



Printact.co

Academy of  
Advanced Skills



# Dr. Data Ng

- Physicist, Biohacker, Educator & Maker in Asia.
- Winner / Participant / Organizer of 30+ hackathons and 40+ startup weekends in HK, SG, CN and TW
- PhD in Physics and BSc (Majors: Physics, Finance; Minor: Astronomy) at HKU
- MInstP – Member of Institute of Physics, UK
- First Qiskit Advocate appointed by IBM
- Vice-president of Cyberport Startup Alumni Association (CSAA)



**0x2A**  
Science

<http://0x2A.science>

Biotech



**Maker  
Academy**

DO SOMETHING THAT MATTER

<http://makertech.academy>

Engineering



**DeepTech  
School**

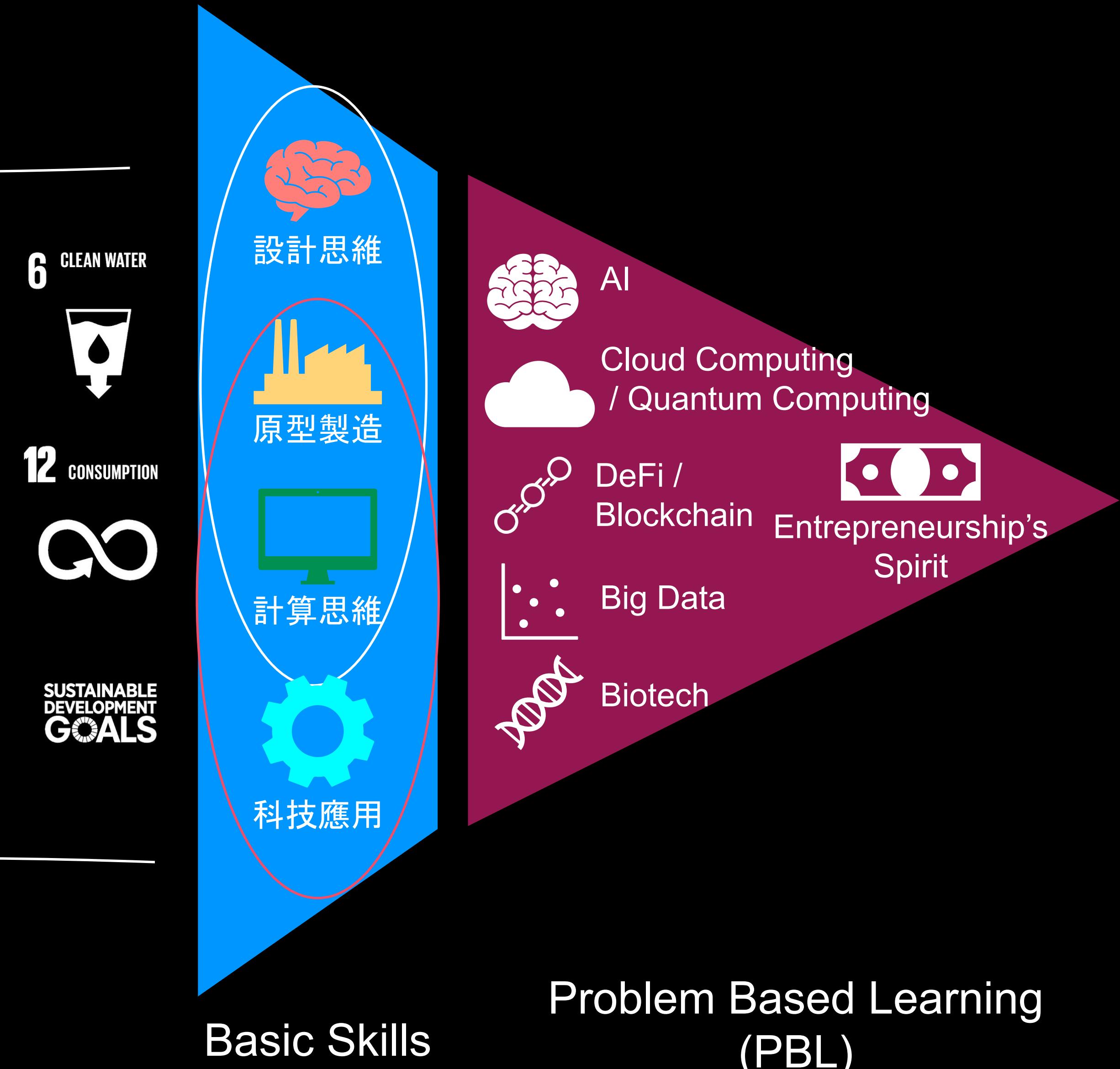
<http://Deeptech.school>

Computational  
Biology

# STEM Teaching Approach from University Research



UN SDGs



# Problem-based Learning: 4 pillars of knowledge fields + 5 fields

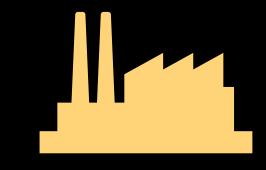


Basic Skills

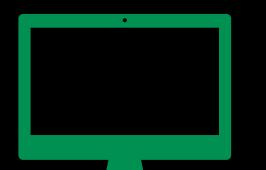
## Essential skills of Innovation & STEM



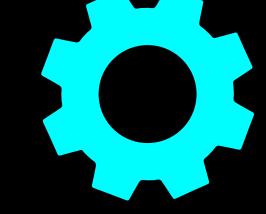
Design  
Thinking



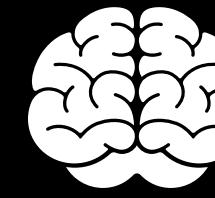
Prototyping



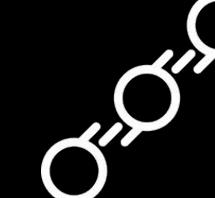
Computational  
thinking



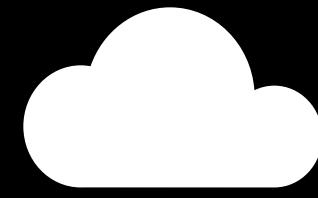
Applied  
Tech.



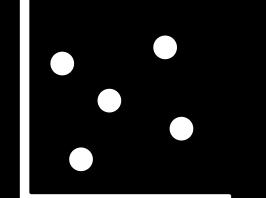
AI



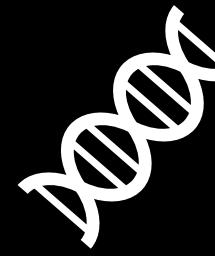
DeFi /  
Blockchain



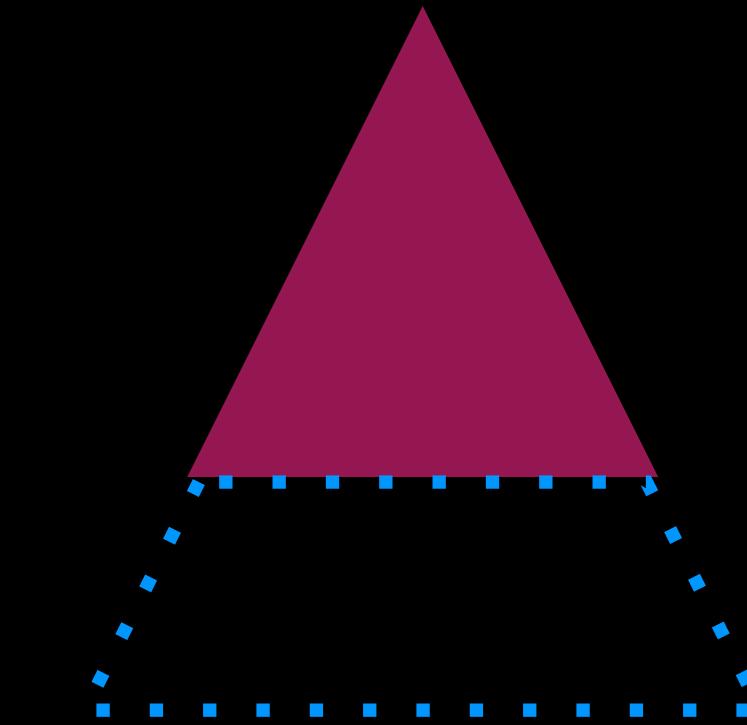
Cloud Computing /  
Quantum Computing



Big Data



Entrepreneurship  
Spirit



Project/ Problem-based Learning  
(PBL)

Application & Problem Driven

**STEM 學科目標:**  
包含各分科課程的特質和重要元素

**STEM+:**  
融入STEM以外的科目

設計思維	認知範疇* ( 認知過程 )	STEM 學科範疇目標				其它學科範疇目標 其他科目
		S 科學 ( 相關學科: )	T 科技 ( 相關學科: )	E 工程 ( 相關學科: )	M 數學 ( 相關學科: )	
同理心/需求定義	記憶	事實				
	理解	概念				
		過程				
創意動腦	應用	概念				
		過程				
測試	分析	概念 / 過程				
	評鑑	概念 / 過程				
原型/落實	創造	概念 / 過程				
	後設認知範疇**	指個人對一般學習、思考和解難策略，以及對進行不同任務所須運用的不同策略的了解。				
	廿一世紀技能範疇	指6Cs - 創造力與想像力、批判思維與解難能力、溝通、合作、品格教育與世界公民意識。				
	情意範疇					
	與學科相關的態度	對學習STEM的興趣和自信心，是否有興趣修讀與STEM相關的課程或於將來從事STEM相關職業等。				
	對 STEM 的態度	各STEM 學科本身所蘊含的精神和價值，如科學精神、尊重證據、持續優化、迎難而上、力求精準和精益求精等態度。				

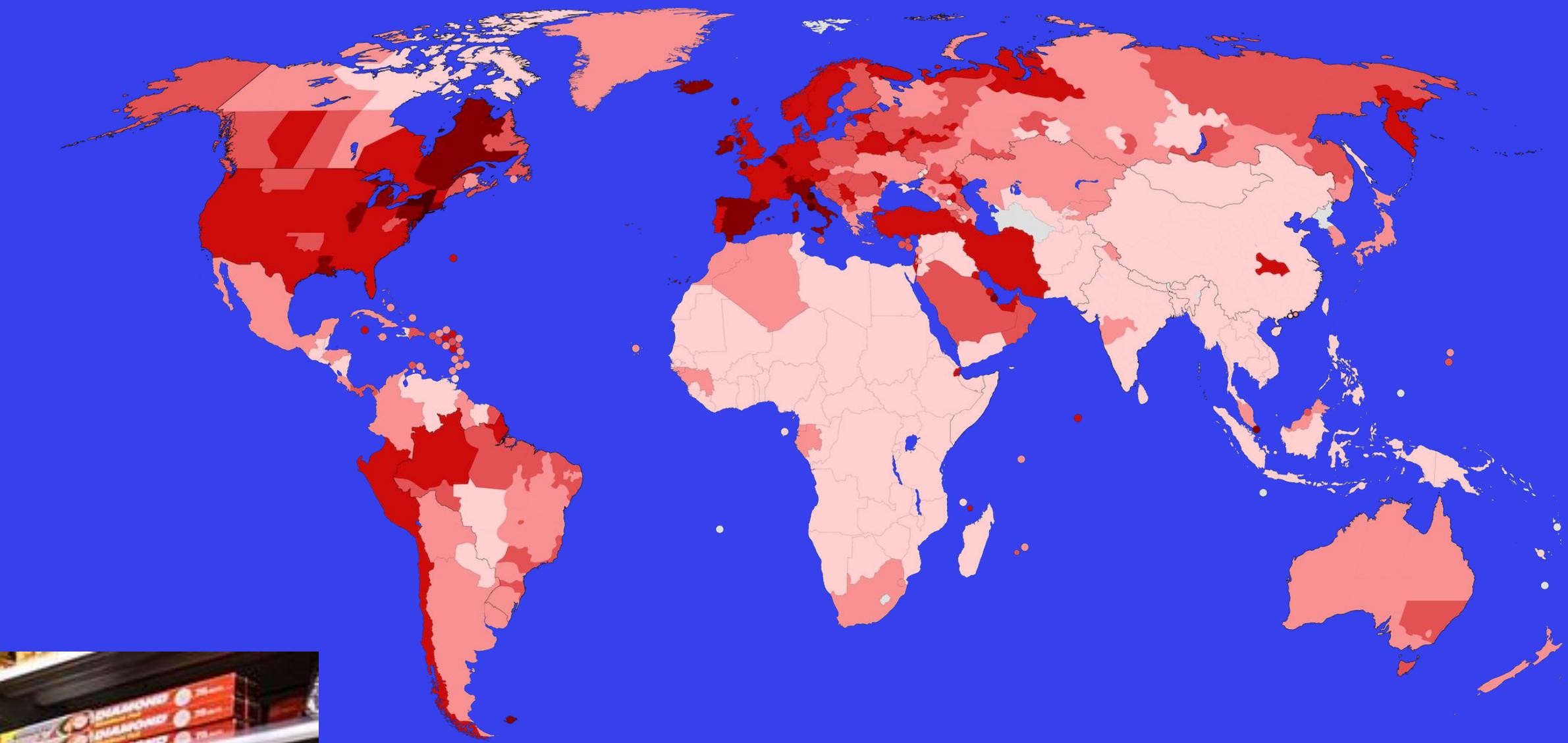
\*認知教學目標分類層階 (Bloom's taxonomy) :六個認知目標層次，分別為知識、理解、應用、分析、綜合和評鑑



<http://0x2A.science>

Biotech

# COVID-19



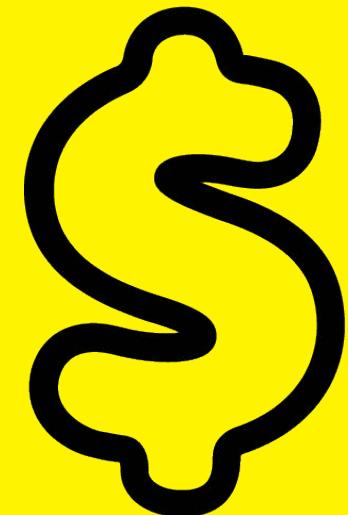
# Lack of Biotech Knowledge

>60%

**biology students have no experience in  
hands-on experiments**



# Problem:



**Can't afford  
expensive bulky  
biotech  
equipment**

**USD\$50k** for  
biotech equipment  
in a science lab



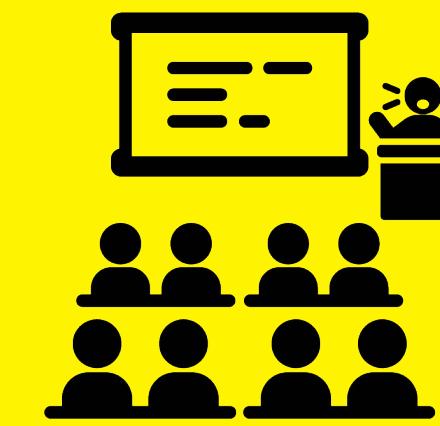
**No laboratory  
in schools**

**<20%** of USA  
schools own a  
proper science  
laboratory



**Lack of relevant  
science  
background  
teachers**

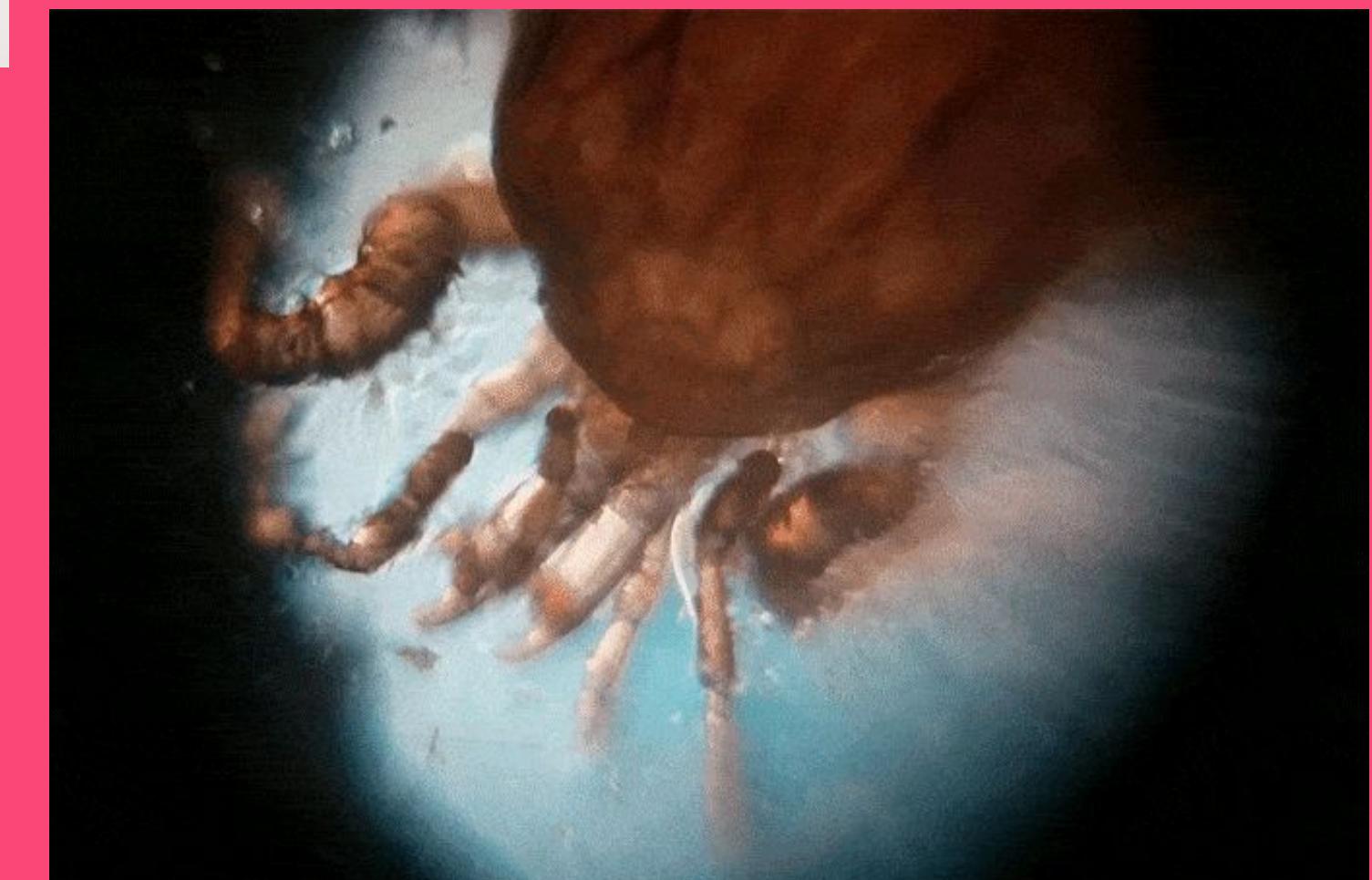
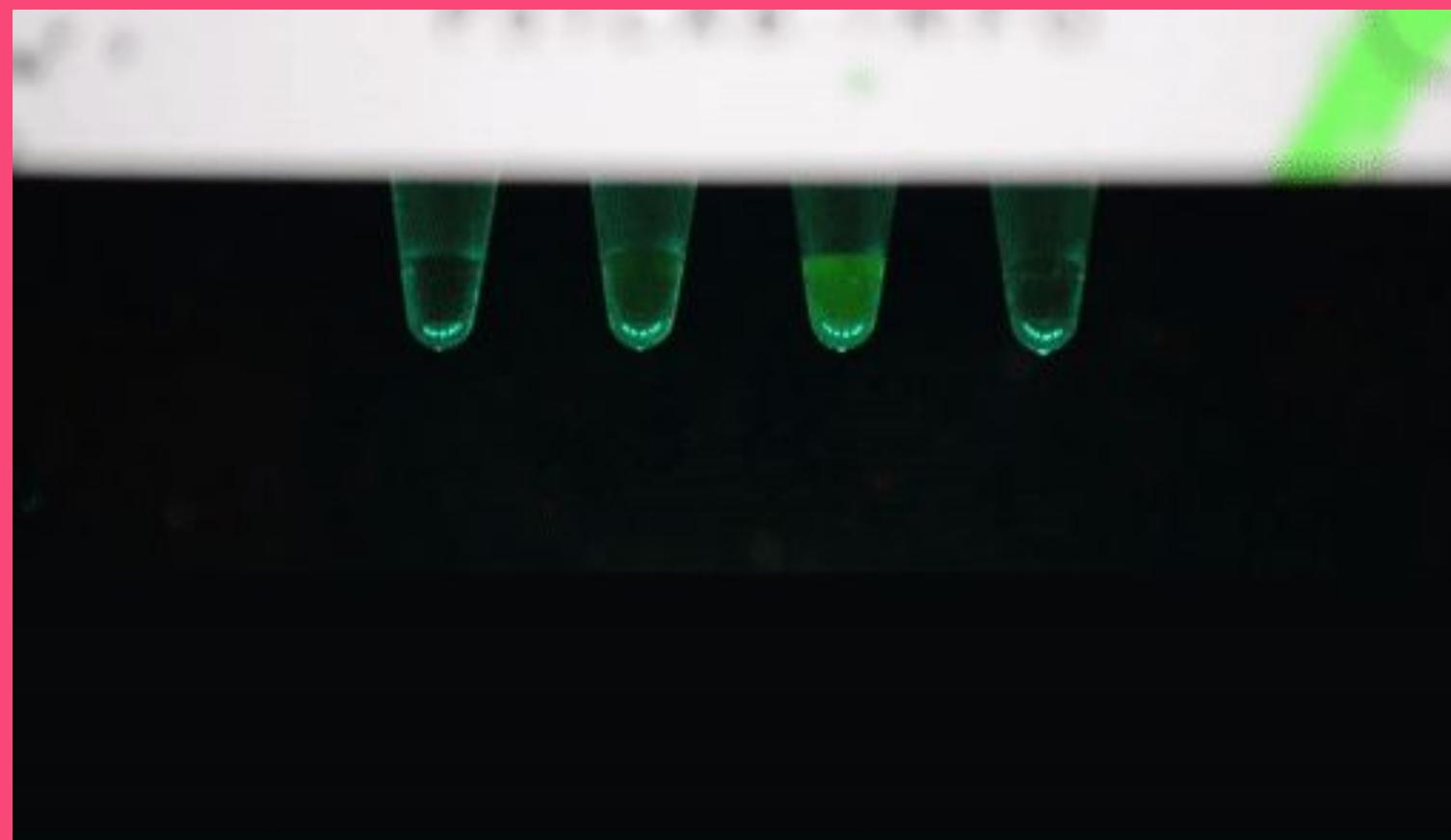
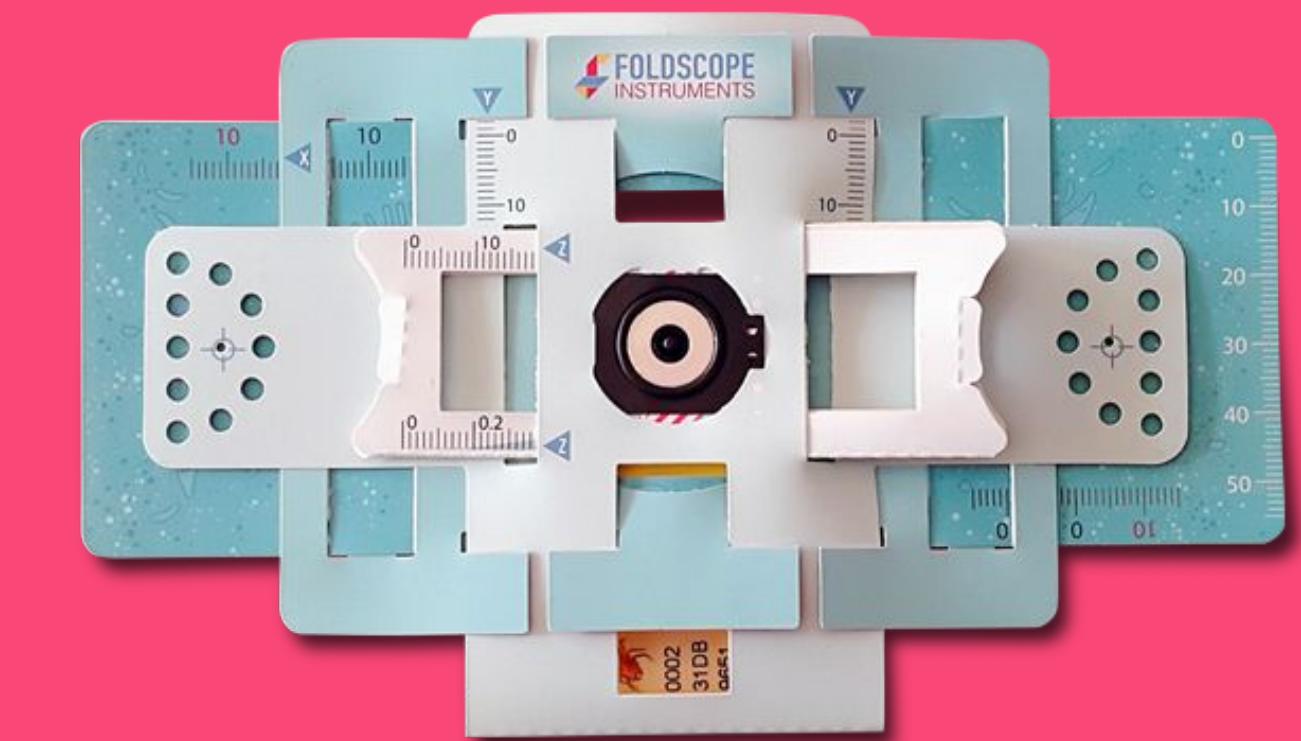
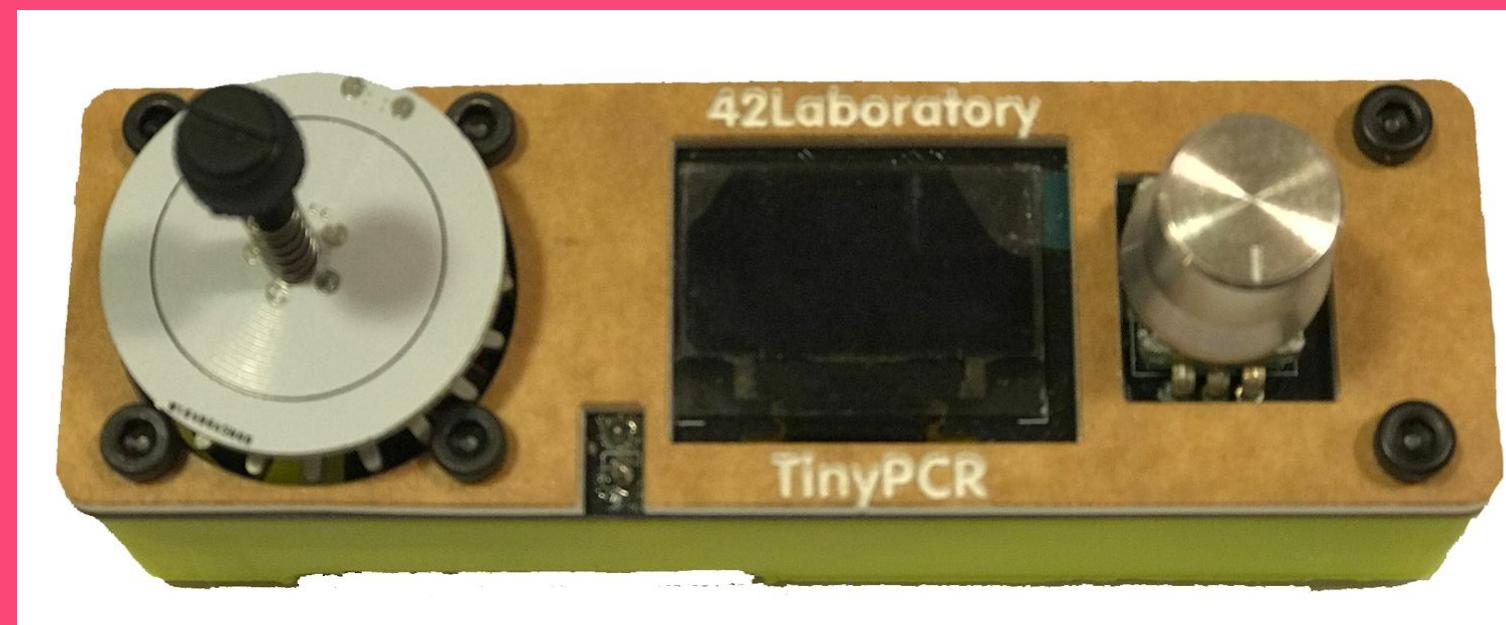
**<50%** school science  
teachers with  
science-related  
degree



