

A Funny Thing Happened on the Way to MFC Sequencing

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Abstract

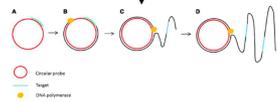
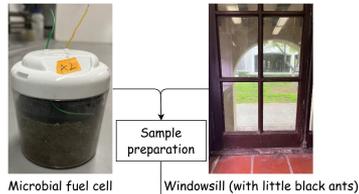
We characterized the bacterial community generating electricity in our microbial fuel cells by PCR, revealing a diverse electrogenic microbial community rather than the expected *Shewanella* and *Geobacter*. We observed overlap with DNA from a *Monomorium minimum* (little black ant) collected at Caltech. We also discovered plant DNA on this ant and cross-referenced a map of trees on campus to understand plant DNA spread.

Background

Microbial fuel cells (MFCs) harness microbes to produce electricity. Electrogenic bacteria metabolize organic substrates and release electrons, creating a usable potential difference. Frequent substrates include sugars and acetate.



Left:
 A yew pine in front of Powell-Booth Laboratory, at Caltech, and a lab member. DNA matching yew pine chloroplast was found on the ant we sequenced, revealing its very fine pollen likely adhered to our ant near Gates Annex.



Rolling circle amplification

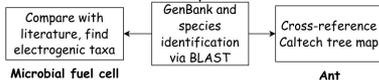
PCR: select preferred 16S region



Illumina MiSeq

Paired-end reads

Cleanup and processing



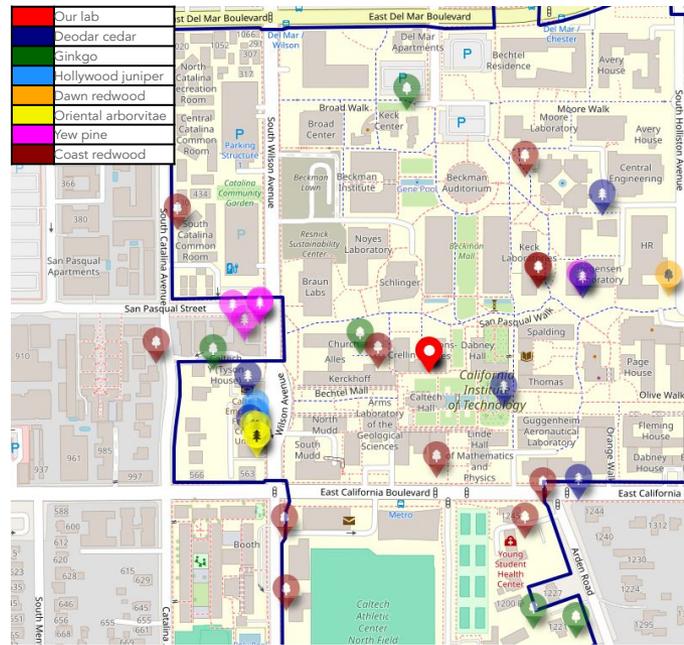
Left: an overview of our process, from MFC biofilm and ant sample to data and results.

Results

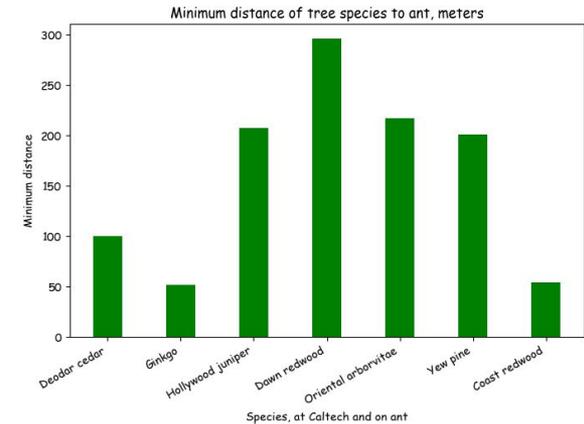
Selected electrogenic bacteria	MFC	Ant
<i>Enterococcus</i>	yes	yes
<i>Salmonella</i>	yes	yes
<i>Aeromonas</i>	yes	no
<i>Lactococcus</i>	yes	yes
<i>Enterobacter</i>	yes	no
<i>Citrobacter</i>	yes	no
<i>Bacillus</i>	yes	no
<i>Klebsiella</i>	yes	yes

Our ant also yielded many species of tree chloroplast, deciduous and coniferous.

We compared the DNA on our ant with a map of trees on the Caltech campus (Caltech Facilities) and reconstructed a map of area trees (see left and below).



Above: A map of selected trees found in our sample. Map and boundaries from OpenStreetMap, tree locations from Caltech Facilities.



We also observed overlap between plant DNA on the ant and trees declared protected or otherwise present in the Pasadena area more generally.

Acknowledgements

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