

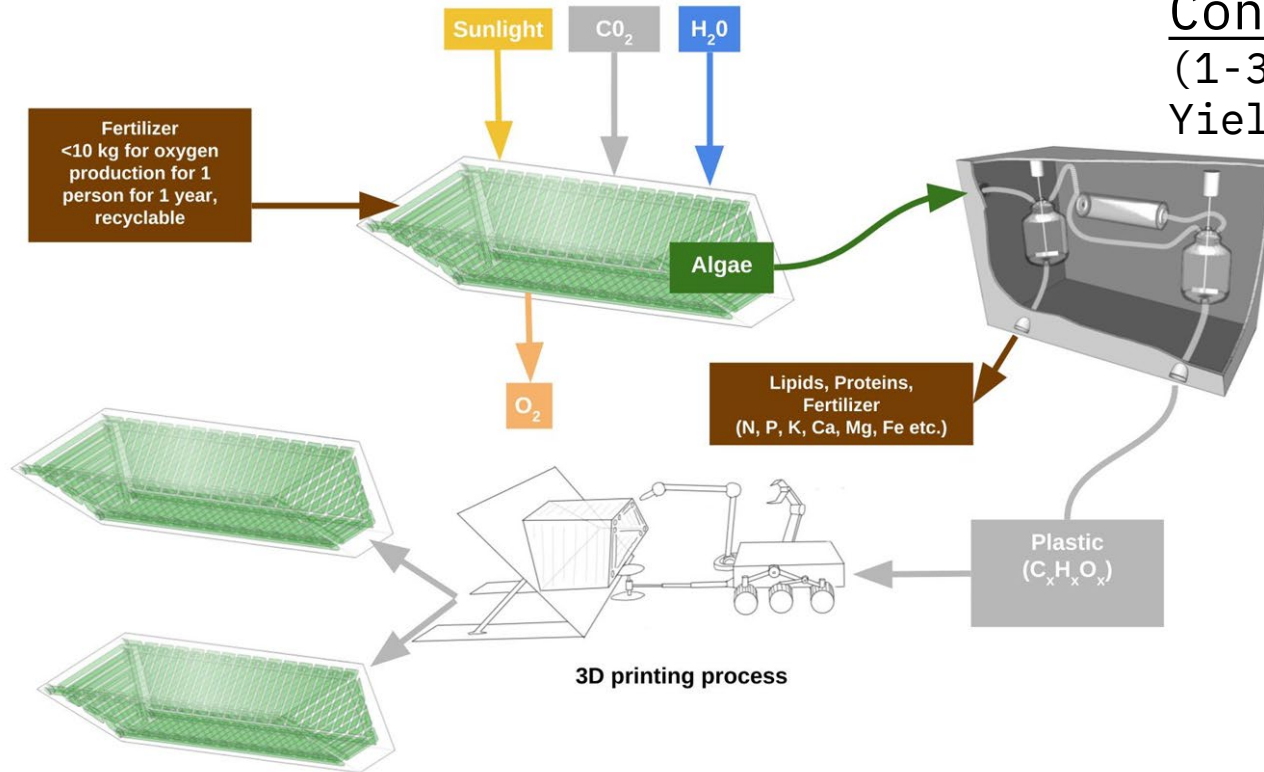


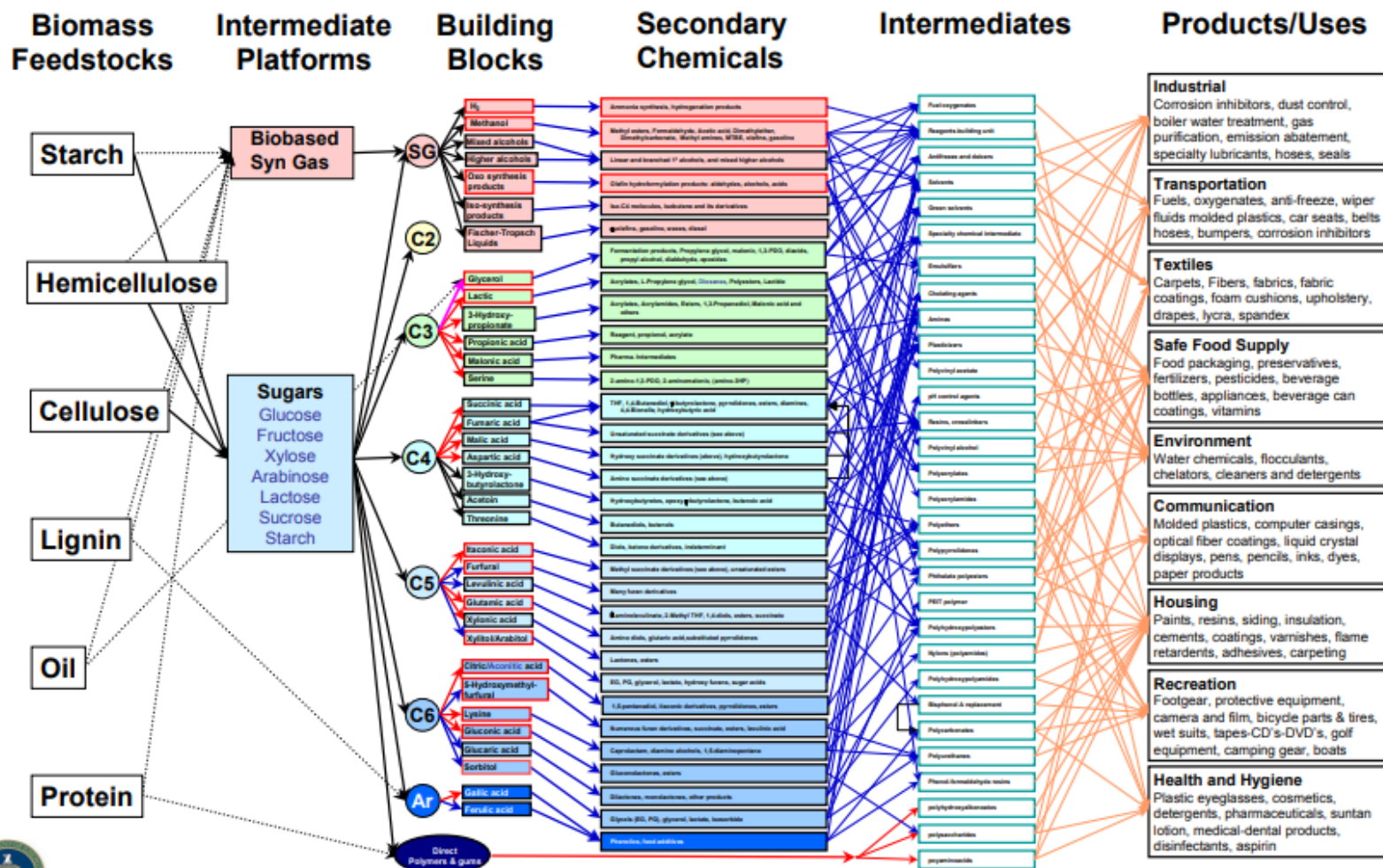
# GROW MARS

L I F E .   A N Y W H E R E .