**Large  
student-to-teacher  
ratio**

**~ 31** Students per  
class

# Advanced Learners



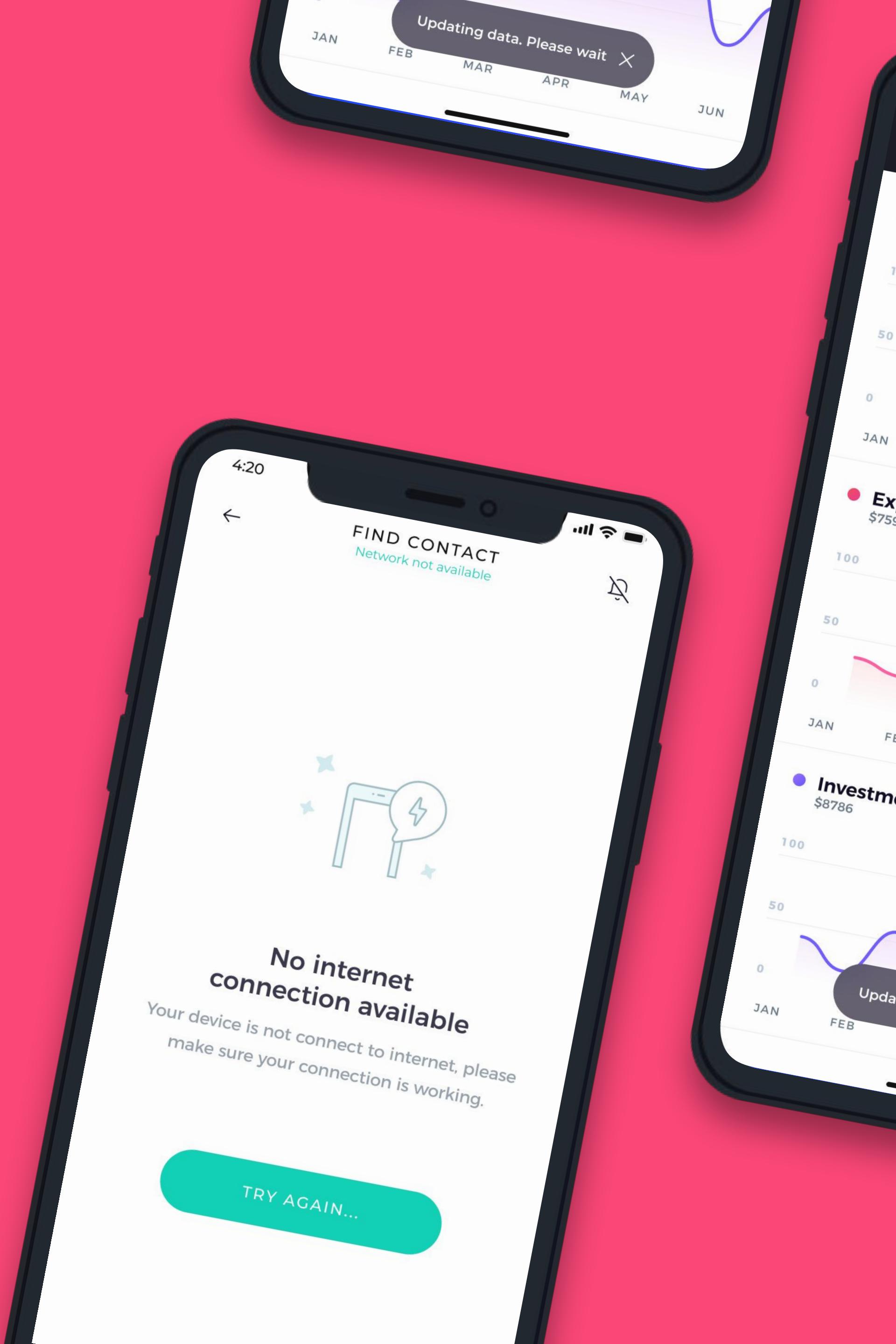
# For Beginners

- Booklets for Schools (B2B)
- Teaching Materials
- Learning Management System  
(B2B & B2C)

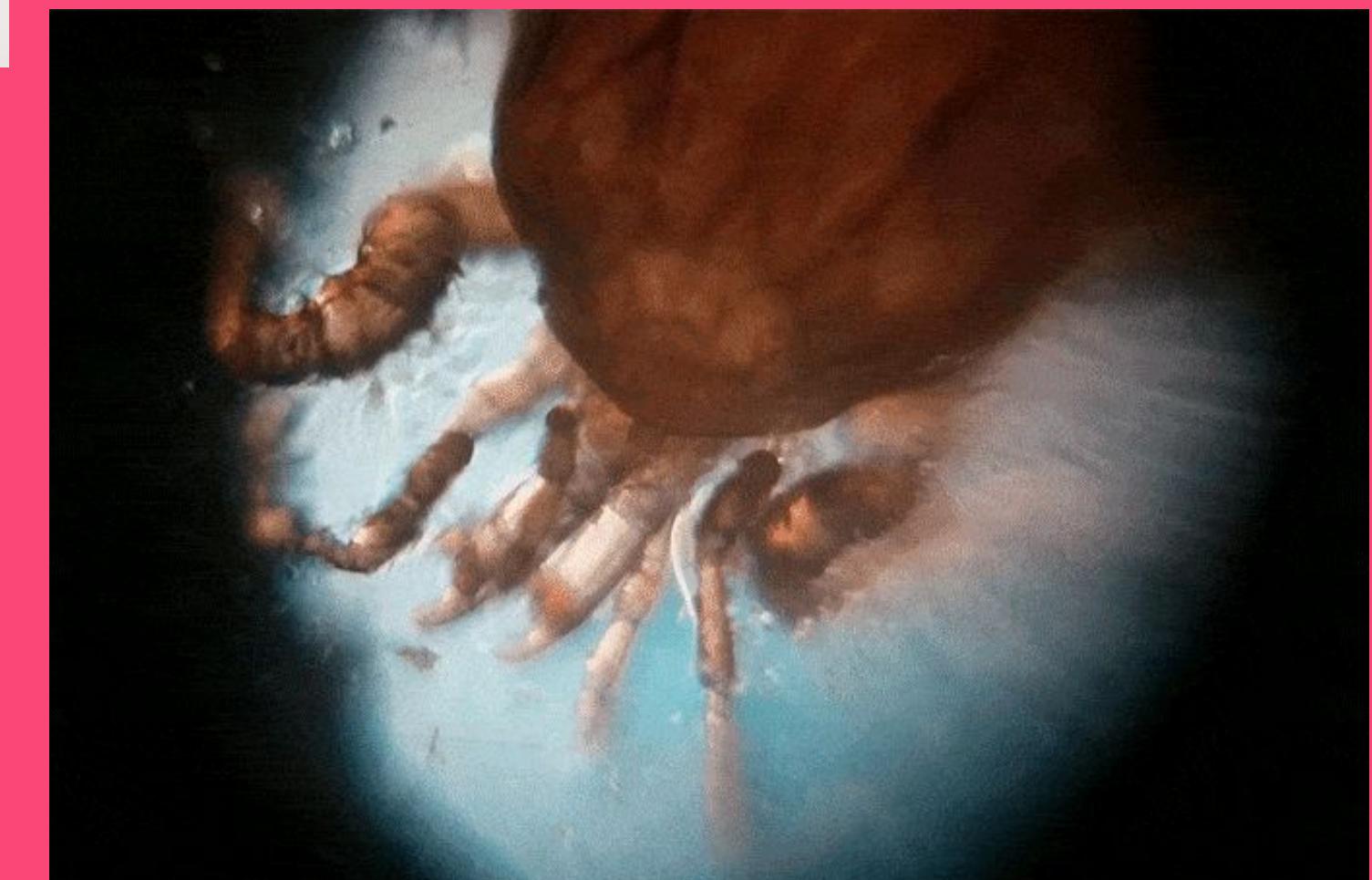
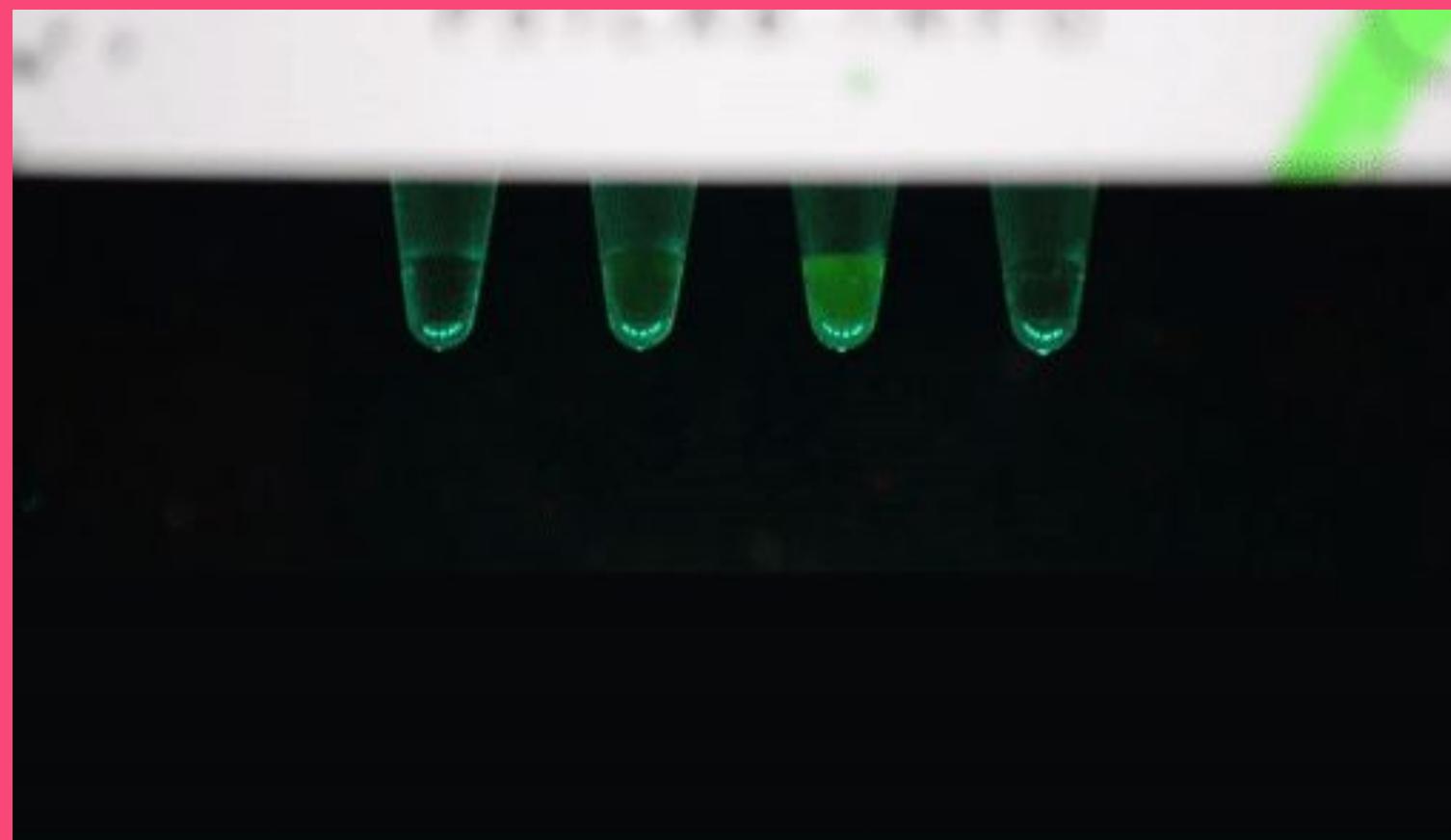
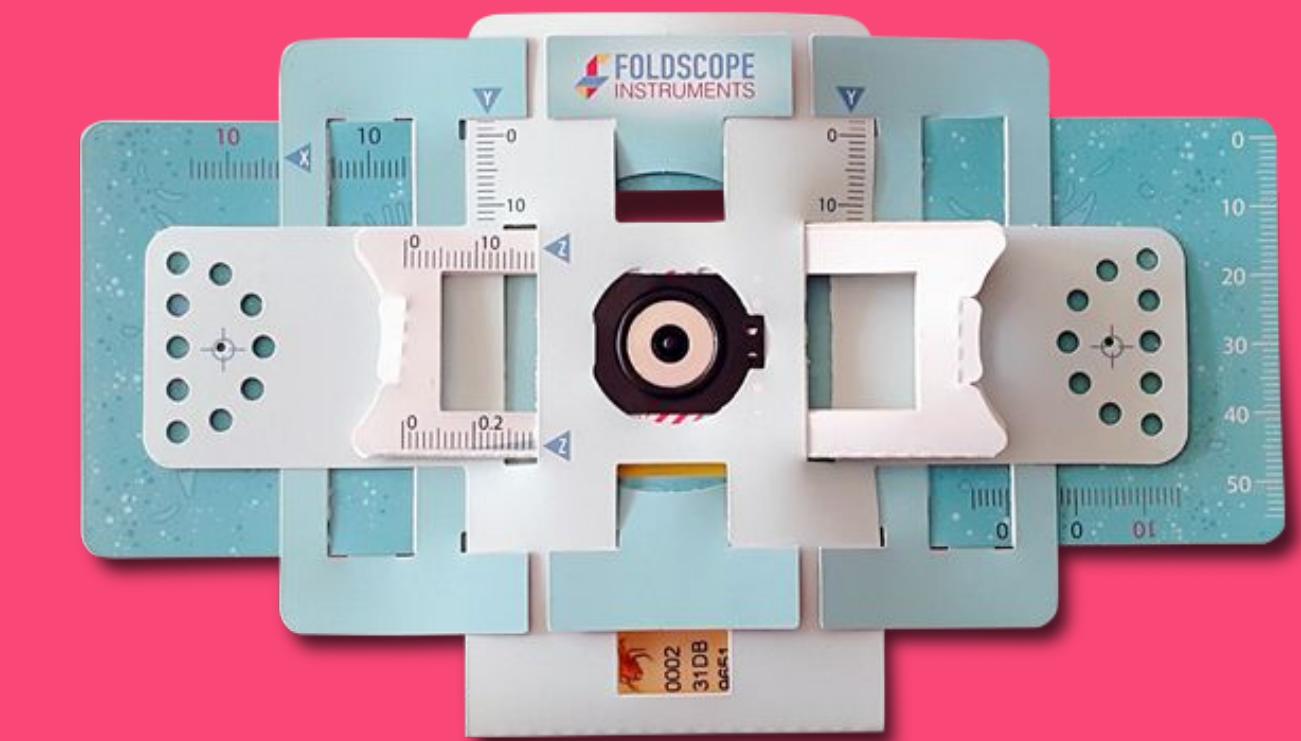
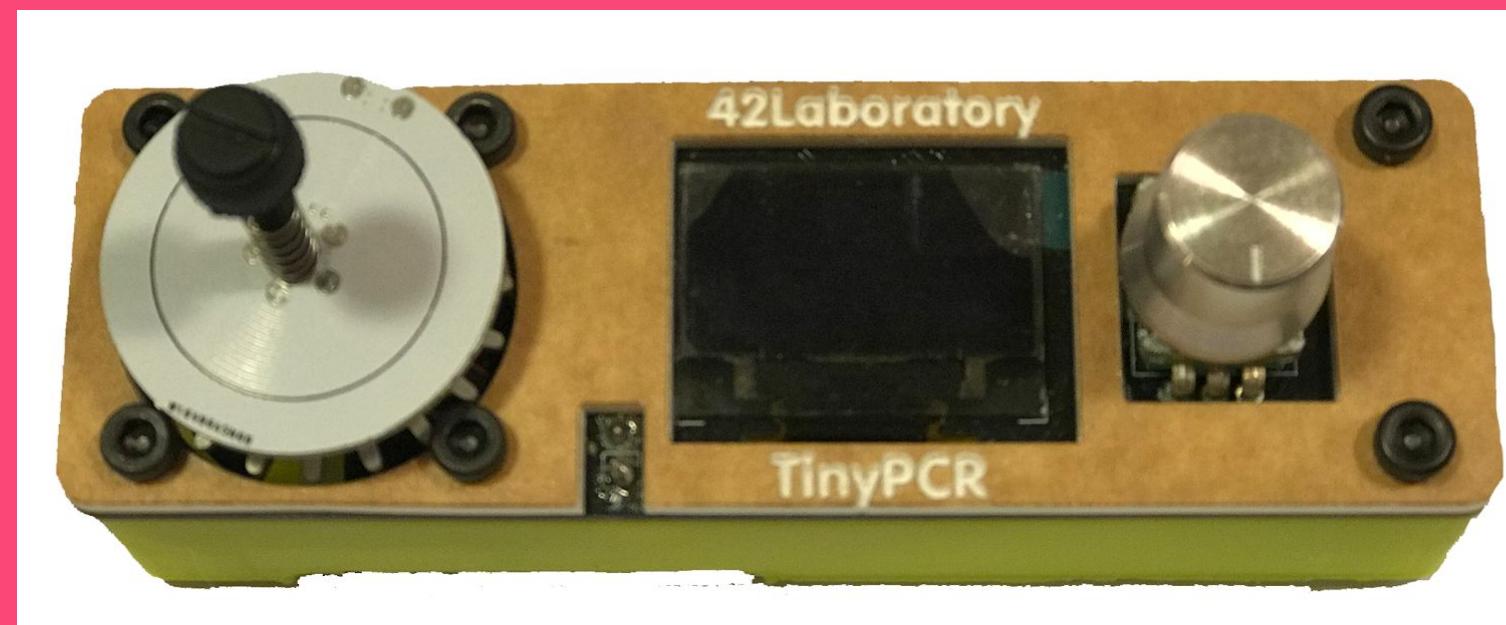


# Advanced Learners

- 6 - infinity y.o.
- Teaching Assistant App
- Freemium
- Monthly Subscription for premium content + support



# Advanced Learners



## Traditional Biotech machine 傳統生物科技儀器

# Beyond Dimension

- 13+ years old 歲以上
- 1% traditional equip.  
傳統生物儀器的1%價格
- 1st Single PCB Heating Element:  
首創單一發熱原件PCB
- Palm-size: 60g, 10cm 手掌大小
- USB-C Powered 移動電池驅動 PCR

