



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Dhuvarakesh Karthikeyan	Project Number S1116
Project Title MFCs Reloaded: A Novel Bio-Augmented Design to Enhance MFC Efficiency	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to see if a bio-augmented design would increase the efficiency, as well as power production, of a Microbial Fuel Cell. Moreover, I aimed to analyze the extent at which it would optimize the power production, if optimization was achieved at all. I established a goal of increasing power production by 10-15%.</p> <p>Methods/Materials I came to discover that there were innate flaws in MFC design that were holding it back from realizing the potential of such a revolutionary technology and set out to change the design itself. The two-chamber MFC is highly inefficient due to its high internal resistance and the single-chamber MFC has both a low lifespan and is not cost-efficient. The same way by which researchers were inspired by nature in the pursuit for artificial photosynthesis, I used nature's model to successfully design a more efficient MFC to reduce internal resistance, increase longevity, and increase the surface area to volume ratio of the system. I used PVC piping and PVC compression fitting to construct the system and was able to control the price to be \$15-\$18 USD.</p> <p>Results The design modifications increased the power production of the system by a factor of 60% in comparison to the baseline power produced. By using the extent at which the design changes were applied as a function of power production, as well as a matrix of meticulous controls, I was able to conclusively determine that it was indeed the modifications in design, and not any adverse affect that lead to an increase in power production.</p> <p>Conclusions/Discussion The 60% increase in power production overshoot the expected 10-20% increase in power production by a huge margin. The next step would be determining and overcoming obstacles regarding scaling up the idea before implementation can begin in developing nations and integrated into developed nations.</p>	
Summary Statement I was able to engineer a more efficient MFC design that yielded 60% more power production while simultaneously reducing its cost.	
Help Received Sister helped with the board; teachers helped streamline the design process with feedback; father helped with practical applications and outreach	