



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Ish B. Bhanu	Project Number S0501
Project Title "Blocking" Ultraviolet Light: Do Sunscreens and Sunglasses Block UV Light?	
Abstract Objectives/Goals The goal is to understand the protection offered by sunscreens and sunglasses to ultraviolet light. To understand the blocking of ultraviolet light and the underlying physics and chemistry of sunscreens six scientific experiments are performed. The experiments compare and quantify the effectiveness of sunscreens of various strengths, brands and ages under different conditions. Methods/Materials Ultraviolet (UV) light sensitive disks are used to test the amount of light that is able to make its way through a sunscreen or a protective surface. When the disks absorb ultraviolet light their color changes to red or blue depending upon the kind of disks that are selected. Both physics and chemistry-based analyses are performed. Physics-based analysis: The blockage of ultraviolet light is measured by performing color related experiments on the computer. In particular, images of control and test groups of disks are taken with a digital camera. The disks within the test group are exposed to the known amount of ultraviolet light. On exposure the disks change their color. The change in color, which is proportional to the amount of absorption of ultraviolet light, is found by measuring the saturation of the color. Quantitative experiments are done for a large number of images that are downloaded on the computer. The results so obtained are evaluated with respect to the composition of chemicals in a sunscreen. Chemistry-based analysis: Active ingredients in a sunscreen include (1) octocrylene, (2) Octyl methoxycinnamate, (3) octyl salicylate, (4) oxybenzone, (5) homosalate, (6) octyl dimethyl PABA, (7) octisalate, and (8) titanium dioxide. Different brands of sunscreen have a little different composition of chemicals. It is this composition that has a significant effect on the efficacy of any given sun block. Results Experiments were carried out to answer the following questions: how do various SPF strengths compare in blocking UV light? Does the brand of sunscreen really make a difference? Does sunscreen block UV light in water? Is sunscreen as effective as a t-shirt for UV light blockage? Does the age of sunscreen matter in its ability to block UV light? How do various colored sunglasses compare in blocking UV light? Conclusions/Discussion Combinations of the active ingredients and standard protection factor have a significant effect on the efficacy of any given sun block.	
Summary Statement Standard protection factor (SPF) of a sunscreen and its chemical composition are important considerations when deciding which sunscreen to use in different environmental conditions.	
Help Received Mr. Kevin Rosa, Honors Chemistry. John W. North High School- Helped develop ideas and provide insight into the topic	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Dora I. Duru	Project Number S0502
Project Title Hello Chitin! Goodbye Ions!	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals #Hello Chitin! Goodbye Ions!# investigates the effect of lobster shell chitin on filtering wastewater metallic ions and how it measures up to charcoal and water distillation.</p> <p>Methods/Materials I used four different metallic solutions: chromium, manganese, copper, and nickel. I created a filtration setup using filter paper, rubber bands, and clear tubes and recorded the rates of filtration. Then, using a centrifuge device, I separated the filtered solutions from the substances still present inside. I used an ultraviolet visible spectrometer to measure the metallic concentrations of the solutions.</p> <p>Results The water distillation method was the most effective in removing metallic ions, removing almost 100 percent every time. Lobster shell chitin removed on average 54.65 percent of the nickel solution#s metallic ions, 92 percent for copper, 89.35 percent for chromium, and 65.6 percent for manganese. When the charcoal-filtered solutions were tested by the ultraviolet visible spectrometer, there was somehow an interference in the readings, and I was unable to determine how much of the metallic ions were removed by charcoal.</p> <p>Conclusions/Discussion The difference in color can act as an indicator as to which solutions were purified most thoroughly. Substances consist of specific colors because of certain wavelengths or colors of the visible spectrum that are being absorbed by the ions or molecules in the substance. By using the Ultraviolet Visible Spectrometer, I was able to measure to what extent the sample absorbed the light. I strongly believe that lobster shell chitin was the second most effective method because the solutions became significantly lighter and different when they passed through the chitin, but when they passed through charcoal, there was not much change in color. However, I will need to conduct further research and experimentation to definitely state that lobster shell chitin was more effective than charcoal.</p>	
Summary Statement I investigated how effective lobster shell chitin was in removing metallic ions from certain ionic solutions.	
Help Received Used lab equipment at California State University Dominguez Hills under the supervision of Dr. Lihung Pu	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Henry Fong; Allen H. Tran	Project Number S0503
Project Title Ir (III) and Pt (II) Complexes as Efficient Singlet Oxygen Sensitizers	
Abstract Objectives/Goals Although singlet oxygen (the first excited state of ground state oxygen) research has been of great interest to many research groups since the 1960s, little information is available on the photophysical properties of transition metal complexes that sensitize the production of singlet oxygen. Therefore, the goals of this project is to measure the singlet oxygen production of a series of iridium(III) and platinum(II) complexes and to characterize these compounds' properties. Methods/Materials Through time-resolved laser spectroscopy the singlet oxygen quantum yields and quenching rates (rate of singlet oxygen deactivation) of cyclometalated octahedral iridium(III) and square planar platinum(II) complexes were determined. Results Many of the complexes tested have high quantum yields (0.4-1.0) and slow quenching rates when compared to most sensitizers. Conclusions/Discussion The relatively high quantum yields of singlet oxygen are attributed to the geometry of the complexes and the electronic conjugation between then ligands and metal center. Singlet oxygen quantum yields also appear to correlate more with the choice of the cyclometalating ligand than the ancillary ligand of the compound. Singlet oxygen is believed to be the only product formed due to several factors including metal to ligand charge transfer and the unlikely occurrence of electron transfer in our system. The results augment current understanding of transition metal photosensitizers and show promise for application of similar photosensitizers to photodynamic therapy. Particularly interesting is that these transition metal complexes can be easily altered to fit its biological application by changing the cyclometalating or ancillary ligands.	
Summary Statement This project characterizes a group of metal compounds that generate singlet oxygen.	
Help Received Used lab equipment at California State University, Los Angeles under the supervision of Dr. Matthias Selke.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Anthony O. Garcia	Project Number S0504
Project Title Photochemistry Ammonium Oxalate and Iodide	
Abstract	
Objectives/Goals Objective: Does the source of light cause different outcomes in a photochemical reaction? Investigate the effect of ammonium oxalate and iodide on different sources of light while determining what light sources and colors have an effect on a photochemical reaction. Hypothesis: In this experiment, I think each solution will have a different reaction; the fluorescent light bulb will have the least effect and the neon will have the most effect on ammonium oxalate and iodine.	
