Mechanized Collection of Organic Spider Silk

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Spider silk is a very valuable but elusive material. It is 30 times tougher than steel yet is difficult to obtain. Synthetic production has had limited success because the chemical changes to the silk protein inside the gland are currently too complicated to understand or replicate. The goal of my research therefore was to create a prototype of a system to pull silk from spiders made up of cheap materials and required minimal human interference. In building the prototype, I tested out different designs and improved upon those which showed the most promise. In order to provide the spider with the resources necessary for silk production I tried extracting silk glands for incubation in liquid media, poking holes in exoskeleton to submerge in liquid media, and eventually concluded that feeding pupae to live restrained spiders worked best in keeping the spider alive and healthy enough to produce silk. For silk extraction and collection, I built different rotating spools. Eventually I tested and designed a spool that could automatically collect silk directly from the spinnerets, drastically reducing the manual labor needed. Calculated from my data, the average rate of web production in this system was .0159 mg/minute; according to that, two months of production of one spider would result in about 1,300 mg of silk with very little labor required. In conclusion, spiders' naturally produce very little silk on their own and while being forcibly extracted; therefore this system would be most effective in collecting silk for biomedical uses.

Awards Won:

American Intellectual Property Law Association: Second Award of $250