

# Sticking point: The Role of QM in Gecko Wall Climbing

Kausik S Das



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EASTERN SHORE



Chesapeake Section of the  
American Association of Physics Teachers  
Spring 2024 Semi-Virtual Meeting  
March 16, 2024 @ **DelawareStateUniversity**



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*How does a gecko stick to a wall or a ceiling?*



A. Using hooks

B. Sticky glue

C. Suction



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## *Gecko toes*





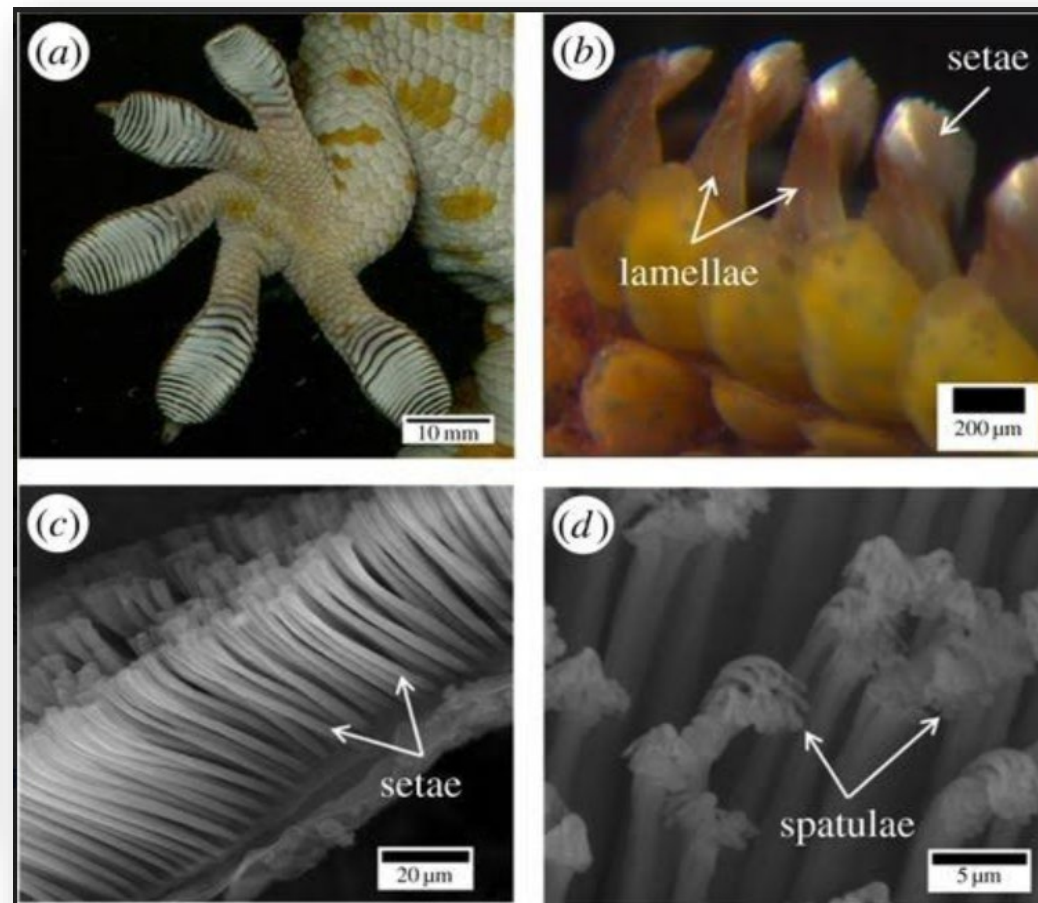


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## *Geckos have hairy toes*





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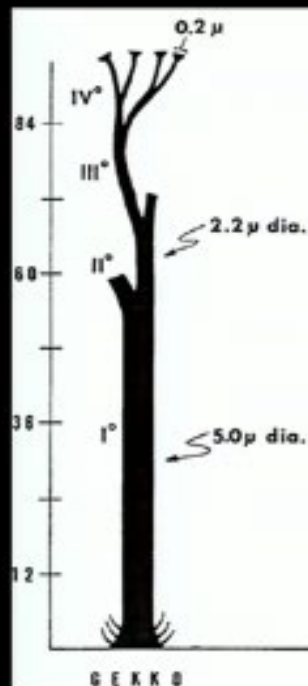


