

Final Report on
“Investigation of viscosity transitions in non-Newtonian fluids”
for the
National Society of Physics Students Undergraduate Research Award
December 10th, 2008

Last fall our group proposed a project for investigating viscosity of non-Newtonian fluids for the SPS Undergraduate Research Award. We wanted to more closely examine the relationship between shear stress and shear rate on the fluid and try to characterize whether or not the fluid undergoes something similar to a phase transition between liquid-like and solid-like behavior.

We have successfully designed and built the apparatus. The main setup consists of a stepper motor rotating a cylinder containing our fluid. There is also a smaller cylinder inside which is dragged along by the rotating fluid. Rotary motion sensors measure the rotational speed of the outside (driven) cylinder and the torque on the inside (dragged) cylinder. By looking at the speed of the outer cylinder and torque on the inner cylinder, we can determine the viscosity of the fluid. We also designed and programmed LabVIEW driver software for the apparatus.

The students who originally proposed this project graduated last spring after successfully building and testing the apparatus. Another SPS member has expressed his intention to continue the research project this spring (2009) with the intention of collecting enough data for presentation in a poster or contributed talk at an SPS Zone Meeting or AAPT conference. Thank you for your generous support of our project.

Spending Summary:

Date	Description	Amount
2/1/08	National Instruments - cable & block	(\$495.44)
2/1/08	PASCO - rotary sensor	(\$221.43)
2/1/08	Omega - power supply	(\$149.57)
2/1/08	Stepper3LLC - stepper motor	(\$67.10)
2/28/08	deposit - award check	\$1040.00
4/18/08	hardware & supplies	(\$114.27)
	balance	(\$7.81)

The over-budget amount (\$7.81) was covered by the department.

Respectfully submitted,

Eric Ayars, Associate Professor & Occasional SPS Research Advisor
CSUC Physics Department