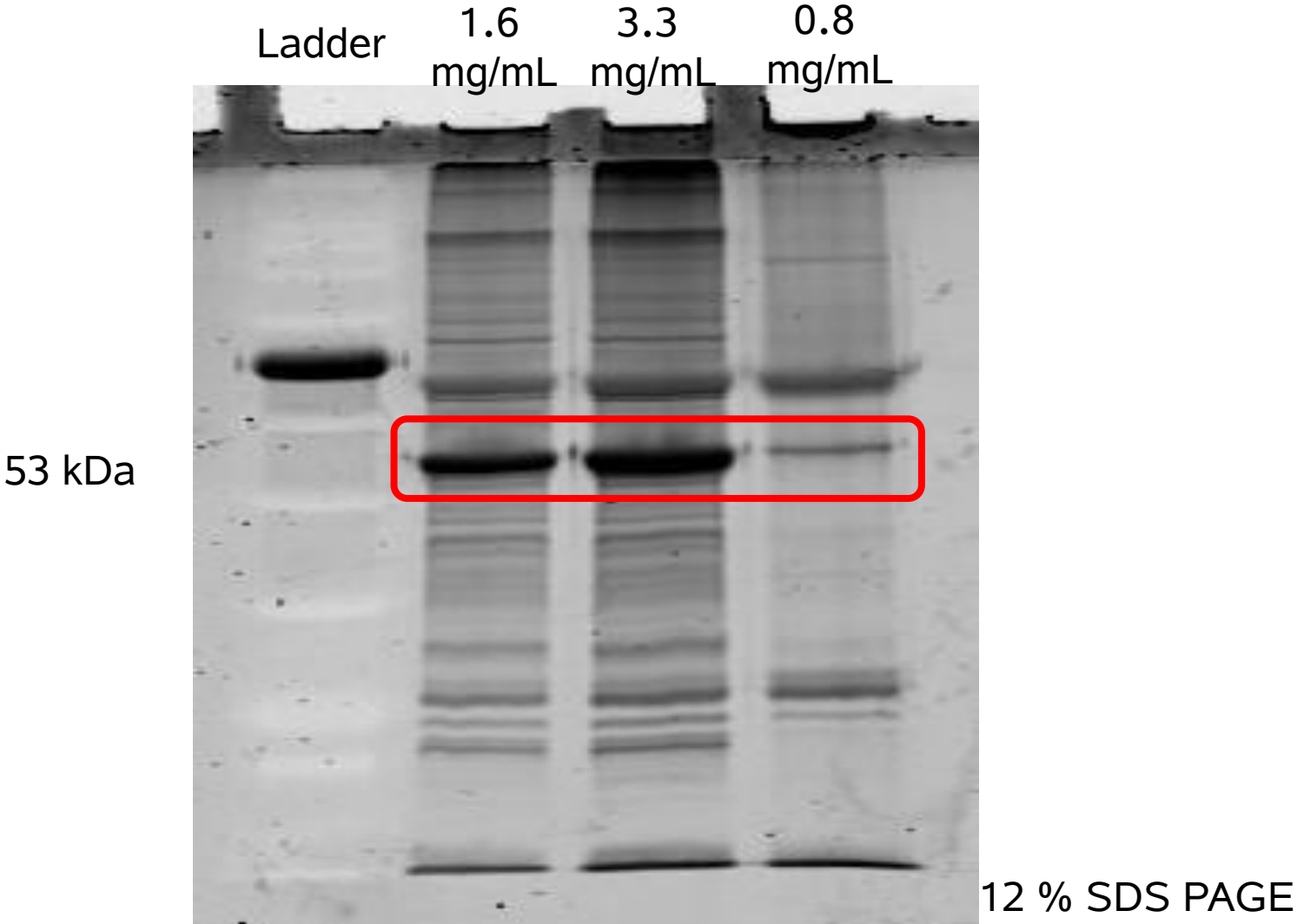
8 % NATIVE PAGE

P53 EMSA