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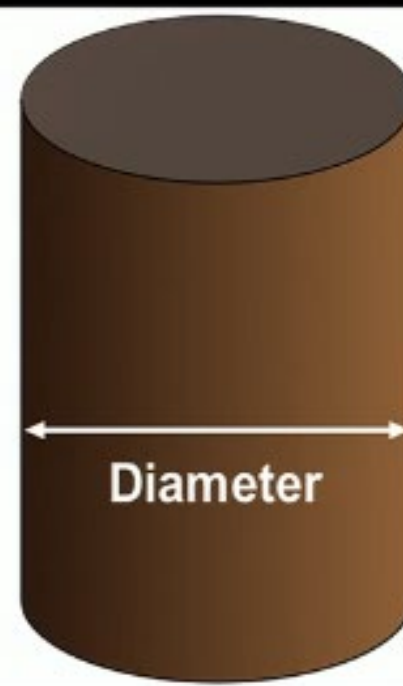
## Geckos have Hairy Toes



Gecko Toe  
Hair



Your Head  
Hair





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*Geckos stick to the wall/ceiling using Van Der Waals force*

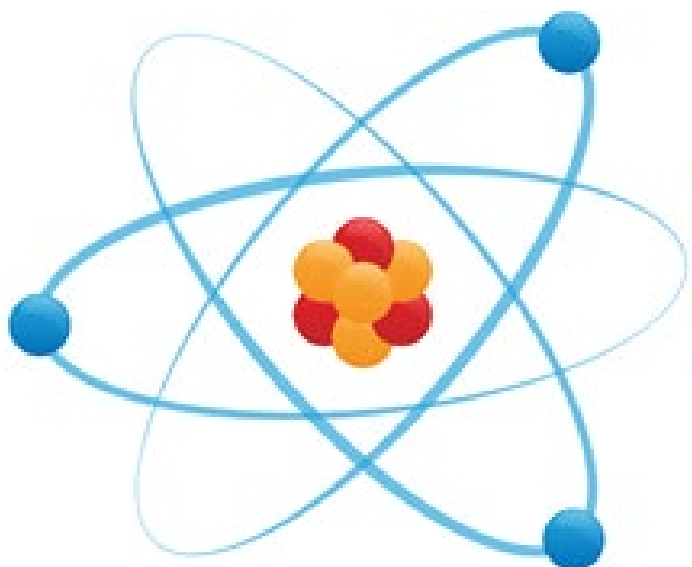


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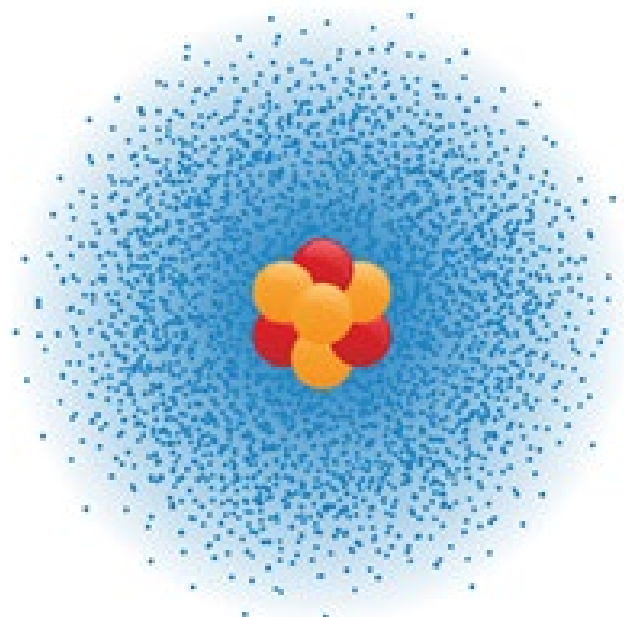


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## *Geckos stick to the wall/ceiling using Van Der Waals force*