Methods/Materials Procedure: 1.)Liquefy ammonium oxalate crystals to make 1 mole of an ammonium oxalate solution. 2.)In each test tube place 2 mL of the prepared ammonium oxalate solution. 3.)Using a medicine dropper, add 10 drops of the tincture of iodine to each of the test tubes. 4.)Cover the top of each test tube. 5.)Expose one solution to total darkness. 6.)Expose the rest of the test tubes to different sources of light including: incandescent, fluorescent, halogen, mercury, and neon light. 7.)After 12 hours, compare the solutions.	
Results Results: The neon light, the brightest of all my independent variables, resulted in the most interesting result. With so much energy and so many photons, the neon light seemed to dissolve all the iodide from the solution. After twelve hours, the ammonium oxalate solution went from a deep orange to a clear substance overnight. The everyday light bulbs, the A-line 60 watt fluorescent, incandescent, and halogen all concluded in the same result. My last solution, mercury, produced the least, only changing the solution from an orange to a light orange overnight.	
Conclusions/Discussion Conclusion: In each one of my solutions, the dependent variable seemed to result in a reduction of iodide from the ammonium oxalate solution. In one case, the orange iodide was completely dissolved and in another, only a small reduction could be found. I have concluded that the energy level along with the amount of light	
Summary Statement I am investigating the effect of ammonium oxalate and iodide on different sources of light, while determining what light sources and color have an effect on a photochemical reaction.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Amber I. Hess	Project Number S0505
Project Title Digitally-Enhanced Thin-Layer Chromatography: An Inexpensive New Technique for Qualitative and Quantitative Analysis	
Abstract Objectives/Goals Thin-layer chromatography (TLC) is a widely used method for qualitative analysis to determine the number of components in a mixture, to determine the identity of two substances, or to monitor the progress of a reaction. The more accurate high-performance TLC (HPTLC) is better suited for quantitative analysis. Unfortunately, HPTLC requires expensive equipment which most high schools and colleges cannot afford. I demonstrate that if digital photography is combined with regular TLC, it can perform highly improved qualitative analysis as well as make accurate quantitative analysis possible. Methods/Materials This novel, "digitally-enhanced" TLC (DE TLC) is very easy to use. A fluorescent TLC plate is illuminated with UV light and a picture of the plate is taken with a digital camera. Then, on a computer, using either TLC Analyzer, the public domain software I wrote, or common photo-editing software, one can quickly produce multi-spectral scans, densitograms, and calibration curves--output previously available only from more expensive equipment or complex procedures. Results With high linearity ($R^2 \sim 0.97 - 0.99$), good repeatability ($RSD < 5\%$), and detection limits approaching those of HPTLC, DE TLC produces surprisingly good results for such inexpensive equipment. Conclusions/Discussion Digitally-Enhanced TLC is a valuable tool that can be added to every chemist's TLC toolbox. Since this technique is much less expensive than other quantitative chromatographic methods, DE TLC is ideal for high school and college labs.	
Summary Statement I developed an inexpensive technique using digital photography that is an alternative to a \$30,000 piece of equipment for chemical analysis.	
Help Received Dr. Kimberley Cousins gave advice by email when needed. Dr. Armando Galindo lent some of his equipment.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Losmeiya Huang; Colleen Tan	Project Number S0506
Project Title Comparing Two Recipes of Biodiesel in Terms of Flashpoint, Water Content, and pH	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Determining which catalyst used in soybean-based biodiesel will produce the most feasible fuel.</p> <p>Methods/Materials We are testing the two recipes in terms of flashpoint, water content using a Karl Fischer titrator, and pH. Titrations on virgin soybean oil are conducted prior to the process to determine the composition of catalyst for the reaction. After completing the purification process, the pH level is taken and samples are taken to complete Karl Fischer and flashpoint tests. Hydrometer tests are run at the end of the process to verify that biodiesel has been created.</p> <p>Results Using potassium ethoxide creates a more feasible, but is more sensitive than sodium methoxide. More catalyst is required in order for the potassium ethoxide reaction to proceed. On average, our test results show that the two fuels are similar in quality in terms of flashpoint, pH, and water content. With similar quality, the potassium ethoxide is a more feasible fuel since ethanol is a renewable resource.</p> <p>Conclusions/Discussion Despite the fact that more potassium ethoxide is needed as a catalyst in soybean-based biodiesel, the renewable resource of ethanol as a component in this catalyst and the similar quality of fuel displays that soybean-based biodiesel created with potassium ethoxide is more feasible.</p>	
Summary Statement We are conducting a comparison study between two catalysts used in creating soybean-based biodiesel fuel.	
Help Received Used lab equipment at Innovative Organics under supervision of Doug Ward, used lab equipment at Gabrielino High School under supervision of Michael Winters	



CALIFORNIA STATE SCIENCE FAIR 2005 PROJECT SUMMARY

Name(s) Kelsey A. Jones	Project Number S0507
Project Title Luminescent Silole Nanoparticles for Chromium (VI) Detection	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The U.S. Environmental Protection Agency mandates that there be no more than 0.1 ppm of chromium in drinking water. To be able to determine whether a water sample had reached an acceptable chromium level, a reliable detector needed to be created. As it had already been determined by the Trogler group that silole nanoparticles could detect chromium through luminescence quenching, the focus of this experiment was to determine the best silole solution for Cr(VI) detection.</p> <p>Methods/Materials To find the solution that would most precisely measure the chromium concentration, three variables were tested: silole concentration, pH level, and the percentage of water in the solution. Luminescence spectra were taken for each solution, showing the fluorescence intensity of the solution. Using the results from the luminescence scans, the most luminescent solutions were chosen for chromium quenching. Chromium was added to each solution in increasing intervals, and luminescence spectra were taken for each solution at each chromium concentration to determine the effect of chromium on the luminescence intensity of the solution. An additional test was done at the end of the experiment to determine the effect of light on the solution over time and the point in time at which the luminescence remains stable for solutions kept in the dark or in the light.</p> <p>Results The results showed that with an increase in percentage of water came an increase in luminescence intensity. This fluorescence increase was also noted when silole concentration was increased in the solution, and again when the pH was non-neutral. When samples were tested for chromium-induced luminescence quenching, three samples had a clearly higher efficiency than the rest. The 4 mg/L silole concentration with 95% water, 6 mg/L silole concentration with 95% water, and 6 mg/L with 90% water all detected chromium at a highly efficient level (all pHs were neutral).</p> <p>Conclusions/Discussion The solutions with a 4 mg/L silole concentration with 95% water, 6 mg/L silole concentration with 95% water, or 6 mg/L silole concentration with 90% water were the best solutions for detecting the presence of Cr(VI), not because they were the most luminescent of the solutions tested (as was predicted), but because they were most efficiently quenched by the presence of Chromium.</p>	
Summary Statement The purpose of this project is to develop a new and reliable detector for Chromium, an EPA-regulated water contaminant, by calculating the quenching effect of Cr(VI) on the luminescence of various siloleamine solutions.	
