Robots in the Lab!

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Advanced Laboratory Automation Specialist
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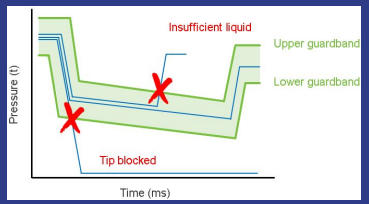
Overview

- Background
- What is Automation
- Automation Examples
- Projects



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Education

BEng - Bioengineering

- Yildiz Technical University - Istanbul/Turkey

MSc - Applied Biopharmaceutical Biotechnology and Entrepreneurship

- University of Nottingham - Nottingham/UK

What is automation?

Automation refers to the use of technology and machinery to perform activities with minimal human intervention.

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Gommeblog.it
BMW

What is Lab Automation?

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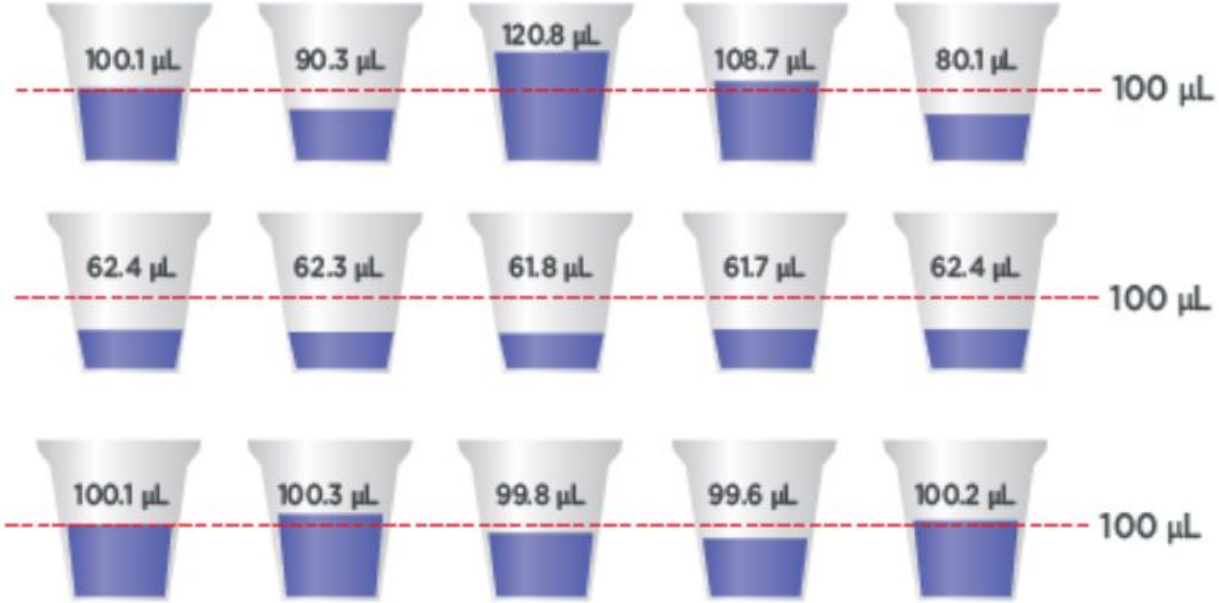
Why?

- Improved Efficiency and Throughput
- Accuracy and Precision
- Reduction of Human Errors
- Cost Savings and Resource Optimization

Accuracy Vs Precision



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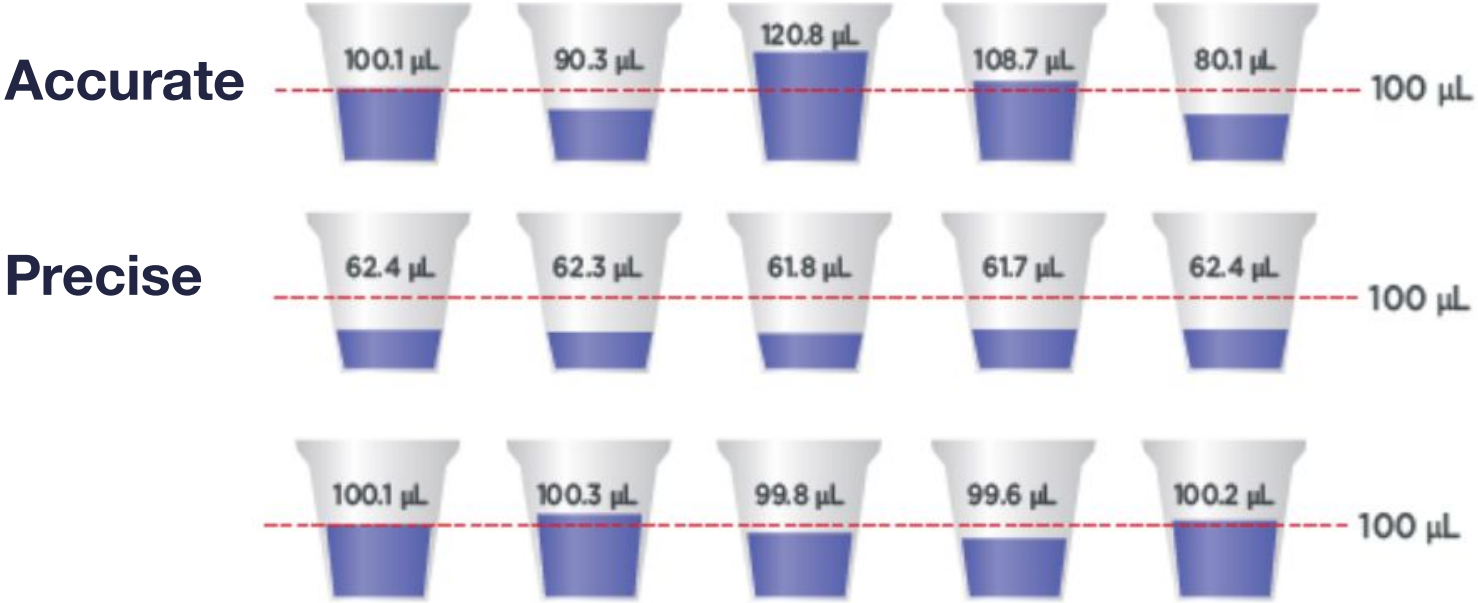
Accuracy Vs Precision