Bohr Model



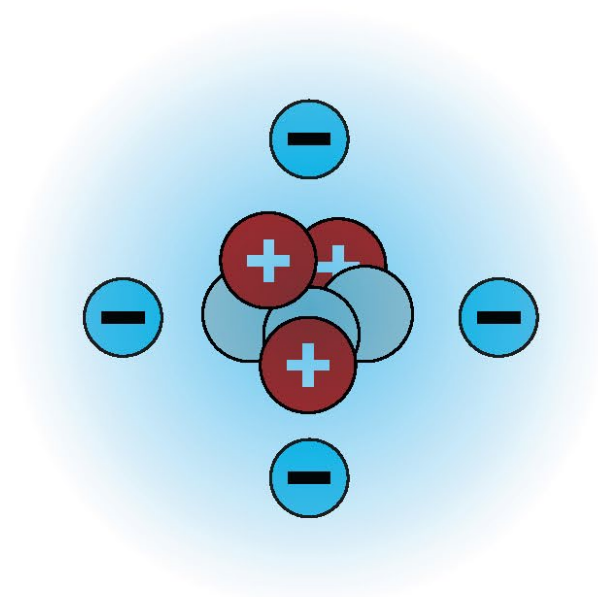
QM Model



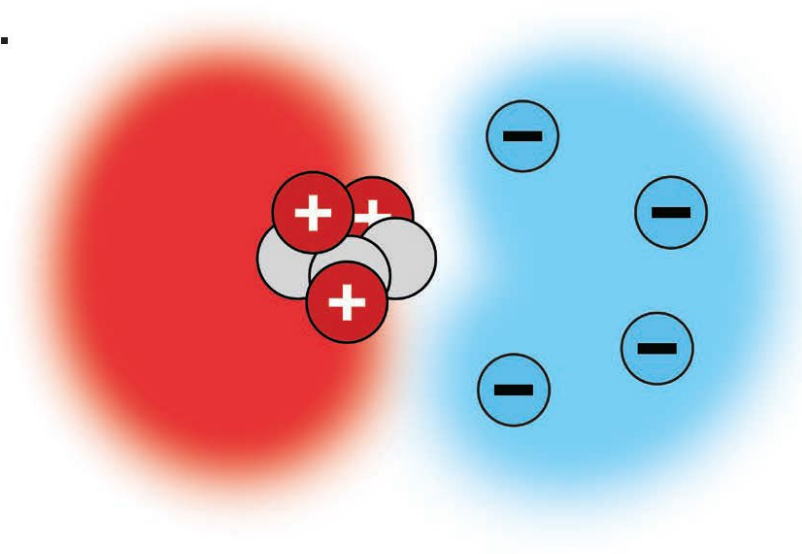


VV8. If it were possible to “see” an atom’s electron cloud at an instant, which picture might it look like?

1.



2.

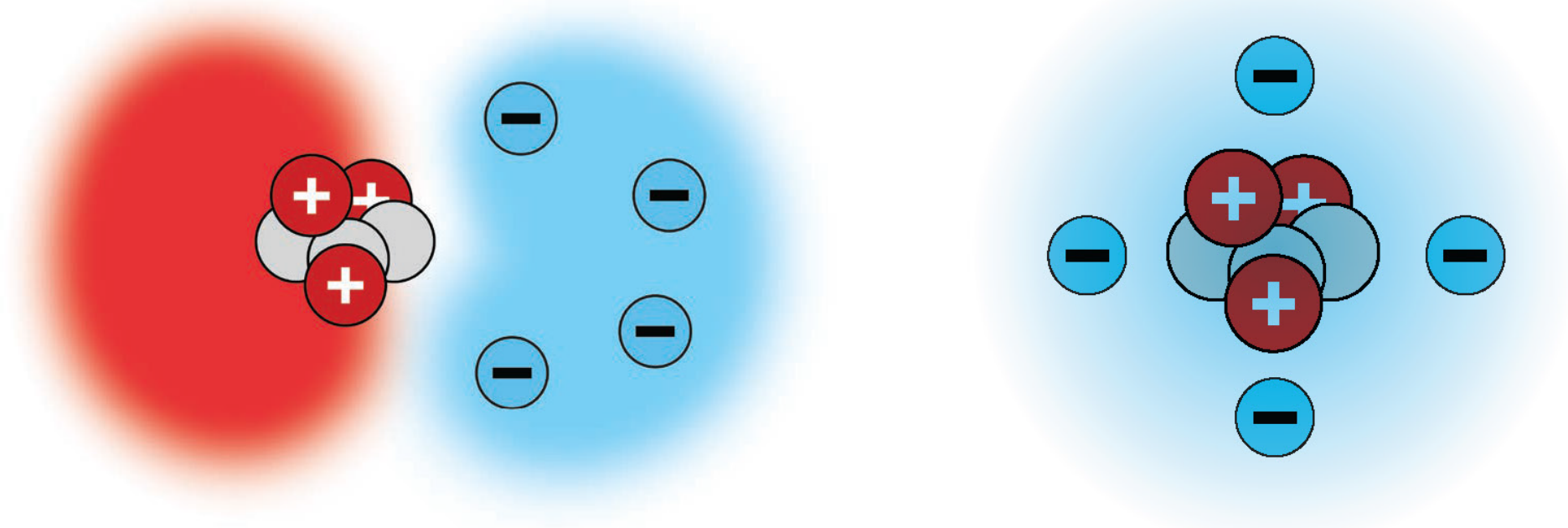


A. 1 or 2  
B. 1 only

C. 2 only  
D. Neither



VW9. If a momentary dipole is close to another symmetric, nonpolar atom, what will happen?