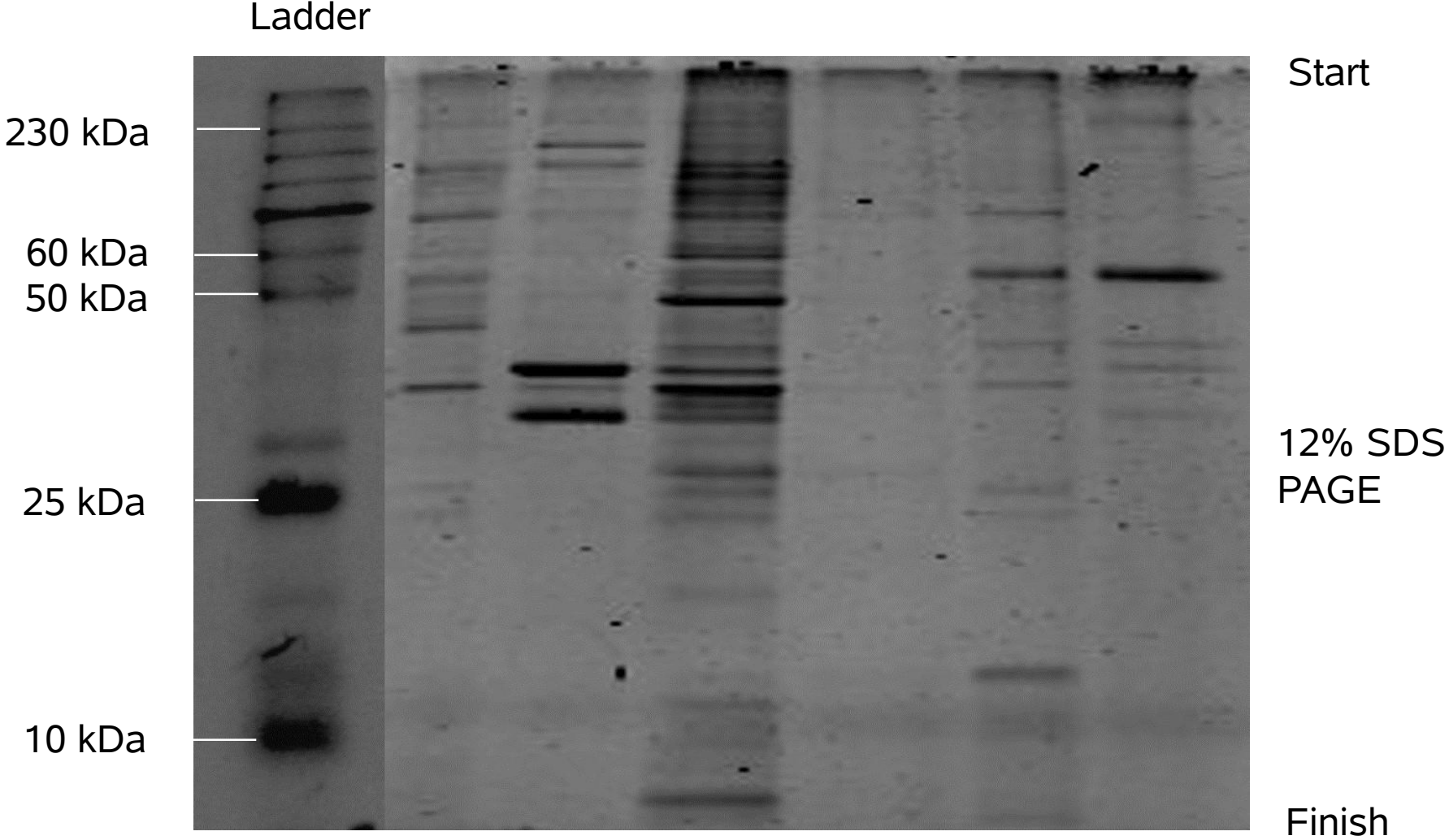


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