

Green Labs – Reduce & Re-use 2018

Martin Howes

Sustainable Labs Co-ordinator, Environment & Energy

Tuesday 20th November 2018 – 17 Mill Lane (Central Cambridge)

Friday 23rd November 2018 – Clinical School (Addenbrooke's Site)

Environment & Energy

Reduce

Communication

- Inductions
- SOPs
- Lab Handbooks
- E&E Resources
- Senior staff buy-in statement



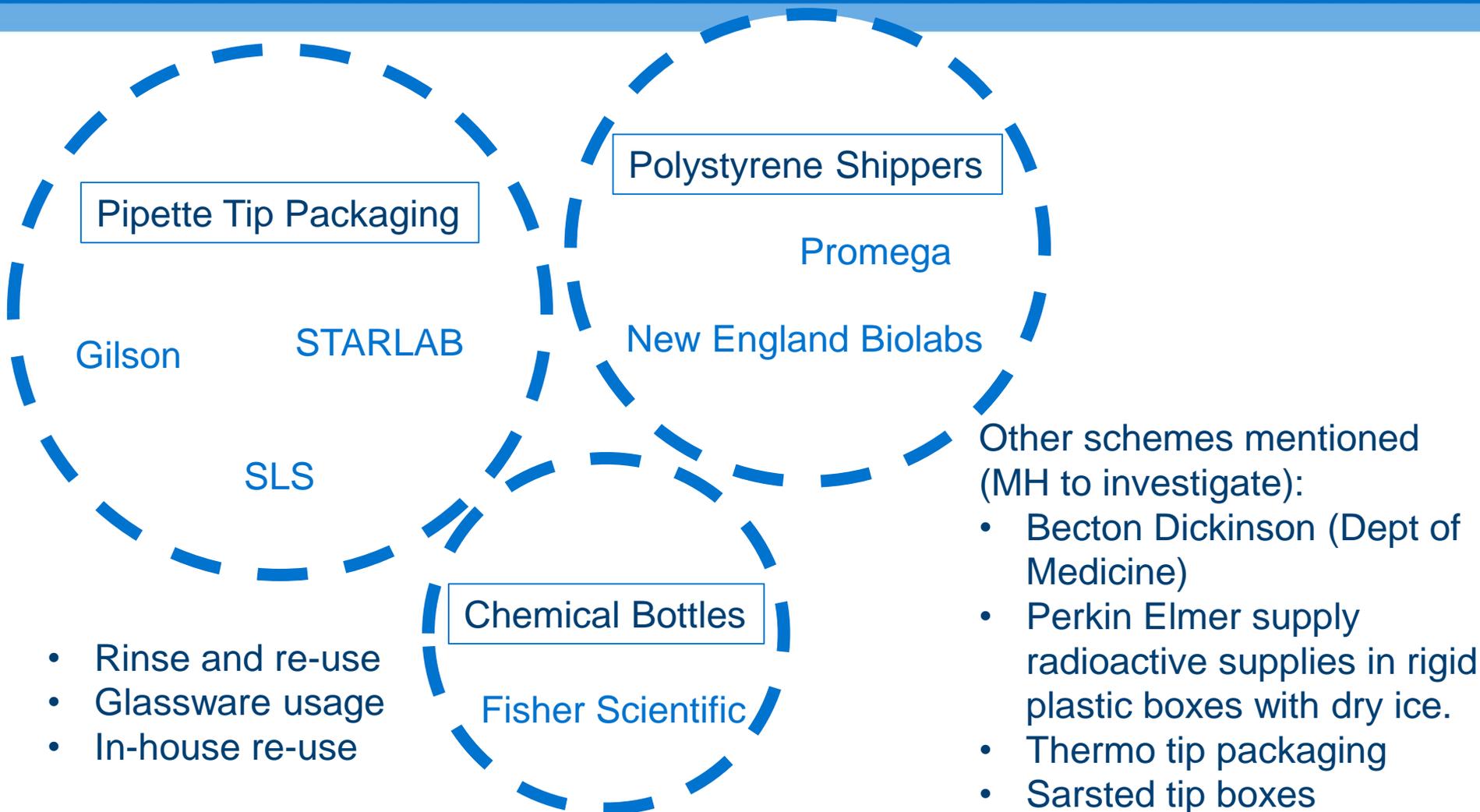
Smart Supply

- Consolidated orders
- Vending Machines

Current trial options:

- SLS
- Sigma Aldrich
- New England Biolabs
- ThermoFisher Scientific
- Merck

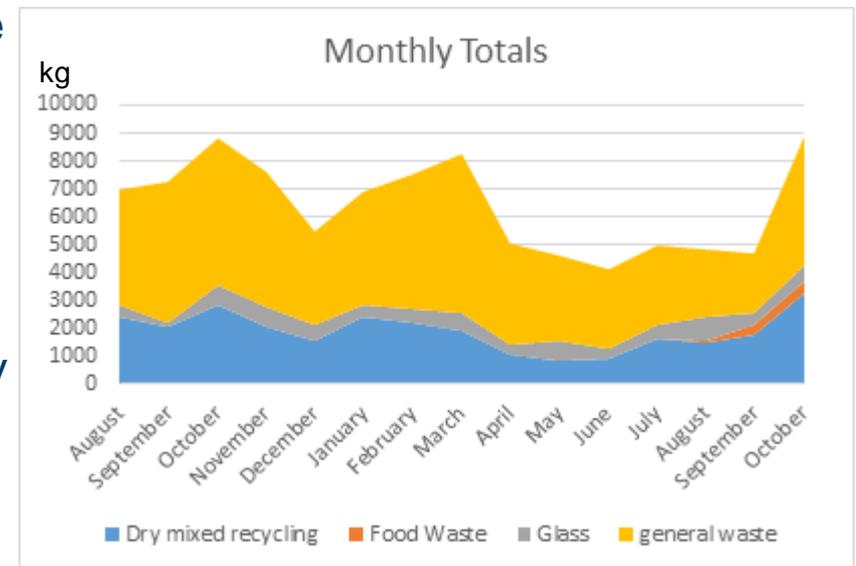
Takeback and Re-use



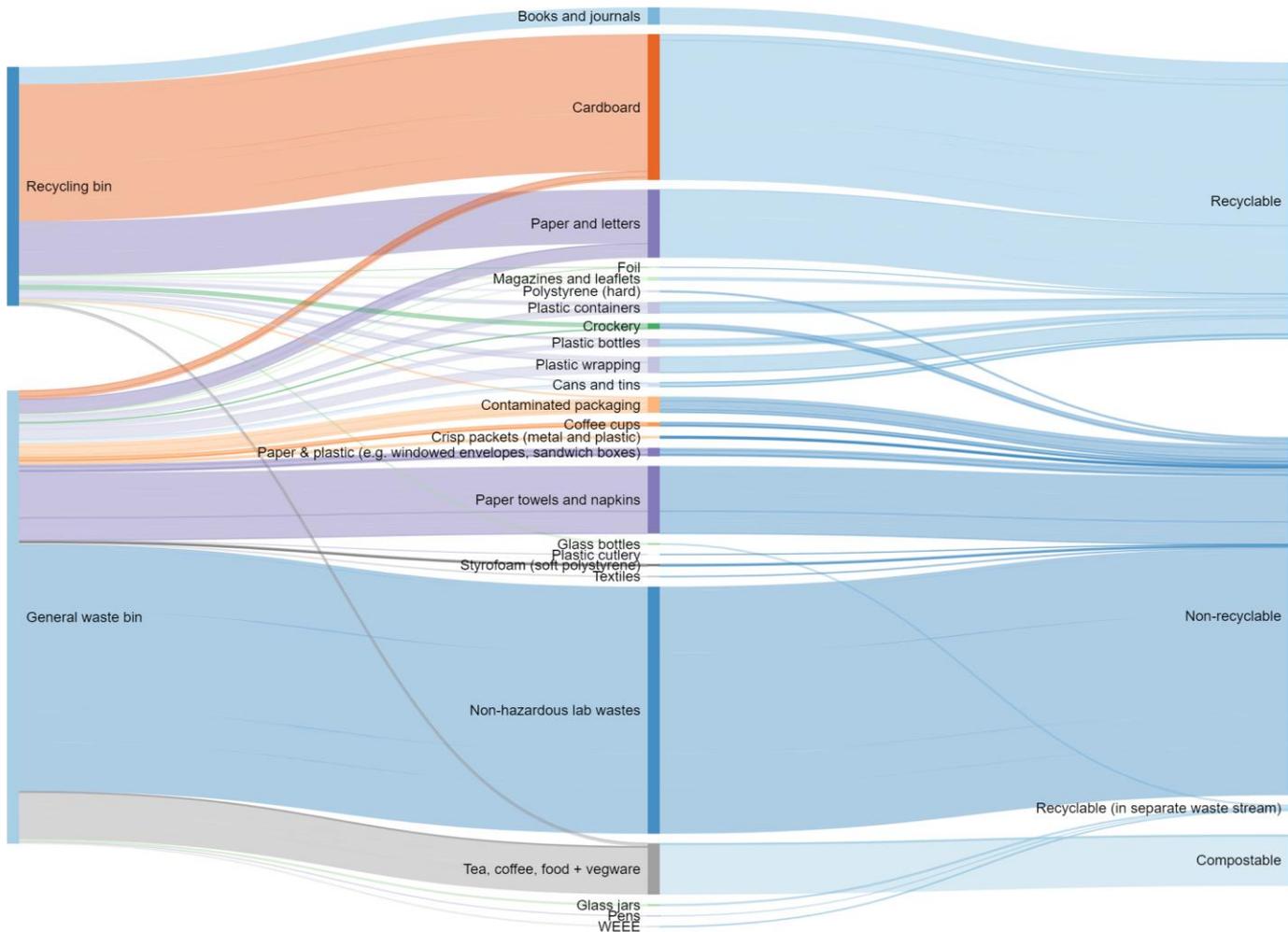
Waste collection data

Recyclability of lab waste is problematic:

- Contamination issues for the waste stream
- Costs of decontaminating and cleaning for re-use
- Perception of operatives when they see lab waste in the bin
- Makes up a large proportion of general waste from lab-heavy departments



Bin busting data



The averaged results of bin-busting activities undertaken in 2017 & 2018 – 6 Mixed Recycling bins and 6 General Waste bins, from across a mixture of departments.

Glass vs. Plastic

There has been a steady move away from re-used glassware to single-use disposable plastic items in laboratories.

Reasons:

- Single-use plastic allows more sterile procedure rather than glassware
- Plastic is shatterproof
- Plastic generally costs less
- Shipping is cheaper and more efficient due to the lighter weight
- Some plastic is recyclable (type-dependent and usage dependent)
- Pyrex, is made from Borosilicate glass which is non-recycleable.

However, are we capturing the true cost?

Glass vs. Plastic

(courtesy of University of Edinburgh, 2018)

Material	CO ₂ e from primary production	CO ₂ e from recycling	CO ₂ e from combustion	CO ₂ e from landfill
1 tonne of glass	895 kg CO ₂ e	21.8 kg CO ₂ e	21.8 kg CO ₂ e	26 kg CO ₂ e
1 tonne of plastic	3328.4 kg CO ₂ e	21.8 kg CO ₂ e	21.8 kg CO ₂ e	9.3 kg CO ₂ e

Conversion factors source: UK Department of Business, Energy & Industrial Strategy

Labs generate roughly:

1 to 10 bags per day of plastic: approx. 4.6 kg per bag

1 box a year of glass: approx 10 kg per box

Best case scenario:

Emissions from plastic: 77 kg CO₂e/day

Emissions from glass: 0.04 kg CO₂e/day

CURRENTLY: 2000 times more emissions from plastic waste than from glass waste

If all items were changed to glass, it would still be a better option, generating 3.6 times less CO₂e than plastic.

There appears to be a huge difference in the carbon footprint of plastic compared to glassware. Just in primary production, plastic produces 3.5x more emissions. *However*, is this undone by glass being heavier and the additional cleaning, chemical, labour, autoclave costs of re-using glassware?

Glass vs. Plastic

Single-use lab plastics are not going anywhere (at least in the short-term).

Recyclability lab plastics is problematic:

- Contamination issues for the waste stream
- Costs of decontaminating and cleaning for re-use
- Perception of operatives when they see lab waste in the bin
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The environmental cost is high. What should stay as glass (or go back)?

The Equipment Sharing Database



Over 10,000 people have accessed the Cambridge Equipment Database

Have you?

Are you a student or member of staff with a project proposal?

Are you seeking funding, further expertise, or training on equipment?

Where do you go if you require replacement equipment at short notice?

The Equipment Sharing Database



What does the database do?

Helps researchers find equipment and facilities available for sharing

Encourages internal, national, and international collaboration

Increases the exposure of facilities that can be used to recover equipment costs

Highlights a commitment to share equipment - beneficial when grant applications are under consideration

Helps toward waste reduction, reduced consumption, recycling, and carbon profiling

The Equipment Sharing Database

UNIVERSITY OF CAMBRIDGE | Study at Cambridge | About the University | Research at Cambridge | Quick links | Search

Research facilities and equipment at Cambridge

Home | Search | Frequently asked questions | Costing equipment and facilities | Fixed assets guidance | Contact | Admin access

Accent RMP 2000 Photoluminescence Mapper

The equipment enables the light emitted from semiconductor quantum well structures to be mapped. The light from the structure is excited using a laser within the Mapper. Wafers up to 6" in diameter can be studied.