Help Received Professor William Trogler of UCSD provided all lab equipment, materials, and the opportunity to research. Sarah Toal (Graduate Student) mentored me through the project.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Swetha Kambhampati	Project Number S0508
Project Title Synthesis of Bismuth Telluride Nanowires by Electrodeposition Coupled with Electrochemical Step Edge Decoration	
Objectives/Goals The objective of this project was to find the optimal potential range and finest set of conditions for the synthesis of Bismuth Telluride nanowires.	
Abstract Methods/Materials The fabrication of Bismuth Telluride nanowires was done by a process known as Cyclic Electrodeposition/Stripping combined with Electrochemical Step Edge Decoration. This method utilizes the current generated by a redox reaction in an electrochemical cell to deposit the material onto a Highly Oriented Pyrolytic Graphite along its step edges. The structure, morphology, diameter, and other physical characteristics were noted using a Scanning Electron Microscope (SEM), while the chemical composition was analyzed using Energy-Dispersive X-Ray Fluorescence.	
Results Potential ranges between -0.04 and -0.4 volts and +0.1 to +0.5 volts were investigated in this experiment. The ranges with a negative limit of -0.04V and -0.05V had low deposition potentials, high stripping potentials, relatively high cathodic peaks, and large anodic peaks which resulted in the synthesis of few nanowires that had low diameters and a composition close to 2:3 Bismuth to Tellurium. The ranges with a negative limit of -0.06V, -0.075V, and -0.09V and positive limit between +0.3V and +0.35V had high deposition potentials, thus allowing formation of well-structured and coalesced wires. Potential ranges with negative limits extending beyond -0.09V and the limits +0.1V and +0.2V had relatively low deposition potentials and extremely small cathodic peaks and anodic peaks, hence causing the deposition of a plethora of nanoparticles that remained disunited. The stripping potentials were small, which resulted in a high bismuth to tellurium ratio. The step edge ratio and diameters of the wires were relatively low.	
Conclusions/Discussion An optimum potential range with a negative limit between -0.06V and -0.09V and a positive limit between +0.3V and +0.35V results in the deposition of the most favorable Bismuth Telluride nanowires with an average diameters of 408 nm. These nanowires had the finest morphology and structure, and were deposited in the greatest quantities. The average chemical composition of these nanowires was 2:3.15, the closest to a desired 2:3 Bismuth to Tellurium ratio. Using the conclusions derived from this project, I can expand my research to maximize the thermoelectric figure-of-merit (ZT) for these nanowires synthesized.	
Summary Statement This project aims to synthesize the optimal Bismuth Telluride Nanowires by Cyclic Electrodeposition/Stripping, for future use in nanodevices such as thermoelectric power generators, microsystems, etc.	
Help Received I am thankful to Dr. Reginald Penner for his guidance and for allowing me to work in his laboratory at University of California, Irvine. I would also like to thank Erik Menke for his support.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Kevin R. Kocher	Project Number S0509
Project Title The Effect of an Acidic Environment on Dental Amalgam	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine if dental amalgam will release mercury when it is placed in an acidic environment for 48 hours.</p> <p>Methods/Materials Three different acids (citric, phosphoric, and sulfuric) as well as tap water were collected. These acids were used to create solutions with pH levels of 7, 5, 3, 2, 1, and 0. Dental amalgam was created by combining silver, tin, and copper with mercury in an amalgamator instrument. That amalgam was placed inside six nylon fasteners that simulated teeth. These "teeth" were each placed in one of the different acidic solutions and left for 48 hours. Then mercury test swabs were swirled around in each solution for one minute. If mercury was present, the swabs turned purple. This process was repeated twice.</p> <p>Results In all three trials, solution #6 (pH 0) was the only solution in which mercury was released and the nylon fastener completely dissolved. In solutions #1 (pH 7), #2 (pH 5), #3 (pH 3), #4 (pH 2), and #5 (pH 1), no mercury was released and the nylon fasteners were not dissolved.</p> <p>Conclusions/Discussion My conclusion is that mercury can be released from dental amalgam, but only at a pH level of 0 or below, which is far below what human saliva can consistently be.</p>	
Summary Statement My project is about whether or not mercury can be released from dental amalgam when placed in an acidic environment	
Help Received Mother helped paste project; borrowed test tubes from school; borrowed dental materials from father's dental office	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Ellie A. Krumpholz	Project Number S0510
Project Title The Wonders of Water	
Objectives/Goals The object of my experiment is to determine whether temperature affects the salinity and pH level of ocean water.	
Abstract	
Methods/Materials Materials: Ocean water, three 5 gallon buckets, two heaters, hydrometer, pH testing kit. Procedure: 1. Fill three 5 gallon buckets with 5 gallons of ocean water each 2. Leave one bucket (labeled #A#) at room temperature 3. Leave one bucket (labeled #B#) at 80 degrees Fahrenheit 4. Leave one bucket (labeled #C#) at 90 degrees Fahrenheit 5. Every other day, measure the salinity using a hydrometer and the pH level using a pH kit of all three buckets 6. Record results and observations in a data log	
Results Based on my results, I have learned that my hypothesis is incorrect and that temperature does affect both the salinity and pH level of ocean water. I have come to this conclusion because two of the three buckets that I used for my experiment, Bucket #B# and Bucket #C,# now have different salinity levels and pH levels than they did at the beginning of my experiment. I have also found that the two heated buckets, Bucket #B# and Bucket #C,# now have less water than they did at the start of my experiment. This is because the heat caused the water to evaporate. I have learned that when the water evaporates, the salt does not evaporate with the water. Instead, the salt stays in the bucket. I know that this statement is true because the salinity level is greater each time I measure it. As for the pH level, it increased in the two heated buckets as well. The pH level and salinity level is greatest in the hottest bucket, Bucket #C,# and lowest in the bucket left at room temperature, Bucket #A.#	
Conclusions/Discussion I have come to the final conclusion that temperature does indeed affect both the salinity and pH level of ocean water.	
Summary Statement My project demonstrates how temperature affects the salinity and pH level of ocean water.	
