The Waterfront *3rd Edition*

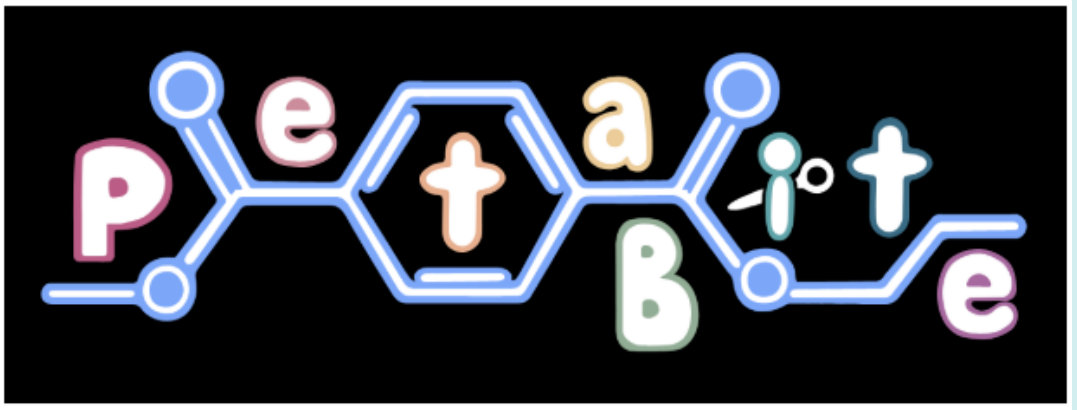
Dear iGEM Torontonians and supporters,

Welcome to the third edition of *The Waterfront*, iGEM Toronto's monthly newsletter! Each month we'll bring you behind the scenes to see what goes on inside and out of the lab.

For anyone new to the newsletter: PetaBite is this year's project that fights plastic pollution at the source. We're engineering a biosensor and enzyme system built around PETase, an enzyme that breaks down PET plastic, paired with a bioreaction that can detect and degrade plastic in the field.

Alongside, we're building PETadex, a database of PETase-degrading enzymes and running a venture and outreach side to share our findings with you.

As we continue representing UofT in the global synthetic biology community, we're excited to share our latest milestones and some upcoming events!

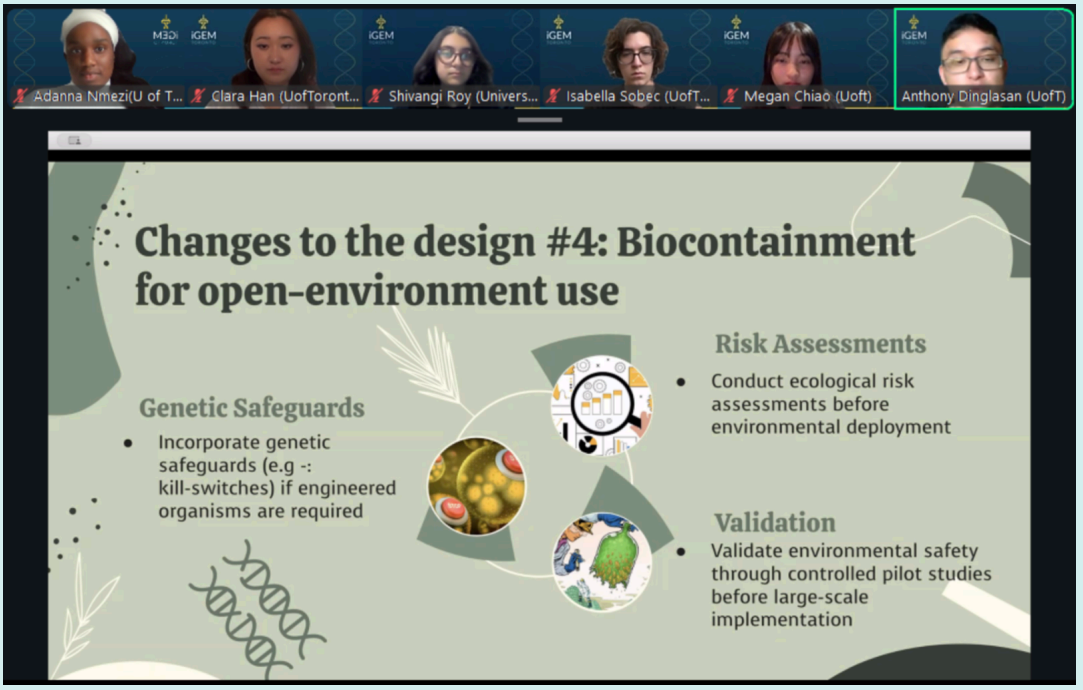


Bioethics Symposium: Building Responsible Synthetic Biology

This event marked a key milestone in our commitment to responsible innovation.

