Innovative Use of Raman Spectroscopy

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Introduction

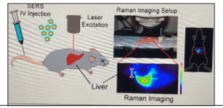
The diverse team led by Dr. Zavaleta offer an interesting dynamic,, with a team of undergraduate and graduate students as well as post-docs.graduates, as well as post-docs. The entire team offers a fun and engaging introduction of their innovative research of **Raman spectroscopy, with a focus on using gold nanoparticles and fluorescents.**

Objective & Impact of Professor's Research

This research of Raman spectroscopy is the use of a light scattering phenomenon that involves a small fraction of light being inelastically scattered when interacting with matter, resulting in lower energies and longer wavelengths. Thanks to each object being made of different molecular compositions, Raman scattering can be used to identify substances by its Raman "fingerprint"

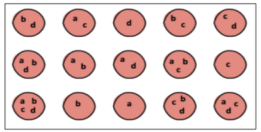
The use of gold nanoparticles stem from the SERS effect which allows small molecules to bind with metals. This combination of gold nanoparticles and SERS can be used for efficiency of imaging contrast agents.

This research plays an important role with the hopes of creating a more reliable and efficient method of detecting tumors with the binding of these gold nanoparticles and use of Ramaspectrosopy to easily spot where the tumor is with great accuracy.

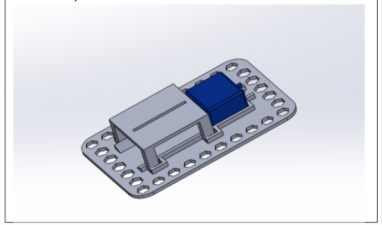


Skills Learned

Taking into account that objects have their own unique Raman "fingerprint," we were able to study under our mentor Alex real life data of multiple examining different "flavors," which are created by changing the small molecules attached to the metal. The fingerprints allow for detecting multiple "flavors" which was what we observed under a code developed in MatLab to create visuals of how much of each flavor went into a sample.



Under the lead of Sean, we were able to interact with the program Solidworks, which is best described as a 3D modeling program. We were able to learn the basics of the program which can be used to make custom parts by 3D printing your creation. This program plays a big role in the lab by offering custom parts, however Sean uses it for a rather more interesting reason. By using this program, Sean creates little, comfortable placeholders for live mice who are unconcious to study how nanoparticles move within their body real time. Balancing ethics with science :).



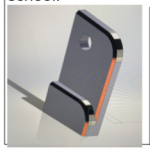
How This Relates to Your STEM Coursework

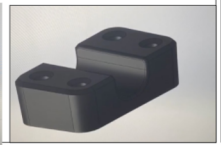
Overall, this SHINE experience opened my eyes completely to the scientific, engineering world. I was unaware of the true advances we have achieved and the true process of research as well as experiments. My knowledge on what science and engineering really was, was limited to machines and medicine. I came into the program unaware of what Biomedical engineering truly was and now have a deeper insight not only on biomed, but as well as other engineering and science fields thanks to the inclusion of the cohort, the engineers we got to meet, as well as thanks to the knowledge and diversity in Dr. Zavaleta's amazing lab.

Personally, something I will be taking back with not only school, but with friends and family is the program Solidworks, mostly part to how much I enjoyed it. It offers a well balanced introduction of challenging as well as not entirely intimidating into what some can say the basics of the engineering world. This program is best described as:

"Legos for adults" -Sean.

At a school that doesn't really receive any types of STEM curriculums except math, I believe Solidworks would be a great addition as a STEM curriculum providing important engineering skills. All in all, I hope to change the lack of attention towards STEM at my school.





Next Steps for You OR Advice for Future SHINE Students

Following the completion of the program, I would love to continue working on Solidworks. This type fit my learning style the most, in introducing a new type of software I was unfamiliar with and providing a challenge. However, it was much fun to interact with while also having a growing skill ceiling and bringing out my own sense of creativity and alternate methods of completing my goal providing a well balanced learning experience.

As for future SHINE students, I suggest being involved with the cohort and challenging yourself to try new software despite how intimidating they might seem at first glance.

Acknowledgements

I would love to give a special thanks to the SHINE mentors, Dr. Mills as well as Ms. Juarez for being entirely involved with us students as well as helping me during this SHINE journey. It was truly an honor to have been accepted into this research program, I appreciate all that Dr. Zavaleta did for my partner, like allowing us to observe what a real lab looked looks like as well as getting us involved directly with her students as they held their labs. During this program we were able to get over learning barriers entirely thanks to our mentors Sean and Alex, who challenged us with new and relevant info & data as well as introducing us to new softwares; I am truly appreciative of the patience and faith they had for us.