Help Received No help.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Megan R. Lederhos	Project Number S0511
Project Title Thirsty? What Would You Like to Drink? Well Water: Is It Healthy, or Is Bottled Water or City Water Better?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To determine if rural water from wells is just as good as city and bottled water.</p> <p>Methods/Materials MATERIALS-water sample containers, testing containers, GPS Device, TDS/EC probe tester, distilled water, bottled waters, pH tester, Nitrate Test Kit. PROCEDURE-Collect Water Samples, number them and use GPS. Describe Source. Test water quality in test containers. Test each sample for Total Dissolved Solids and Electrical Conductivity (salinity), and pH. Record results. Determine Turbidity. Observe the clarity of the waters. Use the Nitrate Test Kit to test for nitrates. Compare, rate and record results. Make Conclusions.</p> <p>Results The city water had an Average: TDS of 196, pH of 8.3, EC of 389, and a Turbidity of 2.8. The rural well water had an Average: TDS of 355, PH of 7.4, EC of 717, and a Turbidity of 3.5. The bottled water had an Average: TDS of 97, PH of 6.5, EC of 186, and a Turbidity of 1. All the samples tested negative for nitrates.</p> <p>Conclusions/Discussion Some well waters were better than city and bottle waters and vice versa. All waters are different. I concluded that many factors can affect the quality of water. Waters vary by a variety of circumstances. Well water varies from many different factors in the environment. Well water is not necessarily better or worse than city or bottled water. The depth to the aquifer, the underground environment at a specific place, the surface elevation of the well, and distance from cities and mountains all make a difference in the quality of water. Some of the waters had a high pH that did not meet the water standards for drinking water, which could have been caused by the CO₂ or other dissolved gases in the water. This could be a marketing ploy: if the water has a lower pH, your body has to make up for it and neutralize it. In that process, it makes you dehydrated faster, and you will need to buy more of their water. The highest EC/TDS was in well water, but even one of the city waters was slightly beyond Drinking Water Standards. Since all waters are different, if you are going to be drinking a certain water for a long period of time, it is best to have it tested. It's good to know what you put in your mouth.</p>	
Summary Statement My project is about comparing the quality of rural well water with that of city and bottled water.	
Help Received My Dad drove me to different well and home sites to get water samples and supervised my water analysis tests.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Lusha W. Liang	Project Number S0512
Project Title Control of Hydrophilicity in Nanoporous Zeolite Film by Organic Functionalization	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Zeolites, nanoporous, crystalline solids, are potential candidates for insulators in integrated circuits. Zeolite however, is quite hydrophilic, so its pores often contain water# a very undesirable feature for an insulator. Thus, the objective of my experiment is to increase the hydrophobicity of zeolite film so that it can be suitable for insulating material in integrated circuits.</p> <p>Methods/Materials I prepared zeolite thin films on silicon substrates using the in-situ crystallization method. This required the preparation of a synthesis solution with a molar composition of 165 H₂O: 0.32 TPAOH: 1 TEOS. The solution was allowed to age, and was then grown onto silicon substrates by being placed together in an autoclave under an extremely high temperature. Then I calcinated the films to remove the structure-directing agent, TPAOH. I was able to measure the hydrophilicity of the film using a water contact angle machine, taking measurements from four different locations on each zeolite film. Organic functionalization by liquid phase silylation caused the previously hydrophilic films to become hydrophobic, which was discovered by taking the water contact angle measurements on each film again. Inspecting the films under the SEM allowed me to assess the quality of the films.</p> <p>Results The water contact angles of the zeolite films before organic functionalization are much smaller in value than the angles after silylation. The average difference between the two is 79.21 degrees. Small variations in water contact angles measured on each zeolite film can be attributed to dust on the film and/or slightly different water droplet sizes. Using the in-situ crystallization method and a synthesis time of 2 hours and 20 minutes, my crystals were found to be slightly large and not very spherical. However, along with comparative simplicity, the in-situ crystallization method does not produce any cracks in the film.</p> <p>Conclusions/Discussion My hypothesis was proven by the data I acquired, but the large magnitude of increased hydrophobicity was unexpected. This development bodes well for liquid phase silylation as a method of increasing hydrophobicity of zeolite crystals. It increases zeolite#s potential as an insulator in fabrication processes for future generation microprocessors.</p>	
Summary Statement I utilized organic functionalization as a means of increasing the hydrophobicity of pure silica zeolite films to improve its potential as an effective insulator in integrated circuits.	
Help Received My father helped me revise my report and introduced me to Dr. Yan, who allowed me to use his lab in UCR for my project. Dr. Yan also instituted a supervisor for me: Chris Lew, who provided me with some useful reading material and was able to answer many of my questions.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Ken L.M. Lozano	Project Number S0513
Project Title Pigment Separation in <i>Allium cepa</i> (Red Onions) using Circular Paper Chromatography	
Objectives/Goals The purpose of this project was to determine which of the eluting solutions of petroleum ether, acetone, and water will separate the color pigments in red onions.	
Abstract The materials and equipment used are red onions, petroleum ether, acetone, distilled water, knife, chopping board, cotton yarn, plastic gloves, plastic bags, #1 filter papers, triple beam balance, watch glass, beakers, glass bottles, graduated cylinders, pipettes, petri dishes, wash bottle, scissors, compass, and ruler. The major steps are Preparation of the chromatography papers; Preparation of the red onion extract; Preparation of the solvents in petri dishes; Spotting of chromatography papers; Observation of pigment movement; and Recording of visual results. Two experimental batches of three trials each were conducted with petroleum ether, acetone, and water as eluting solutions. Four sample spots were done for each paper. The papers were air dried with the movements of the pigments visually noted and measured. The Rf values for the pigments were computed, tabulated, graphed, and analyzed.	
Methods/Materials The materials and equipment used are red onions, petroleum ether, acetone, distilled water, knife, chopping board, cotton yarn, plastic gloves, plastic bags, #1 filter papers, triple beam balance, watch glass, beakers, glass bottles, graduated cylinders, pipettes, petri dishes, wash bottle, scissors, compass, and ruler. The major steps are Preparation of the chromatography papers; Preparation of the red onion extract; Preparation of the solvents in petri dishes; Spotting of chromatography papers; Observation of pigment movement; and Recording of visual results. Two experimental batches of three trials each were conducted with petroleum ether, acetone, and water as eluting solutions. Four sample spots were done for each paper. The papers were air dried with the movements of the pigments visually noted and measured. The Rf values for the pigments were computed, tabulated, graphed, and analyzed.	
Results There was pigment movement in the water and acetone dishes, but none in all six petroleum ether dishes. Visual analysis of the all chromatography papers also showed that two colored pigments, yellow and/or purple moved from the sample spots in the water and acetone dishes. The Rf values for the purple pigment ranged from 0.875 to 0.975, with a mean of 0.932, and the yellow pigment had a range of 0.075 to 0.625 with a mean of 0.174 in the water dishes. On the other hand, only the yellow pigment moved in three of the six acetone solvent dishes, with an Rf range of 0.800 to 0.975 and a mean of 0.454.	