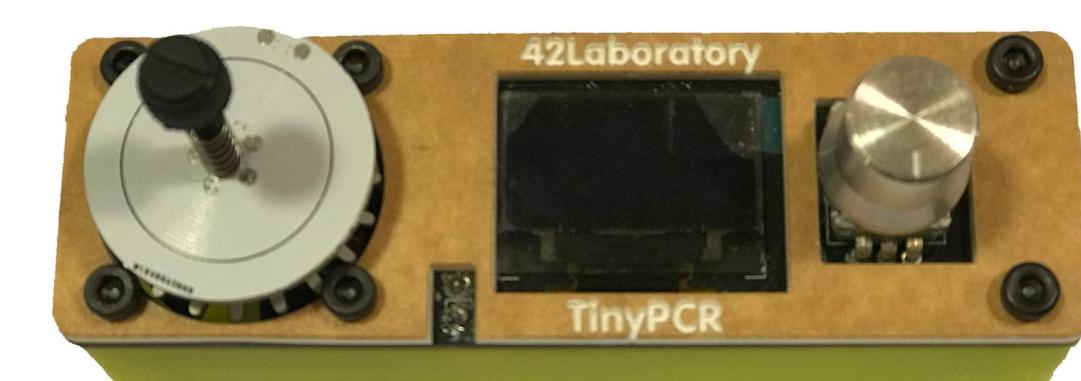
1st Generation  
第一代

70cm, 700g

2nd Generation  
第二代

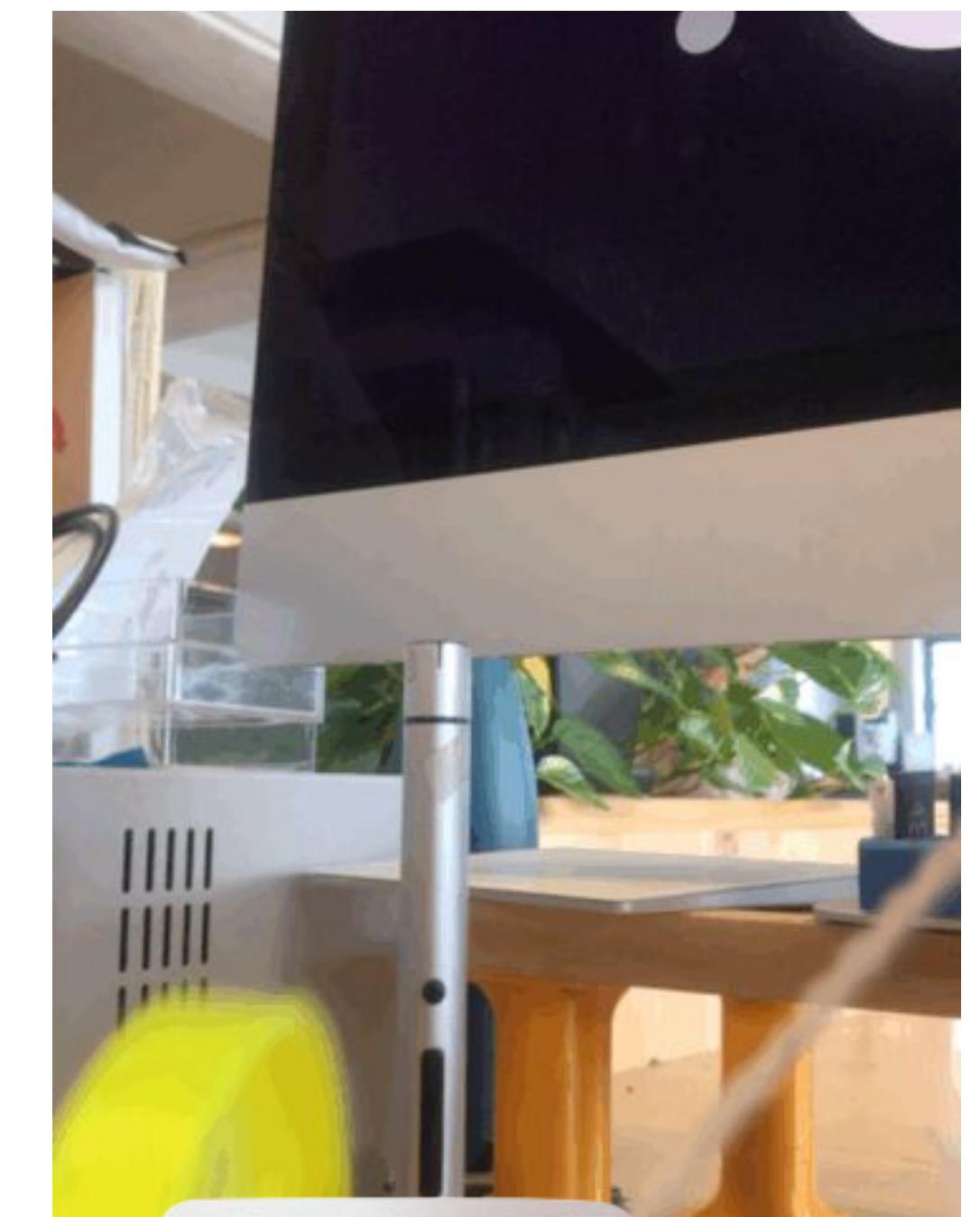
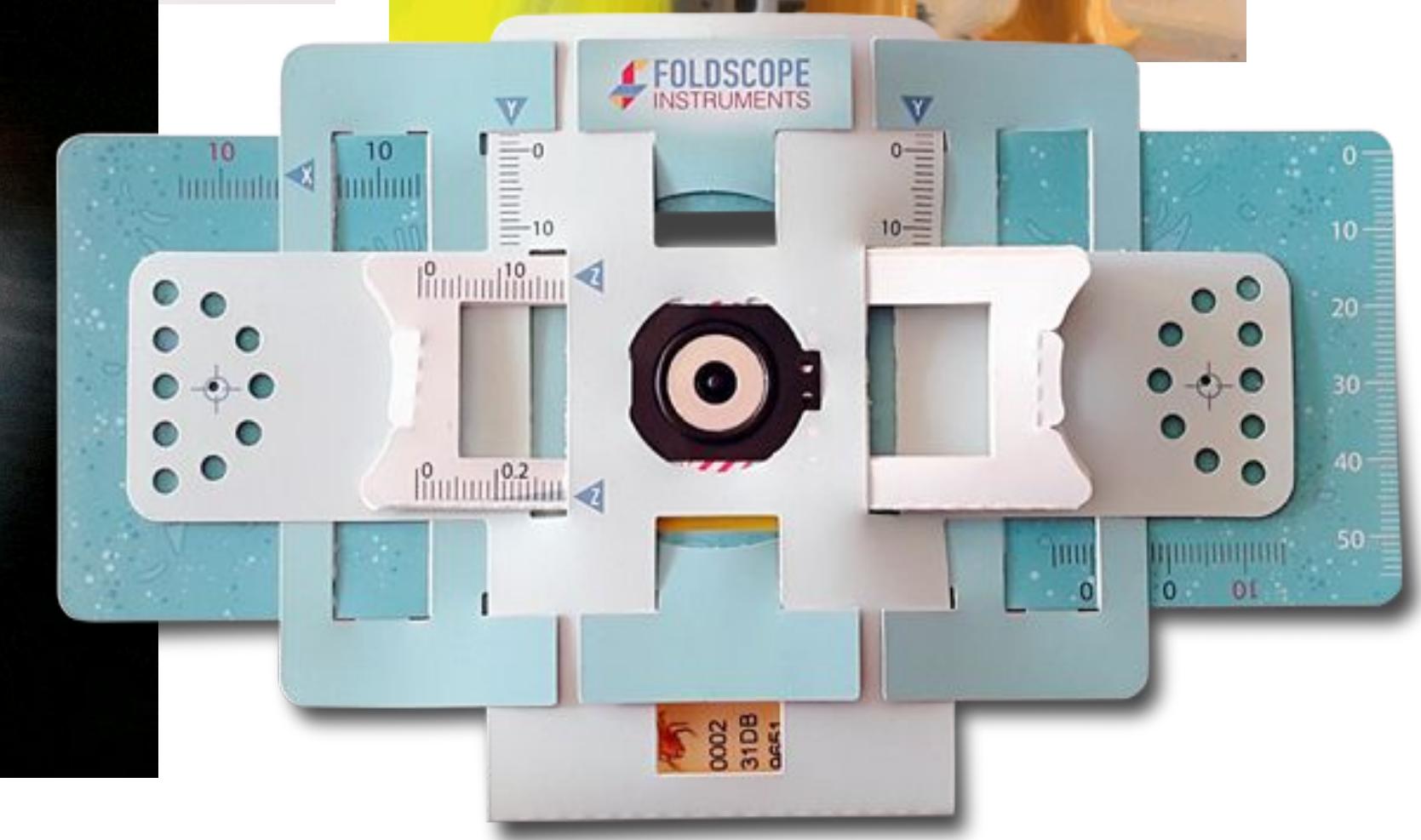
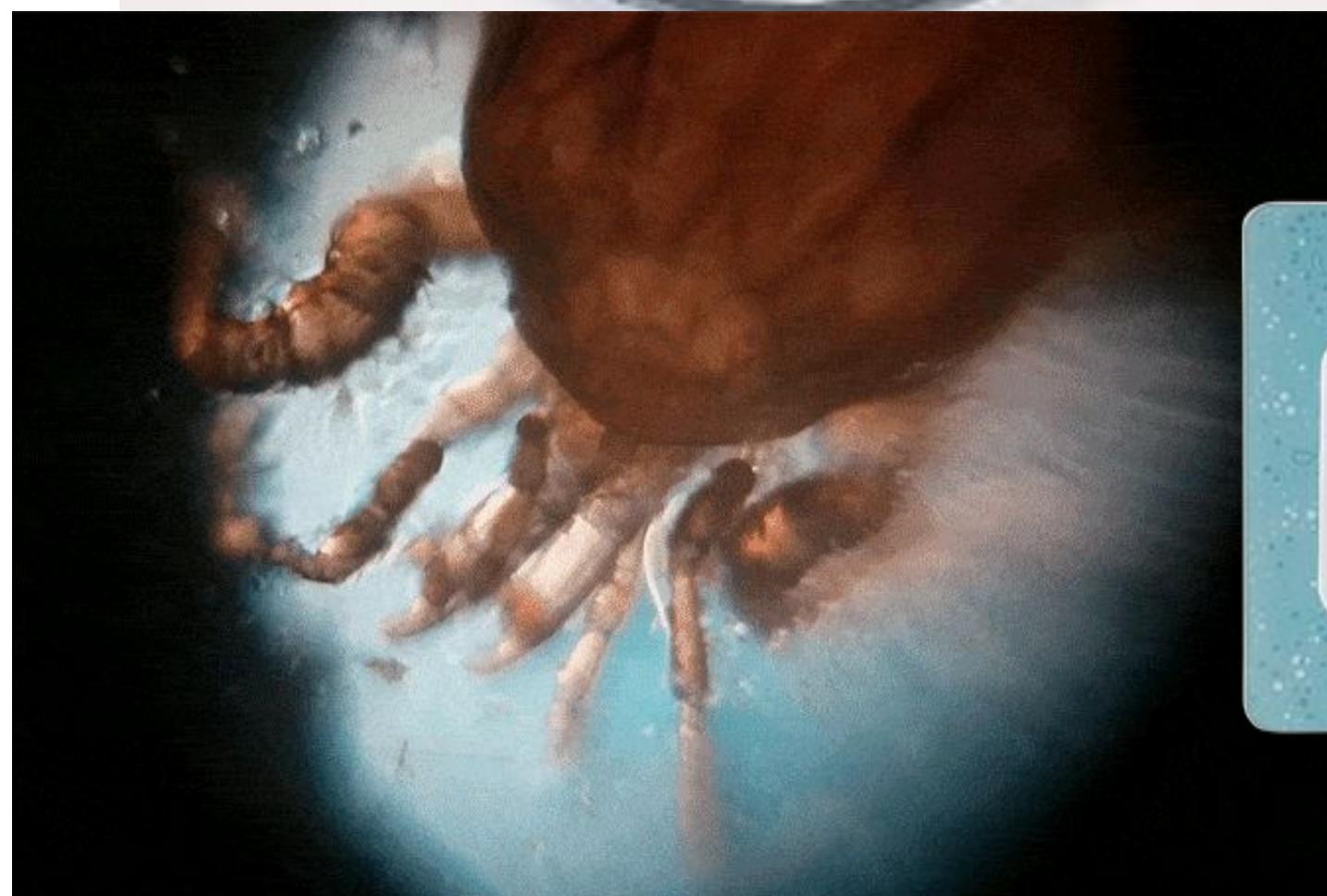
10cm

Tiny PCR



# Beyond Power

- Hand-powered Centrifuge  
手動離心機  
(6k rpm)
- Paper Microscope  
紙顯微鏡  
(140X, 2 micron)



# Beyond Power

Comparing w/. traditional  
biotech machine:

對比傳統生物科技儀器，

- Same accuracy

同樣精度

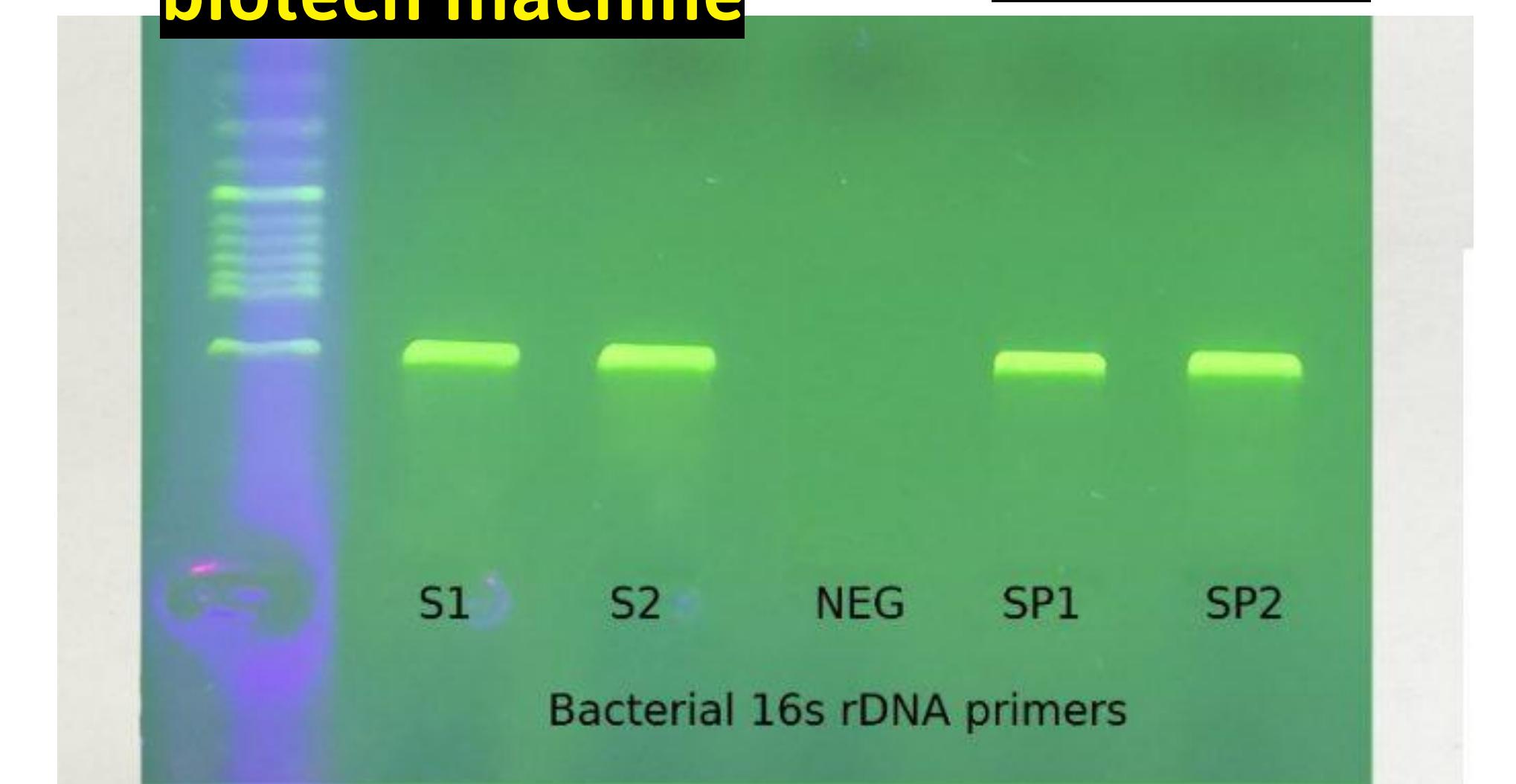
- 10% size & weight

十分之一大小及重量

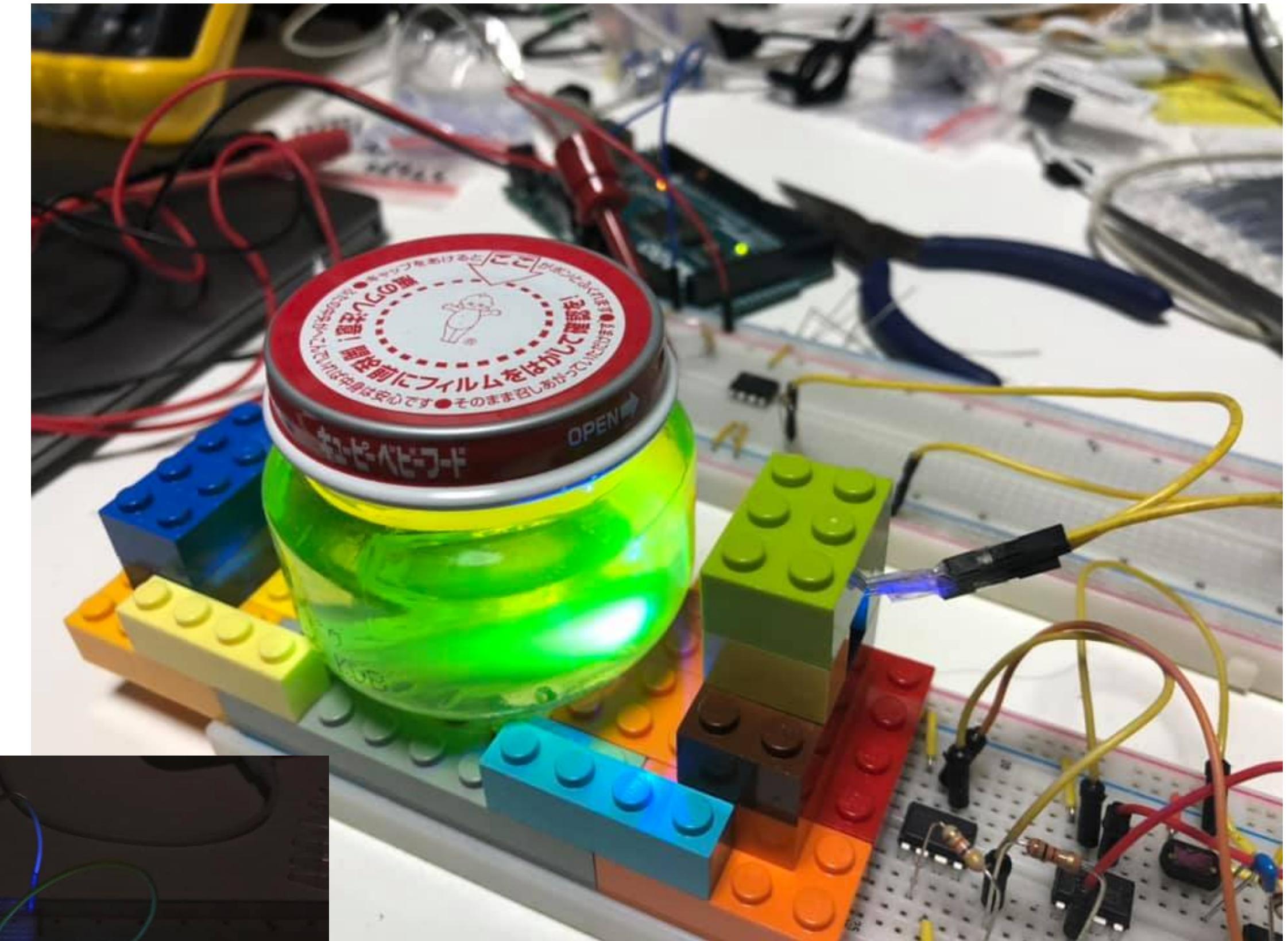
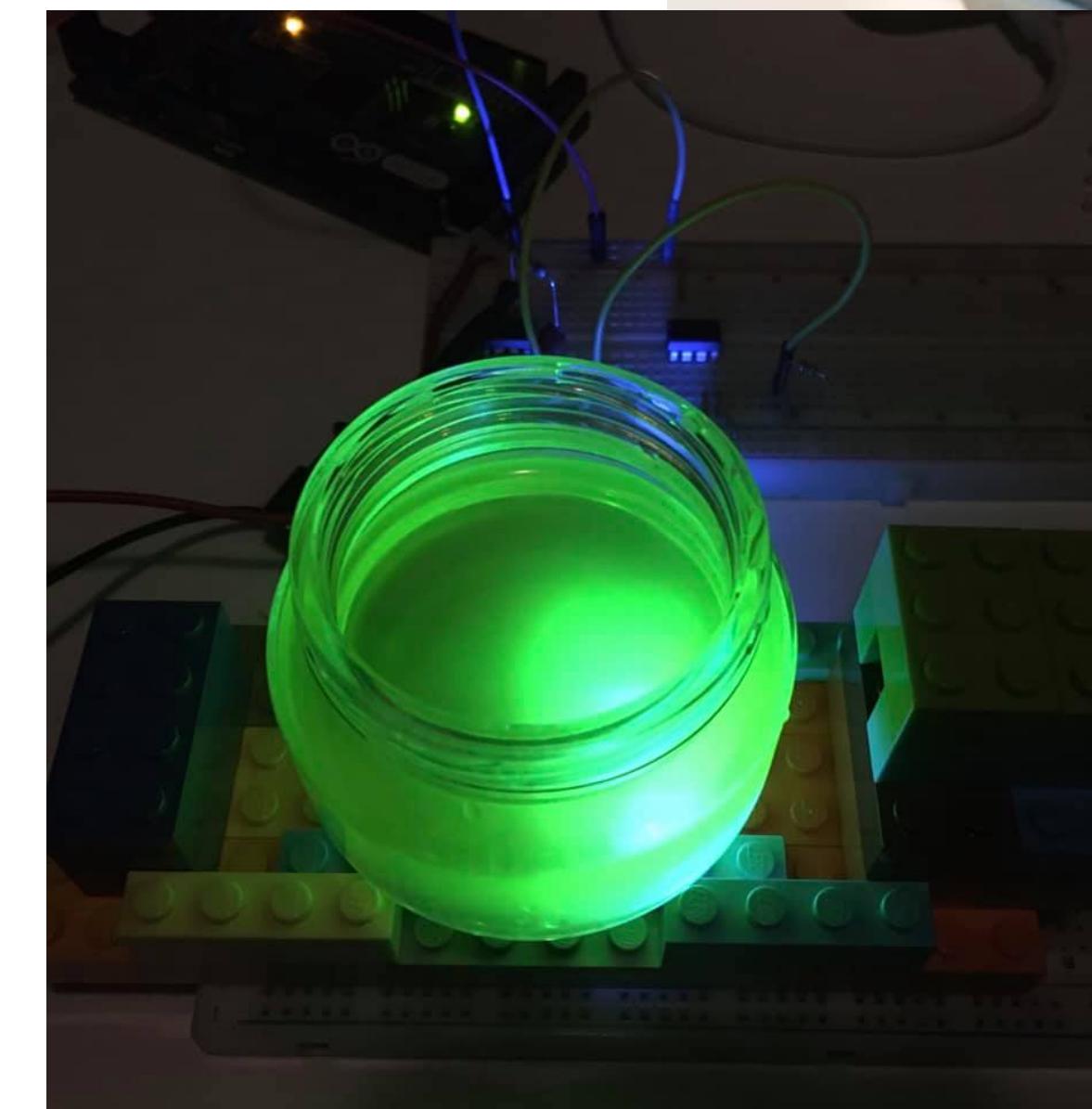
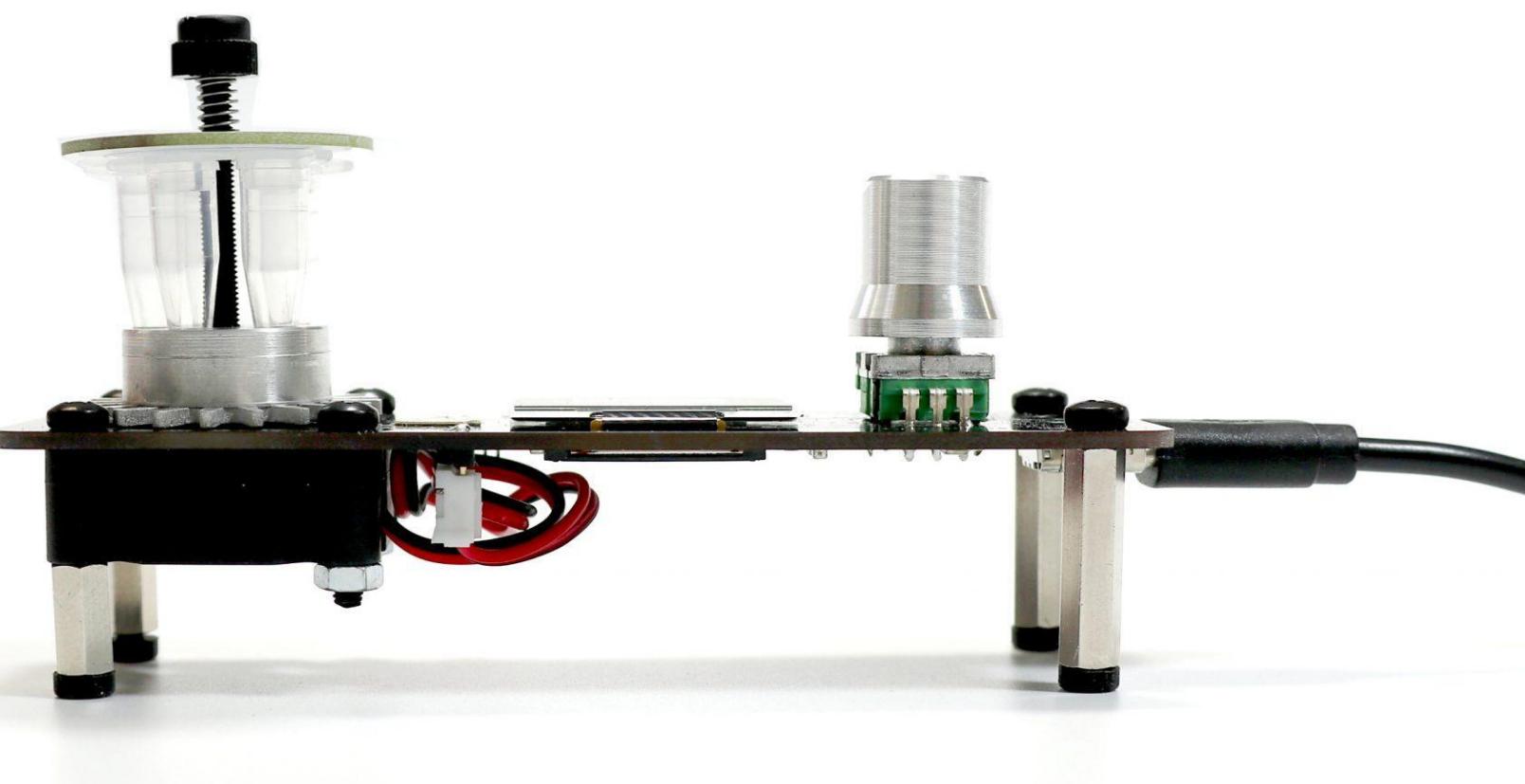


