



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Page H. Monji	Project Number S0215
Project Title How Does a Circular Deformation in Rubber Affect Its Mechanical Stress and Strain?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals How does a circular deformation in rubber affect its mechanical stress and strain? I observed patterns in mechanical stress and strain, locally, nominally, longitudinally, and transversely. I hypothesized that all the stress and strain would be greater than nominally when affected by a discontinuity. Also, the discontinuities and added tensile force (the weights) will only affect the longitudinal strain. I predicted that the transverse distances would not increase nor decrease because the material was being pulled vertically or longitudinally by weights.</p> <p>Methods/Materials Materials: Seven sheets of 15 cm. by 37 cm. by 1/2 cm; Foam rubber; Metric ruler; white pen; Exacto-knife; Compass; Hand drill with 1/8 inch drill bit (0.3175 cm. drill bit); Four 15 cm. by 3 cm. by 1/2 cm. pieces of wood; 4 small wood clamps; 1 yard of copper wire; pole (from which to hang apparatus); Gram weights in 5000 g and 1kg increments Procedure: A. suspend sheets of rubber with 5 cm. diameter circular discontinuity from pole and add weights to stretch rubber. B. Each trail is affected by different tensile force or weight C. All seven trails have same apparatus: same 15 cm. by 37 cm. by 1/2 cm foam rubber, same 5 cm. circular discontinuity, 5 minutes allowed for each trail. D. I measured distance between pins, located transversely locally, transversely nominally, longitudinally nominally, longitudinally, locally. With these distances, I calculated stress, strain, and stress concentration.</p> <p>Results Because the discontinuity intensifies stress locally surrounding it, the local strain was greater than the nominal strain. The stress concentrations, the ratios of the longitudinal local strain to the longitudinal nominal strain, remain constant negative strain is associated with transverse strain, while positive strain is associated with longitudinal strain. This means that as the material elongates, the discontinuity causes it to decrease in width.</p> <p>Conclusions/Discussion In engineering, it is extremely important to consider the effects of flaws upon the overall strength of a material. They cause the most stress directly surrounding the flaw. as the discontinuity increases, the strain also increases.</p>	
Summary Statement Testing the patterns in mechanical stress and strain in rubber effected by a circular deformation.	
Help Received Dad taught me how to drill holes in apparatus	