Conclusions/Discussion The pigments in <i>Allium cepa</i> L. were separated into two visible colored components: yellow (quercetin) and purple (anthocyanin). The water eluting solution moved the purple and yellow components in all the six trials indicating that these pigments are polar in nature. The acetone eluting solution moved only the yellow pigment in three of the six trials indicating that perhaps it is weakly polar in nature.	
Summary Statement This project deals with the separation of pigments in red onions using paper chromatography utilizing three kinds of eluting solutions selected based on polarity.	
Help Received Mrs. Ruth M. Villareal, a retired chemist/plant pathologist for project planning advice, Mr. Leonardo C. P. Lozano for helping me put together the wood stands, and Mrs. Joji M. Lozano for guiding me through all the steps of making a science project.	



CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s) Smita Mascharak	Project Number S0514
Project Title Oxidation of Dopamine by High-Valent Manganese: A Link to Neurodegenerative Disorders?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this project is to determine whether high-valent manganese compounds readily oxidize dopamine, a neurotransmitter. It also examines whether cysteine (a sulfur containing amino acid) interferes with this oxidation.</p> <p>Methods/Materials The oxidation of dopamine by compounds containing manganese in various oxidation states (+2, +3, +4) were followed spectrophotometrically. In a typical experiment, a batch of ~10mg of the manganese compound was added to a solution of dopamine in DI water or phosphate buffer (pH 7.4) and the oxidation products were analyzed by monitoring the electronic absorption spectra. The courses of the same reactions after the addition of cysteine were also monitored in a similar fashion. The mechanism of the oxidation was explored by intervening the oxidation reactions at various intervals and identifying the products at selected times by various spectroscopic techniques as well as measuring the pH of the reaction mixtures.</p> <p>Results High-valent (+3, +4) manganese compounds promote rapid oxidation of dopamine to aminochrome and neuromelanin. In presence of cysteine, the potent neurotoxins DHBTs are produced. Coordination of the catecholate moiety of dopamine to the metal center and subsequent electron transfer result in such oxidation .</p> <p>Conclusions/Discussion The results correlate well with the conditions observed in the basal ganglia and other affected areas in the brains of Manganism patients. Manganism is similar to Parkinson's Disease and is found in welders and miners. Loss of dopamine and sulfur-containing molecules like cysteine, the presence of dopamine-derived neurotoxins and enhanced oxidatitve damage have all been linked to neurodegenerative diseases like Manganism.</p>	
Summary Statement My project focuses on the mechanism of oxidaion of dopamine by high-valent manganese compounds.	
Help Received My dad, Pradip Mascharak, provided the chemicals and the instrumental facilities. Two UCSC graduate students, Alegra Eroy-Reveles and Raman Afshar supervised the use of the instruments. Dr. Koushik Ghosh helped with the fluorescence measurements.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Courtney H. McKee	Project Number S0515
Project Title The Effect of Pill Type on Disintegration Rate and Process	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to determine which ibuprofen product dissolved quickest and by what process in the stomach, and therefore which pill could potentially provide the fastest symptom relief.</p> <p>Methods/Materials In order to best approximate the conditions of the stomach, I dissolved pills in distilled white vinegar with a pH equal to the stomach while digesting (pH 2.) I timed the pills dissolution, recording the time of the initial change in pill shape as well as final dissolution time. I recorded whether the pills dissolved symmetrically or asymmetrically and did a cost per pill analysis of my pills. I completed ten trials for each of five pill types: generic Longs ibuprofen (control), Advil Tablets, Advil Caplets, Advil Liqui-gels, and Advil Gelcaplets.</p> <p>Results The generic Longs ibuprofen had both the fastest dissolution time and lowest cost, and therefore could provide the fastest symptom relief and best value. The Advil Caplets were second in dissolution time but the most expensive. The Advil Tablets were a close third in dissolution time and had the second lowest cost. The Advil Gelcaplets were fourth in dissolution time and tied for second in cost. The Advil Liqui-gels had the longest dissolution time and were third most expensive. All pill types dissolved asymmetrically every trial, except the Advil Gelcaplets, which dissolved symmetrically every trial.</p> <p>Conclusions/Discussion My data suggests that there is not as wide a margin between pill types as many believe, and that generic drugs are not necessarily lower in quality, in fact, they can be as or more efficient than brand-name products. However, I found that I was not able to completely mirror the conditions in the stomach; I had no way to provide constant heat or motility, or any way to obtain hydrochloric acid. This may have affected the results of the Advil Liqui-gels and Advil Gelcaplets, which have a gelatin coating that is dependent on heat to dissolve.</p>	
Summary Statement My project was designed to find out if there was a difference in the dissolution of brand-name and generic ibuprofen products and which pill type could potentially provide the fastest symptom relief.	
Help Received Monetary assistance from parents.	



CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s) Amanda L. Mundell	Project Number S0516
Project Title Examining Freezing Point Depression as a Function of Solute Ionization from a Thermodynamic Perspective	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to determine whether solutes which ionize (like NaCl) would lower the freezing point of water more than solutes which do not ionize (like sucrose).</p> <p>Methods/Materials Freezing points were determined for 44 aqueous solutions of four non-ionizing solutes and eight ionizing solutes. The solutes were tested over a range of concentrations, from 0.1 m to 5.0 m. A Pyrex test tube containing each solution was lowered into a dry ice bath. Temperature readings were obtained every thirty seconds during the freezing process and graphed to produce cooling curves. Freezing points were extrapolated from the curves.</p> <p>Results At all concentrations, the ionizing solutes lowered the freezing point of water more than the non-ionizing solutes. In addition, three-ion solutes lowered the freezing point more than two-ion solutes; and four-ion solutes lowered the freezing point even more. The results, however, were not linear, suggesting that factors other than the degree of solute ionization might play a role in lowering the freezing point.</p> <p>Conclusions/Discussion It may be possible to express the effect of a given solute on the freezing point of water through the following equation: $\Delta T(f) = 1.8CA(s)$, where $\Delta T(f)$ is the freezing point depression, C is the solute concentration, 1.8 is the value derived from this experiment for the freezing point depression of water by 1.0 mol/kg of non-ionizing solute, and A(s) is a constant unique to each solute which takes into account such factors as the number of solute ions; the enthalpy of solution; the size of the solute molecule; hydrogen bonding; and solute/solute and solute/water interactions.</p>	
Summary Statement A hypothesis derived from thermodynamics regarding the effect of solute ionization on the freezing point of water was confirmed by testing aqueous solutions of various molecular and ionic solutes over a wide range of concentrations.	