# Bioplastic expanding loop process

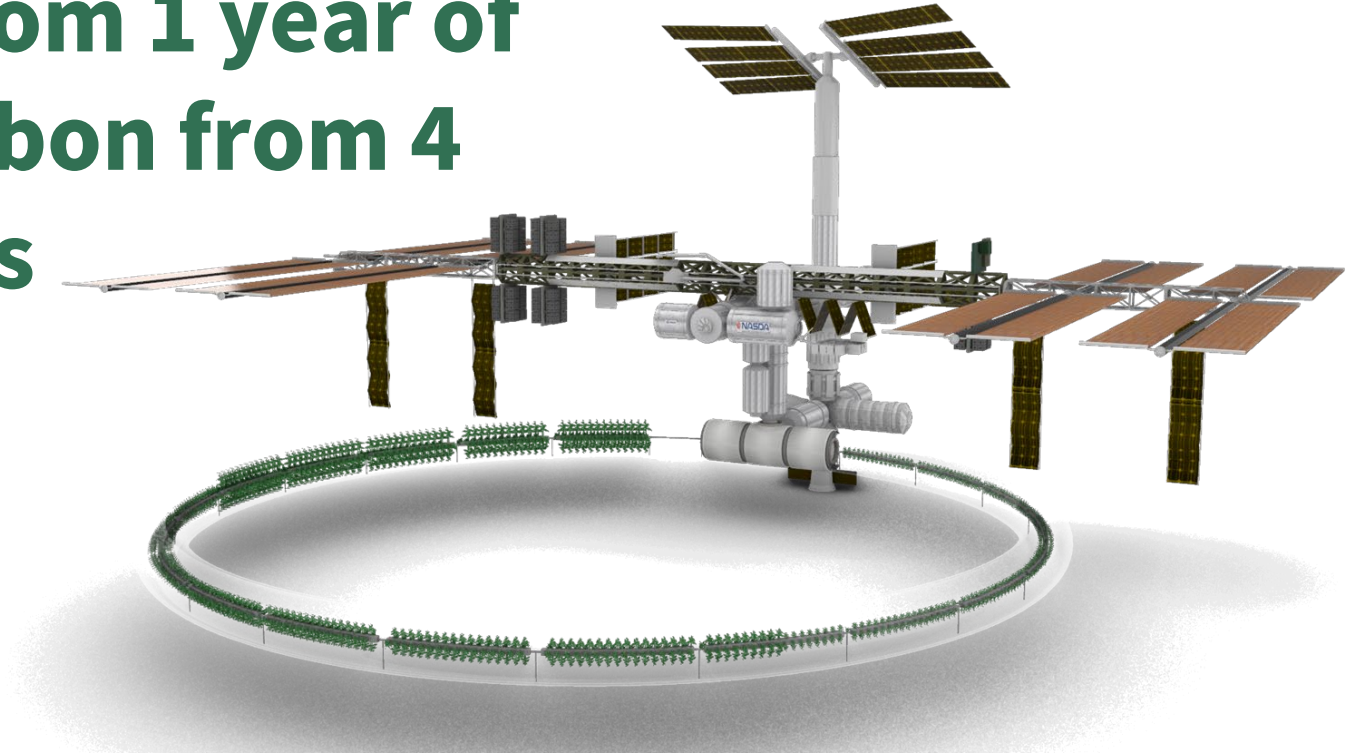
Biomass to Plastic  
Conversion Reactor  
(1-3kW, <50kg,)  
Yield 2kg plastic/hour