traditional  
biotech machine

PocketPCR



# COVID-19 Detection (LAMP)



- Using LAMP: 30 - 45 mins obtained the result
- Using traditional PCR: 2 - 3 hours

# PCR 多聚酶鏈式反應

## 1. Extraction

DNA from organism  
(e.g. Banana)

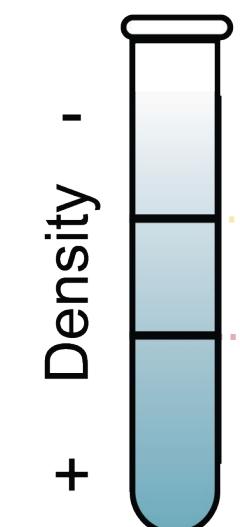
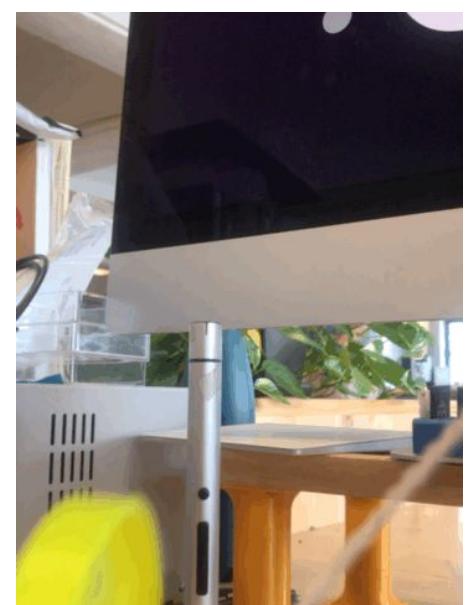
由生物提取基因  
(如香蕉)



## 2. Purification

by Centrifuge  
to separate DNA  
from the mixture

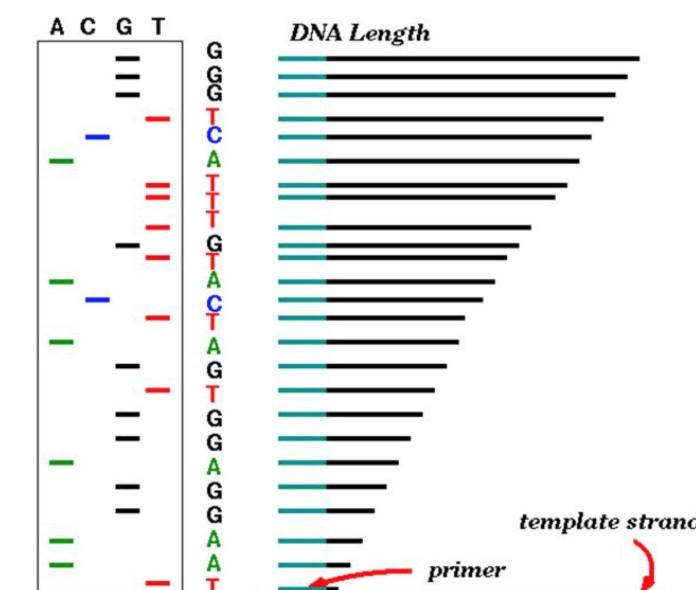
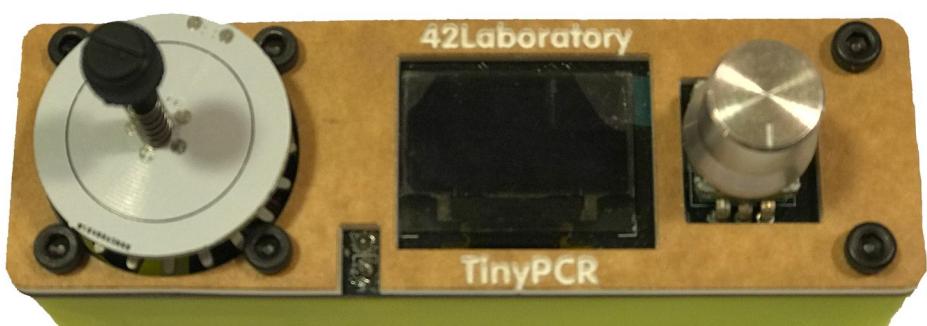
由離心機提純基因



## 3. PCR (Polymerase chain reaction)

to increase the copy  
of DNA

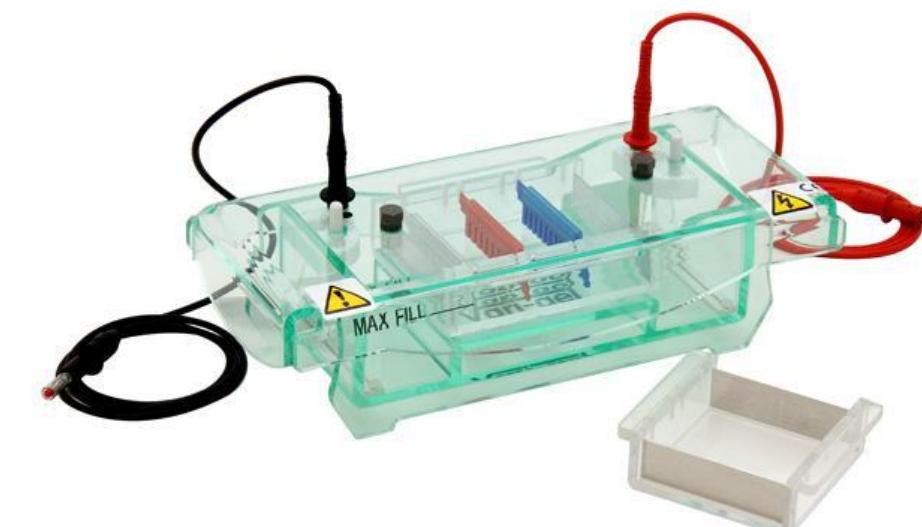
由PCR 增加基因數目



## 4. Sequencing

DNA fragment by  
weight in Gel Tank

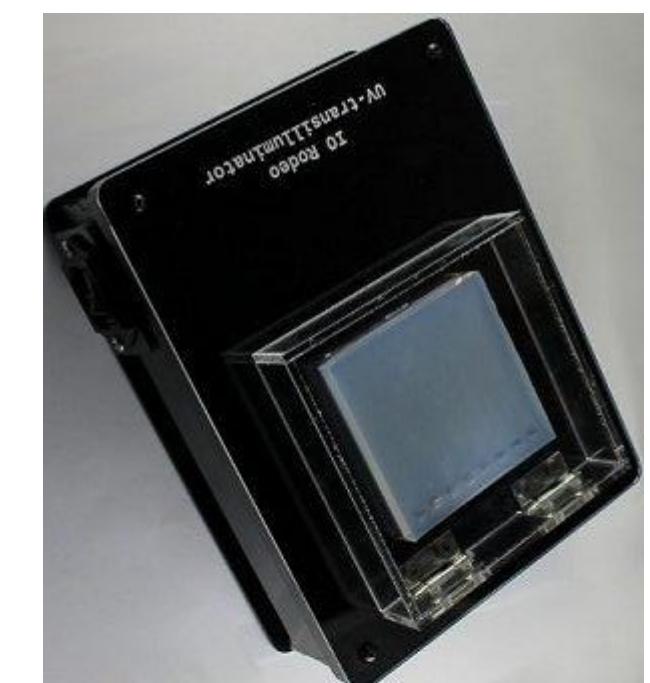
凝膠電泳中排序基因

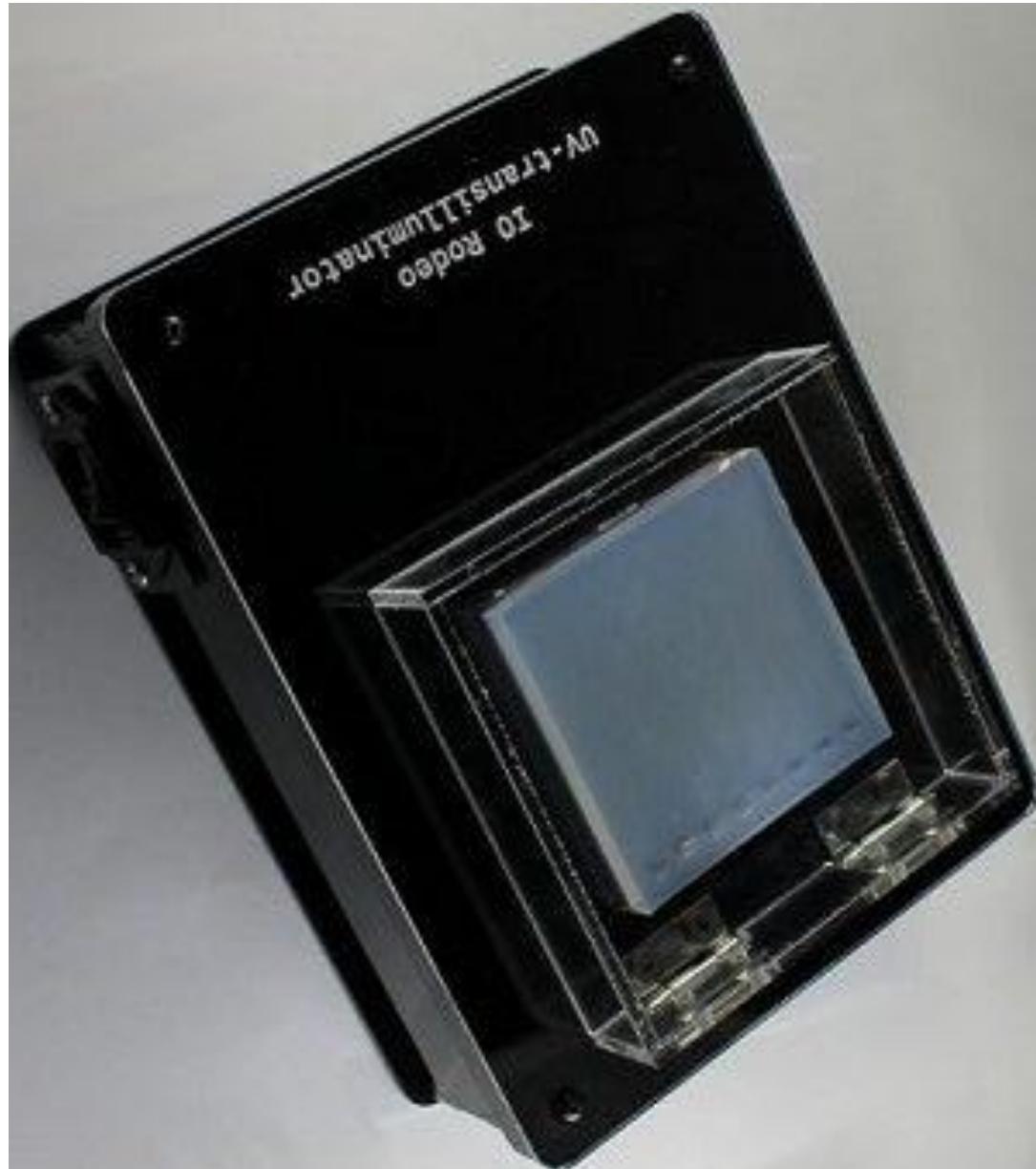
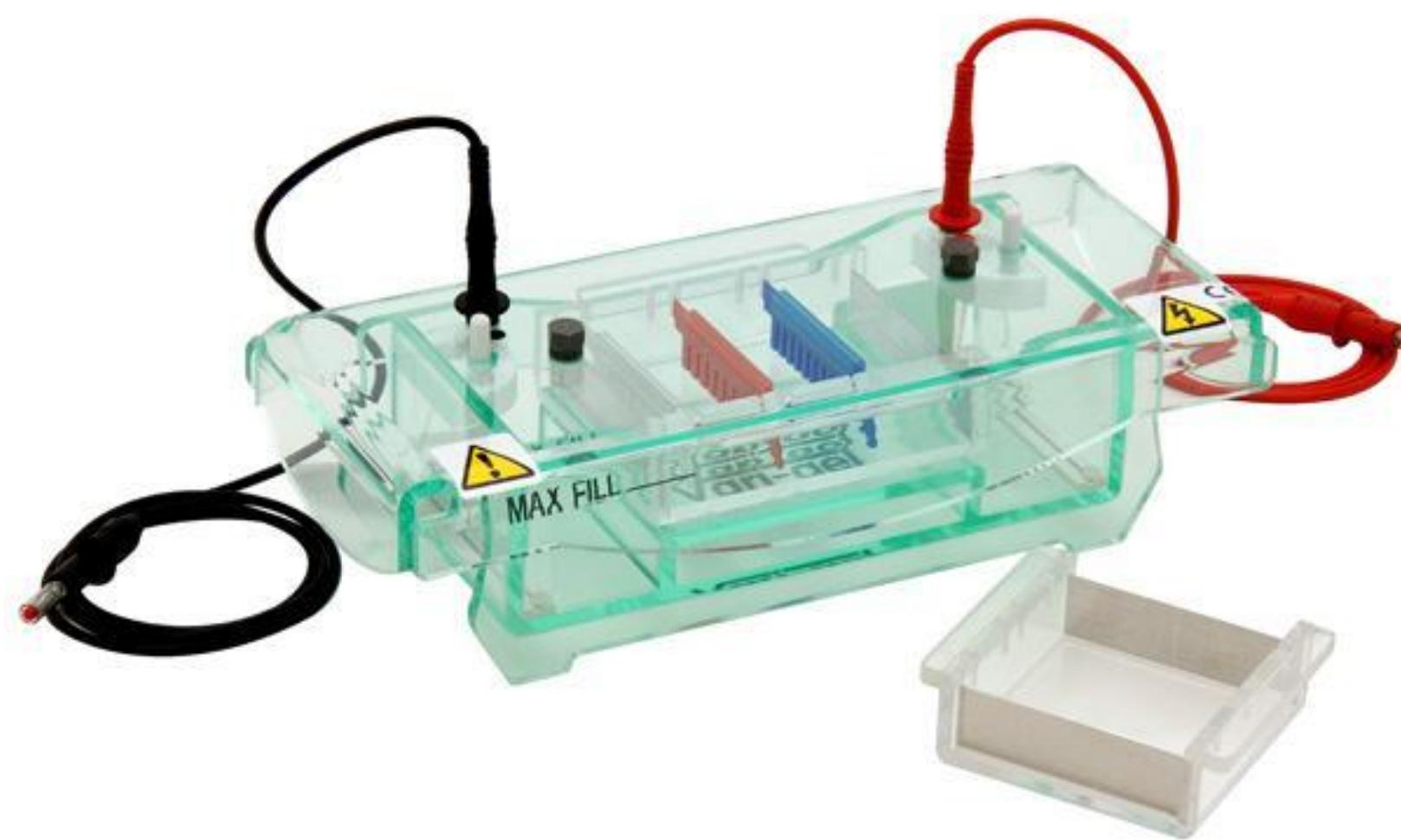
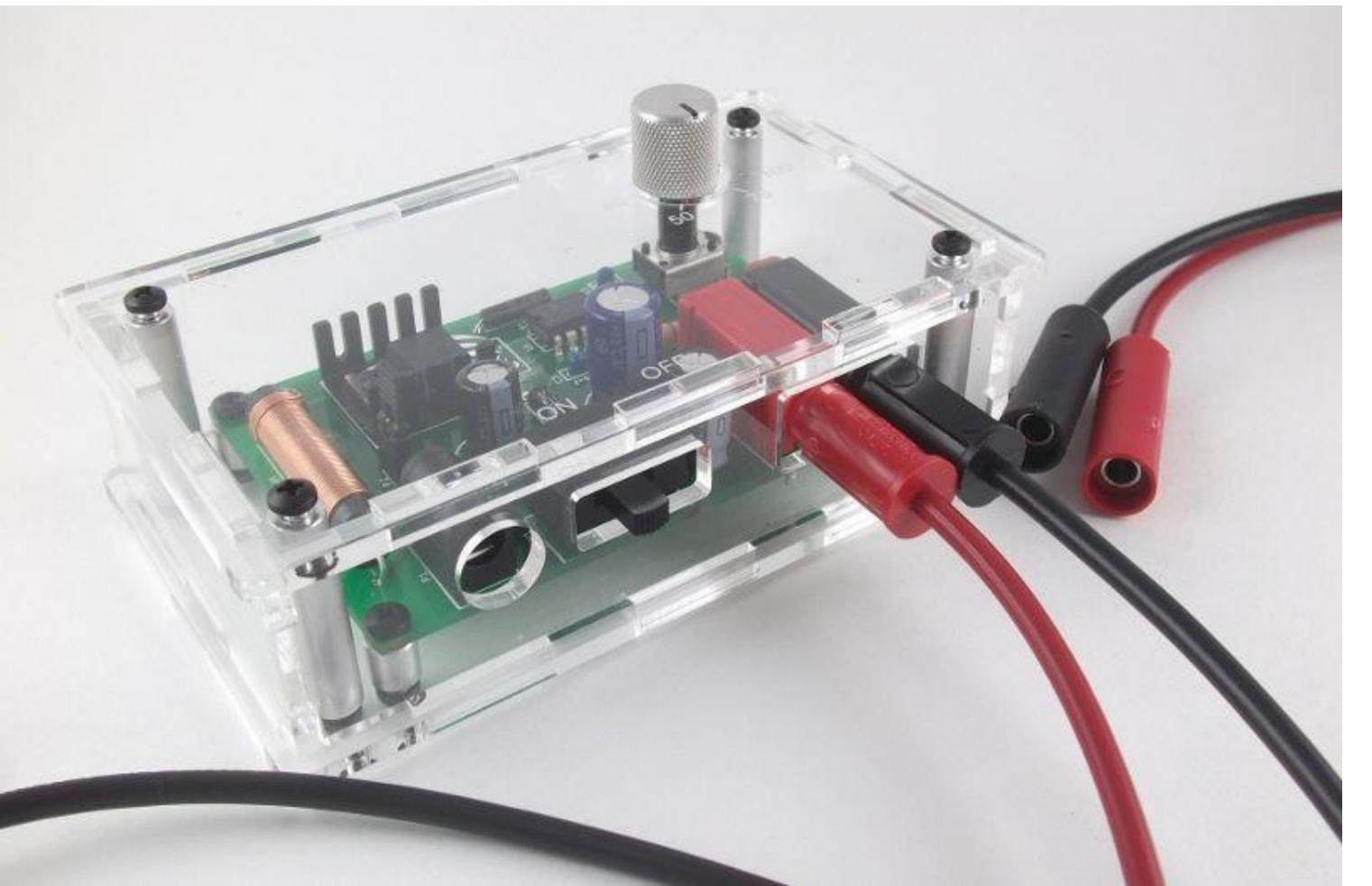