Help Received Dad drove me to the library to do research, paid for my lab equipment and chemicals, and handled the dry ice for me during the experiments. My project supervisor and the scientists at askascientist.com (a great resource) helped me learn about thermodynamics, solutions, and phase changes.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Laila M. Nikaien	Project Number S0517
Project Title The Effect of Temperature on the Decay of Ascorbic Acid	
Abstract Objectives/Goals It is imperative that humans receive the recommended daily value of ascorbic acid (vitamin C), but individuals are receiving a reduced amount because vitamin C decomposes through time. The purpose of this experiment was to determine the effect of temperature on the ascorbic acid (AA) rate of decay in oranges, vitamin C tablets, and orange juice. If the AA content of these samples are tested individually in 3 temperature environments (heated, cold, and room temperature) then the environment that causes the greatest amount of AA decay can be determined. Methods/Materials The concentration of AA was measured in 3 sets of oranges, orange juice, and vitamin C tablet solutions. The concentration of AA was determined by comparing the reaction of the sample to a solution of vitamin C having a known AA concentration, the control. To measure the AA concentration of a liquid, 5 drops of the liquid was placed into each of the 3 wells in a microplate. Two drops of a liquid starch solution was added to each of the 3 wells. An iodine solution was added, one drop at a time, to each well until the starch indicator in the liquid turned and stayed blue for at least 15 seconds. The samples were placed into the 3 temperature environments. The AA concentration of each sample was measured every 24 hours for 6 days. Results The AA in the samples placed in the heated environment decomposed at the highest rate. The total average AA rate of decay in the heated environment for 18 days of experimenting was 10% loss/day. The ascorbic acid in the sample placed in the refrigerated environment decayed at the lowest rate. The total average AA rate of decay in the refrigerated environment was 3% loss/day. Of the 3 materials tested, the vitamin C tablet solution had the highest AA rate of decay, and the orange juice had the least. The total average ascorbic acid rate of decay in the vitamin C solution for 18 days of experimenting was 8% loss/day. The total average ascorbic acid rate of decay in the orange juice was only 3% loss/day. Conclusions/Discussion The vitamin C tablet solution retained the least AA, and the orange juice retained the most AA. Samples placed in the heated environment had the greatest AA rate of decay, and the samples in the cold environment had the lowest AA rate of decay. The findings of this experiment verify that vitamin C is an unstable chemical compound that is degraded when exposed to elevated temperatures.	
Summary Statement The purpose of this experiment was to determine the effect of temperature (ranging from 2 to 45 degrees Celsius) on the ascorbic acid rate of decay in oranges, vitamin C tablets, and orange juice.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Lisa B. Noble	Project Number S0518
Project Title PPAR Delta Crystallography	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The peroxisome proliferator-activated receptor delta (PPAR delta) is a ligand dependent protein which regulates the transcription of genes related to lipid and cholesterol metabolism. The compound L-165,041 was developed by Merck and was found to act as a selective PPAR delta agonist. The nature of the interactions occurring between the protein and this ligand are presently unknown.</p> <p>Methods/Materials To gain further understanding of PPAR delta biology, the protein (PPAR delta), and the ligand, Merck compound L-165,041, were first cocrystallized and then x-ray crystallography was used to visualize the structure. The crystallography experiment commenced by diffracting microscopic protein crystals with a beam of X-ray photons that were collected on a charged coupled-device. It was necessary to use a beam of photons that was extremely powerful that can only be produced at synchrotron facilities such as the Advanced Light Source at the Lawrence Berkley National Laboratory. Various computer programs were used to refine, integrate, and scale the diffraction data and to calculate a 2.5 Å resolution electron density map of the crystal lattice</p> <p>Results A model of the protein-ligand structure was constructed using this information. The ligand-binding site was found to be in the center of PPAR delta. The ligand is held in this site by van der Waals forces and hydrogen bonds with the surrounding amino acids of the protein.</p> <p>Conclusions/Discussion This particular structure may help to design new compounds that have improved interactions with PPAR delta. The greater understanding scientists have of PPAR delta and its biology will impact how future drugs help our society with the growing issue of cholesterol metabolism.</p>	
Summary Statement My project explores the technique of x-ray crystallography to determine the three dimensional structure of the PPAR delta protein bound to Merck compound L-165,041.	
Help Received Used lab equipment at the Lawrence Berkley National Laboratory under the supervision of Dr. Andrew Shiau.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Leneve Ong	Project Number S0519
Project Title Burn That Fat! The Predictive Role of Free Fatty Acids in Biodiesel Fuel Degradation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Free fatty acid numbers are often used as arbitrary measures of fuel quality. An increase in fatty acids should thus correlate with fuel degradation, such as polymerization that restricts fuel flow. I plan to evaluate the environmental conditions the fuel encounters in storage and during engine use to characterize fluctuations in biodiesel properties. Such information can help predict the performance and shelf life of biodiesel fuel and give insight into improving and promoting biodiesel fuel as a viable alternative fuel.</p> <p>Methods/Materials Titration for free fatty acids and a filtering process mimicking a typical fuel system lays the groundwork for a model that predicts the relationship between free fatty acid values and polymerization of fuel. For the purposes of this study, established diesel sources and biodiesel made from soybean oil were used in order to limit confounding factors. Rather than wait for the fuel to degrade, degradation was induced in samples through alternating cycles of exposure to heat and cold.</p> <p>Results As environmental stresses were placed on the fuel, there was a general upward trend in fatty acid concentration. In terms of filtration, there was a decrease in the amount of fuel filtered in the set amount of time, though minimal.</p> <p>Conclusions/Discussion From the data obtained from free fatty acid determination, thermal stress of the fuel had a considerable effect. Although flow was not significantly correlated with increased free fatty acids initially, the clear trend that free fatty acids had with time could be modeled. The magnitude of the results are seen in comparison to the free fatty acid value of stored biodiesel. In future studies, opacity and color may also serve as indicators of flow restriction and degradation.</p>	
Summary Statement Free fatty acids released by chemical reactions in biodiesel fuel should be an accurate determinant of fuel degradation.	