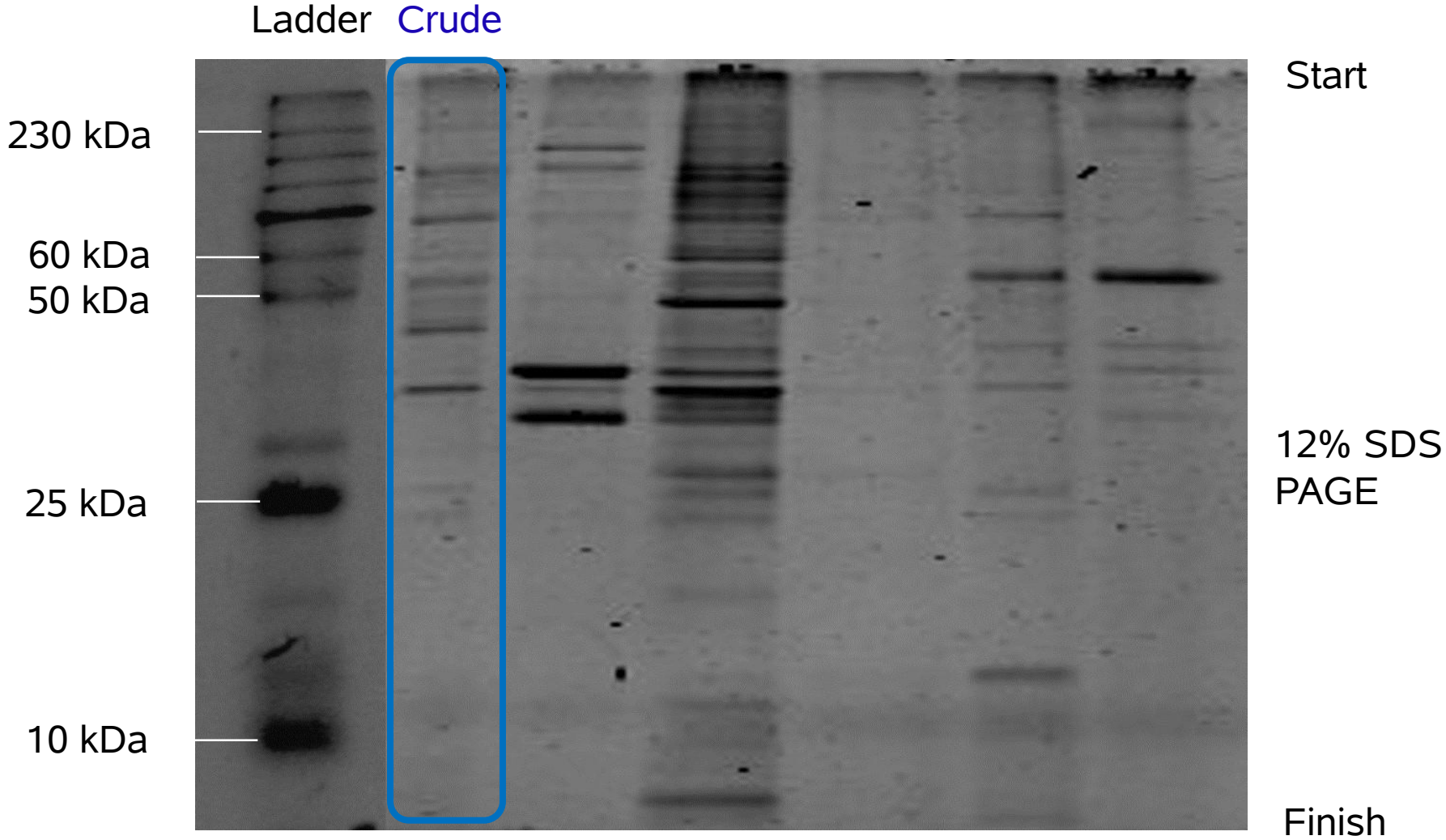
Purity of the P53



