CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
J0117

Project Title
Propulsion Possibilities: Finding the Most Efficient Propellers for Nanobots

Abstract

Objectives/Goals
The objective of my experiment was to find out the most efficient propeller design for a nanobot moving in the blood stream. My hypothesis is that if I use a propeller designed like an Archimedes screw, it will be more efficient than other designs.

Methods/Materials
I designed 7 different propellers and printed them in plastic on a 3D printer.
The propellers were each tested 5 times at 3 different voltages: 0.75 v, 1.0 v, and 1.4 v. The power supply had digital readings for accuracy. Each propeller started at the same point and each one moved 25 centimeters. The recorded data was the electrical current and time for each trial.

Results
The data does not support my hypothesis that the Archimedes screw will be the most efficient. The most efficient one was the "Broken Starfish" (#7) at 0.75 volts. The "Play Dough" design (#6) came next. Only then did the Archimedes screw come in third.

Conclusions/Discussion
The two best propellers both had inclines in their spirals of more than 45 degrees. This made a big difference. Also, the faster a propeller is spinning and the thinner the gap in the propeller for the liquid, the less time the liquid has to fill the gap. This is because the speed of the blades and their thickness decides the actual window of time for the liquid to get in and out. And when it gets pushed away the gap is not fully filled, and less liquid is pushed. Less liquid is less force and less force is less efficiency. (General Thrust Propulsion, 2015)

Scientists can use my information to design better propellers for small scales or dense liquids, and then we can evolve these into a new generation and a way to deliver life-saving drugs into any place in the body, saving people from things such as cancer.

Summary Statement
Finding an efficient propeller design for a robot in the blood stream.

Help Received
I appreciate the advice from my science teacher, Mrs. Miller, and Dr. Steven Long, retired UCSB professor.