Questions:

- If you had to redo the design of your pioreactors, what would you do differently?
    - Wouldn't choose a raspberry pi —- would choose a microcontroller (harder to develop) but user experience is usually better // also so cheap lol
    - Mechanicals: move the reactor off the raspberry pi/circuit board -> separate wetware from the hardware
    - Use off the shelf PCBs as much as possible instead of designing your own
        - PCBs TAKE SO MUCH TIME
    - Software & 3D printing take no time for iteration (can always change this later)
    - Components that take a long time to ship (consider this!) glassware, stir bars, custom caps(?)
- Adding onto prev question: how did you select the electronic components?
    - Use more stemmaqt connector protocol by adafruit; for PCBs, other actuators
    - Really nice temperature probe for medical usage
    - Eye-spies have a known connector
    - Always been I2C; but hardware is stemmaqt
        - Software exists for stemmaqt! He will send over later
        - Cheaper
    - Metrics for electronics:
        - Heating: Ambient -> 40C
        - Pumping: low flow rate -> mL/min; or less is fine
        - OD: up to xyz value (probably more opaque doesnt matter)
        - Mixing: 100 to 1000 rpm
- Why choose a 1:1 ratio between pioreactors and Raspberry pis?
    - Are you working on any softwares/hardwares that can connect multiple pioreactors to one raspberry pi?
    - Why raspberry pi and not other options? Arduino? STM?
    - Acknowledges compute abundance—but good for web server, plugins, file system
    - Just easy to run one microcontroller per bioreactor that you can take in and take out as you wish
- Are you working on any updates to the pioreactor design (what areas)? If it's confidential, what general theme? Accessibility, technology, etc.
- Did you face any issues when initially designing the pioreactors, what challenges do you foresee for us?
- Why did you choose certain design features over others? Ex. screws over snapping systems,
    - 3D printing iterations? Especially to fit with screws
        - Historical accident lol: people understand how to use screws, no risk of breakage, screws are really cheap
        - Feature of screws: heat set inserts
- why the hat PCB?
- Pros and cons of switches/physical buttons on the pioreactor vs the software (why did you decide to go with software)
- What were the original objectives of the pioreactor?
- Product lifespan (how many reactions? warranty?)
    - Glassware may be a consumable -> breaks down the fastest
    - Stir bar gets lost (???)
    - Vial caps may fail

    - Hardware wise (in order of failure): pumps (motors have a lifespan), tubing, some time.. ICs like PCBs
- Looks similar to duet3d software. What did you use to develop your software? Any open source softwares as reference code?
- Who were the customer/stakeholders (wetlab?) that you designed for initially? Who did you consult (could we get more contacts for HP lol)
- Why is the wifi connectivity for the pioreactor the way it is? Is there an easier way?
- Design tradeoffs
- Why can't you 3D print it to be assembled, why aren't things covered
- How does the leader/follower cluster system work? Does one leader set controls for everyone else?
- Peristaltic pump issues with disassembly cleaning:
    - Opne source pump design !!
    - Snap fit, hinge to clean
- Physical vs software interface:
    - Longer development cycle for physical —- one more layer of complexity
        - New pioreactor that has a screen!!!
    - UIs are really cheap, web server, easy to develop
- Power management, data management, etc. of 96 parallel bioreactors ☠️
    - Surprisingly no? Better to ask our mechatronics prof about this ->
    - Probably wifi issues though (too much latency) if a lot of data being sent
    - Thomas wants high quality data though.. So maybe frequent data transfer
- Detection of data outliers? Error checking -> (find a way to label bioreactors..)
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