## 5. Illustration

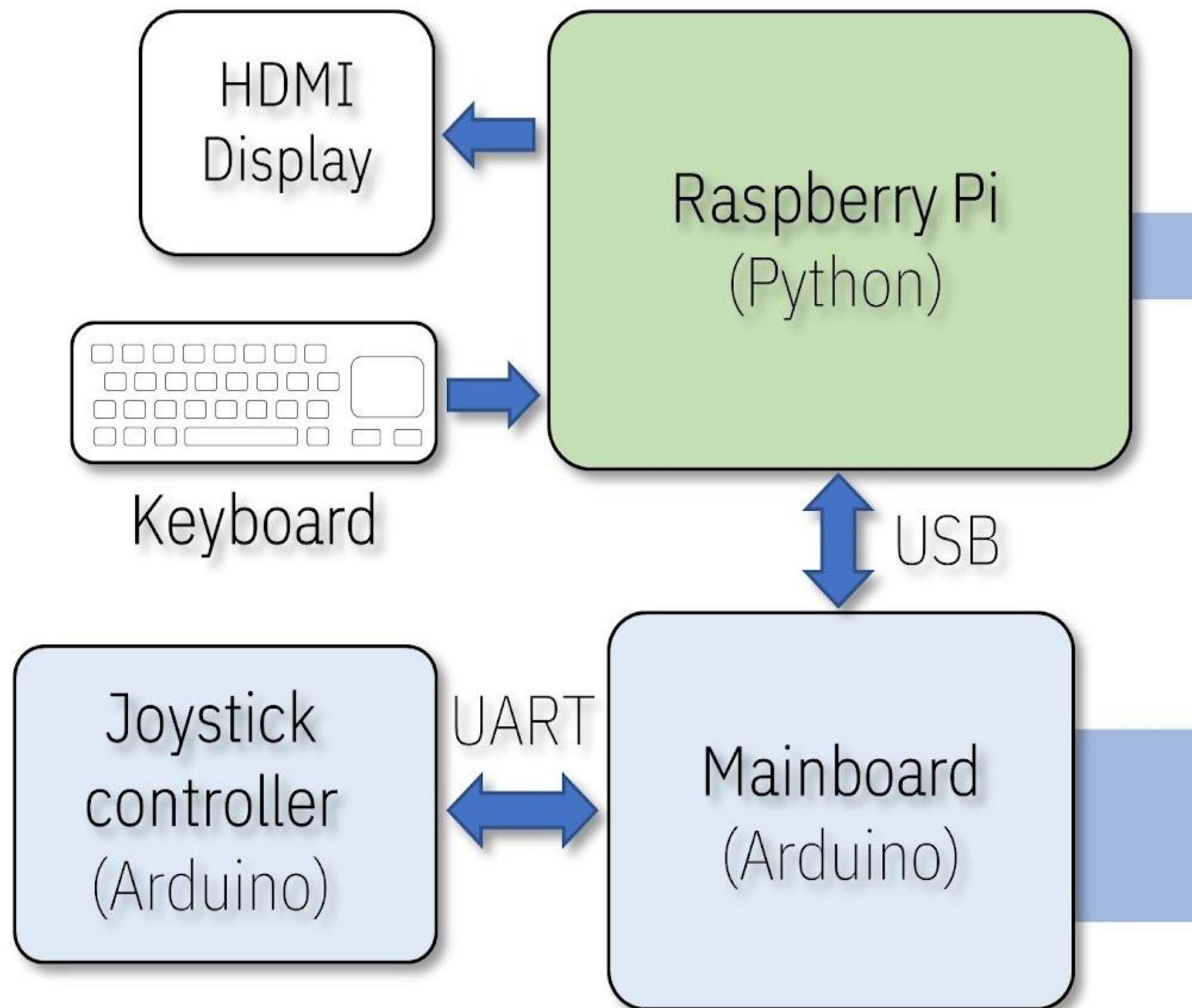
DNA sequence by  
Transilluminator

用照膠儀顯影基因排序





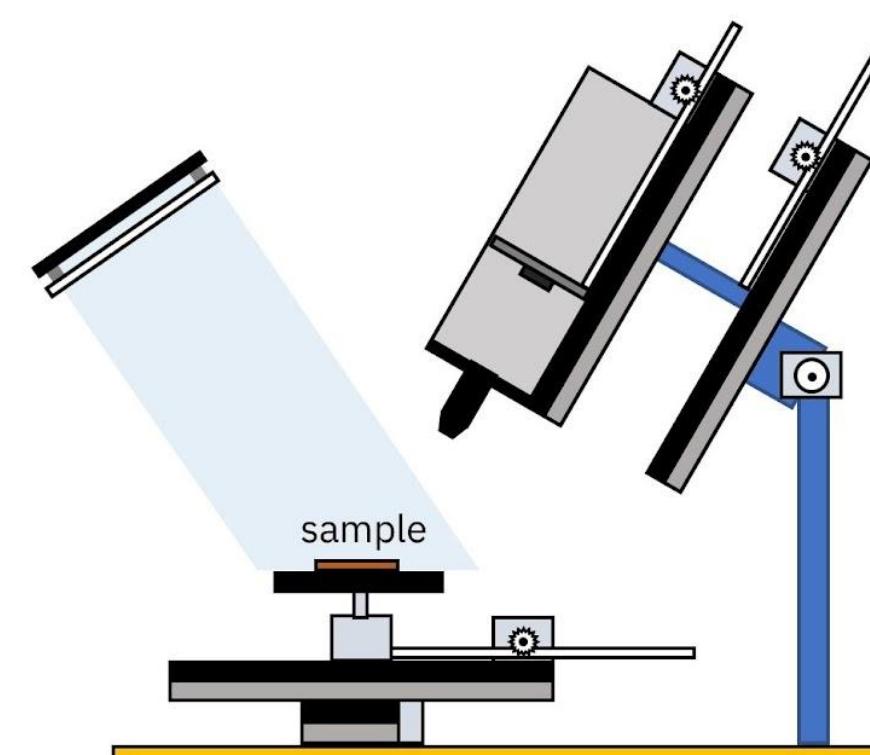
# AIoT Microscope



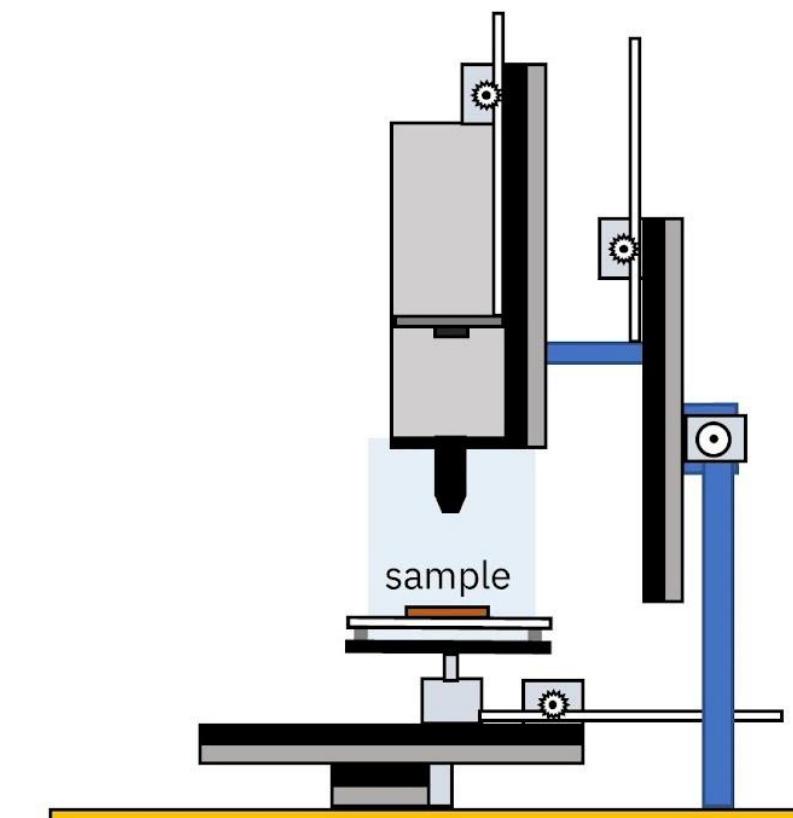
AI(Computer vision) + IoT Connected Microscope

# AIoT Microscope

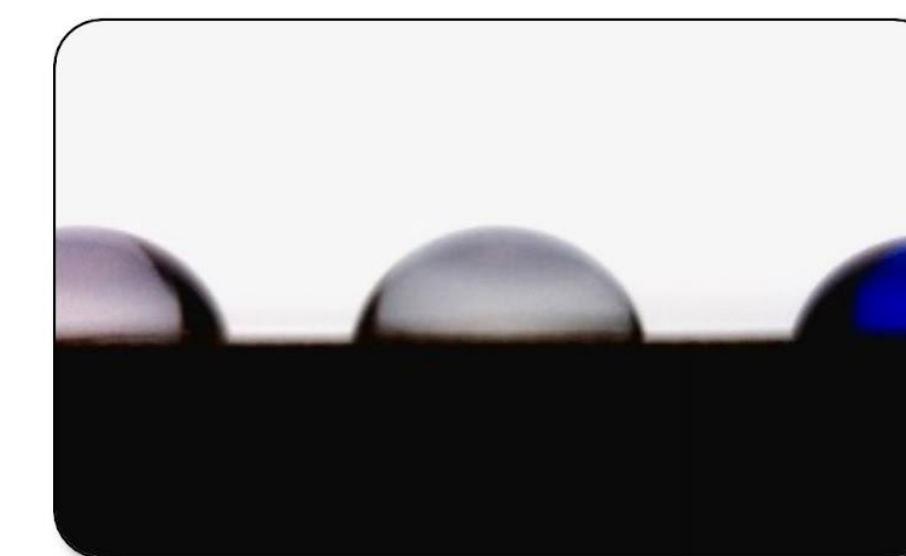
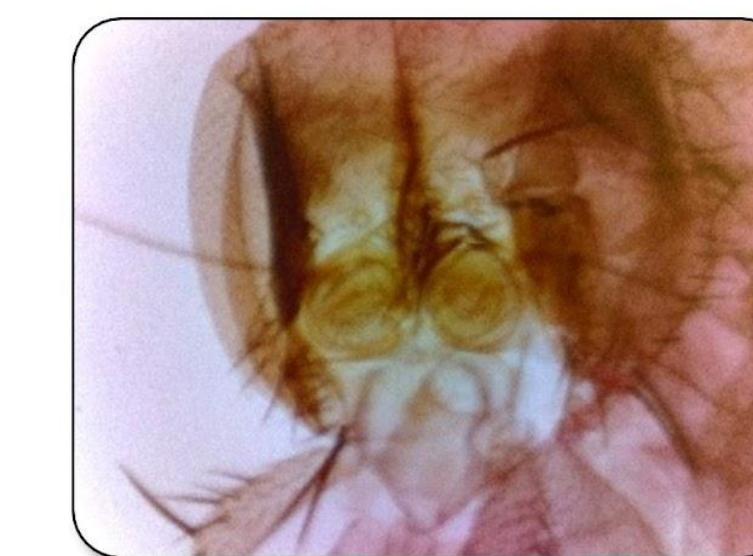
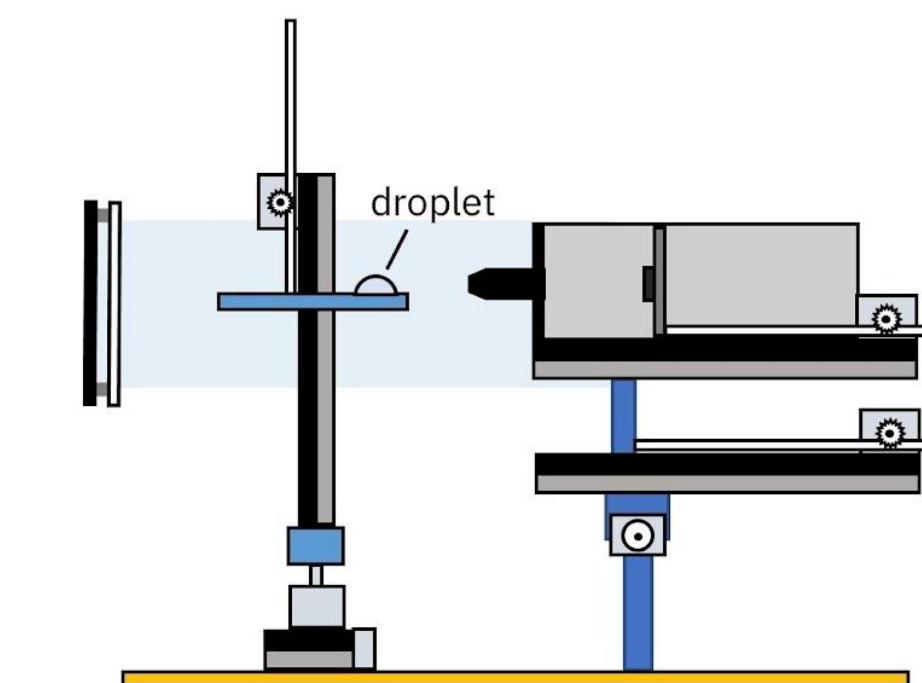
REFLECTED LIGHT



TRANSMITTED LIGHT



CROSS-SECTION or  
CONTACT ANGLE



AI(Computer vision) + IoT Connected Microscope

# AIoT Microscope



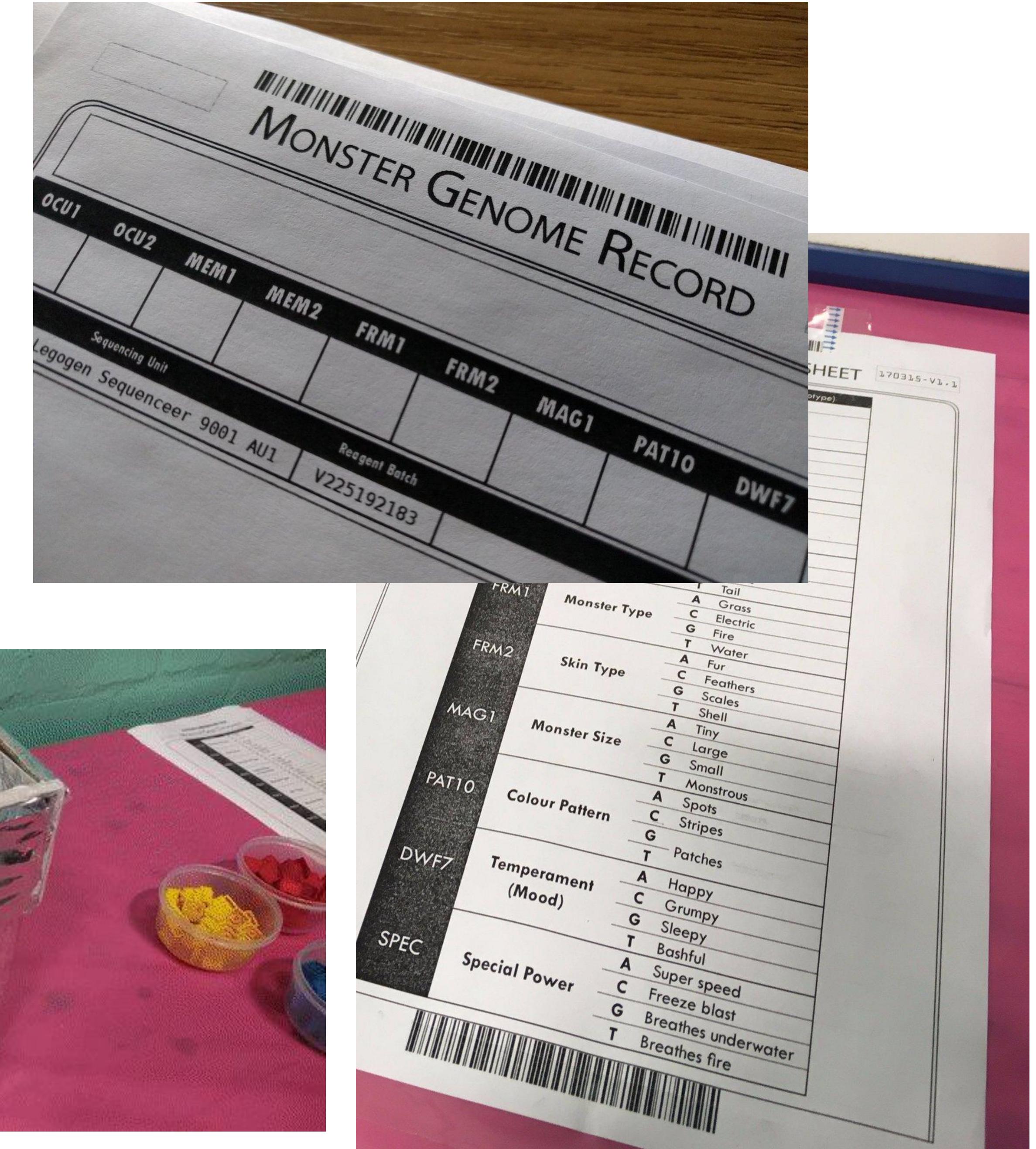
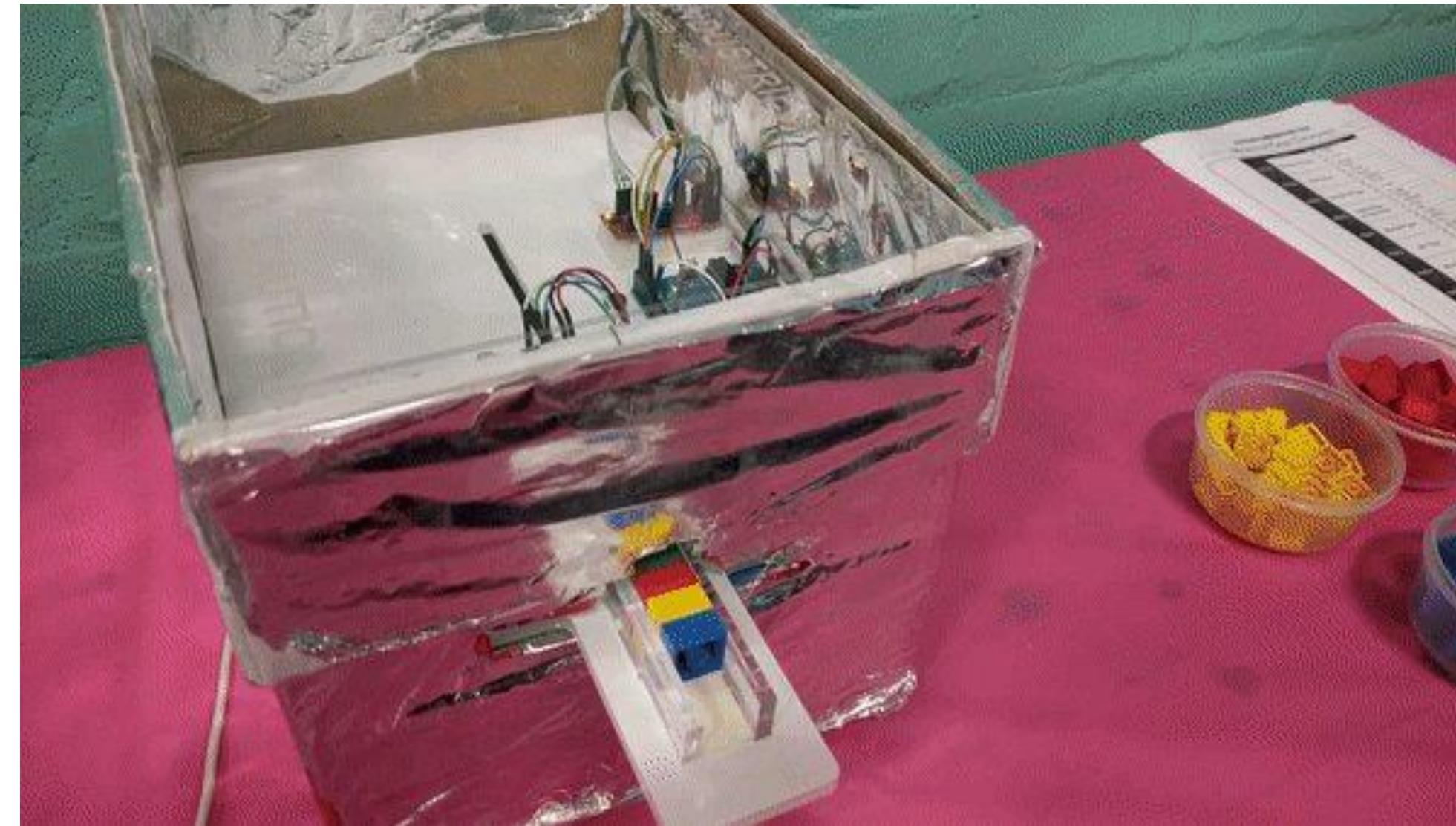
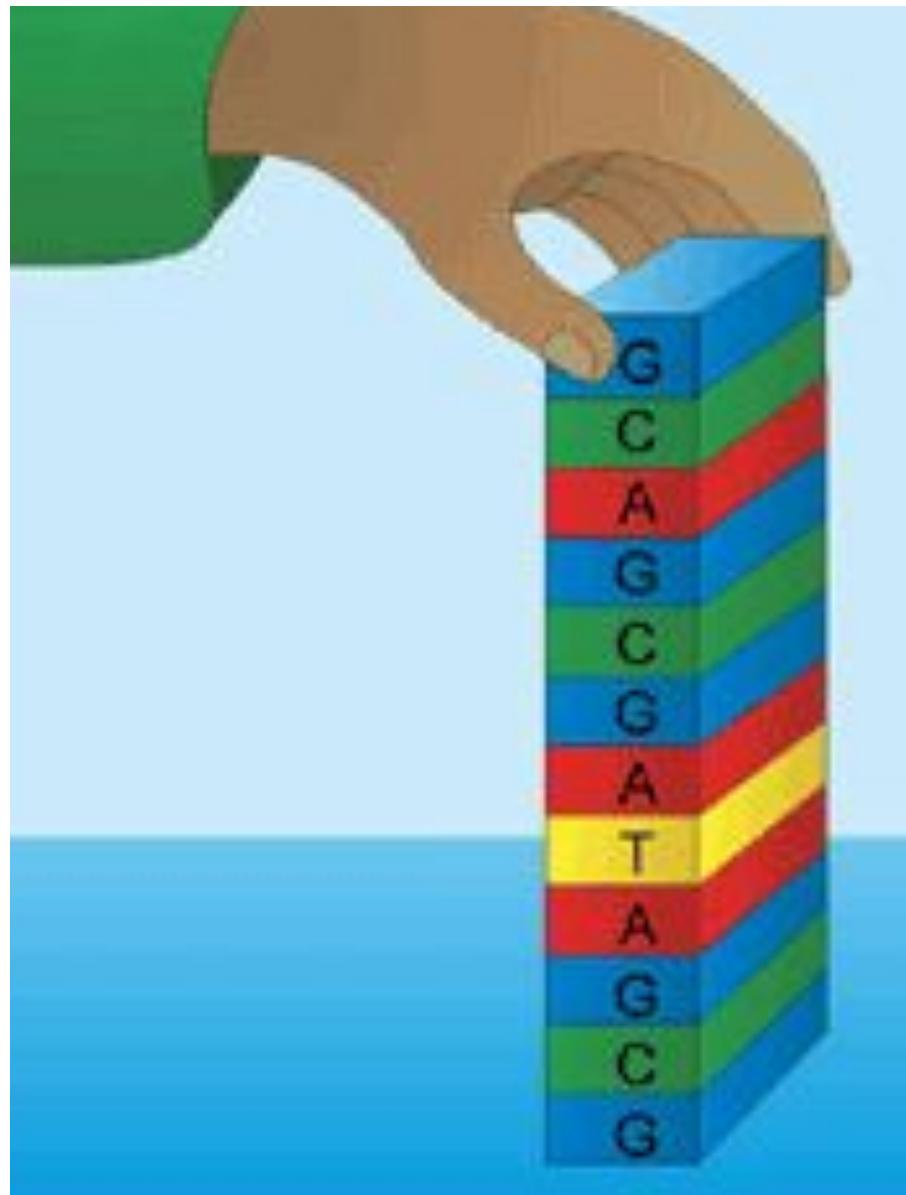
Paramecium  
(草履蟲)