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Examples of instruments used in Lab Automation

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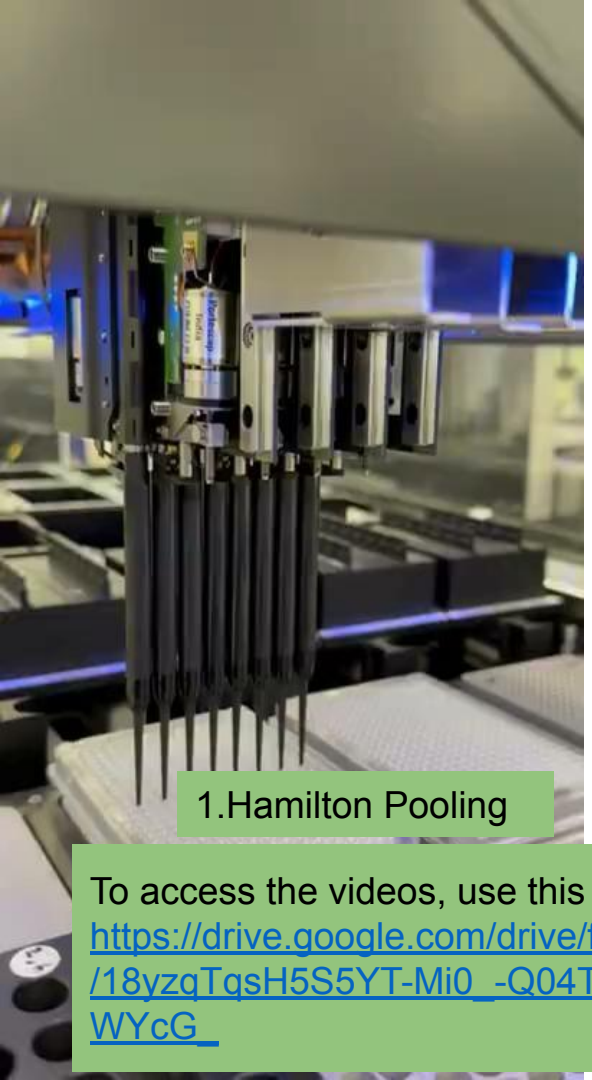
Hamilton

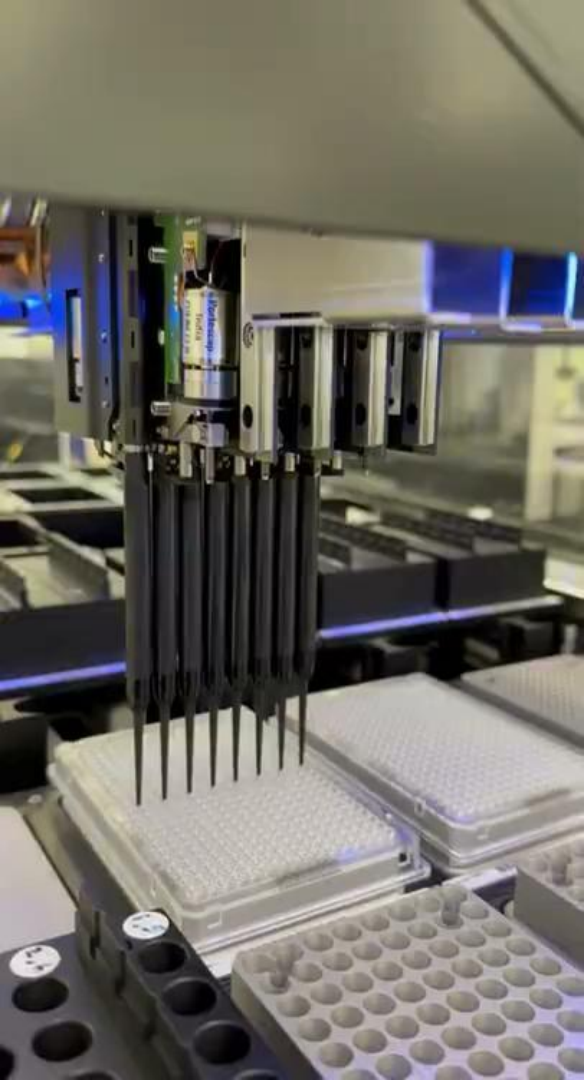
We have many of these Hamiltons on site. They are known for their precision and modularity (can be integrated with other instruments).

It has 8 spans and comes with a head with 96 or 384 channels.



1.Hamilton Pooling

To access the videos, use this link: https://drive.google.com/drive/folders/18yzqTqsH5S5YT-Mi0_-Q04Tm5pFWYcG_



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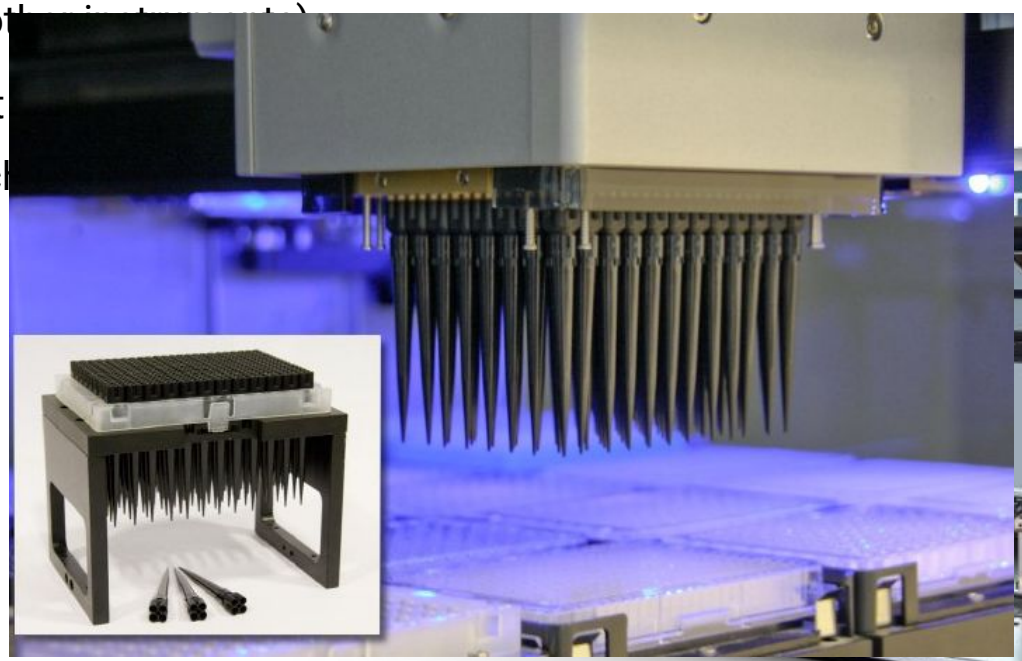