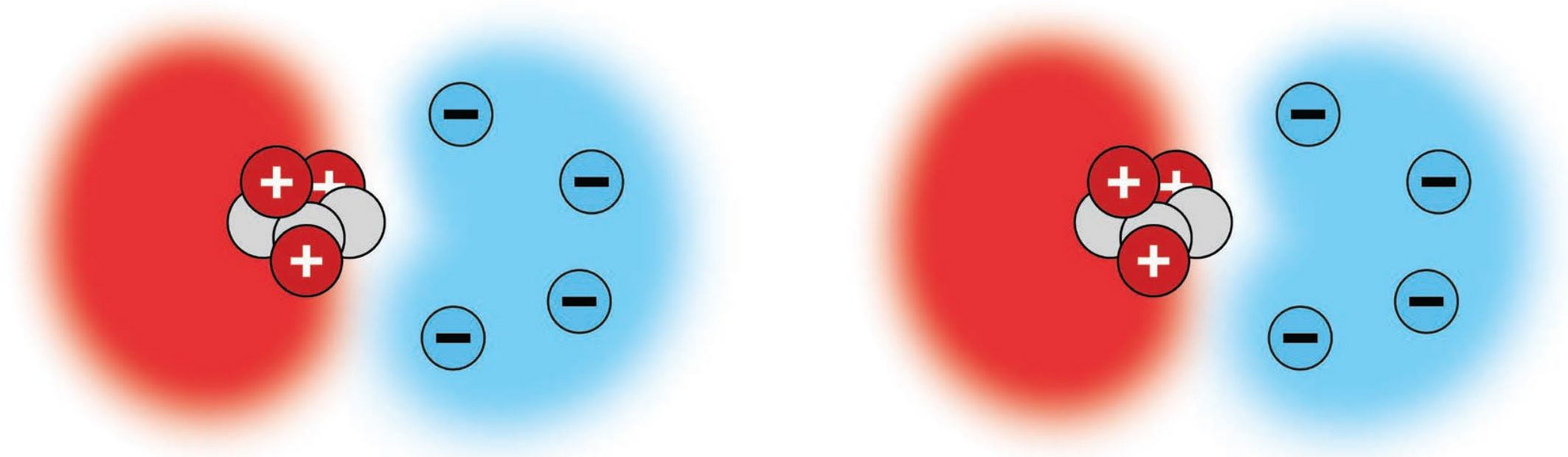


A. The dipole's electrons will push away the other atom's electrons, forming a second dipole, and the two atoms will attract each other.

B. The dipole's electrons will push away the other atom, so the two atoms will repel each other.

C. The two atoms will not interact.

VW10. What is the name of the attractive force, caused by momentary dipoles, between two nonpolar atoms or molecules?



- A. Gravitational force.
- B. Van der Waals force or London dispersion force.

- C. Nuclear force.
- D. Weak force.

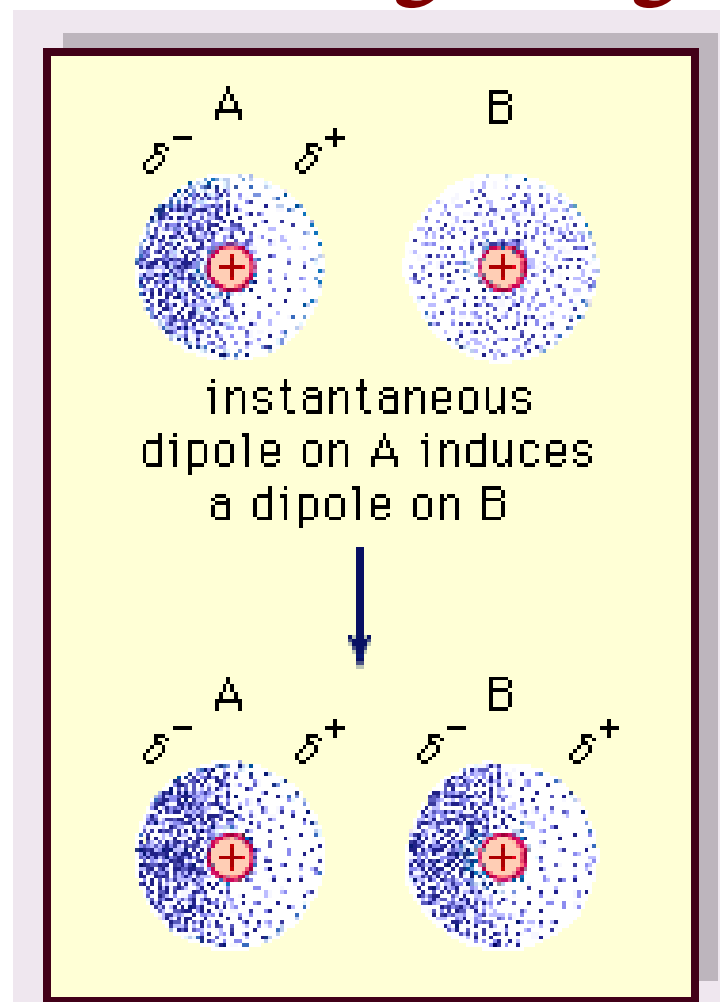


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## For making the gecko “tape”

