



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Charles J. Huang	Project Number S0310
Project Title Crystallization of Calcium Carbonate into Chitin in Agaricus bisporus for Synthetic Bone Grafting and Prosthetics	
Objectives/Goals The objective is to engineer a new material as a cheaper alternative for Synthetic Bone Grafts and a biodegradable alternative for short-term-use prosthetics.	
Abstract Methods/Materials Agaricus Bisporus, Lyophilisation Machine (from Shannel's Flowers), 1% Acetic Acid (Diluted Vinegar), 10mM Calcium Chloride Solution, 10 mM Sodium Carbonate Solution, Google Sketchup, 3d printer, Double Diffusion Chamber (I designed and 3d printed this apparatus)	
Results From the double diffusion, I ended up with 5 materials: a 3 hour, 6 hour, 24 hour, and two 48 hour crystallization periods. Then, I measured the maximum mass each material could hold and found that the six hour crystallization period was the strongest, as it was able to hold 1952 times its own mass. The lowest results came from the 48 hour crystallization period, where it was able to hold 1031.57 times its own mass. This shows that the materials are able to withstand a lot of weight before breaking.	
Conclusions/Discussion With the average male/female being only 60 kilograms and the maximum mass 1 kg of the material could hold being 1952 kilograms, the material is applicable (as of strength) in prosthetics. Due to its biodegradability, it will most effectively apply into short term prosthetics such as holding up an arm/wrist while it heals. Because the composition of this material is very similar to bone's composition and may yield a high osteoconductibility, it could provide a cheaper alternative for synthetic bone grafts because the Agaricus bisporus mushroom can be harvested in bulk.	
Summary Statement I engineered a new material as a cost effective alternative for synthetic bone grafts and a biodegradable alternative for prosthetics by crystallizing Calcium Carbonate into Chitin in the fungus, Agaricus Bisporus.	
Help Received I designed and constructed the double diffusion chamber myself. Mr. Lendy Dunnaway helped print and lazer cut the parts of the chamber. Melanie from Shanel's Flowers offered me the opportunity to use her lyophilisation machine.	