Moving Liquid with Sound!
Echo 525

The Echo liquid handler is an instrument that uses acoustic energy to transfer samples from one source plate to another destination plate. It can transfer very small volumes of liquids in 2.5nL or 25nL.

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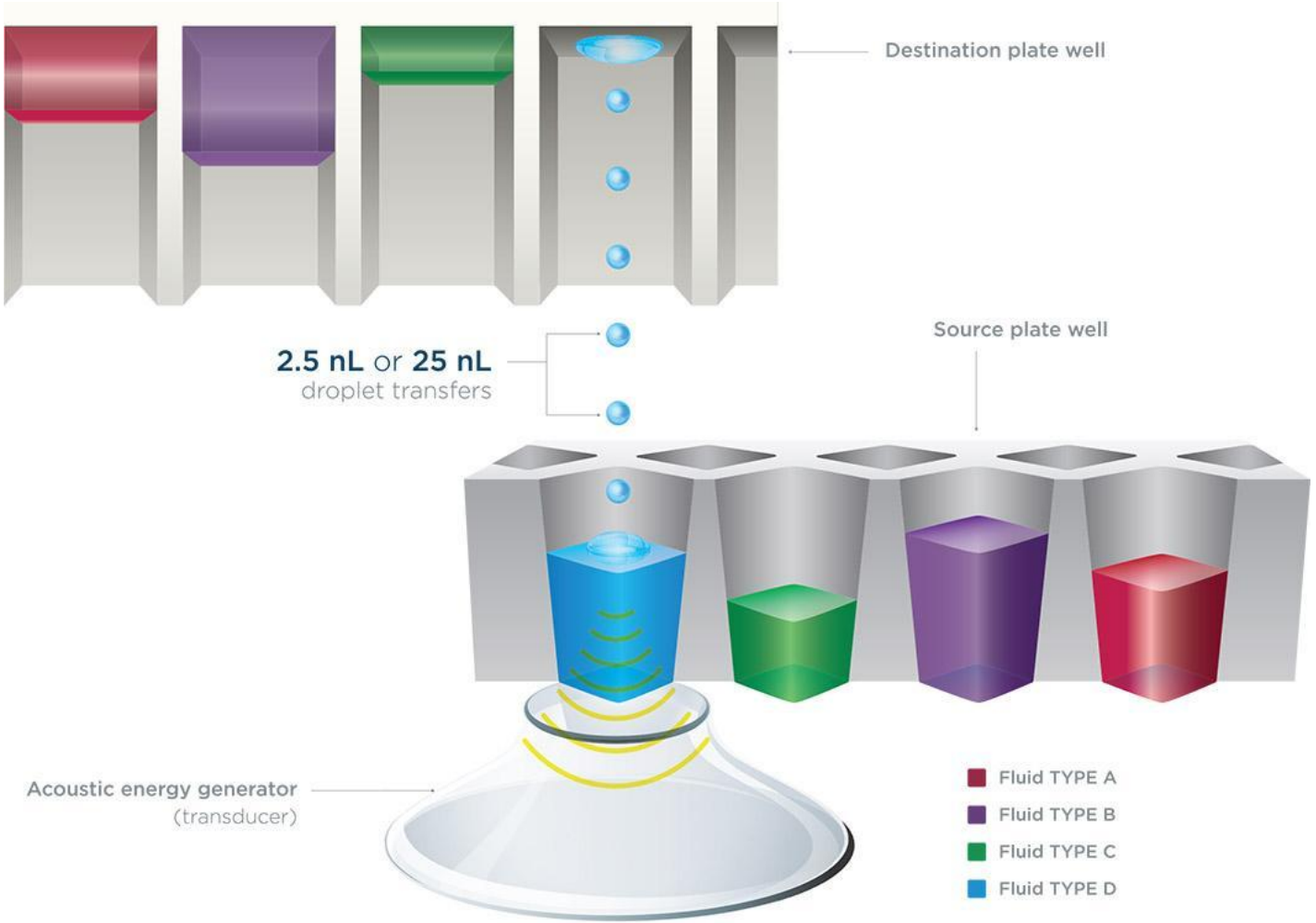
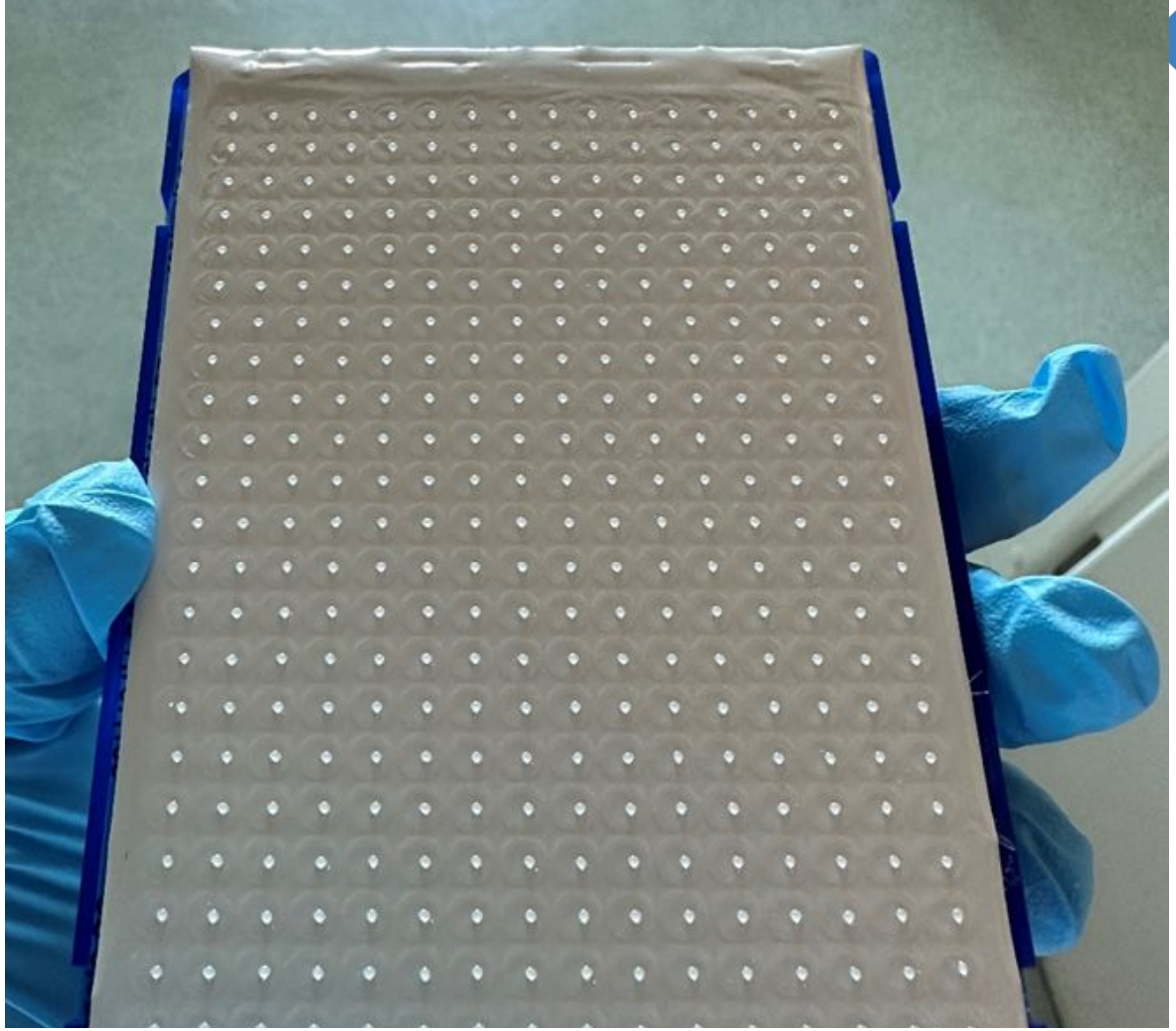