- Silicone RTV Mold-Making System
  - o Side A 1 lb,
  - o Side B Fast Catalyst (Blue) 0.1 lb,
- Polycarbonate Millipore Track etched Isopore membrane filter

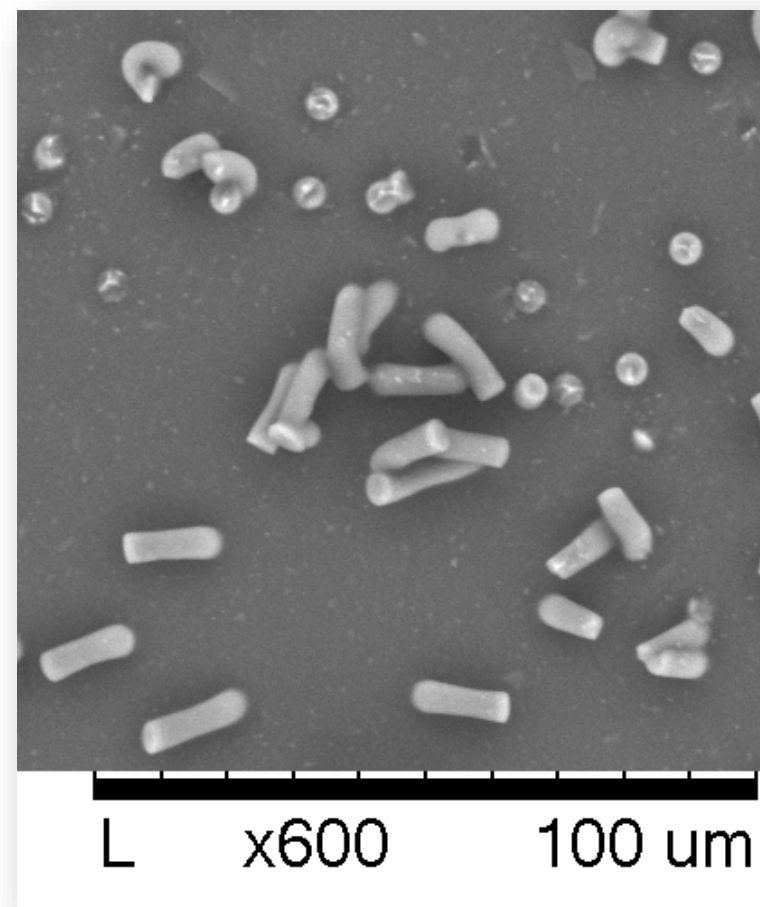




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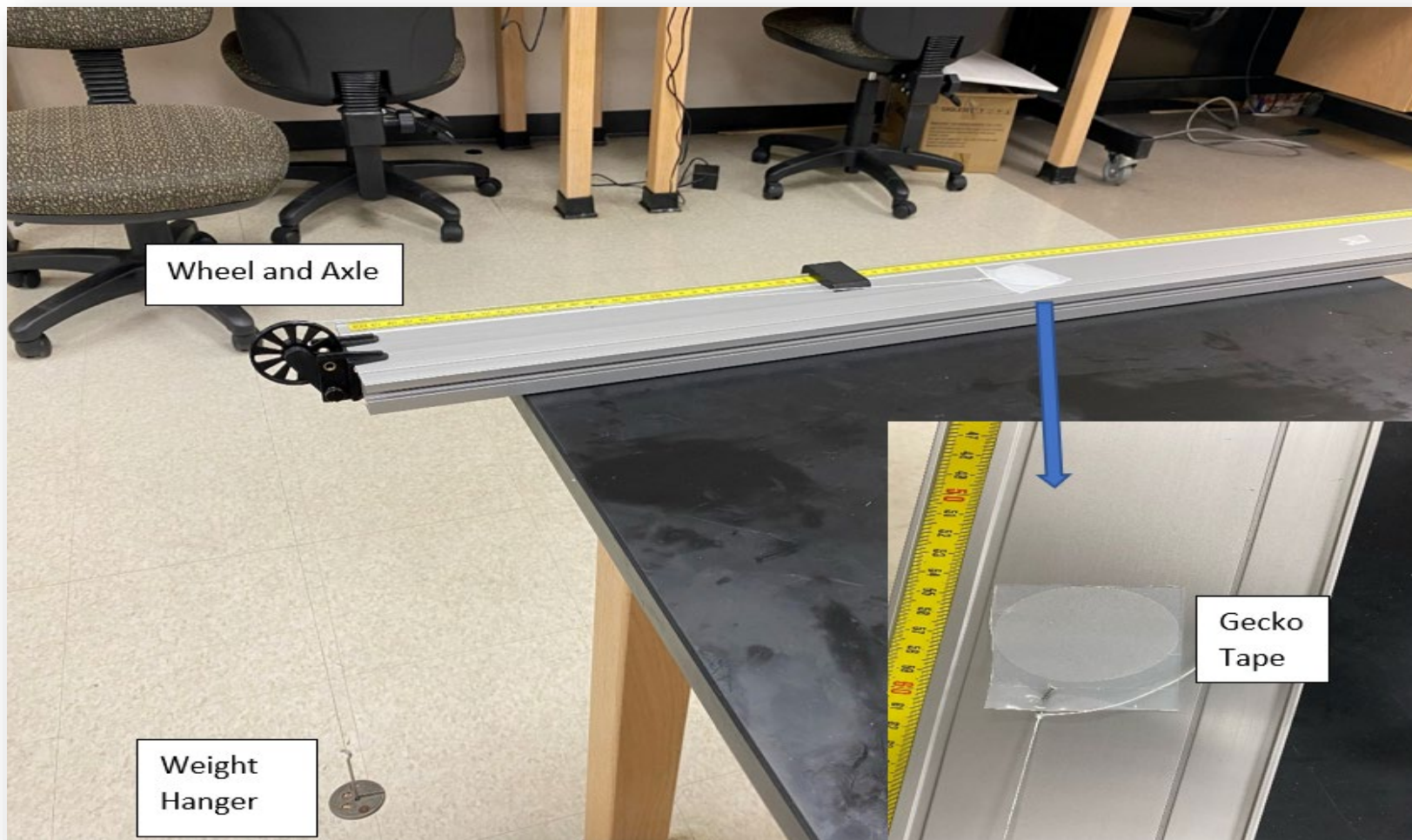
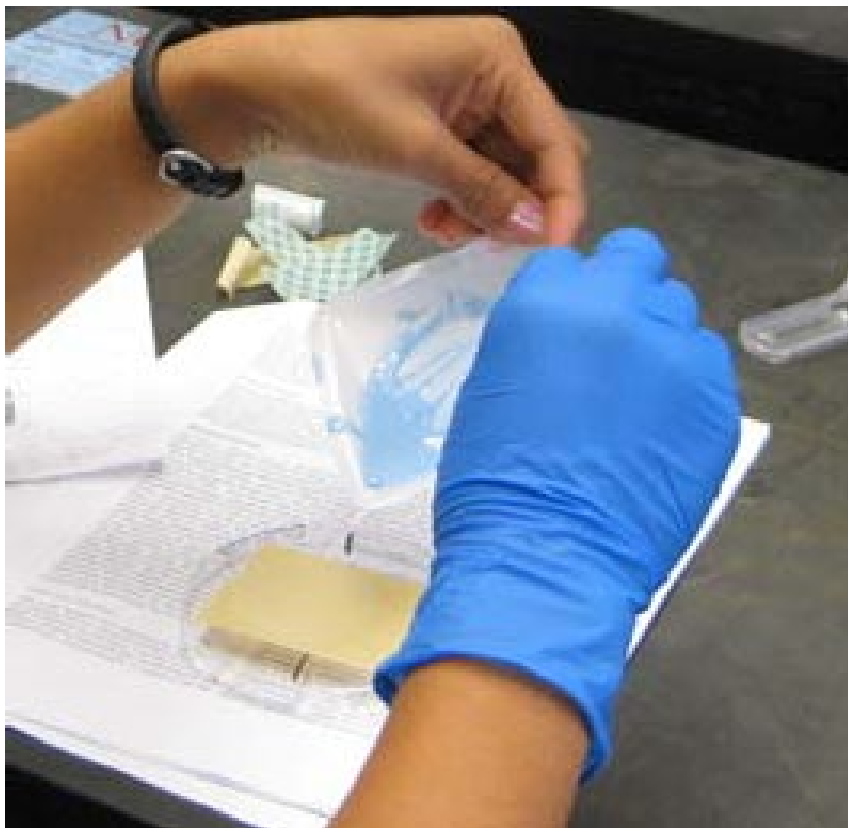