Help Received Materials and equipment were bought with grant monies from BP; Father helped cut wood pieces for experimental equipment; Biodiesel was produced by the Tongva Ecofuels Project; Used lab equipment at Innovative Organics under Doug Ward	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Evelyn J. Park	Project Number S0520
Project Title Testing Known Antioxidants for Inhibition of Peroxidation in Organic Solvents	
Abstract Objectives/Goals Organic peroxides are dangerous, explosive chemicals that can form in organic lab solvents, such as diethyl ether tetrahydrofuran (THF), when exposed to light, heat, or air. The formation of these peroxides is caused by the presence of free radicals in the solvent. An inhibitor which blocks the action of free radicals may therefore slow the formation of peroxides. The object of this experiment was to test biological antioxidants as inhibitors of peroxide formation and compare them to BHT, a commercial inhibitor. Methods/Materials Several vials were prepared, using dilutions, with different solvents (THF or ether) and different concentrations of Vitamin E, retinol, Vitamin C, BHT, selenium, and beta-carotene. The peroxide levels of each vial were measured weekly with EM Quant semiquantitative peroxide test strips. Results The study found that ether formed peroxides at a much slower rate than THF, and that increasing concentrations of the antioxidants would decrease the concentration of peroxide formed, with the exception of retinol. When retinol's concentration was increased, the concentration of peroxide formed increased. Also, the peroxide levels in the vials with selenium and Vitamin E were roughly equal to the peroxide concentrations in the vial with BHT. Conclusions/Discussion The results show that Vitamin E and selenium are equally effective as BHT in inhibiting formation of peroxides in THF, contrary to the hypothesis that some antioxidants will be more effective than BHT as inhibitors of peroxide formation. The results also show that retinol promotes rather than inhibits formation of peroxides.	
Summary Statement The aim of my project was to test various biological antioxidants for their ability to inhibit the formation of dangerous organic peroxides in the organic solvents THF and diethyl ether.	
Help Received Used lab equipment and chemicals at UCLA under the supervision of Dr. Kwon	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Alexander S. Parra	Project Number S0521
Project Title The Effects of Ultraviolet Radiation on Crystal Growth	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Taking into consideration the sensitivity and delicacy of crystal growth. I decided to subject seed crystals, taken from crystal clusters which I grew, and expose them to a continuous source of Ultraviolet light. UV light is an electromagnetic radiation of a higher energy than visible light because of its shorter wavelength. Crystals are so sensitive that even gravity interferes with perfect growth. This led me to speculate whether a continuous stimulation of 33% UVA and 8% UVB radiation would interfere with their symmetry or their growth.</p> <p>Methods/Materials I grew four different types of crystal clusters- Aquamarine, Citrine, Diamond, and Ruby. From these clusters, seed crystals were chosen, mounted, and divided into two sets of control and test crystals for each type. I called this part of my project Phase I. In Phase II all crystals were grown in 10 to 1 supersaturated solutions and allowed to grow for 10 days. However, the test group was subjected to continuous 33% A (aquarium light) and 8% (black light) Ultraviolet light while the control group was grown in a relatively light free environment.</p> <p>Results Both tests and controls of the Aquamarine and Citrine crystals showed significant growth while the Diamond and Ruby control and test groups formed well shaped crystals their growth was not noteworthy. However, what was significant was the overflowing eruptions of dendritic crystals in only the test Aquamarine and Citrine specimens.</p> <p>Conclusions/Discussion The fact that my Aquamarine and Citrine crystals were created from doped (food dye) solutions of monoammonium phosphate and my Diamond and Ruby crystals from doped solutions of potassium aluminum sulfate tended to clump my experiment into two groups even though the crystal lattice of all the crystals were different. However, the production of dendritic crystals in only the test group of the Citrine and Aquamarine made me believe that the UV radiation had an energizing effect because the control group was free of dendritic crystals. I thought this to be significant. I'd like to do further research using UVC, a still more powerful radiation, under stricter conditions with more varied crystals, preferably protein crystals to gain more insight into the Space Shuttle crystal experiments.</p>	
Summary Statement I wanted to find out if Ultraviolet radiation would disturb the crystal lattice of a growing seed crystal.	
Help Received My dad helped me secure some materials such as containers and rocks for crystal cluster mounts. He also drove me to garage sales and thrift stores to look for measuring containers.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Uppili S. Raghunathan	Project Number S0522
Project Title An Innovative Method to Reduce VAT Dyes Electrolytically by Avoiding Toxic Sodium Hydrosulfite	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals VAT dyeing is a process through which all insoluble commercial VAT dyes are taken up by cotton fibers in an alkaline or base-soluble form by reduction and made insoluble again through fixation by oxidation. In the case of the current experiment, indigo synthetic[C(16)H(10)N(2)O(2)] is the example dye used. When sodium hydrosulfite[Na(2)S(2)O(4)] is added to the solution of water, sodium hydroxide and indigo synthetic; and heated to a temperature of 75 degrees Celsius, indigo synthetic gets reduced to indoxyl [C(16)H(12)N(2)O(2)], which is a highly unstable yellow compound. When the cotton fabric is immersed in the indoxyl solution and exposed to air to dry, the yellow coloring in the fabric gets oxidized into indigo synthetic and turns blue. Here, handling sodium hydrosulfite (hydros) is injurious to health since a toxic smell involved during dyeing process seriously affects the health of the dyers by irritating their eyes, nose and skin. Hence, it is thought worthwhile to study an electrolytic method for VAT dyeing; which is simple, economical, free from pollution and the costly handling of sodium hydrosulfite; during reduction.</p> <p>Methods/Materials The experiment is setup in a H-Type electrolytic cell. Catholyte consists of 300mL of water; 5g of sodium hydroxide; 1g of sodium sulfate and 100mg of cerous sulfate as catalysts; and a lead sheet as cathode. Anolyte consists of 40mL of water, 1.1mL of sulfuric acid and a lead sheet as anode. The cell is heated to 75 degrees Celsius and 100mg of indigo synthetic is added. A DC 12 volts power supply is taken; the positive alligator clip is connected to the anode while the negative alligator clip is connected to the cathode. Hydrogen gas is released in the catholyte and indigo will get reduced to indoxyl.</p> <p>Results As the electrolysis was allowed to run for 10 minutes, the catholyte barely changed color. But when the experiment was continued for an hour, the catholyte had slightly turned green. In order to save time, the catholyte was decanted and the sediments were found to be yellow in color. When the sediments were allowed to dry and get oxidized, the color of sediments changed from yellow to blue.</p> <p>Conclusions/Discussion Results show that an electrolytic method for reducing VAT dyes is indeed a very time consuming process but definitely a safe alternate method that actually works. In the years to come, this process will be further researched on how it can be sped up.</p>	
Summary Statement The goal is to test whether or not electrolysis can reduce VAT dyes without the assistance of sodium hydrosulfite, which is the commercial toxic reducing agent used by VAT dyers.	
