# CALIFORNIA STATE SCIENCE FAIR
# 2005 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J1008**

**Project Title**
## Are Fingerprints Hereditary? A Statistical Analysis

**Abstract**

**Objectives/Goals**
The purpose of my science fair project is to determine whether fingerprints are hereditary, which types are hereditary, and which parent to child combination is most hereditary.

**Methods/Materials**
Collecting data: look at fingerprints or ink the fingerprints. Label using ten types: left loops(LL), left pocket loops (LPL), right loops (RL), right pocket loops(RPL), central pocket loops(CPL), double loops(DL), arches(A), tentarches(TA), whorls(W), and accidentals(X). A family must have a father (F), mother (M), and at least 1 child (daughter-D or son-S).
For analyzing data, a scientific calculator and a z-test distribution table are necessary. For generating random families, generate random numbers with the calculator to assign each individual to a new family. Maintain family composition (if a family has two daughters, the new random family in its place should have two daughters). To create a proportion #r# (null hypothesis), take e.g. the # of sons# prints that are LL and divide it by the total # of sons# prints. Create a second proportion #p## the sample statistic # the #of sons# prints that are LL where the father#s print was also an LL divided by the # of sons# prints that are LL. Next, calculate the standard deviation (SD) of the second proportion. Use SD= the square root of [p(1 - p) /n], where n is the # of sons. To calculate the Z-statistic, use [Z =(p #r)/SD]. Next, calculate the same for the # of sons# prints that are LL where the M#s print was also an LL divided by the # of Ss# prints that are LL. Do the same for all 10 types of prints. Repeat for S-M, D-F, and D-M. With the Z-test, use a confidence level of 95%.

**Results**
In all, there were 15.2 average matches from all the real categories, and 10 average matches from all the random categories.
LL, As, and TAs were shown to be hereditary in all four parent to child comparisons. LPL and PL were shown to be hereditary in three of the parent to child comparison groups. RPL, CPL, and Ws were shown to be hereditary in two of the comparison groups. DLs could only be shown hereditary in one group. Accidentals were not shown to be hereditary in any of the groups.

**Conclusions/Discussion**
My hypothesis was correct in that fingerprints are hereditary and that in my sample, the Ss to Fs were the most hereditary, but I was incorrect because I couldn#t show that all the types I evaluated were hereditary and Ds to Ms was not the most hereditary group.

**Summary Statement**
I determined whether fingerprints are hereditary, which types are hereditary, and which parent to child combination is most hereditary using a z-test and other statistical methods.

**Help Received**
Over 30 families contributed fingerprints; science teacher helped me find volunteers, lent materials, helped with stats, edited writing; math teacher helped with stats, lent materials; friend and friend#s father edited writing; family helped me find volunteers, helped with math/stats/data, bibliography, and edited