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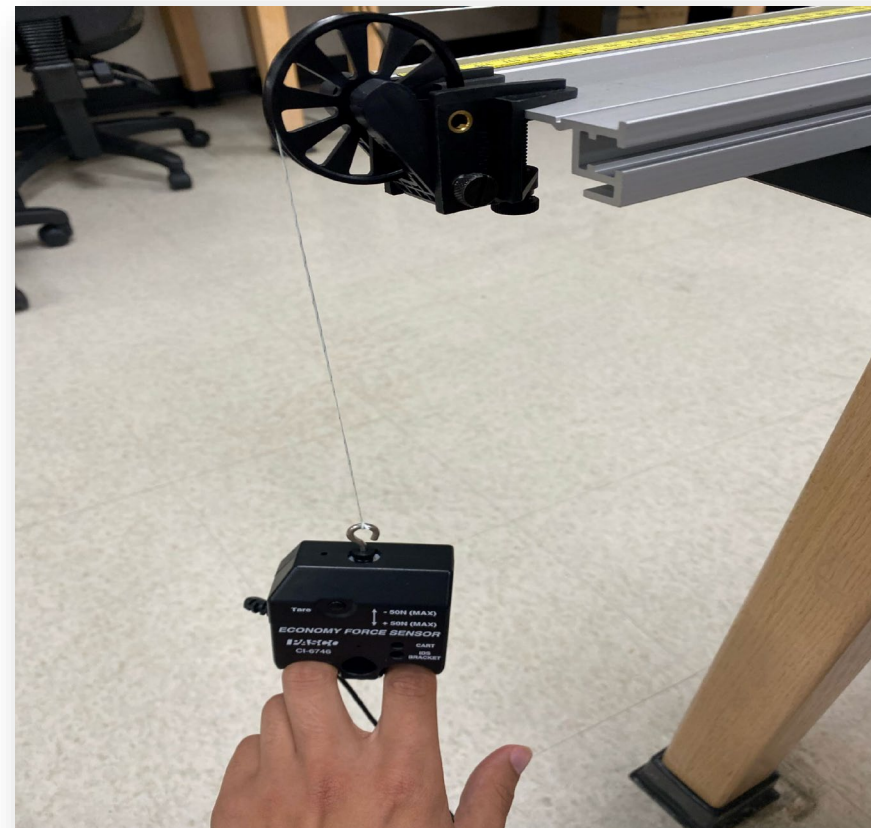
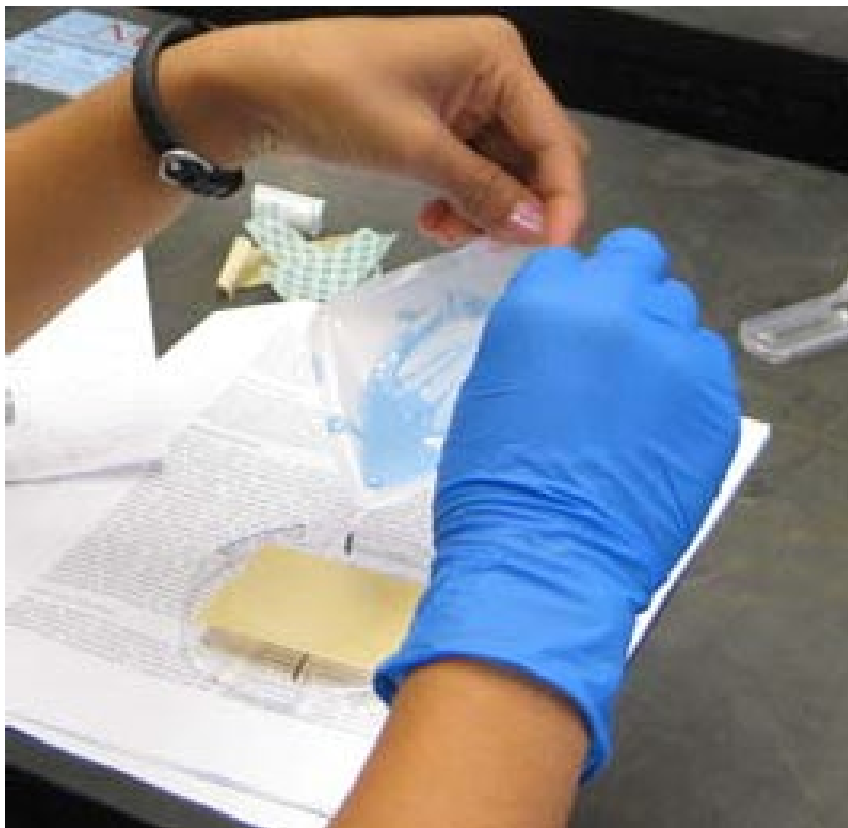




