Electroactive responses of bacteria for monitoring water quality

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- Applications for water quality monitoring
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- Modelling of the system

Background



Background

AGRICULTURE

INDUSTRY

DOMESTIC







Change in nutrients pH changes

Trace compounds:

Heavy metals, non-metallic toxicants, Organic molecules, Pesticides

Background



SELF-POWERING BIOACTIVITY SIMPLE **COST-EFFECTIVE** FAST RESPONSE ONSITE Water Aid, (2010)

EPA, (2015)



Chouler and Di Lorenzo, Biosensors, 5(3), 450-470, (2015)



Chouler and Di Lorenzo, Biosensors, 5(3), 450-470, (2015)

• Device schematic

Anode chamber: 128 µL Electrode surface area: 0.32 mm² Fed with artificial wastewater





Chouler et al., Electrochemica Acta, 192, 89-98, (2016)



Applications for water quality monitoring

• Detecting organic content in water



Applications for water quality monitoring

• Responses to temperature, conductivity, pH



Applications for water quality monitoring

• Responses to toxic compounds- i.e. formaldehyde



Modelling responses

- Is there a way we can model responses to indicate what *one change* in the input is?
- Is there a way we can model responses when *two or more events* are happening at once?



Biological Processes



Physiological Processes



Electro Chemical Processes









Identification and quantification of mixtures

Conclusions

- Microbial fuel cells can give an indication of *water quality*
- Challenges ahead:
 - Corroborating the output response to input parameters for *complex mixtures*
 - Coupling the output response to *system processes* and *properties*.

Questions?