Destination plate well
2.5 nL or 25 nL
droplet transfers
Source plate well
Acoustic energy generator
(transducer)
Fluid TYPE A
Fluid TYPE B
Fluid TYPE C
Fluid TYPE D

150 nL dispensed into the seal of the plate



Biosero

Biosero provides mobile robots that is able to move labware within the lab from one instrument to another

They also provide Scheduler software (Green Button Go) to allow for communication between different instruments

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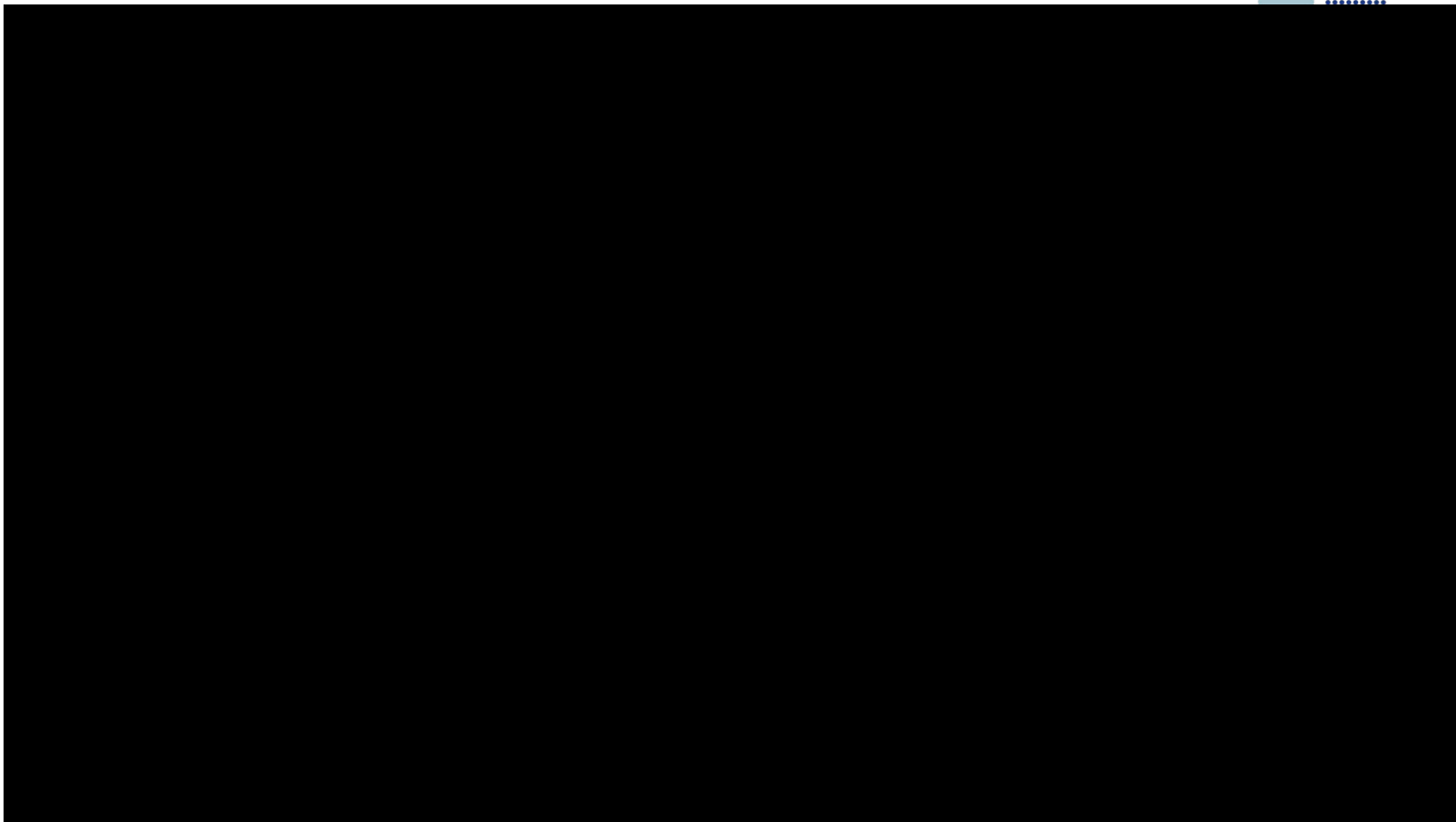
2.Multi-platform integration - Part 1



