



California Science Center
CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.) Adam C. Currie	Science Fair Use Only
Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) The Brazil Nut Effect	J1405
Preferred Category (See page 5 for descriptions.) 14 - Physics & Astronomy	Division <u>X</u> Junior (6-8) _ Senior (9-12)
Abstract (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>Have you noticed that whenever you open a can of mixed nuts all the larger nuts are at the top? This is sometimes called "The Brazil Nut Effect." This effect is observed in all granular (particulate) mixtures that are undergoing shaking or vibration. It causes large granules to "float" to the top when vertically shaken, while smaller granules tend to sink to the bottom. This happens because the small granules can find crevices to slip into during each vertical shake, but there is never a crevice large enough for the big granules, so they tend to rise to the top. One way in which I investigated the brazil nut effect was using a cylindrical container full of rice. I placed three different size beans at the bottom of the container, covered them with rice, then shook the container vertically with an electrically driven speaker. I asked two questions in my experiments. First, does the rate at which the bean rises during shaking depend on its size relative to the rice? Second, does the rate of rise depend on the position of the bean (center, side, or half-way) within the container? My hypotheses were (1) larger beans will rise quicker and (2) the closer to the center of the container the bean is, the faster it will rise. My results showed that both these hypotheses were correct. This effect has important consequences in geology, where it can determine how different size rock particles move and stratify, and in the pharmaceutical industry, where it can produce "shaking-induced de-mixing" in powdered or granular chemicals.</p>	
Summary Statement (In one sentence, state what your project is about.) I investigated the separation or "de-mixing" of granular substances produced by vertical shaking, called the "brazil nut effect."	
Help Received in Doing Project (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. Father helped with creating graphs and printing out figures for poster.	