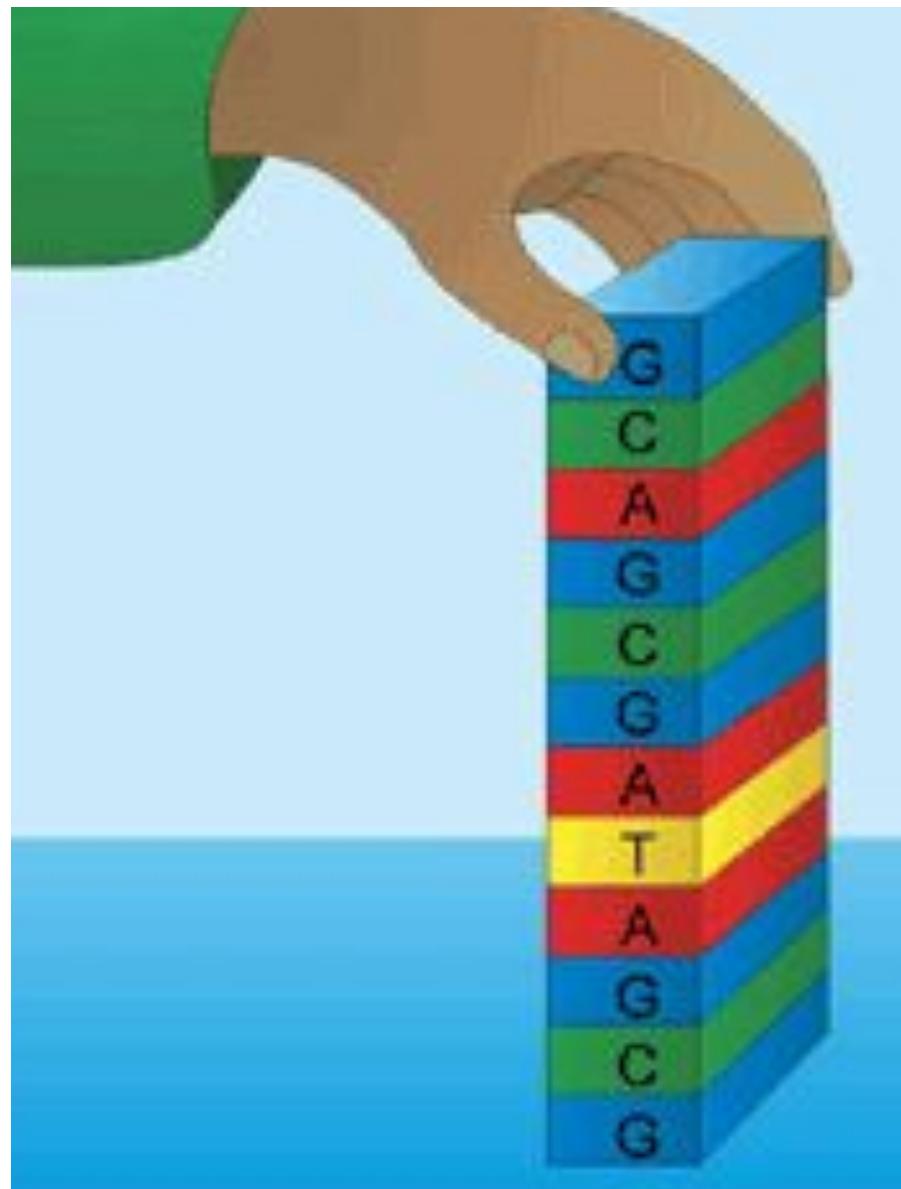
Amoeba (變形蟲)

# Lego DNA Sequencer

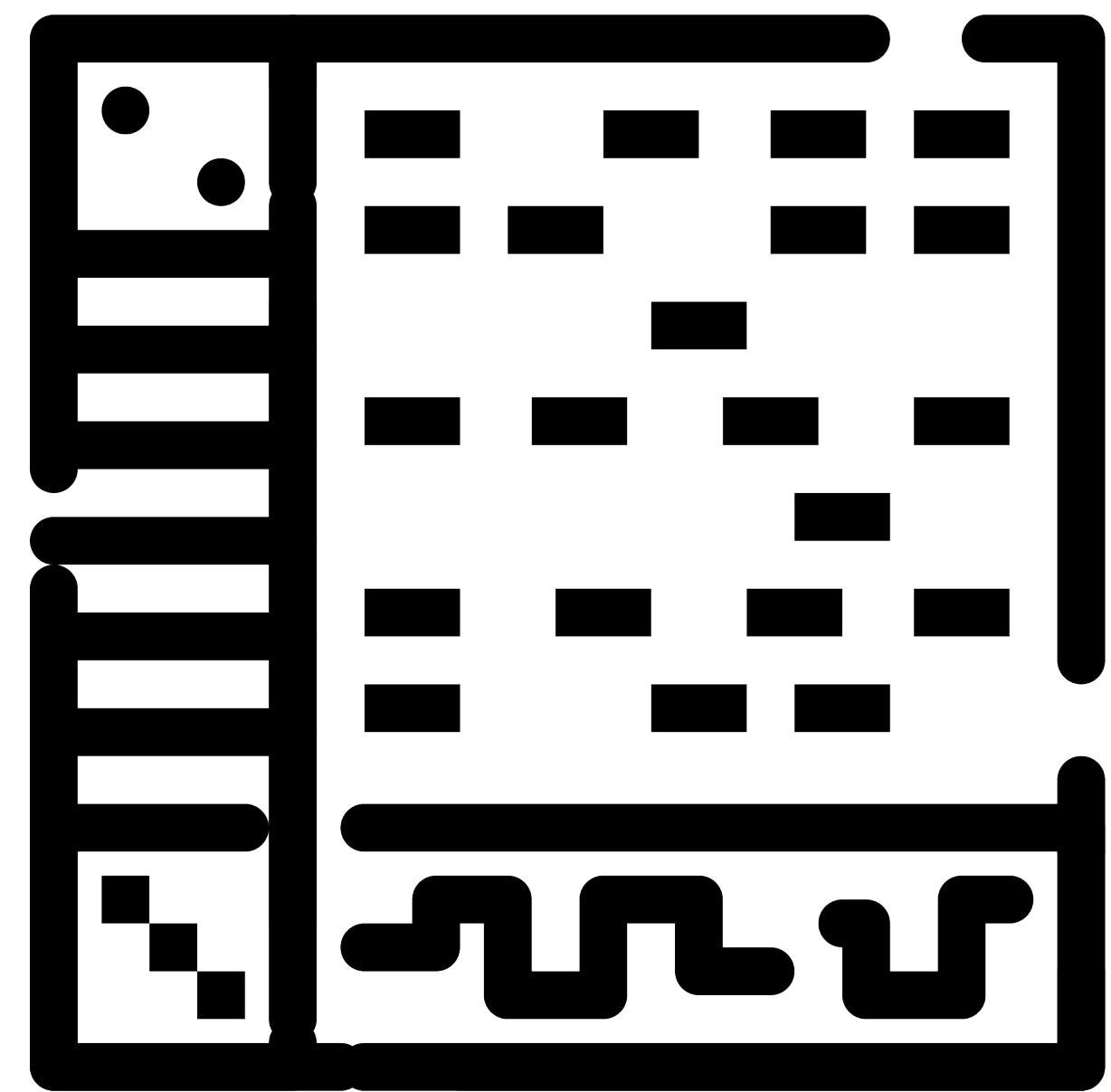
Using Lego as analogy of 4 DNA nucleotides  
- ATCG



# Lego DNA Sequencer



DNA Stack

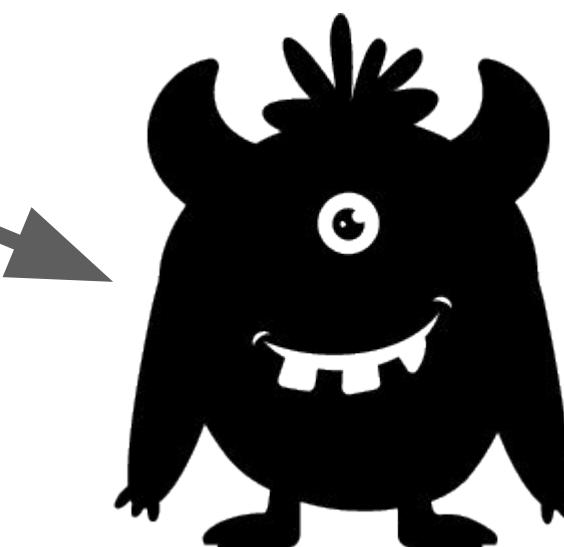
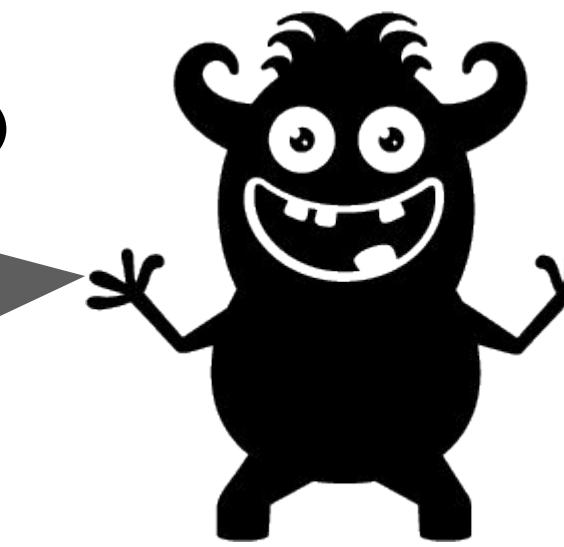
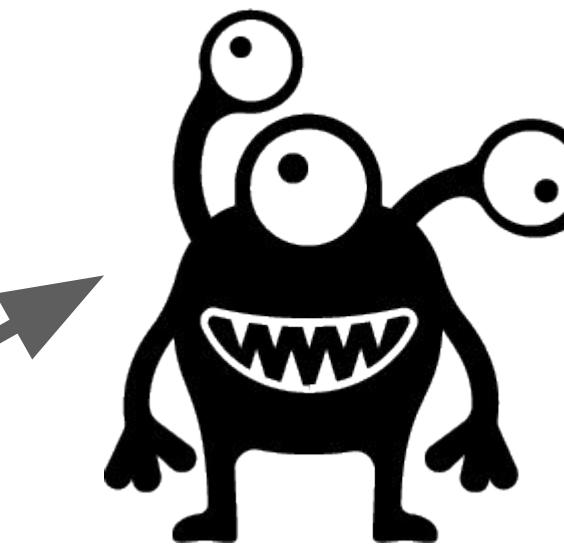


Sequencer

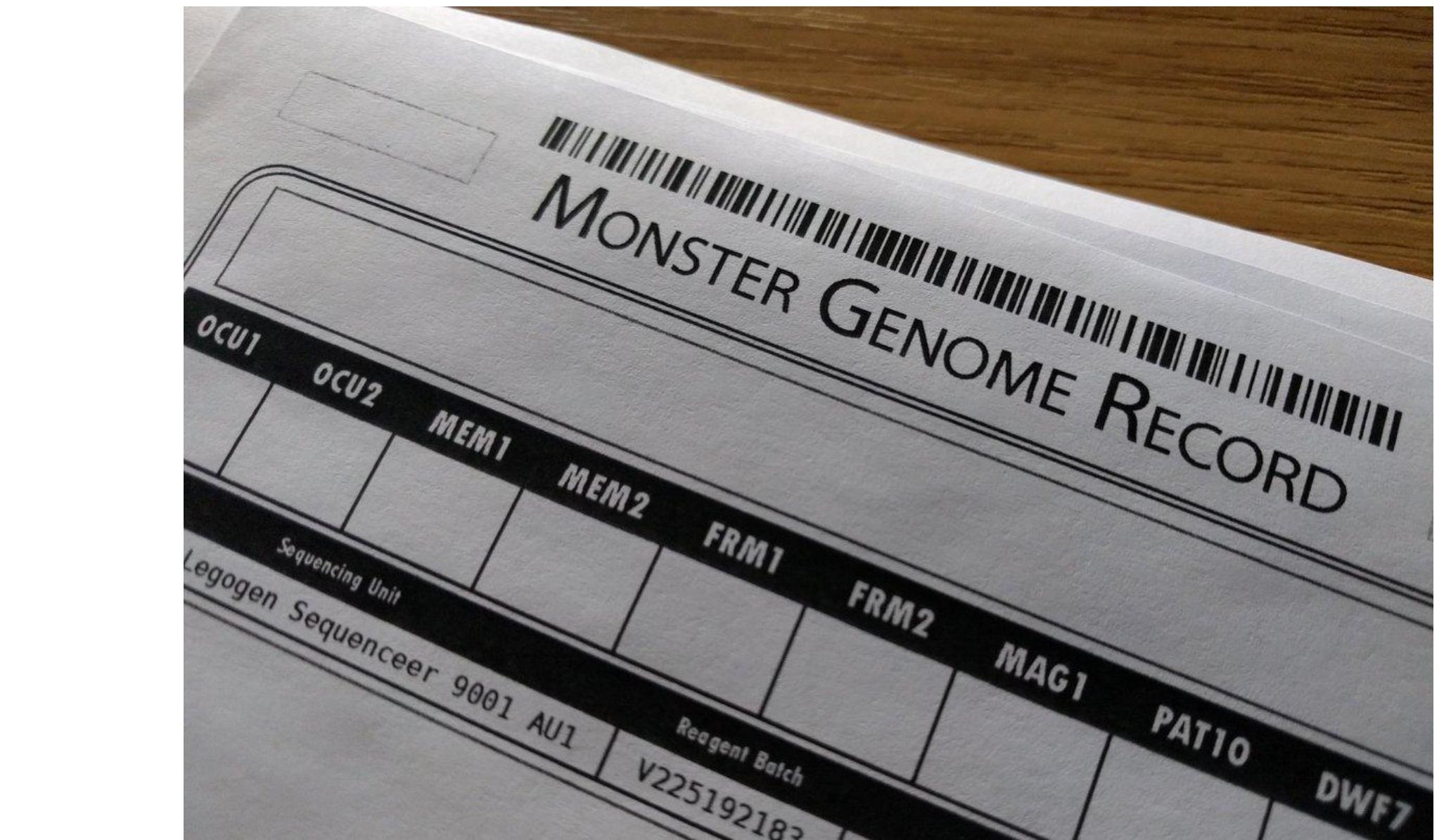
No. of  
eyes?

Mood?

Special  
Power



# Lego DNA Sequencer



UV-010-01

170315-v1.1

# MONSTER GENE DATASHEET

	Description	Base	Result (Phenotype)
OCU1	<b>Number of Eyes</b>	A	1 Eye
		C	2 Eyes
		G	
OCU2	<b>Eye Colour</b>	T	8 Eyes
		A	Blue
		C	Green
		G	Brown
MEM1	<b>Number of Legs</b>	T	Random
		A	2 Legs
		C	4 Legs
		G	
		T	8 Legs

**MEM2**

**Appendages  
or Extremities**

**A** Wings

**C** Antennae

**G** Horns

**T** Tail

**FRM1**

**Monster Type**

**A** Grass

**C** Electric

**G** Fire

**T** Water

**FRM2**

**Skin Type**

**A** Fur

**C** Feathers

**G** Scales

**T** Shell

**MAG1**

**Monster Size**

**A** Tiny

**C** Large

**G** Small

**T** Monstrous

PAT10

DWF7

SPEC

## Colour Pattern

A Spots

C Stripes

G Patches

T

## Temperament (Mood)

A Happy

C Grumpy

G Sleepy

T Bashful

## Special Power

A Super speed

C Freeze blast

G Breathes underwater

T Breathes fire

# 30+ Experiment

- 6 - 18 y.o.
- Apparatus + Consumables
- Life Sci. & Biotech (1st phase)
- Engineering & Art (2nd)





Astrobiology



Marine  
Science



Micro  
fluidics



Water  
Recycle



DNA  
Extraction &  
Sequence



Renewable  
Energy from  
Plants



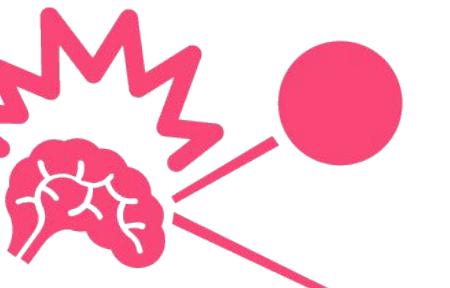
Kitchen  
Science



Sensation  
of  
Living Things



Microworld



Protection  
of  
Organs



Bionic Robot



Hygiene



Waste Water  
Treatment



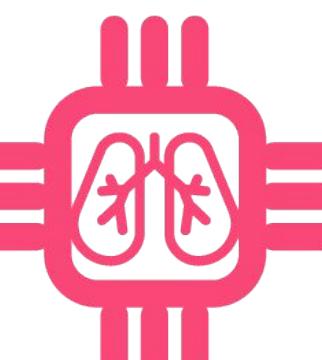
Ecology



Vital Signal



Cooking by  
Sun



Organ on Chip



Metabolism



more  
experiments...

# From Washing Hand to DNA Editing Experiment



# Bioart

1. Isolate soil microbes
2. Identify microbes
3. Make agar art (paintings using microbes)



4. Create hypothesis based on art
5. Experiment
6. Present findings

# DIY Plant Based Meat



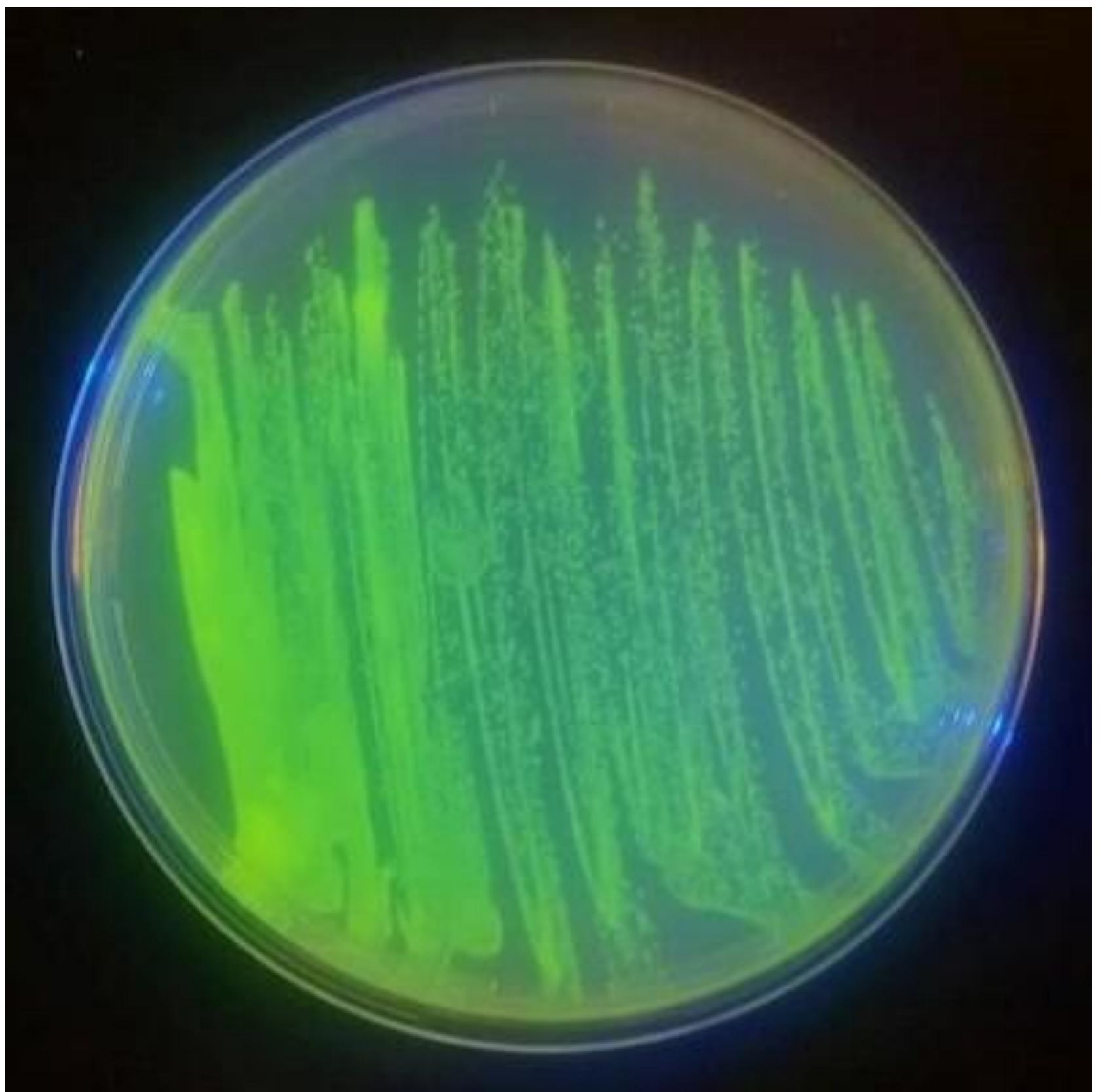
Figure 1: Raw vegan burger mixture with  
**Metolose® MCE-100TS**