3.Multi-platform integration - Part 2

Projects

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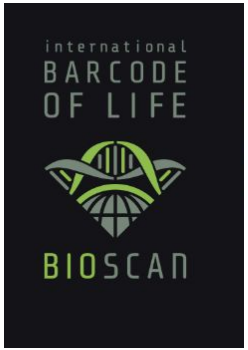
BUGLORD
BIOSCAN

Bioscan

- Bioscan project aims to sequence 1 million flying insects across the UK in the next 5 years.
- Samples sent from partner sites across the UK where they capture the insects using malaise traps.



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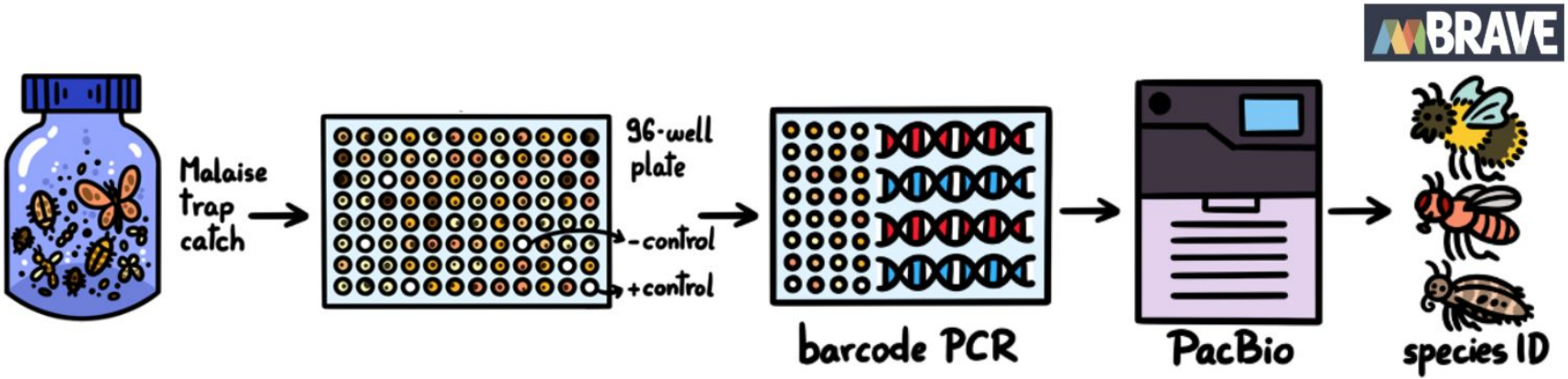
Bioscan



Illustrations by Petra Korlevic @petrathepostdoc

What does the Lab Automation Specialist do?

- Workflow Design and Implementation
- Programming and Scripting
- Maintenance and Troubleshooting
- Training staff on how to use robotics
- Quality Control and Assurance

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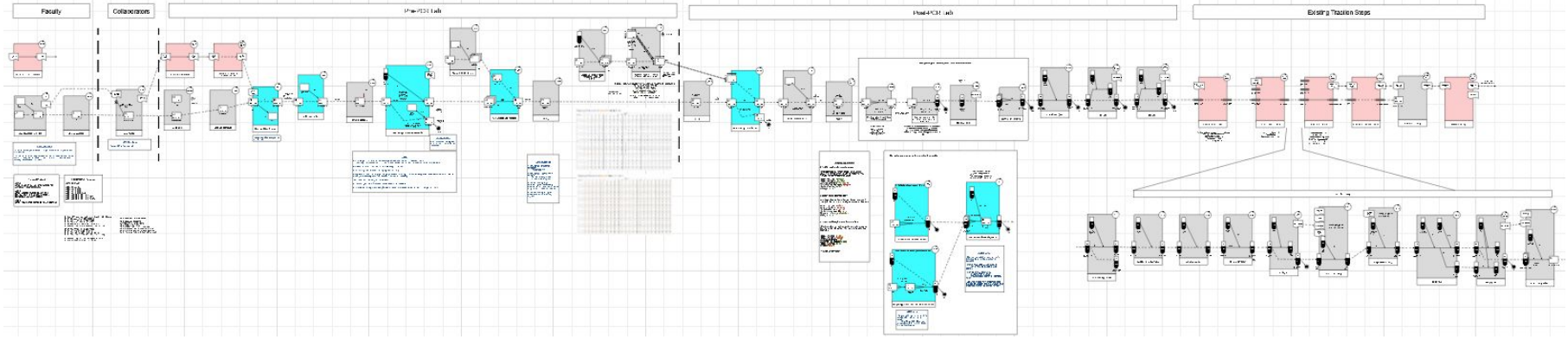