Help Received Grandfather gave the idea for the project and also gave directions to conduct the experiment; Used lab equipment at Lynbrook High School under the supervision of Mrs. Banchieri; Father helped put together the posterboard.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Matthew S. Shepherd	Project Number S0523
Project Title Elucidation of Molecular Structure and Bonding by Viscosity	
Abstract Objectives/Goals I wanted to determine whether viscosity would be useful to reveal characteristics of functional groups of molecules that change in biochemical processes, such as fermentation. Methods/Materials I investigated the viscosity of compounds and aqueous solutions as a function of temperature using a Cannon Fenske viscometer. Reference compounds included alcohols, ketones, organic acids, methylated aromatics, salts, peroxide, and water. Juice was extracted from Citrus aurantium, Vitis vinefera, and Vitus labrusca and then a portion was anaerobically fermented prior to measuring viscosity on the raw and fermented juices. The displacement time between viscometer fiducial marks for each compound was plotted and the velocity and acceleration corresponding to the displacement time was determined from the slope of the data. Results A matrix was developed that correlates changes in the direction of the viscosity acceleration vector over temperature with functional structure, enabling the category identification of unknown species. This was successfully employed to assess the efficacy of anaerobic fermentation and conversion to alcohol of fruit juices, achieving the initial research goal. The independence of viscosity with mass concentration was demonstrated by cleaving solutions of polyvinyl alcohol. Conclusions/Discussion Slight differences in structure that establish polarity and a dipole moment make substantial differences in viscosity by enabling inter-molecular bonds. Viscosity acceleration vector changes over temperature provide a classification basis to identify compounds of similar molecular structure. This allows me to postulate that there is a diffusion-based, second order, temperature-dependent, transport process occurring of greater complexity than given by either the colligative models of Poiseuille and Einstein or the thermal activation relationship identified by Carrancio.	
Summary Statement I found that temperature-based changes in the acceleration vector direction of fluids effusing through a viscometer provided a basis to identify the functional structures of the solutes.	
Help Received My judges at the county science fair provided explanations of the role of polarity and the dipole moment in the observed results. Len Thibodeau of Brookfield Engineering explained how to calibrate a viscometer. My parents helped with board layout.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Michele L. Trichler	Project Number S0524
Project Title Fuel for the Future?	
Abstract Objectives/Goals The objective of my project is to determine how efficient certain biofuels are in comparison to diesel fuel and to determine whether using new or used oil in the making of the biofuels altered their efficiency. Methods/Materials Five oils were made into biofuels by the addition of sodium methoxide. Three of the oils; canola oil, soybean oil, and olive oil were new oils and two of the oils; fryer grease and grease trap waste, were used oils. After the addition of sodium methoxide, two layers were formed in the resultant solution; glycerin and the biofuel. The biofuel, the top layer, was removed and isolated. The biofuels, as well as diesel and methanol, were then tested three times in a homemade bomb calorimeter. The heat gain was measured in the water in order to determine energy emissions. Methanol, the standard, was used to compensate in the calculations for all of the heat loss experienced in the experiment. Results The soybean biofuel and diesel had the same average energy emitted per gram per second, while canola, which emitted the second highest energy per gram per second, was a third less efficient. However, in regards to emitting the most energy per gram, the soybean biofuel was again the most efficient, which was followed closely by olive and then canola biofuel. Diesel had a very low emission rate per gram. Throughout all the tests fryer grease biofuel constantly preformed the worst, while grease trap waste did not convert to a fuel at all. Conclusions/Discussion Biofuels, if manufactured correctly have the potential to have a comparable energy output to fossil fuels.	
Summary Statement My project is comparing the efficiency of homemade biofuels in relation to diesel.	
Help Received Neighbor helped orgainze ideas and obtain used oils; Mother and Father help to time and record data; Used lab equipment at university of california under the supervision of Lauren Aubin; Mr. Bausback, my chemistry teacher, helped me in my board layout and requirements; Mother helped take pictures	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Briana Vincent; Brandon Wisely	Project Number S0525
Project Title Blazin' Wax	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Test the effect scent has on the rate of combustion. Hypothesis: The fragrance oils added to the wax will decrease the rate of combustion.</p> <p>Methods/Materials The materials used include: 3 Scented Paraffin wax candles, 1 Unscented Paraffin wax candle, Matches, Candle Outer and a Stopwatch. The candles were placed on a flat surface spaced equally apart. The candle were then lit 15 seconds apart and allowed to burn for 1 hour. After an hour, measurements of the candles height were taken in mm. The candles were then lit for a second consecutive hour and a second set of measurements were taken.</p> <p>Results The rate of combustion (in mm/hour) for the scented candles was less than that of the control group (unscented).</p> <p>Conclusions/Discussion The content of the wax appears to have an effect upon the rate of combustion in candles, thus the hypothesis is accepted. The wax burned as predicted with the control-unscented combusting at an increased rate in relation to the scented candles. However, the experiment suggests lurking variables may be present. These include the slope of the surface on which the candles were burned, and other additives in the wax besides the scent such as dyes.</p>	
Summary Statement The scents impact upon the rate of combustion in candles.	
Help Received Father helped with data calculations; mother helped assemble board	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Vasilios A. Morikis	Project Number S0599
Project Title Stranding and Looping	
Abstract Objectives/Goals I will test the hypothesis that nature prefers strands and helices in building biomolecules. I will also test if strands and helices are more stable structures than extended conformations. Methods/Materials I used a computer to make model peptides with repeating pentapeptide blocks of the type of [AAAAA](n) and [DAAAK](n), where n is the number of blocks; n=1-4. I modeled extended, strand, and helical structures. I measured and compared the stabilities of the peptides with and without energy minimization. I used the programs Insight II, IsisDraw, and DeepView. Results Examination of the potential energies, showed that helix is in general the most stable conformation, followed by strand, whereas the least stable is the extended conformation. As more amino acid blocks were added the gaps in the stabilities of helices, strands, and extended conformations become larger. Conclusions/Discussion Analysis of the individual potential energy terms for bond, angle, torsion, van der Waals, and electrostatic contributions, showed that the van der Waals term contributed the most to the increase in stability and to a lesser extend the electrostatic term. The [DAAAK](n) peptides were more stable than the [AAAAA](n) peptides, because of the formation of favorable anion-cation interaction between D, an acid, and K, a base.	
Summary Statement My project demonstrated that helices and strands are the preferred conformations for arranging amino acids in biomolecules.	
Help Received Father suggested the project and introduced me in molecular mechanics. Part of this work was performed at the University of California, Riverside under the supervision of Dr. Dimitrios Morikis. Mother helped me in gluing the project.	