Figure 2 and 3: Fried vegan burger patty  
with **Metolose® MCE-100TS**

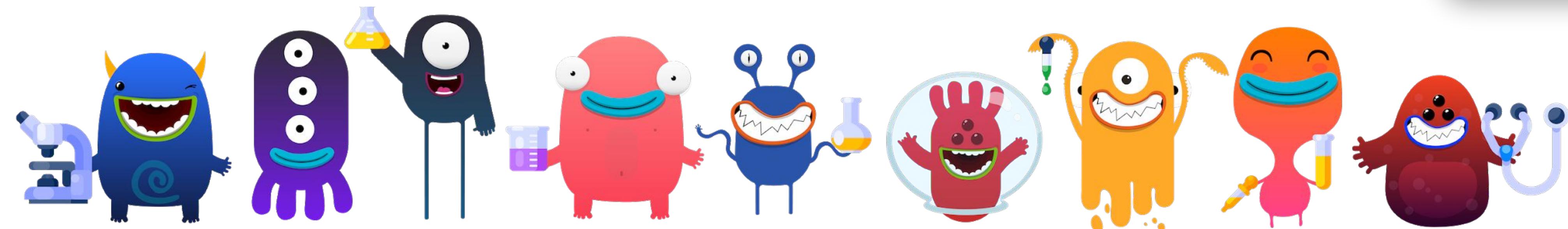
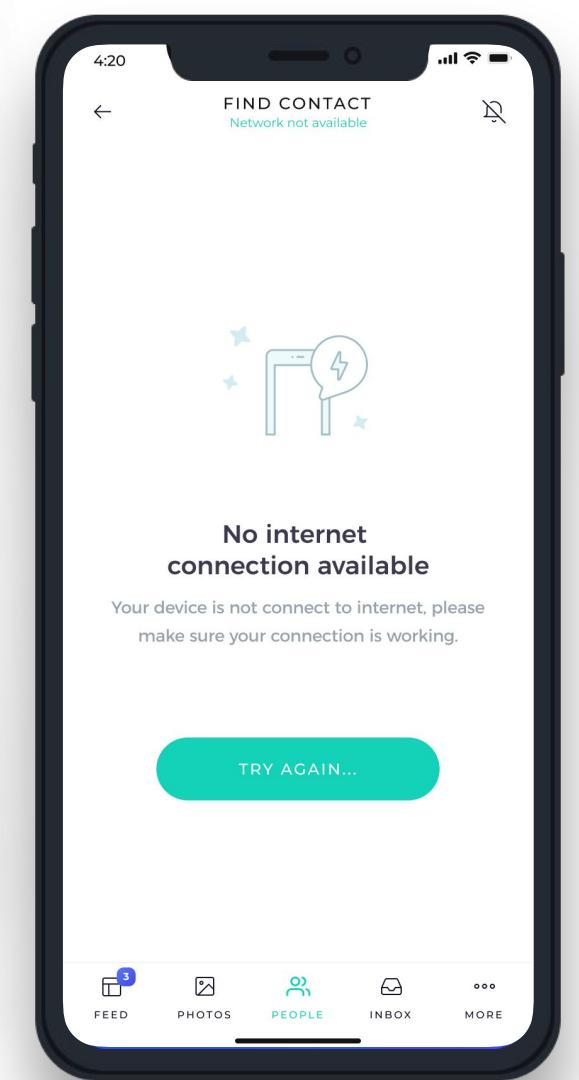
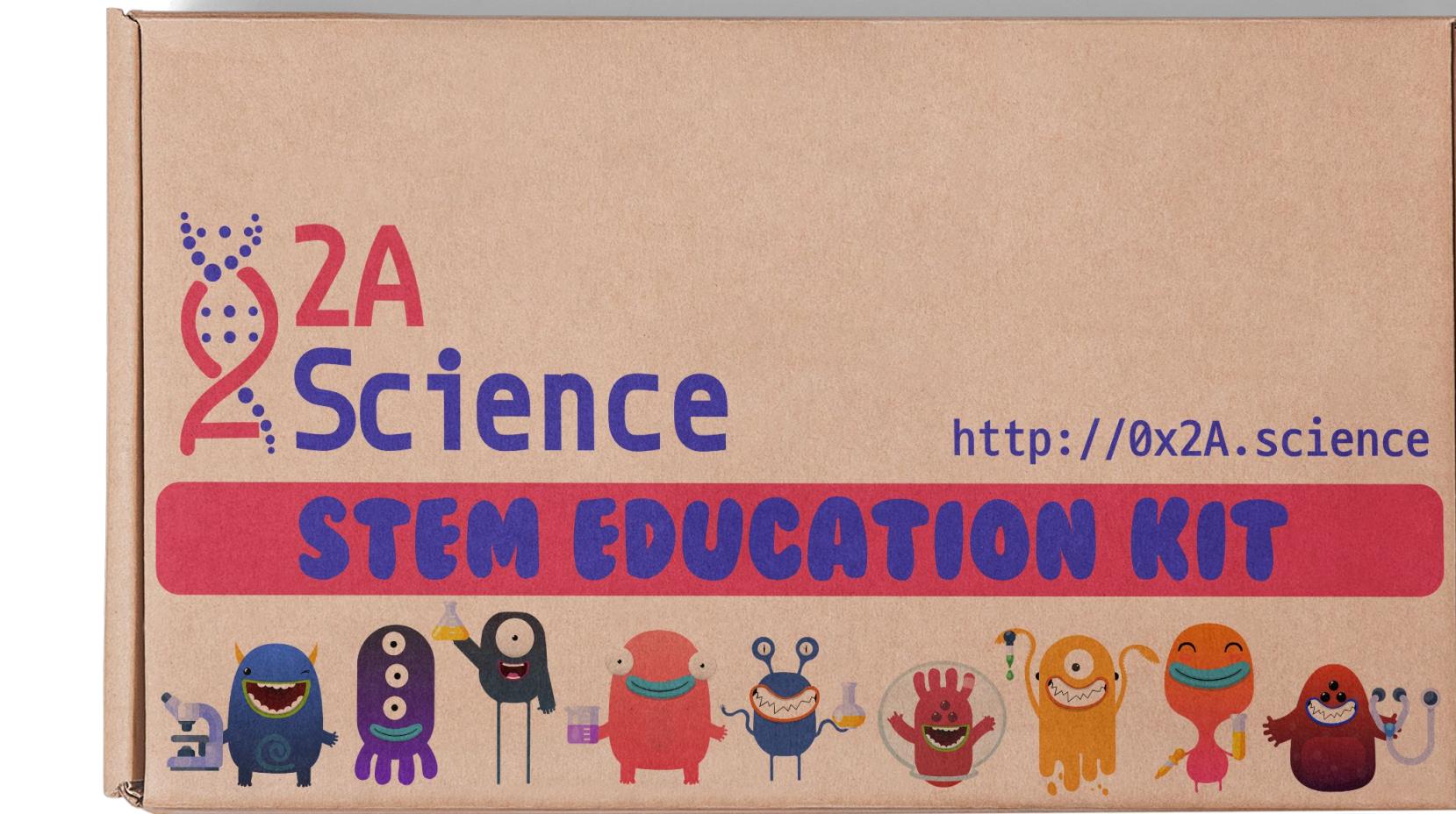
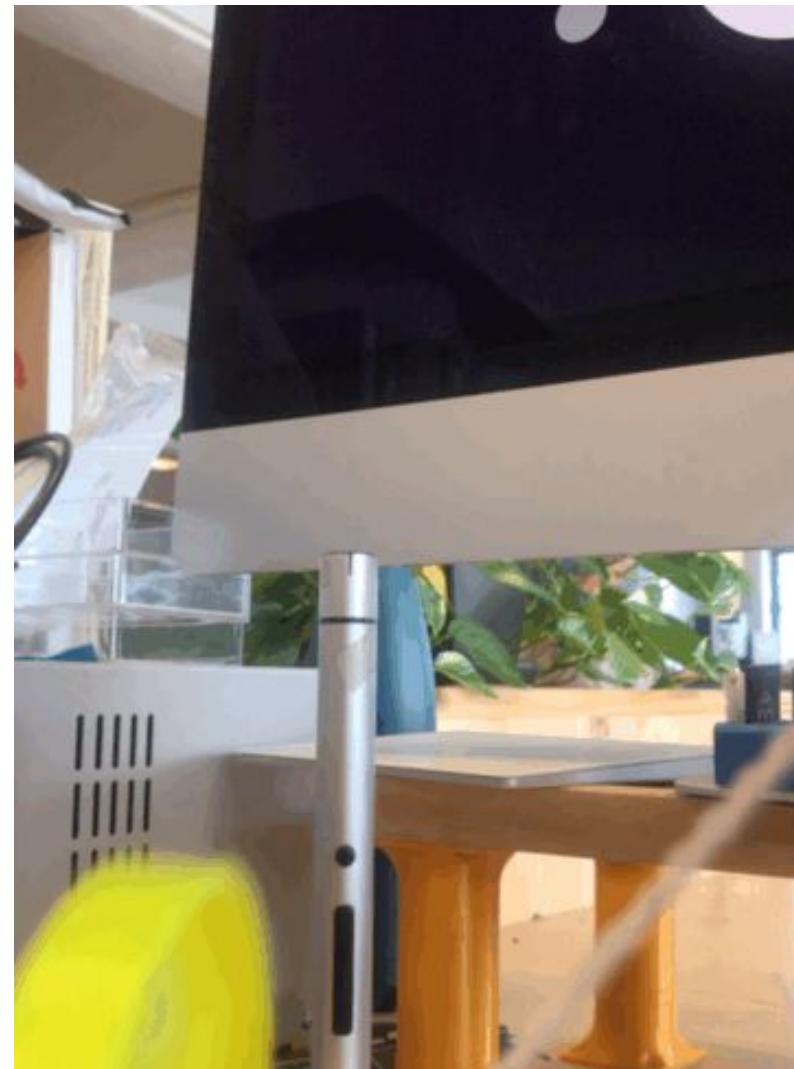
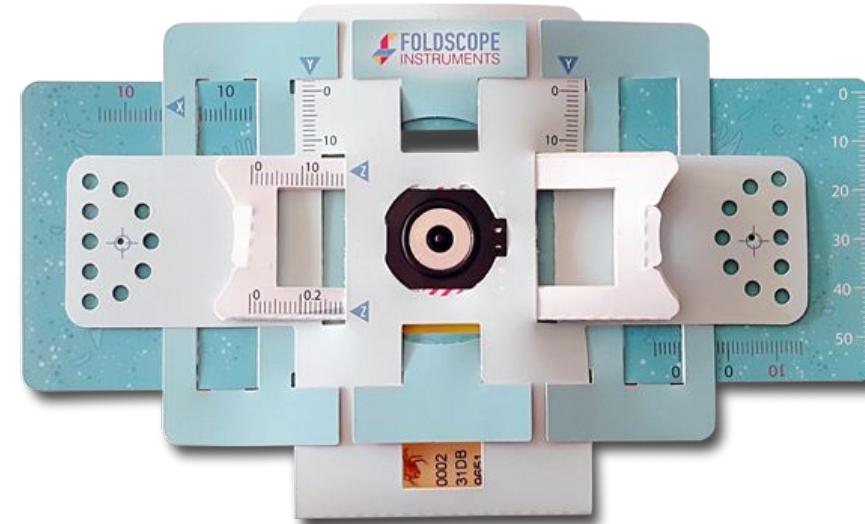
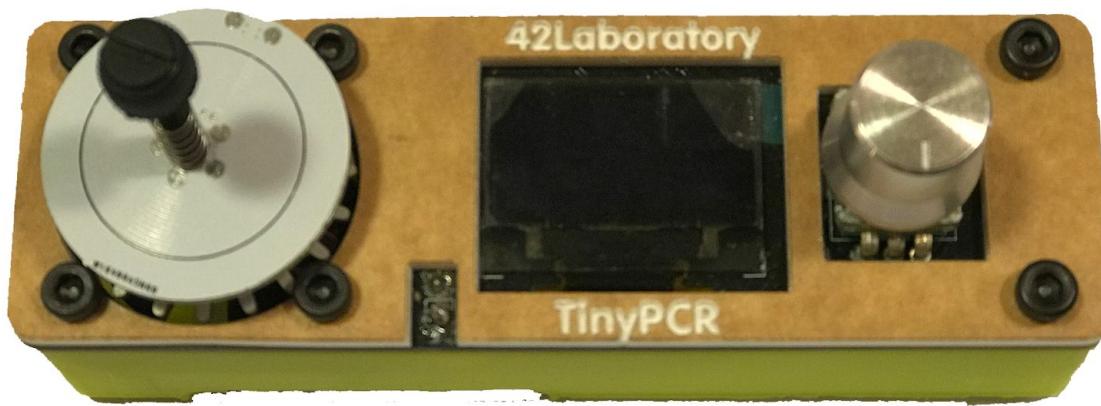


Green  
Fluorescent  
Protein(GFP)  
-jelly fish



# 0x2A Science

<http://0x2A.science>



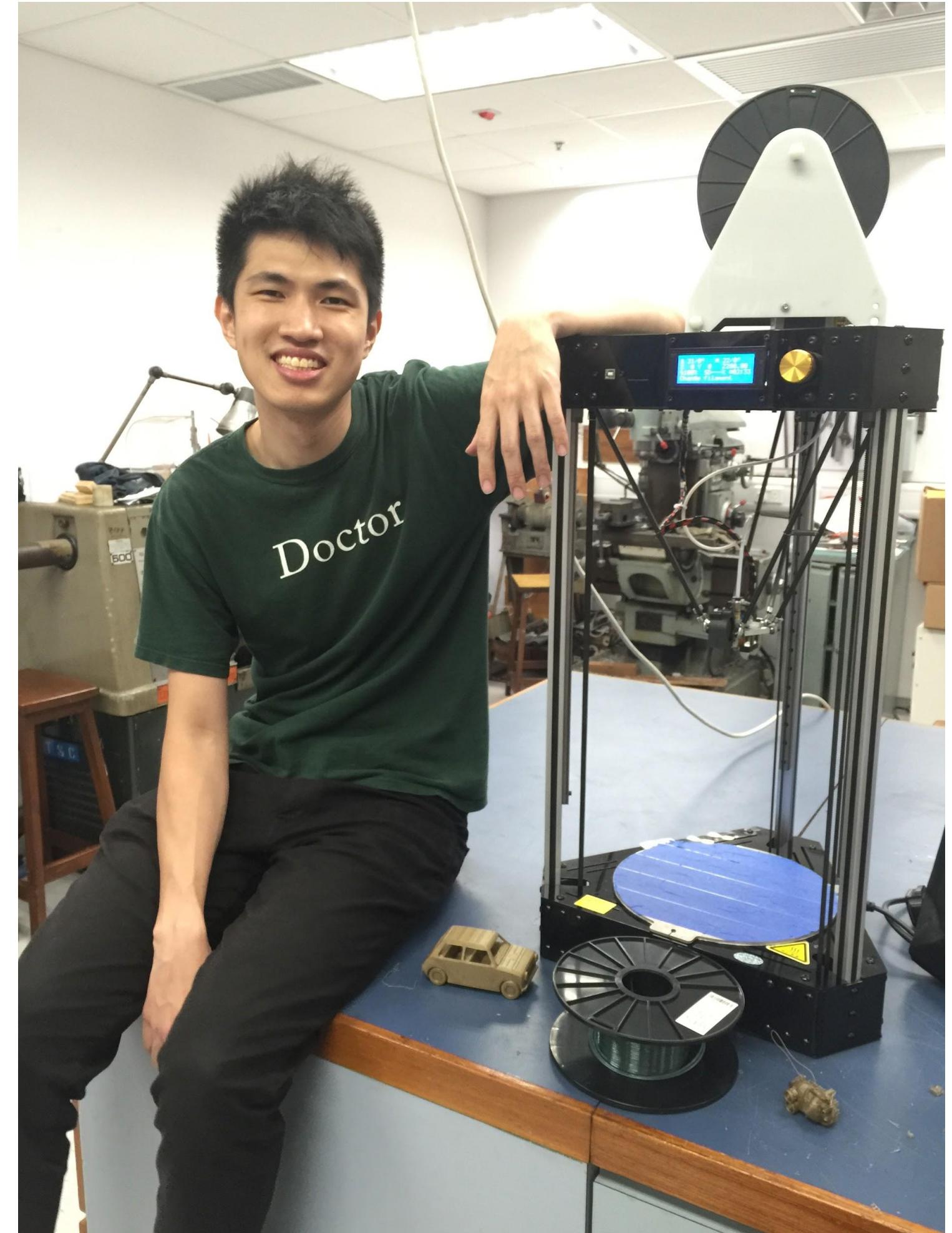


# Maker Academy

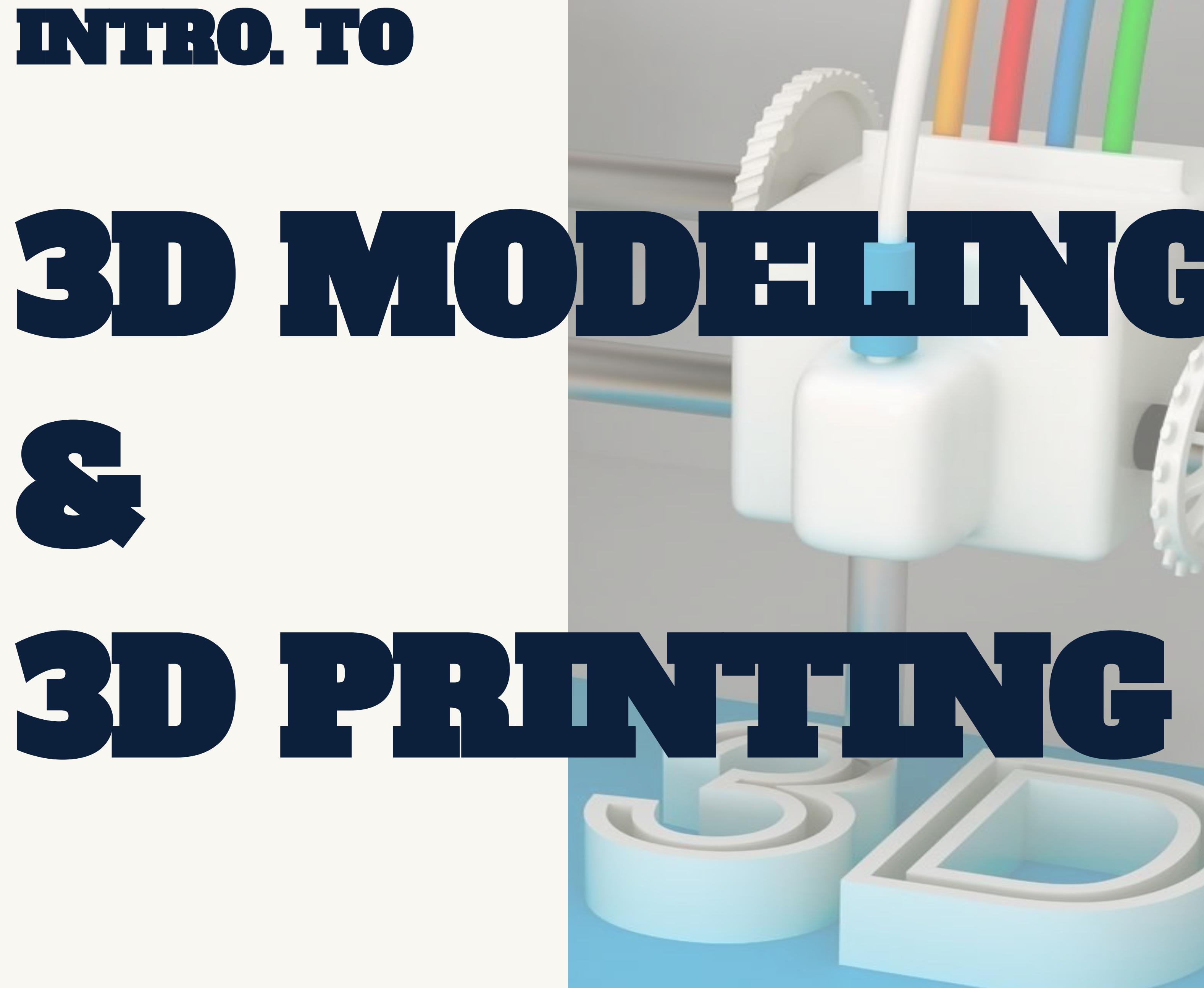
DO SOMETHING THAT MATTER

Engineering  
bo

- BEng in Electronics Dropout
- Experimental Physicist specializing in biophysics, Positron Physics and Semi-conductor Physics



# INTRO. TO 3D MODELING & 3D PRINTING



## CONTENT

- Principles of 3D Printing
- Introduction to Computer Aided Design(CAD) tools for 3D modelling
- 3D Printing Tools

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for Autodesk services

## DURATION

- 1-hr talk + 1-hr workshop



**Maker Academy**  
DO SOMETHING THAT MATTER

# INTRO. TO CAD DESIGN & LASER CUTTING



## CONTENT

- Principles of Laser Cutting
- Introduction to Computer Aided Design(CAD) tools for laser cutting

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for autodesk services

## DURATION

- 30-min lecture + 1-hr workshop



**Maker Academy**  
DO SOMETHING THAT MATTER

# INTRO. TO CAD DESIGN & CNC CUTTING



## CONTENT

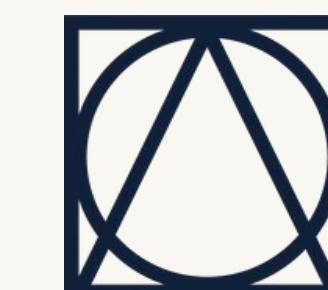
- Principles of Computer Numerical Control (CNC) Cutting
- Introduction to Computer Aided Design(CAD) tools for 2.5D modelling

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for autodesk services

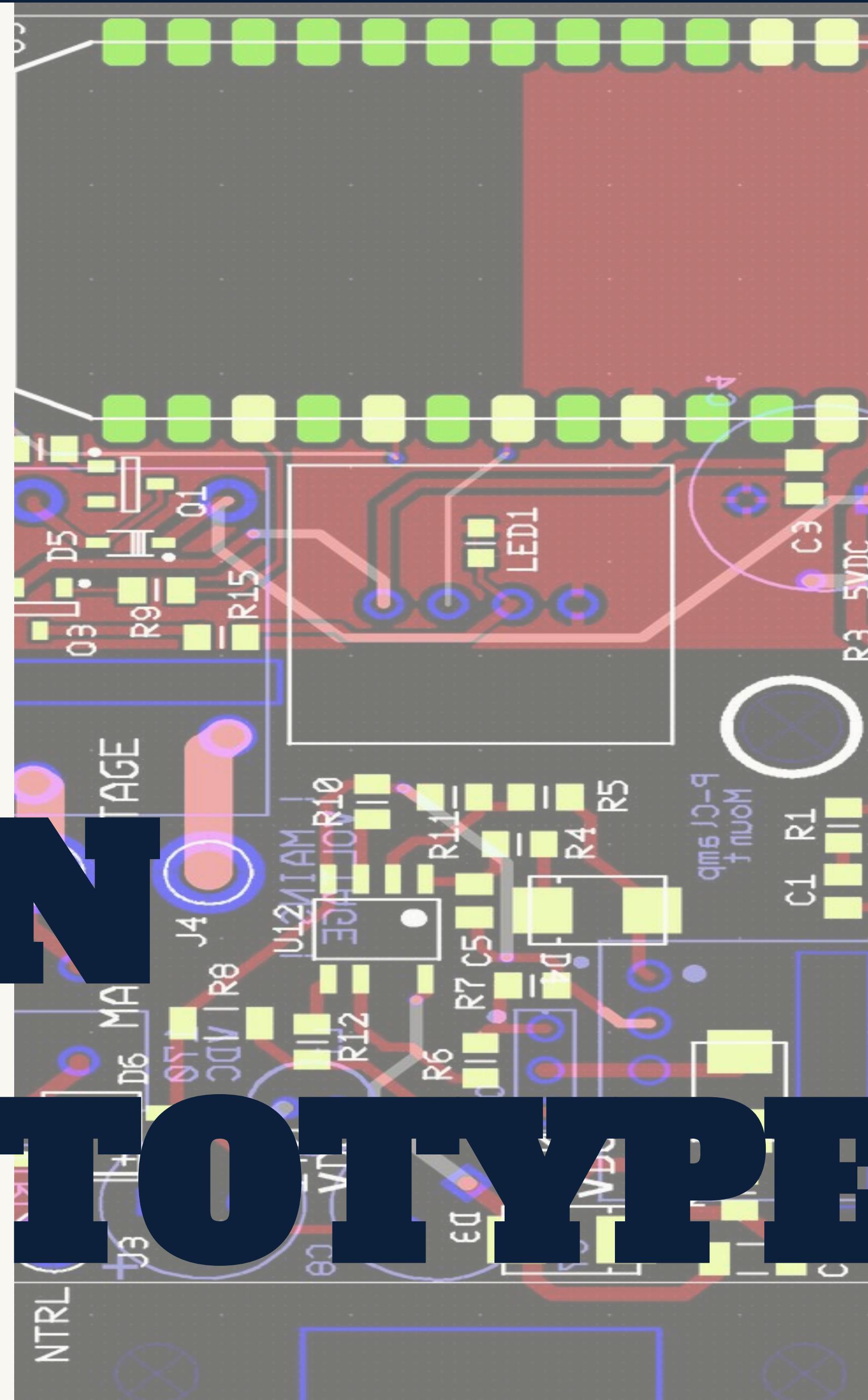
## DURATION

- 30-min lecture + 45-hr workshop



**Maker Academy**  
DO SOMETHING THAT MATTER

# INTRO. TO BASIC PCB DESIGN & PROTOTYPE



## CONTENT

- Basic Electronic Principle
- Basic tools for electronic simulation and prototyping