Bioscan Automation

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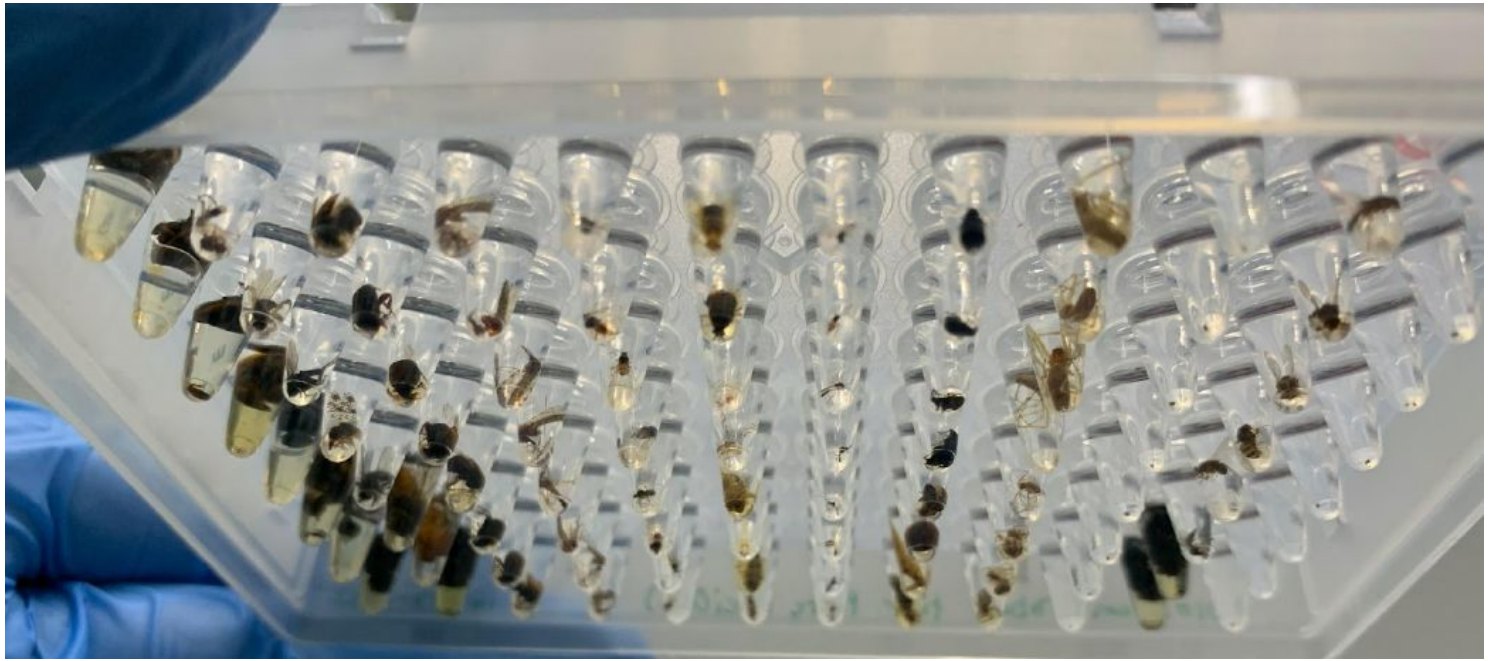

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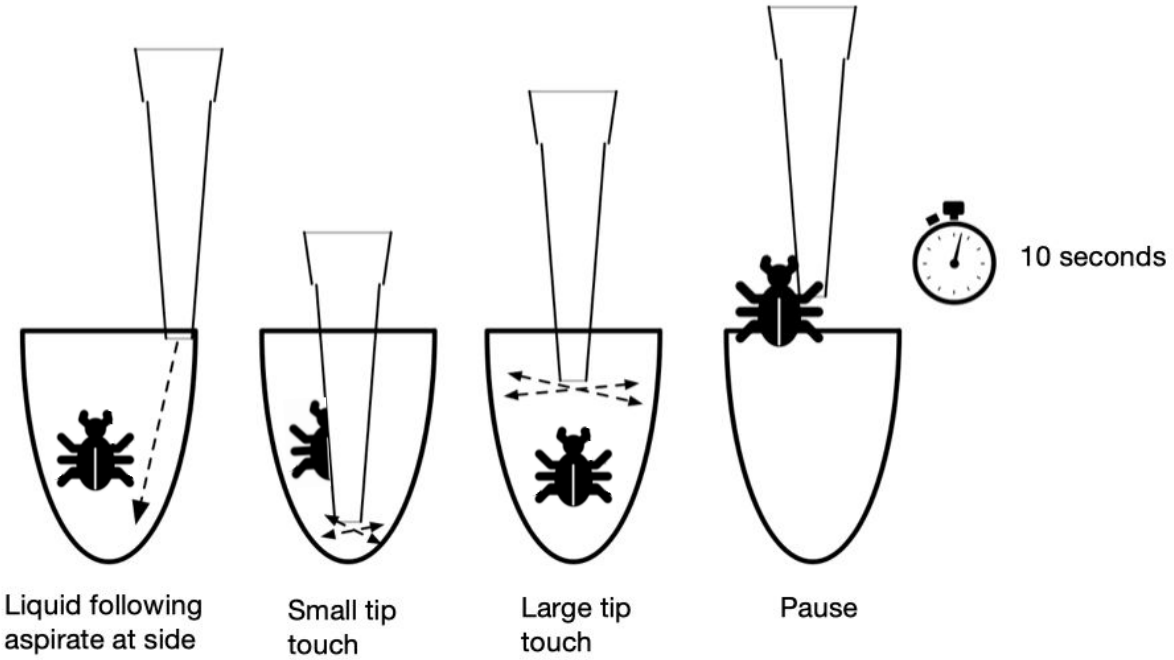
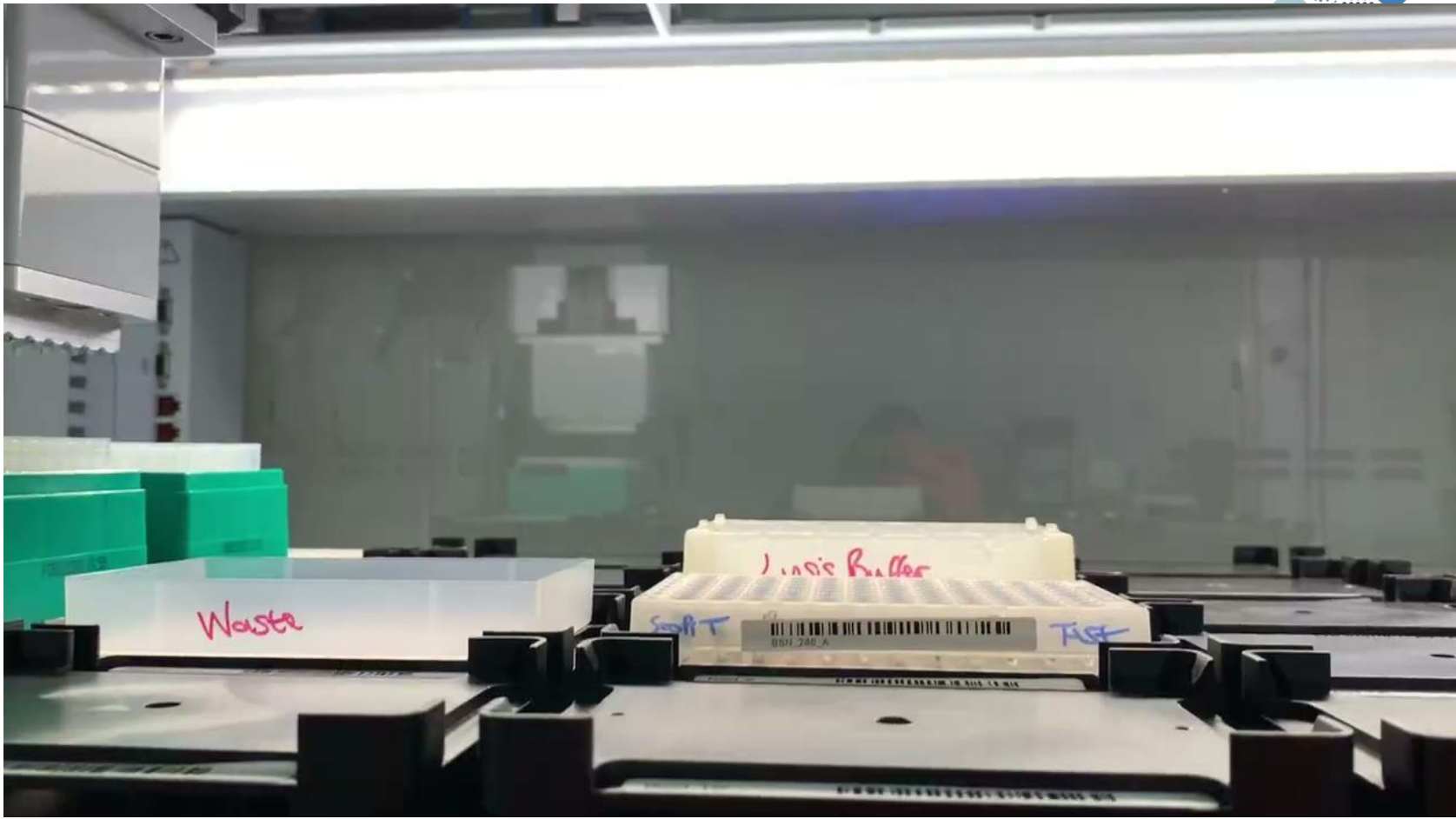