Source- NREL

**4,000kg+ greenhouse can  
be built from 1 year of  
waste Carbon from 4  
astronauts**







## Future food options:

1. Food

2. Greenhouses to grow fresh food

3. Machines that makes

Greenhouses<sup>2</sup>

4. Machines to electrochemically  
produce plastic, sugar, protein

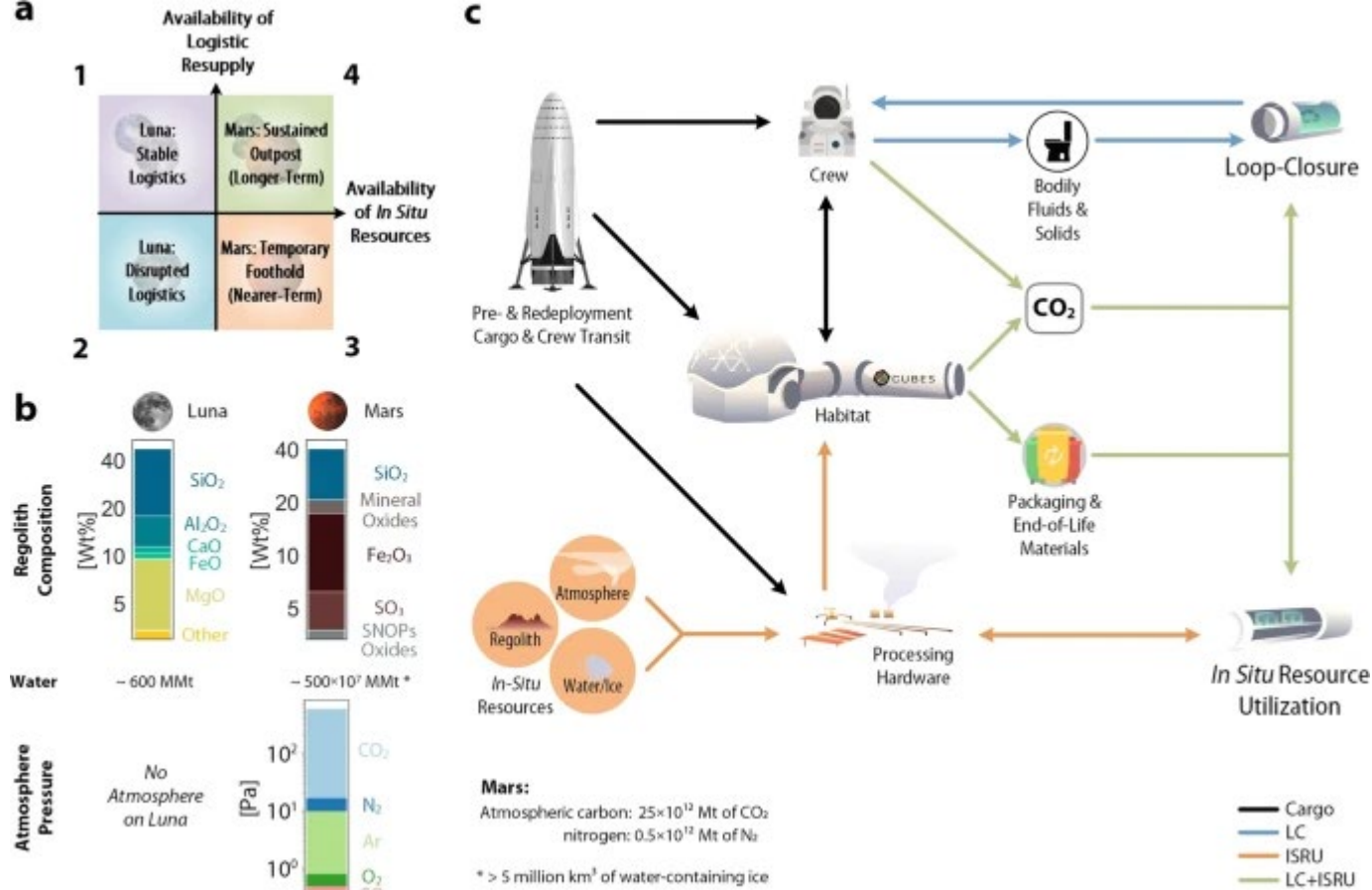
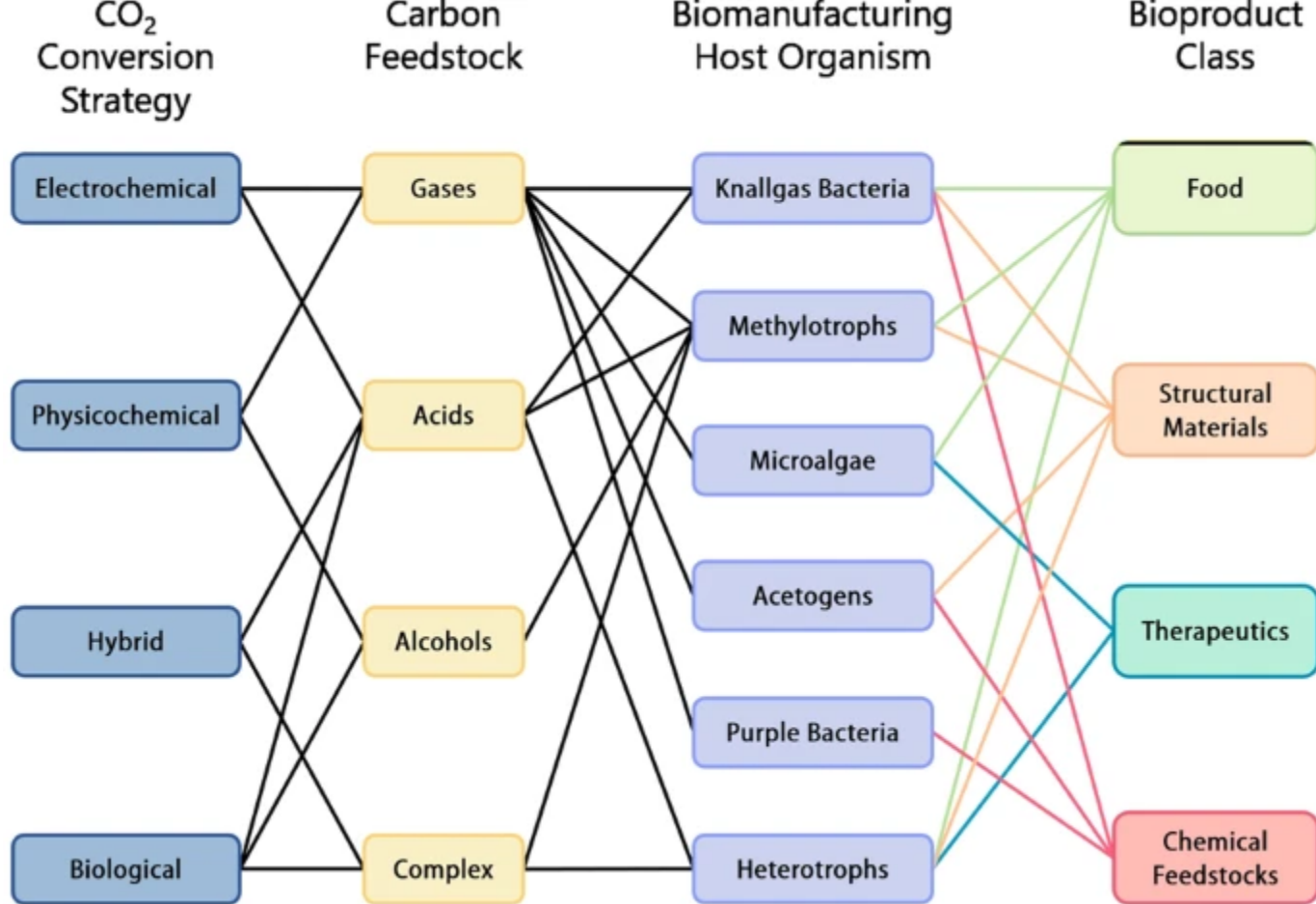
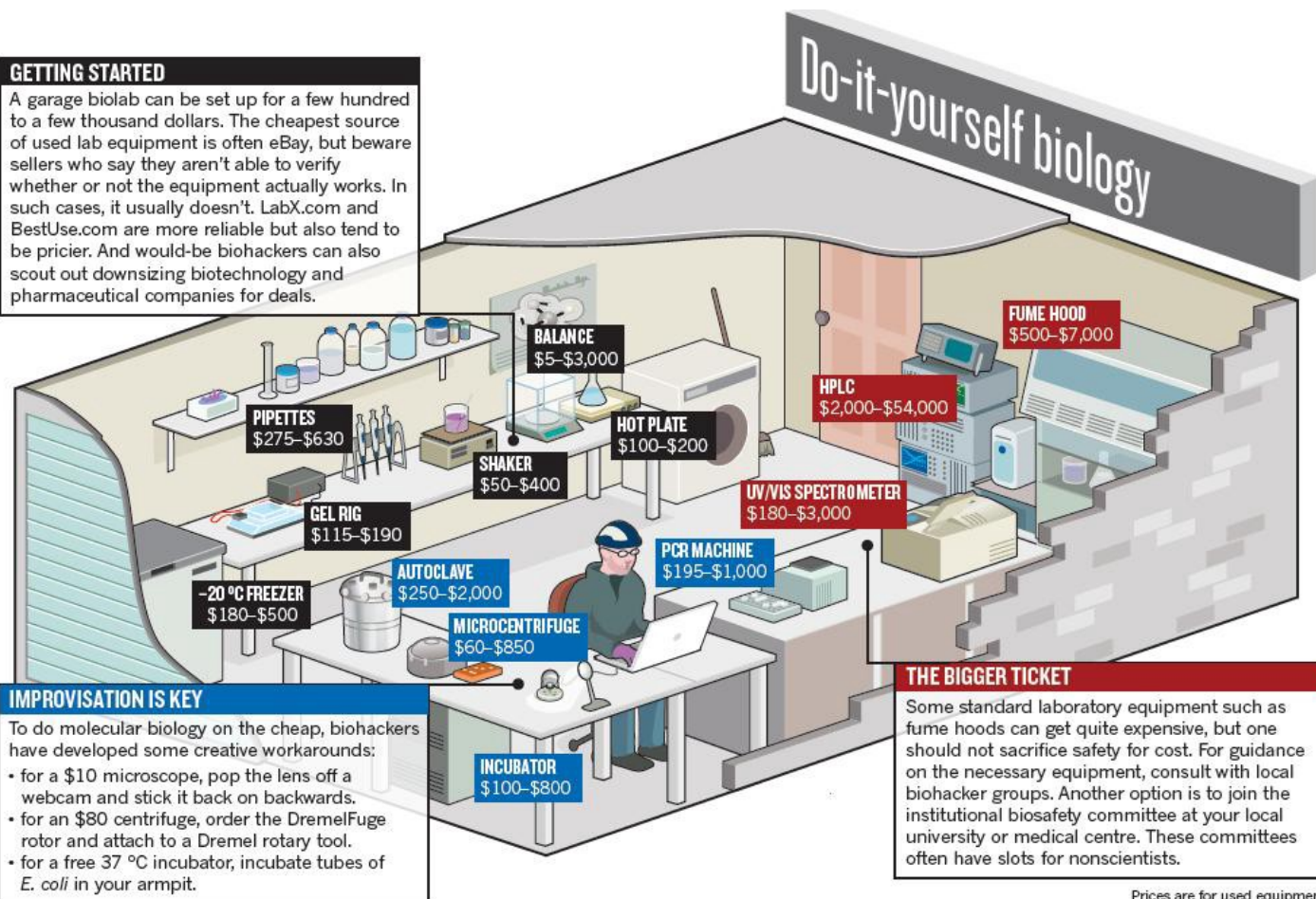


