



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

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| Name(s) Zahabiya H. Chithiwala | Project Number J0703 |
| Project Title Silicon vs. DNA: The Battle Has Begun | |
| <p style="text-align: center;">Abstract</p> <p>Objectives/Goals Determine if DNA has the ability to solve complex problems which cannot be solved by present day silicon based computers due to technology limitations.</p> <p>Methods/Materials This experiment will demonstrate how DNA can be used to solve a combinatorial problem such as the Hamilton Path Problem. Step 1: This step was to hand draw the Hamilton Path Problem on a piece of paper & to create a DNA sequence for each city on the path (20 bases long). A complimentary strand was created for each sequence. Then a DNA strand was created for the path between each city, by taking the 3# end of the first number and the 5# end of the second number and combining them. The oligos; the DNA sequence blueprint were then sent to be made. After receiving the oligos they were combined for the five path problem, then the ten path problem in test tubes according to the path drawing. Step 2: Used the PCR machine to run 35 cycles at 94C for 15 sec. & 30 degrees Celsius for 60 sec. to amplify the samples(create reactions to help the separate strand to bond.) Step 3: Running a gel electrophoresis with the samples. This step shows the length (base pairs) of the Oligos, to see if they are long enough for the next step then used the gel protocol kit to extract the DNA from the gel. Step 4: Amplify the samples from step 3 using PCR machine again is to purify the DNA for sequencing. Step 5: After DNA is sequenced, compare the sequences to ones done by hand. If the sequences match ,it can be determined that DNA can solve mathematical problems.</p> <p>Results This experiment was repeated numerous times and failed in step 3 possibly caused by external variables or materials. If all the steps went correctly the experiment would have turned out as expected and showed the DNA sequence for the path between each city. Each sequence would have matched the ones that were created when solving the Hamilton Path Problem by hand on paper.</p> <p>Conclusions/Discussion Although the results did not come out as expected through numerous tries , it can still be proven that DNA can solve a complex combinatorial problem, as seen in previous experiments conducted by other scientists. This experiment will be repeated several times before the state fair this May. DNA has a lot of potential, it is already being used to solve crimes and in the future will be used for many other things, one being computing.</p> | |
| Summary Statement DNA is one of many possible alternatives to silicon- based computers to overcome the limitation faced by current computers in the near future. | |
| Help Received Sybil Smith was my mentor for this project, used Cal Lutheran University Lab. | |