10 seconds
Liquid following aspirate at side
Small tip touch
Large tip touch
Pause

4.Aspiration technique on Beckman Biomek i5



Programing and Scripting

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Programing and Scripting

alert.py

```python
from ..models import *
from sqlalchemy import create_engine
from sqlalchemy.sql import select
from ..globs import *
from app import struct_logger, LOGGING_INSTANCE
import copy
import boto3
from twilio.rest import TwilioRestClient

class Alert(Resource):
  def post(self):
    status_code = status.HTTP_400_BAD_REQUEST
    response = None
    try:
      data = copy.deepcopy(request.json)
      client = TwilioRestClient(TWILIO_SID, TWILIO_AUTH_TOKEN)

      message = client.messages.create(
          body="Alert",
          to=data.get('phone_number'),
          from_=TWILIO_PHONE_NUMBER,
        )
    except Exception as e:
      struct_logger.error(instance=LOGGING_INSTANCE, path=request.path, method=request.method, exception=e.message)
      response = e.message
      status_code = status.HTTP_400_BAD_REQUEST

    return response, status_code

  def send_sms(self, text, number, identifier):
    try:
      client = TwilioRestClient(TWILIO_SID, TWILIO_AUTH_TOKEN)

      message = client.messages.create(
          body=text % identifier,
          to=number,
          from_=TWILIO_PHONE_NUMBER,
        )
    except Exception as e:
      struct_logger.error(instance=LOGGING_INSTANCE, path=request.path, method=request.method, exception=e.message)
```

