



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Hala Javeed	Project Number J2009
Project Title Does Chemical Lightening Affect the Structure of Human Hair?	
Abstract Objectives/Goals The objective of my study was to determine if chemically lightening human hair affected its structure, based on how it reacted to humidity. Methods/Materials hygrometer, hydrogen peroxide developer in 10, 20, and 30 volume, bleach, swatches of chemically untreated human hair The hydrogen peroxide developer and bleach powder were obtained from my teacher's friend since he works at RedKen. Mixed a 1:1 mixture of hydrogen peroxide developer (in all 3 volumes) and bleach powder. Dyed all samples 1 for the each volume of the peroxide and left the dye on for intervals of 10,20, or 30 minutes. I built 4 hygrometers, and then placed a strand of the dyed hair on a hygrometer. Placed the hygrometers in bathroom while shower was on hot setting for 10 minutes. Repeated for a total of 30 trials, 3 trials for each differently treated, sample of hair.Measured the expansion of hair, in millimeters and compared results. Results My data shows that the hair sample H9, (treated for 30 minutes and with hydrogen peroxide developer of 30 volume) expanded 7mm in the first and second trial, and 6.5mm in the third trial. This is the most expansion seen compared to other samples. Since the hair shaft shifted causing it to expand, this means dyeing your hair does weaken its structure. The other samples expanded less because they were not exposed to the dye that long and were treated with smaller volumes of developer. Conclusions/Discussion I thought that hair sample H9 would expand the most is because I thought chemically lightening hair would have a big impact on the strength of it. After I did research, I found this to be true. The hydrogen peroxide in the hair dye increases the number of hydrogen ions in the solution, which breaks down the outermost layer of your hair, the cuticle layer, and lipids. One#s hair is already weak by dyeing it, but what does humidity do? Hydrogen bonds in one#s hair form water molecules between keratin in your hair. This is why sample H9 resulted in a longer expansion size in all three trials. Now that people know that dyeing your hair weakens it, you can lessen the frequency of dyeing your hair or choose not to do it at all. Also, you can use natural alternatives such as lemon based lighteners, or henna dye. People who have dyed their hair can use keratin treatments to close their hair cells and make them stronger while still dyeing regularly.	
Summary Statement In my experiment, I proved that chemically lightening human hair affected and weakened its structure, based on how the hair strand reacted to humidity.	
Help Received Mrs. Wolfe (my advisor) led me to Mr. O#Donnell, a chemist who specializes in hair and chemical lightening. He works at RedKen and without him I could not have successfully dyed all my hair swatches and obtained materials like hydrogen peroxide based developer in such large and specific quantities.	