



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

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<b>Project Title</b> <b>Germination Simulation</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective is to determine the effects of artificial gravity, ultraviolet light, and magnetic field on seed germination and the growth of the root. I believe that artificial gravity will orient the seeds' roots towards the center of rotation due to the centripetal acceleration. The ultraviolet light's energy is in the short wavelength and I believe that it may burn the seeds. Lastly, I believe that a magnetic field will help the seeds germinate quicker by aligning the molecules of the root in a favorable condition.</p> <p><b>Methods/Materials</b> For my normal condition experiment, I first soaked beet and radish seeds in water for 24 hours. I then placed the seeds in cotton balls and the cotton balls into plastic containers for observation. For my artificial gravity condition experiment, I built an apparatus using a fan motor, a rotating platform, and a speed controller. I then placed soaked seeds on cotton balls and into containers that were placed 3" from the center. For my ultraviolet light experiment, I placed soaked seeds in containers and containers under the ultraviolet light. For my magnetic field condition, I first placed two magnets 1 1/2" apart in the correct pole orientation (North/South). I then placed seeds in cotton balls and these cotton balls inside the magnetic field.</p> <p><b>Results</b> The beet and radish seeds dried and eventually burnt under the ultraviolet light. The magnetic field quickened the growth rate of the beet and radish seeds. Lastly, the artificial gravity directed the root growth outside, but the stem growth towards the center of rotation.</p> <p><b>Conclusions/Discussion</b> To germinate seeds in space, magnetic and artificial gravity fields would be recommended for better results. However, the exposure to ultraviolet lights must be minimized to prevent seeds from being burnt.</p>	
<b>Summary Statement</b> I studied the effects of artificial gravity, ultraviolet lights, and magnetic fields on seed germination and the growth of the root.	
<b>Help Received</b> Mother helped format report and father helped build apparatus.	