



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Paul H. Lego	Project Number J0912
Project Title How Do Computers Remember?	
Objectives/Goals I wanted to learn how computer memory works, and to build basic computer memory myself. Specifically, I wanted to find a way to make the binary logic to remember a single digit number. I had previously learned that basic computer memory is made up of binary logic called Flip-Flops, so I decided to try to use Flip-Flops to build my basic memory.	
Abstract I researched the binary logic for computer memory and flip flops. I chose a D Flip-Flop as the logic design for my experiment. I rewired my BCD to 7-segment display project from last year to make it more simple. I tested the display and noted that as soon as I changed the input switches, the output LED changed without any delay. I added logic for 4 D flip-flops and a clock between the input switches and the inputs of the BCD to 7-segment decoder. I added a push button switch to trigger the clock. I tested the logic again and finalized the logic diagrams and schematics.	
Methods/Materials 1. I researched the binary logic for computer memory and flip flops. 2. I chose a D Flip-Flop as the logic design for my experiment. 3. I rewired my BCD to 7-segment display project from last year to make it more simple. 4. I tested the display and noted that as soon as I changed the input switches, the output LED changed without any delay. 5. I added logic for 4 D flip-flops and a clock between the input switches and the inputs of the BCD to 7-segment decoder. 6. I added a push button switch to trigger the clock. 7. I tested the logic again and finalized the logic diagrams and schematics.	
Results With the D Flip-Flop logic between the input switches and the inputs of the BCD to 7-segment decoder, I observed that, even if I changed the switches, the LED display "remembered" the last number input until I pressed the clock switch to clock the flip-flops.	
Conclusions/Discussion I found that D Flip-Flop logic could be used to make a single bit of basic computer memory and that using four of these Flip-Flops and my BCD to 7-segment decoder and display, my project could "remember" a number until I pressed the clock button.	
Summary Statement My project investigated how computers use binary logic called flip-flops to "remember".	
Help Received My mother helped me with suggestions for how to lay out my display board.	