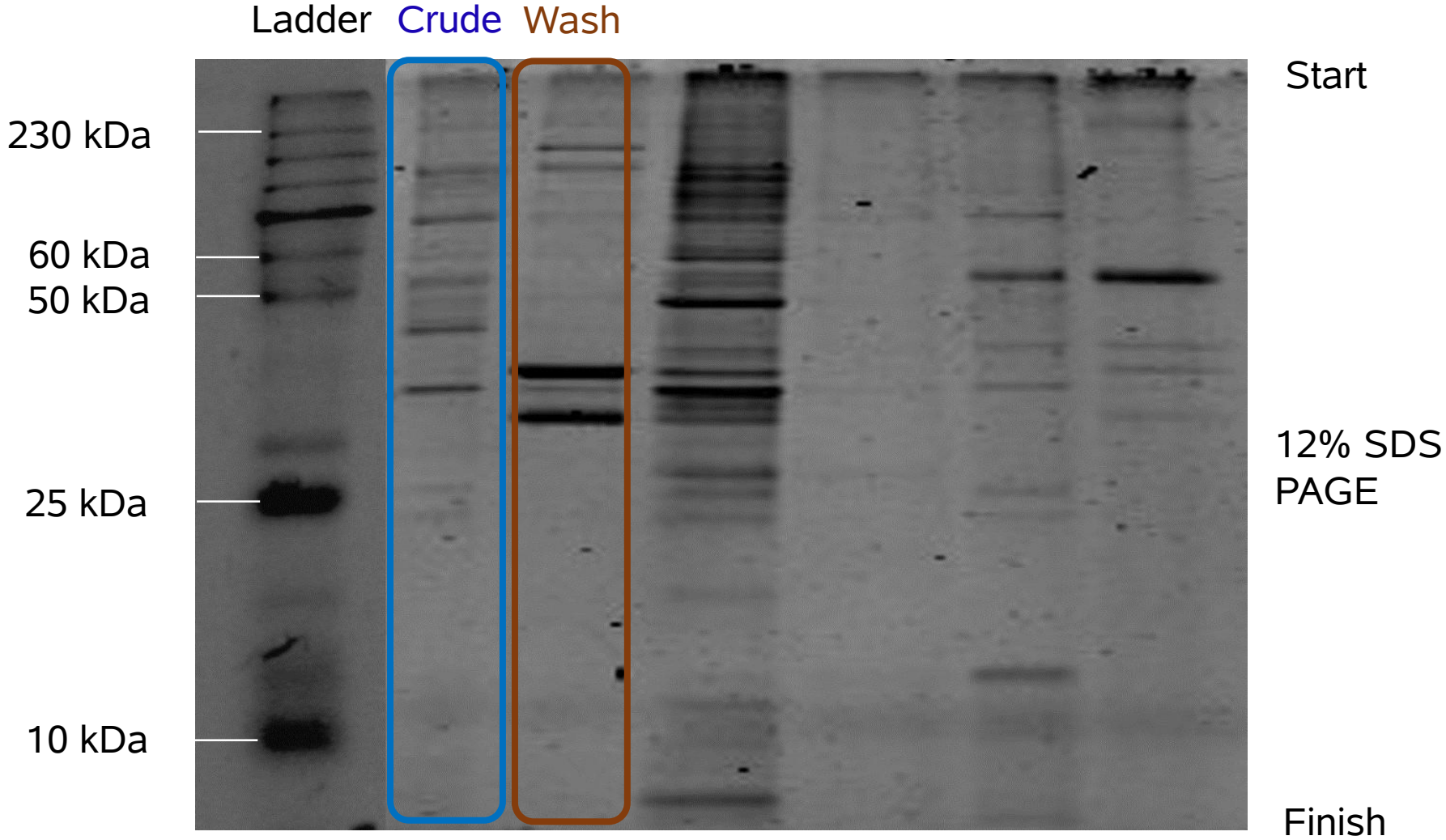
P53 Purification



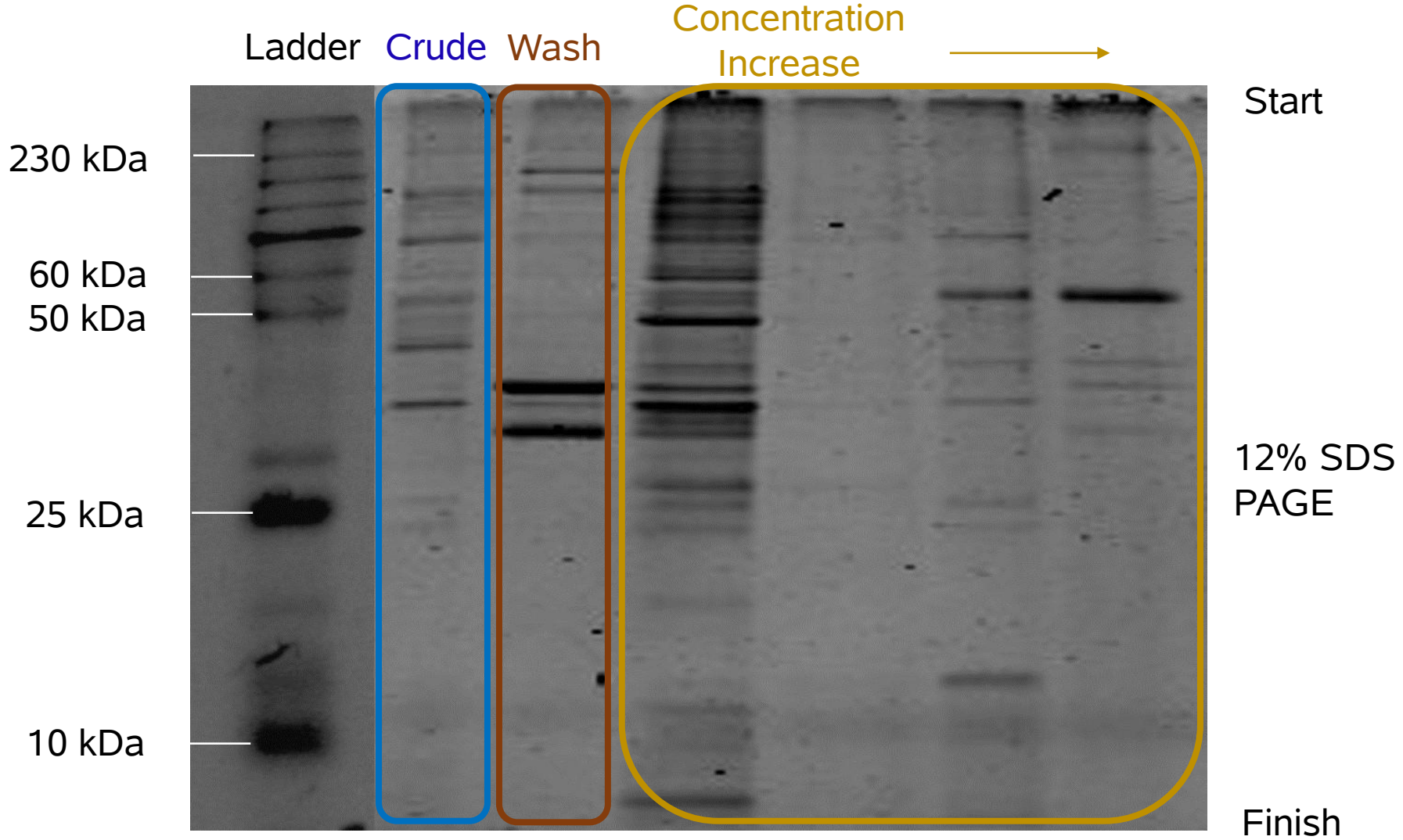
P53 Purification



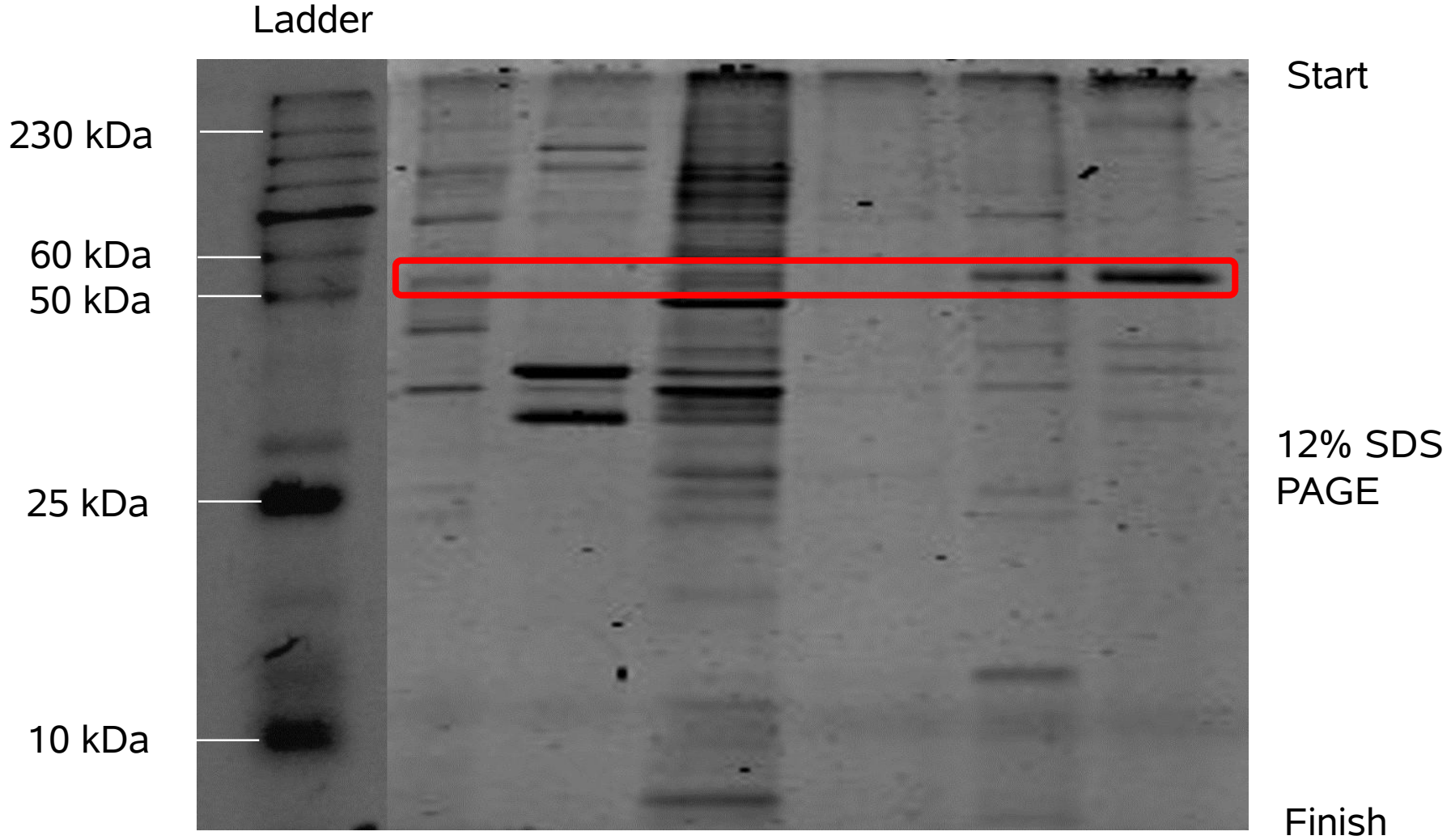
P53 Purification



P53 Purification



P53 Purification



Continued Efforts

- Establish control to show promoter is functional
- Delivery of p53 to cells with validated promoter

Acknowledgments

Dean Morales

Reich Laboratory

California Nanosystems Institute

Neural Research Institute



National Institutes
of Health



DNA Annealing

