



California Science Center  
**CALIFORNIA STATE SCIENCE FAIR**  
**2001 PROJECT SUMMARY**

<b>Your Name</b> (List all student names if multiple authors.) <b>Stephanie C. Tsai</b>	<b>Science Fair Use Only</b>  <h1 style="margin: 0;">S0420</h1>
<b>Project Title</b> (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) <b>Photoelectrochemical Imaging on Single Crystal Silicon</b>	<b>Division</b> _ Junior (6-8) <u>X</u> Senior (9-12)
<b>Preferred Category</b> (See page 5 for descriptions.) <b>4 - Chemistry</b>	
<p><b>Abstract</b> (Include Objective, Methods, Results, Conclusion. See samples on page 14.)          Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.</p> <p><b>Objective:</b> The object is to find out if it is feasible to incorporate computer (computer LCD projector) technology into the current process of etching single crystal silicon, (making porous silicon). Later on, for practical purposes, I wanted to determine the maximum resolution that could be achieved with the setup.</p> <p><b>Materials and Methods:</b> A new computer LCD projector was obtained and reconstructed to focus the LCD image through a camera lens, onto the surface of a silicon wafer, (which sits inside a Teflon cell). I designed a unique Teflon cell apparatus and acquired it from a manufacturer. After these steps were accomplished, actual etching process could be attempted. Other materials, required for the etch procedure, include hydrofluoric acid, platinum wire, ethanol, and polystyrene. To determine the resolution of an etch, the setup was used to image diffraction gratings onto a silicon wafer, and a laser was used to diffract the patterns onto a surface. The resolution was calculated by taking measurements and using the Fraunhofer Equation.</p> <p><b>Results:</b> Multiple (over 10) etches have been successfully completed, many of which display properties such as photoluminescence and sensor capabilities. The maximum resolution achieved with the developed setup was calculated to be in the range of 50 microns.</p> <p><b>Conclusion/Discussion:</b> The use of computer technology in etching, or imaging, single crystal silicon is functional and effective. Additionally, the determined resolution, which appears to be limited now by the setup, indicates a high level of precision. Currently, the first steps have been taken in the research of porous silicon in sensor application.</p>	
<b>Summary Statement</b> (In one sentence, state what your project is about.) My project is about incorporating new technology into a current electrochemical etch procedure used to produce porous silicon.	
<b>Help Received in Doing Project</b> (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4. Worked at Sailor (Chemistry) Lab at UCSD under supervision of Daniel Derr, Ph.D; My high school chemistry teacher, Victoria Coordt, helped with county science fair, (getting started, research paper, forms, etc.); Sister helped get me started.	