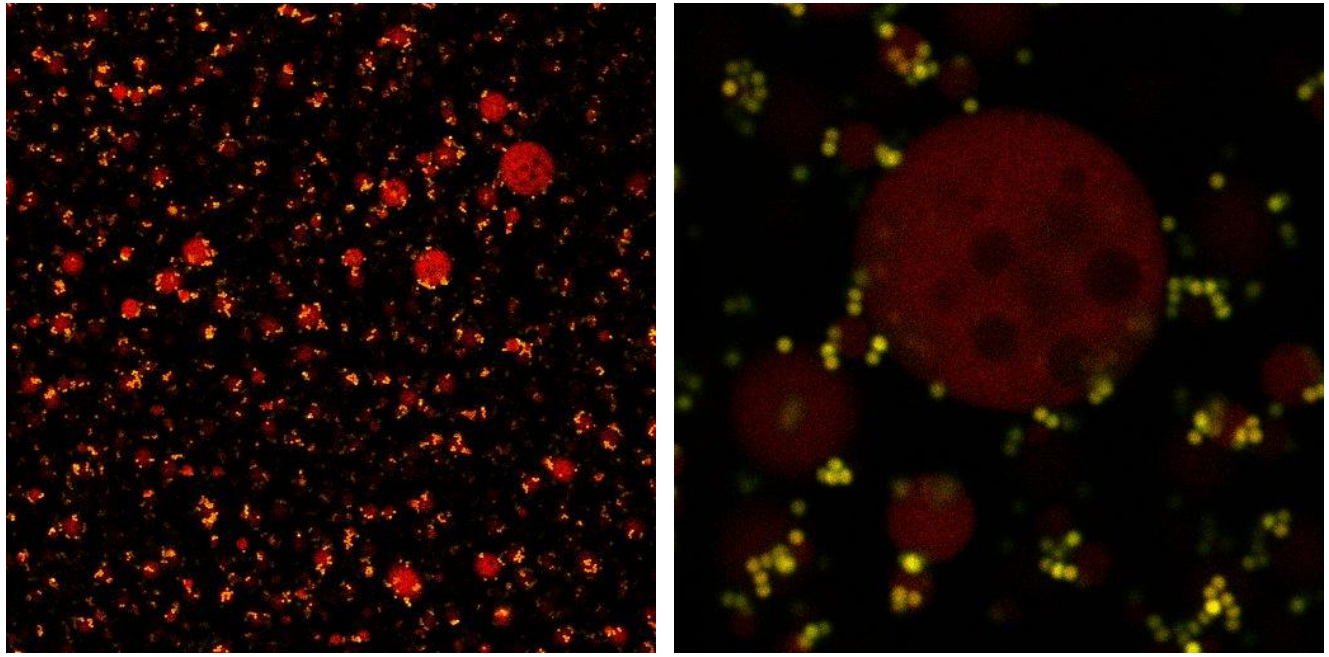
Understanding the affinity between condensates and probe particles

Felix Song[1], Will Wang and Yinan Shen[2], David Weitz[2]

[1]Tufts university, [2]Harvard University

Wyss Institute, grant num

Recently, scientists discovered that membraned organelles are not the only integral organelles within cell and membrane-less organelles known as biomolecular condensates, circular compartments where proteins and other chemicals are held and displaced, are also crucial for many processes in the cell. Scientist believe that understating these condensates will greatly improve our ability understand diseases and create medicine, specifically for cancerous and brain-related diseases. Labs have already created condensates and begun experimenting on how changes in temperature, concentration of components, and size of structures affect the formation of condensates. Our project aims to use rheology to further our understanding of condensates. However, probe particles are often seen clung to the surface of the condensate rather than within it, which puts many restrictions on how ability to analyze. By adding probe particles coated in certain molecules, we hope to create circumstances where the probe particles penetrate the condensate and allow for micro rheology to be maximized. By changing the relative size of the coating molecule, we can further understand the affinity between the condensate and probe particles.



Left: Image of PolyA-PEG condensate using 63x-microscope lens
Right: image of single condensate using 63x-microscope lens with 8x zoom

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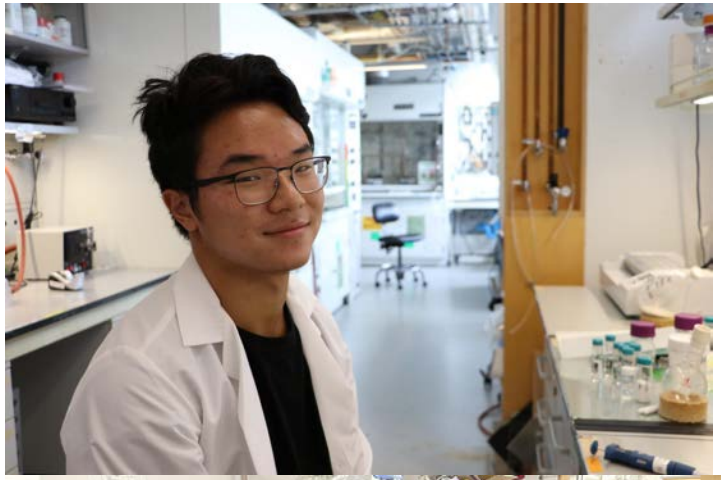
Felix is a rising sophomore at Tufts University, majoring in Physics with a minor in Computer Science and Economics. He previously did research at the Weitz lab with microscopy correction and denoising systems and at Mass. General Hospital with simulations of axon structure and analysis, specifically for understating neurodegenerative diseases. After completing his undergraduate, Felix hopes to pursue a PhD in physics or biophysics. Felix has several hobbies such as swimming, volleyball, playing music, and exploring new skills. During his time at the Harvard REU program, Felix learned several technical skills in the lab through the process of creating condensates and in the optics room through the process of imaging and analyzing images and data. The most important and impactful skill he learned was to see the interconnections between fields. Exploring a project with such a major component in biology was surprising for someone who planned to major in physics, but I've discovered a new interest in biology and I plan to explore this interest in the future.



Top: Photo of Felix working happily in the lab
Bottom: Felix and his mentor looking at images