Photoluminescence Mapping at MSM: The Photoluminescence (PL) mapping system (Accent RMP 2000 series) purchased in 2006 using SRIF funds has shown to be a tremendous asset for the characterisation wide-bandgap semiconducting materials. This state-of-the-art equipment addresses past under-investment and helps to accelerate improvements in material quality and device performances. Material characterisation plays a crucial role in the departmental research and photoluminescence mapping studies can reveal much about epitaxial structures and their on-wafer uniformity before expensive device processing steps are carried out. The RMP 2000 equipped with a 266nm Q-switch excitation source permits the compositional mapping of materials such as GaN and its alloys with AlN and InN over a broad composition range. The equipment also makes it possible to determine the thickness of the thin semiconductor films evaporated on a foreign substrate. Examples of such detailed compositional and thickness maps of two-inch wafers are shown in the figure below. Each map of a 2-inch wafer is obtained in less than 10 minutes, allowing rapid feedback to the crystal growers. The wafer holder allows mapping of wafers up to 6-inch in diameter. The high power density of the Q-switched laser of the PL mapper is extremely useful to give an accurate prediction of the optical properties of a fully developed UV/blue/green light-emitting diode (LED) devices, potentially saving many expensive hours in clean-room facilities. The RMP 2000 PL mapper has proven to be crucial for the research of the Cambridge Centre for Gallium Nitride (Colin Humphreys, Rachel Oliver) but also for the Device Materials Group (Zoe Barber, Judith Driscoll) and the Electronic Devices and Materials Group (Bill Milne) with research efforts in ZnO and Fe2O3 nanowires, respectively. In these particular cases, the crystal growers use the PL mapper to assess the materials' quality and hence to determine their optimum growth conditions. The GaN group is a partner of the EPSRC National Centre for III-V technologies. A link to the website of the III-V centre is posted below. Please liaise with primary contact to discuss and arrange access.



Details

University
University of Cambridge

School
School of the Physical Sciences

Department
[Materials Science & Metallurgy](#)

Location
M036..ANNEXE 118

Category
Semiconductor Device Analyzer

Utilisation level
● Medium (40% to 60%)

URL
<http://www.gan.msm.cam.ac.uk/>

Contacts

Name	Email	Tel.
KAPPERS, Dr M	mjk30@cam.ac.uk	01223 762958

The Equipment Sharing Database



Sharing equipment reduces consumption and cost!

- Dr Maya Al-Sid-Cheikh (Plymouth)
 - Arthur Kouyoumdjian, CEB
 - Lydia Whitaker, Education
 - Paul Miller (Oxford)
 - Chris Truscott, Chemistry
 - Sukanya Datta, Chemistry
 - Dr Rainer Doffinger, Clinical Biochemistry
- Leica CM3600
 - Mercury Intrusion Porosimetry Machine
 - Psychometric Test Equipment
 - Maxcyte STX Machine/Incucyte
 - Atomic Force Microscope (AFM)
 - Gas Chromatography Mass Spectrometer
 - Airfuge

The Equipment Sharing Database



Improving the equipment disposal process

- Ayla Selamoglu, Clinical Medicine
- Joanne Hackett, Obs and Gynae
- Deborah Singh, CEB
- Harriet Milligan, Archaeology
- Amie Baker, Clinical Neuroscience
- Mick Mantle, CEB
- Chris Smith, Biochemistry
- David Pate, MRC

Expired hospital equipment for research
Magmax Express 96
Decommissioning LSM510 Confocal Microscope
Advertising unwanted equipment
ABI DNA Analyser
Disposal of Automatic Mercury Porosimeter
Disposal of Qiaxcel Advanced Capillary System
Protein crystal X-ray diffraction system

The Equipment Sharing Database



Service Contract Consolidation

Following a consultation with Lab Managers and PI's we formed the PPMS Stratocore User Group
£133k spent annually on PPMS Stratocore Equipment Booking System
Working strategically, we're hoping to increase coverage whilst reducing cost

Similar approaches used for other suppliers (working with Procurement) –
Leica, Illumina, GE, Zeiss

Booker (with Equipment Pilot): <https://www.educationspace.cam.ac.uk/room-booking/about-booker>

The Equipment Sharing Database



How can I learn more?

Follow us on twitter to learn about funding opportunities and upcoming events
Request an induction session individually, as a research group, or as a department

<https://twitter.com/cam equip>
<https://www.equipment-sharing.cam.ac.uk/home>

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Collect



Store



Sell







info@unigreenscheme.co.uk



[@UniGreenScheme](https://twitter.com/UniGreenScheme)



Green Gown
Awards 2017

Winner



Conclusion, Outcomes

- Identify your barriers. Others may have overcome them.
- Make the most of schemes available
- Single-use plastics in labs have a high environmental cost. Which lab procedures need to be single-use plastic?
- Maximise the equipment we have got
- Old unused lab equipment has value. Can its usage be extended elsewhere?



THE CAMBRIDGE *green*
CHALLENGE
• GREEN LABS •

Thank you for coming

environment@admin.cam.ac.uk

Martin Howes

Sustainable Labs Co-ordinator, University of Cambridge

Tel: 01223 330984

Email: martin.howes@admin.cam.ac.uk