On July 12, PetaBite participated in the 2026 Bioethics Symposium, hosted by the Michigan Synthetic Biology Team.

The event brought together student research groups for a focused discussion on ethical frameworks in synthetic biology, ranging from environmental responsibility to access and long-term societal impact.



The virtual session featured presentations from each team, followed by Q&A and a broader discussion on ethics across academia and industry.

Teams explored questions such as:

- **How core bioethics principles shape project design**
- **What equitable access would look like at scale**
- **Which social disparities the technology could address**
- **How the system would adapt for real-world industry use**

For PetaBite, the symposium was an opportunity for our iGEM team to articulate the ethical considerations behind enzyme-based plastic remediation, including environmental justice, accessibility of biodegradation tools, and the responsibilities tied to deploying biological systems in real-world waste streams.

Scientific and Technical Breakthroughs

July delivered major advances across our enzyme-discovery and computational pipelines.

First AI model trained on PETadex

- Our fine-tuned ESM-C model completed a six-day training cycle with strong convergence, validating our computational strategy for identifying high-performance plastic-degrading enzymes.

Degenerate library breakthrough

- Developed two library designs that capture ~80% of natural PETase cluster diversity using only a small number of oligos, enabling rapid experimental screening and real-world testing.

PETadex rebuild underway

- PETadex is being re-engineered into a fully versioned, reproducible pipeline spanning curated seed sequences through Logan's 39 million assembled datasets, supporting upcoming publications and long-term open-science infrastructure.

Plasticome re-curated

- The Plasticome has been refined to approximately 470 validated enzymes, strengthening the foundation for downstream analysis and model training.

Reproducibility standard established

- All computational workflows now read and write from S3 and record tool versions and database dates, ensuring that any result can be regenerated from scratch.

Together, these advances move PetaBite toward a fully integrated computational-experimental system for discovering next-generation plastic-degrading enzymes.

Experimental and Engineering Progress

July marked the transition from setup to real experimental throughput and prototype development.

- Completed core protocols for PETase extraction, copper chemistry, and fabric staining
- Achieved reliable DH5α transformations, enabling cloning workflows
- Passed first round of institutional safety interviews
- Finalized architecture for an eight-bioreactor prototype with real-time monitoring and control
- Completed CAD, circuit diagrams, KiCad layouts, and microcontroller mapping
- Thermal tests reached promising stability ranges

By the end of summer, PetaBite will have a fully integrated bioreactor system ready for testing, alongside continuous assay development through August and September.

Looking Ahead

From wet lab's first full experimental schedule as a fully BME trained team to dry lab's expansion of PETadex to over 300 million enzyme candidates, the team has made tremendous progress this July! Hardware is entering the prototype stage, outreach continues to grow our audience through the Road to Jamboree series, Human Practices is laying the groundwork for the inaugural University of Toronto Microplastics Conference, and Venture is bringing home recognition on the national stage!

This month, we submitted our video pitch for the **Global Pitch Challenge** hosted by Imperial College London, and we will be pitching live on July 30 for a €3,000 prize pool! The **Great Canadian iGEM Meet-up** is coming up on August 8–9 at McMaster, where it will be a major chance for us to showcase PetaBite's development and connect with the wider Canadian iGEM community.

The **University of Toronto Microplastics Conference** is shaping up to be one of the most exciting events of the year! Big updates are coming soon, so stay tuned for all the details!

Our promo video is also in production, and the link will be included in the following newsletter once it is ready!

Thank you to everyone contributing their time, expertise, and enthusiasm. We cannot wait to see you next month!

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