Photo credit- Averesch, N.J.H., Berliner, A.J., Nangle, S.N. *et al.* Microbial biomanufacturing for space-exploration—what to take and when to make. *Nat Commun* 14, 2311 (2023). <https://doi.org/10.1038/s41467-023-37910-1>



## GETTING STARTED

A garage biolab can be set up for a few hundred to a few thousand dollars. The cheapest source of used lab equipment is often eBay, but beware sellers who say they aren't able to verify whether or not the equipment actually works. In such cases, it usually doesn't. LabX.com and BestUse.com are more reliable but also tend to be pricier. And would-be biohackers can also scout out downsizing biotechnology and pharmaceutical companies for deals.



## IMPROVISATION IS KEY

To do molecular biology on the cheap, biohackers have developed some creative workarounds:

- for a \$10 microscope, pop the lens off a webcam and stick it back on backwards.
- for an \$80 centrifuge, order the DremelFuge rotor and attach to a Dremel rotary tool.
- for a free 37 °C incubator, incubate tubes of *E. coli* in your armpit.

## THE BIGGER TICKET

Some standard laboratory equipment such as fume hoods can get quite expensive, but one should not sacrifice safety for cost. For guidance on the necessary equipment, consult with local biohacker groups. Another option is to join the institutional biosafety committee at your local university or medical centre. These committees often have slots for nonscientists.

Prices are for used equipment