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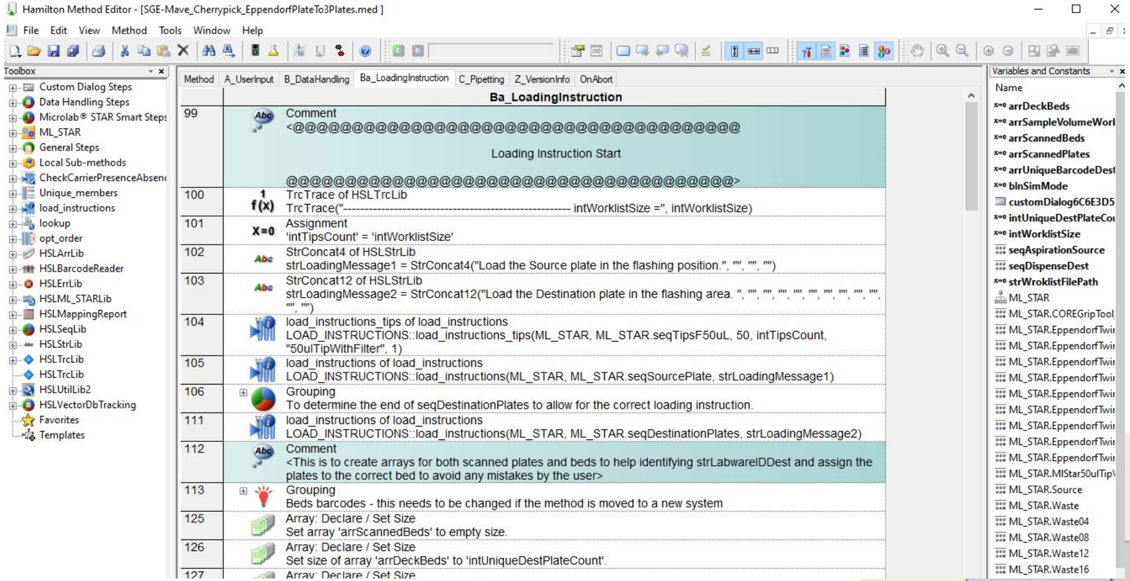
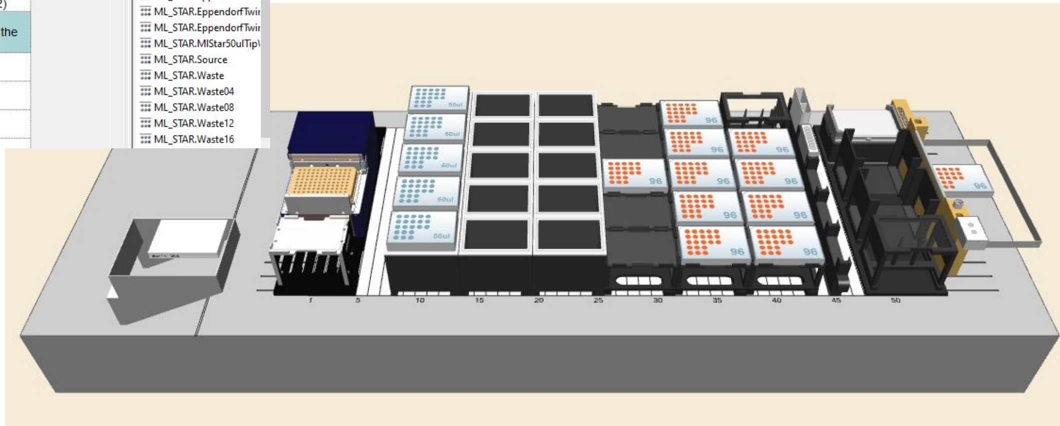
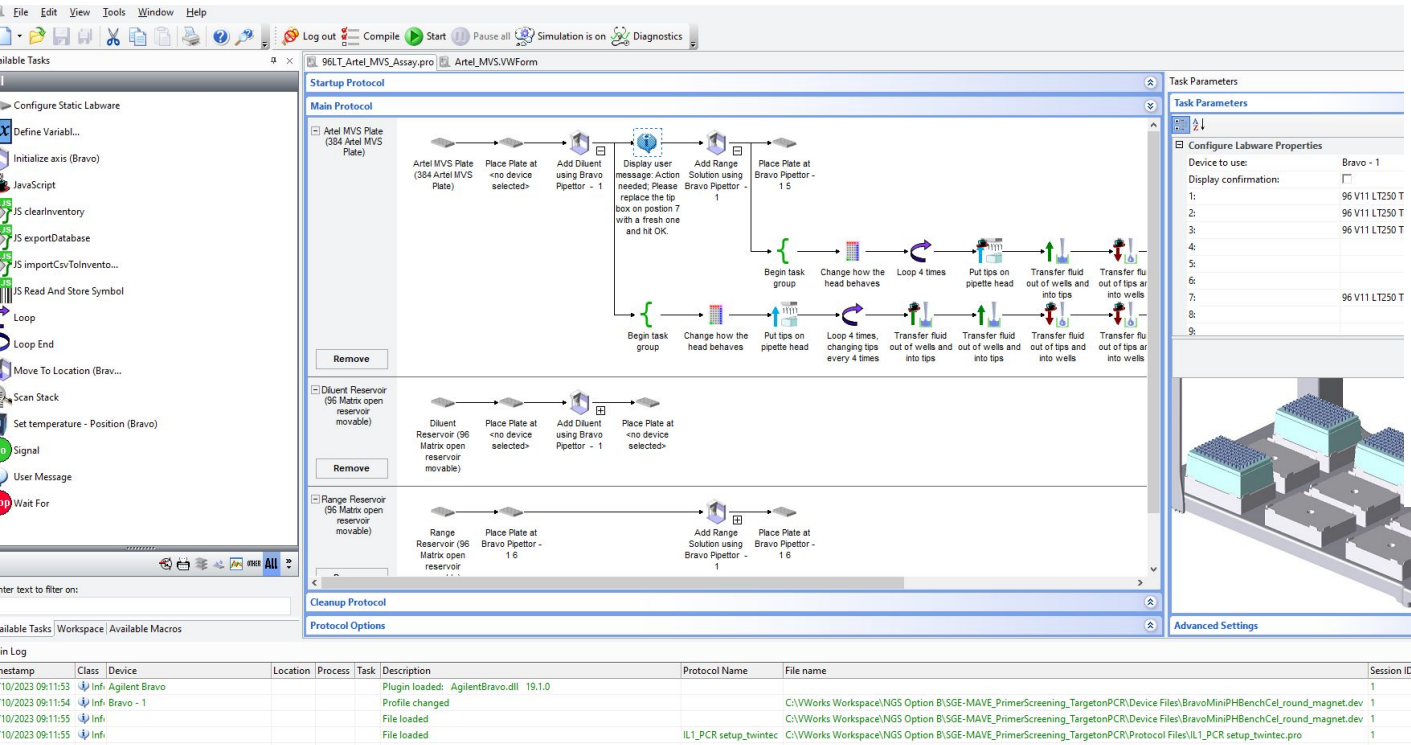
Programing and Scripting





Programing and Scripting



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Other Automation Examples

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Reagents are moved, mixed, separated and incubated


#FORMULATRIX®

YT Links

Echo video: https://www.youtubeeducation.com/watch?v=azQPGFxzZuI

Voltrax - Oxford Nanopore Tech: https://www.youtubeeducation.com/watch?v=RJ2IMSYiCiw

Rover - Formulatrix: https://www.youtubeeducation.com/watch?v=kKmv6VtxMug

Bonus link: https://www.youtube.com/watch?v=RcP85JHLmnI

Automation team

Thanks for listening!

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