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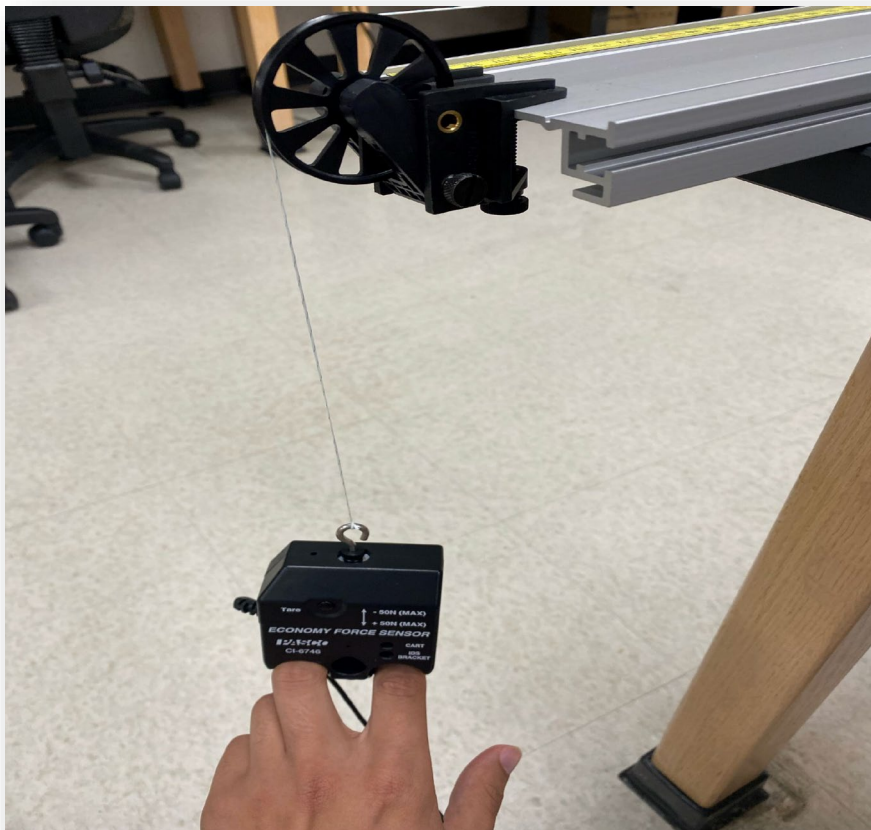




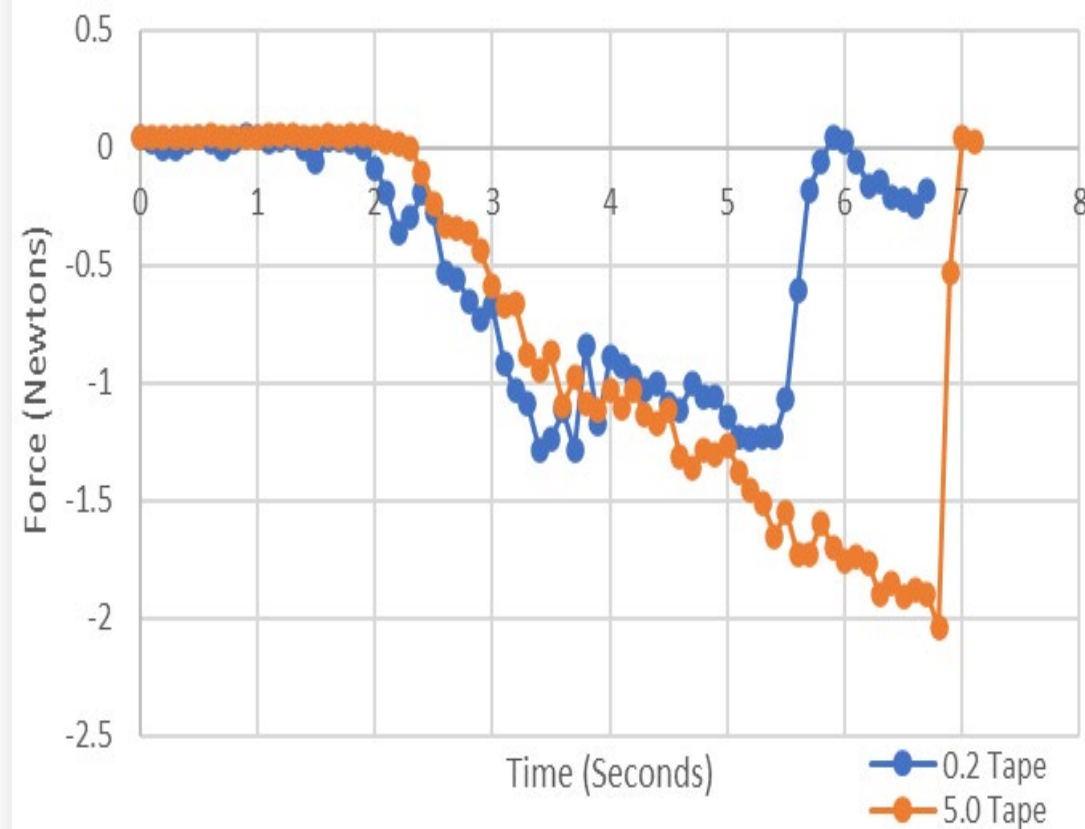
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0.2 Tape vs 5.0 Tape







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# Acknowledgement

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