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for autodesk services

## DURATION

- 45-min lecture + 45-min workshop



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DO SOMETHING THAT MATTER

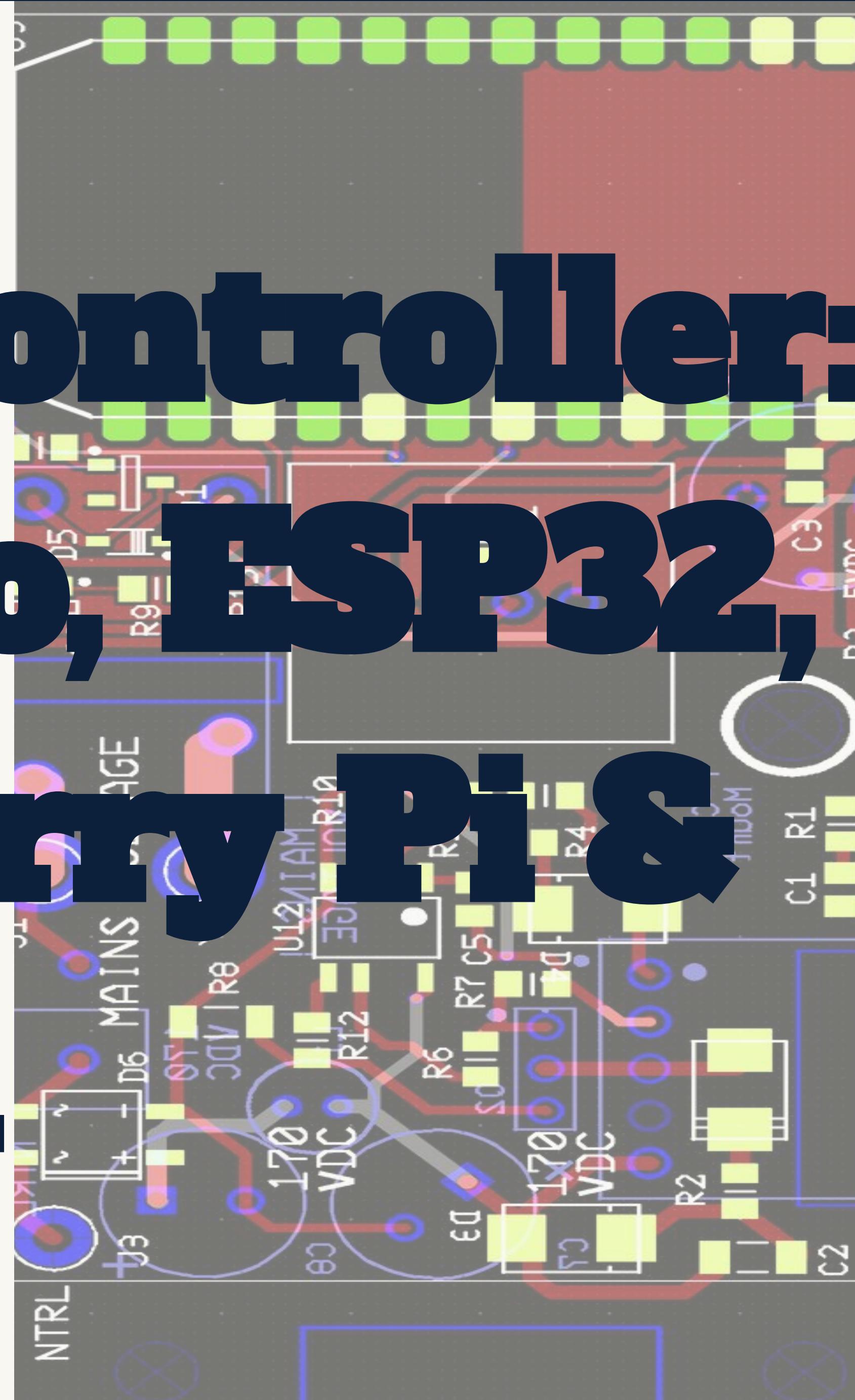
# INTRO. TO

# Microcontroller:

# Arduino, ESP32,

# Raspberry Pi &

# Beyond



## CONTENT

- Basic Electronic Principle
- Basic working principle of microcontrollers
- 

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for autodesk services

## DURATION

- 45-min lecture + 45-min workshop



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DO SOMETHING THAT MATTER

# INTRO. TO GRAPHIC DESIGN WITH CANVA



## CONTENT

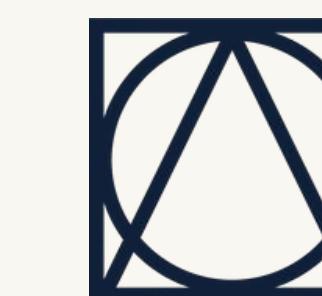
- Elements and effective communication for graphic design
- Using Canvas for marketing tools

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for Canva services

## DURATION

- 30-min lecture + 1-hr workshop



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# INTRO. TO UI DESIGN

&

# MOCKUP FOR MOBILE APP



## CONTENT

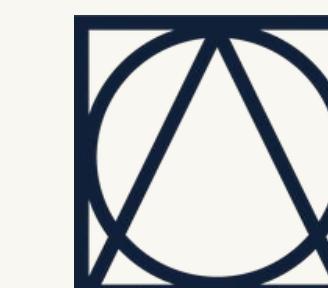
- Basic of UI Design
- Tools for wire framing and prototyping for mobile application

## REQUIREMENT

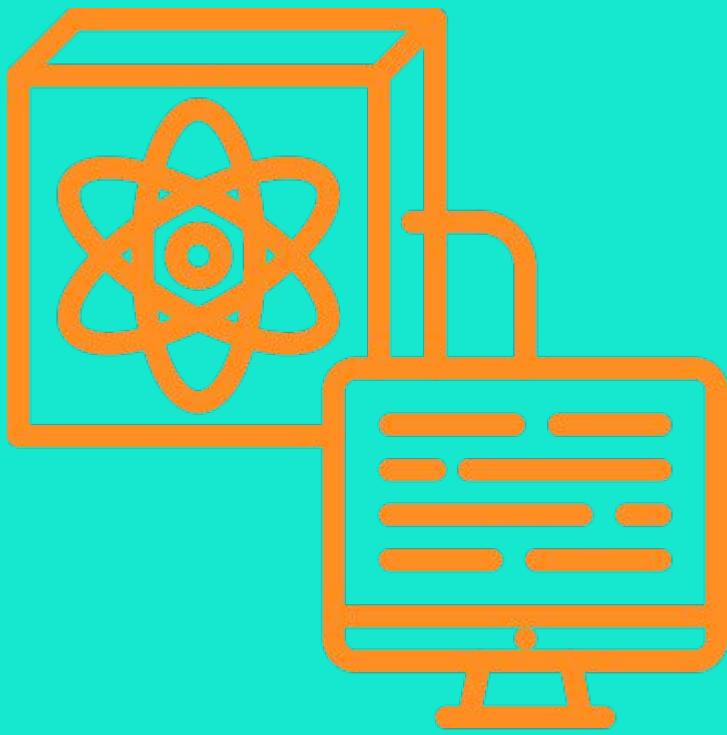
- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for wire-framing and prototyping tools & services

## DURATION

- 45-min lecture + 1-hr workshop



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DO SOMETHING THAT MATTER



# |0>+|1> School

## Computation

7th Aug 2020

DeFi Meet-up (Zoom) at MIT Innovation node



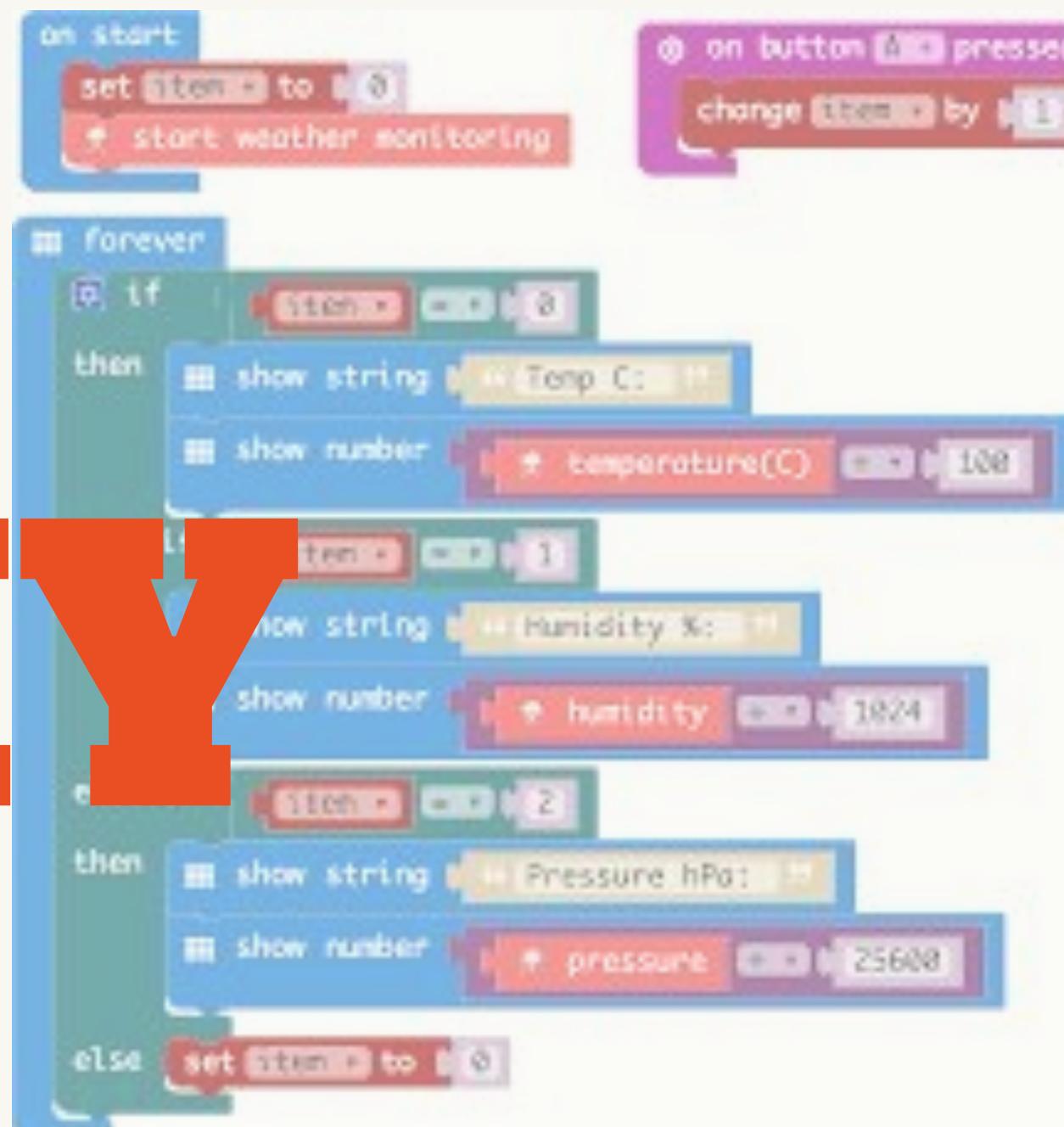
- Technology Coach
- 1st Qiskit / Quantum Computing Advocate of IBM in HK
- DeFi (Decentralised Finance) HK Organizer
- Host of Blockchain Radio Programme



Aug - Oct 2019

區塊鏈與你電台節目

# INTRO. TO CODING WITH BLOCKY



## CONTENT

- Basic logic of programming
- Making a mini project

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser

## DURATION

- 45-min lecture + 1-hr workshop

# INTRO. TO

# Low/ No Code

# App or AI Development



## CONTENT

- Basic logic of programming
- Making a mini project

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser

## DURATION

- 45-min lecture + 1-hr workshop

# INTRO. TO DATA SCIENCE & MACHINE LEARNING



## CONTENT

- Basic knowledge of Data Science
- Basic knowledge of Machine Learning
- Types of Machine Learning Algorithms

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for Microsoft and Google services

## DURATION

- 45-min lecture + 1-hr workshop

# INTRO. TO DEEP LEARNING & AWS DEEP RACER



## CONTENT

- Basic knowledge of reinforced learning
- Introduction of Deep Racer of AWS

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser
- Validated email for AWS services

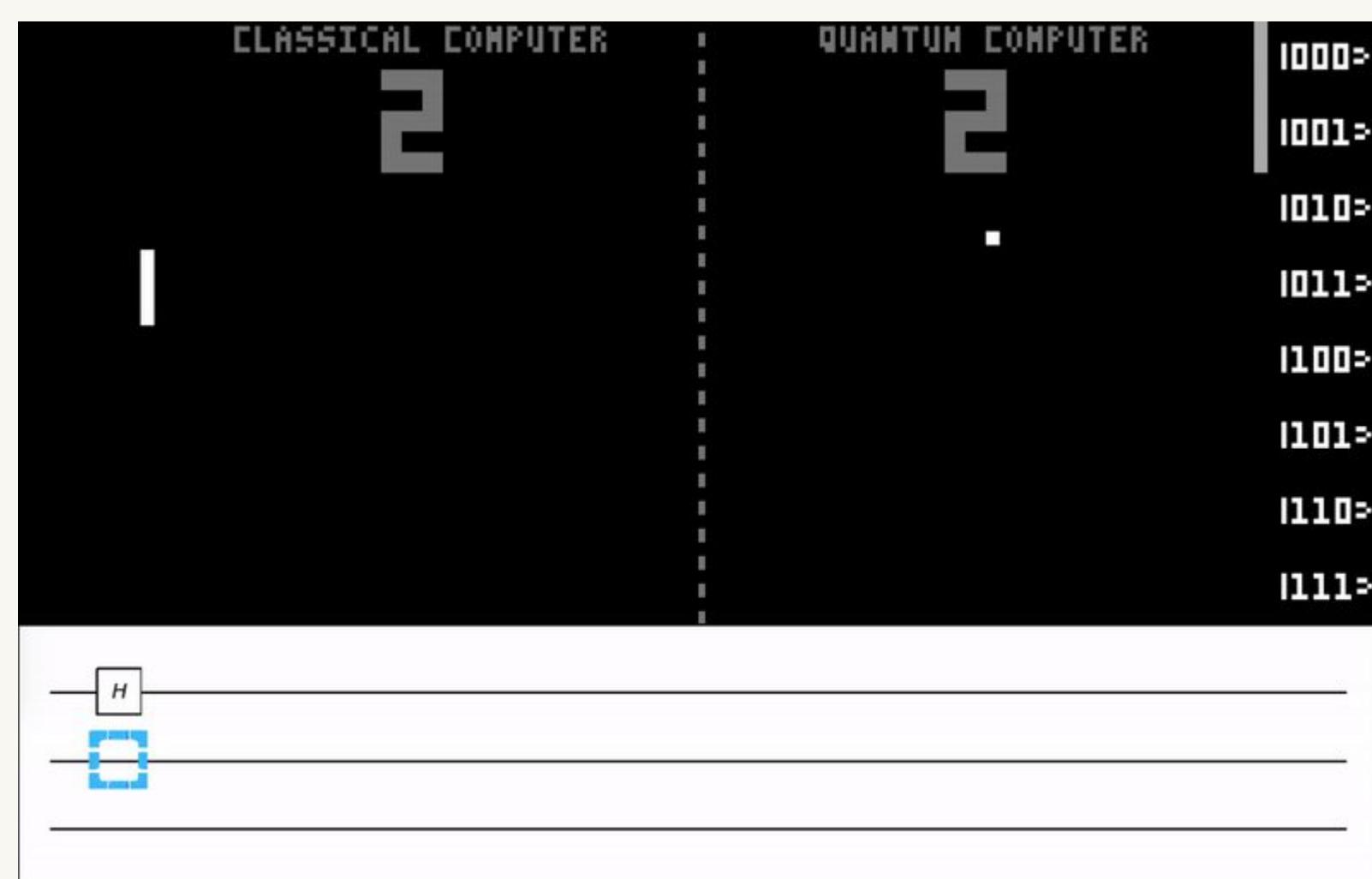
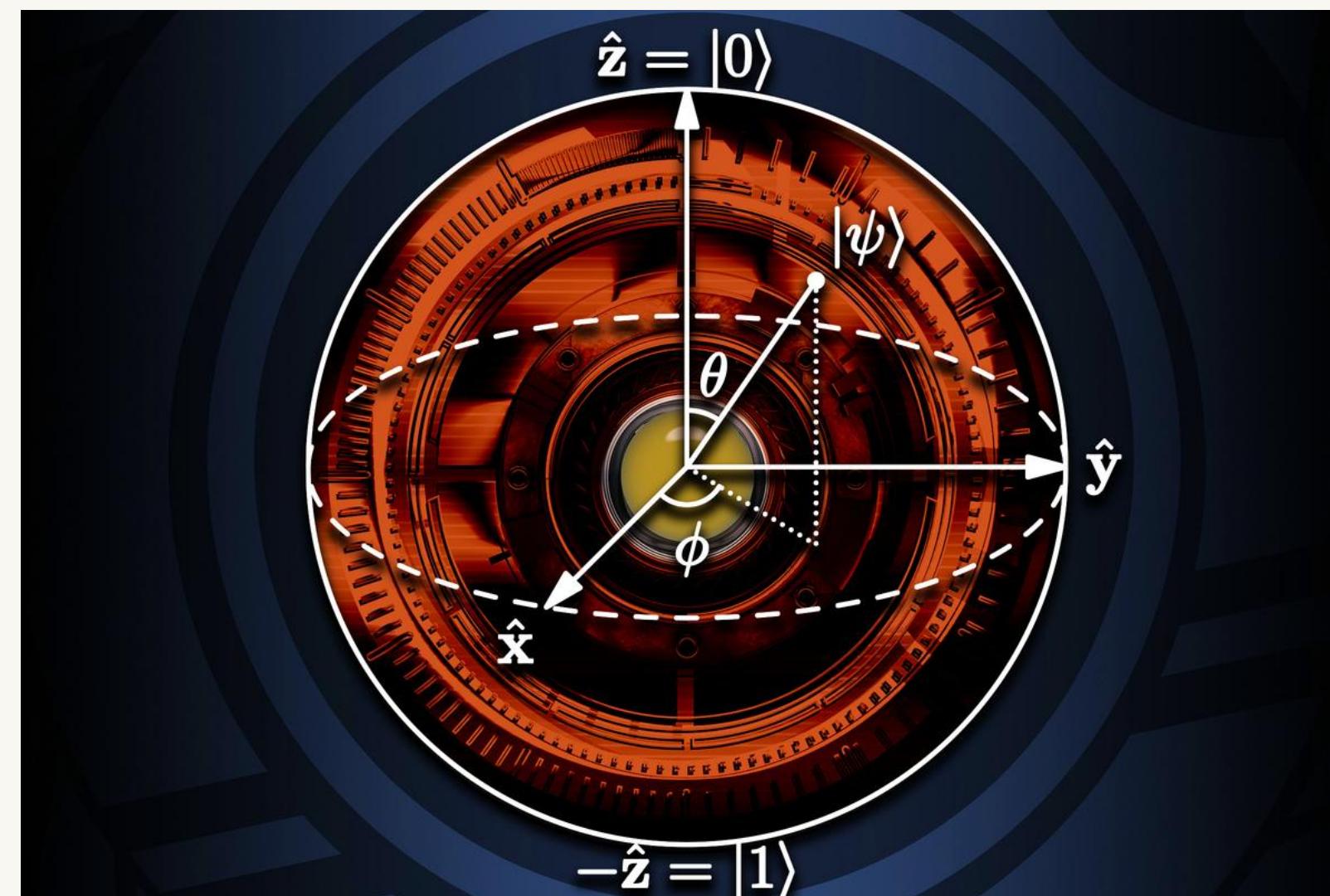
## DURATION

- 45-min lecture + 1-hr workshop

A screenshot of a web browser showing a profile page for Dr. Data Ng. The URL in the address bar is `qiskit.org/advocates/`. The page features a portrait photo of a smiling man with short dark hair, wearing a dark blue suit jacket over a light-colored striped shirt. To the right of the photo, his name "Dr. Data Ng" is displayed in a large, dark font. Below his name is a purple circular badge with the word "Asia". Underneath the name, there are two location icons: a pin icon followed by "Kennedy town, Hong Kong" and a small globe icon followed by "@Dr. Data Ng". The browser interface includes standard navigation buttons like back, forward, and search, along with a refresh button and a plus sign for new tabs.

- First Qiskit Advocate in HK / GBA appointed by IBM

# INTRO. TO Quantum Computing



## CONTENT

- Basic knowledge of Quantum Computing
- Introduction of Qiskit
- Quantum Simulation

## REQUIREMENT

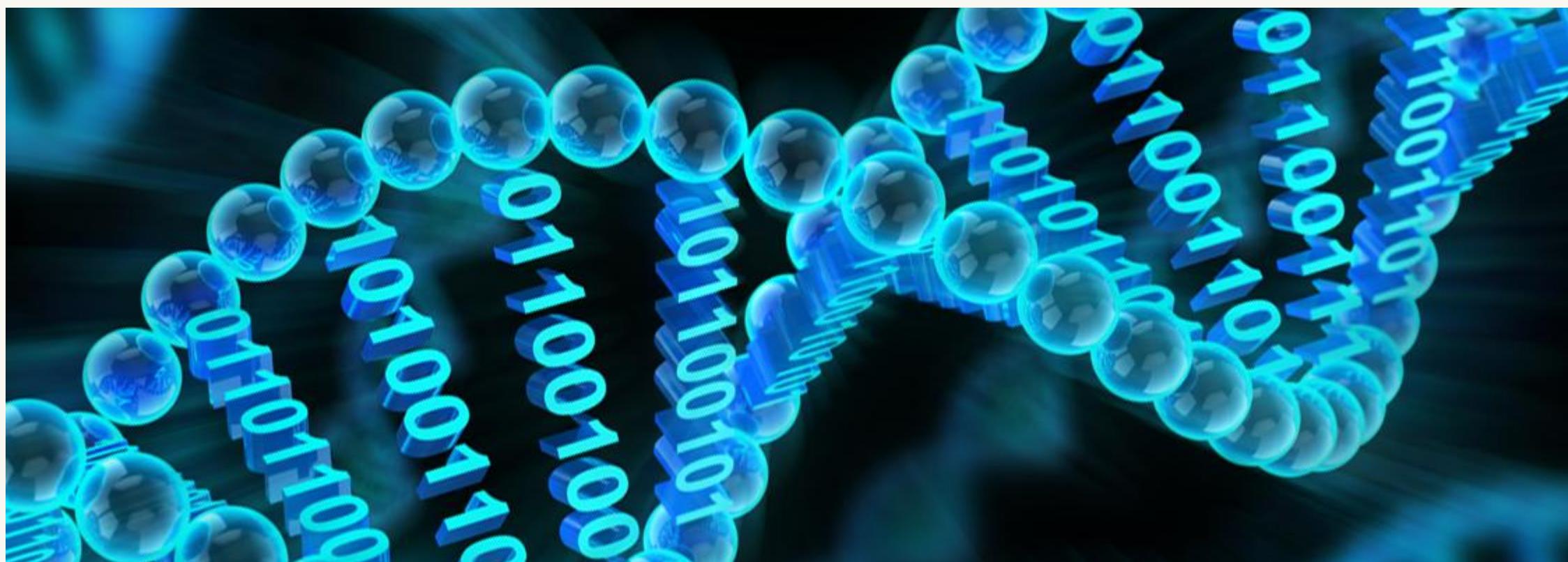
- Internet connected laptop with mouse and latest Chrome Browser

## DURATION

- 45-min lecture + 1-hr workshop

# INTRO. TO

# Bioinformatics



## CONTENT

- Basic knowledge of bioinformatics
- Application of bioinformatics

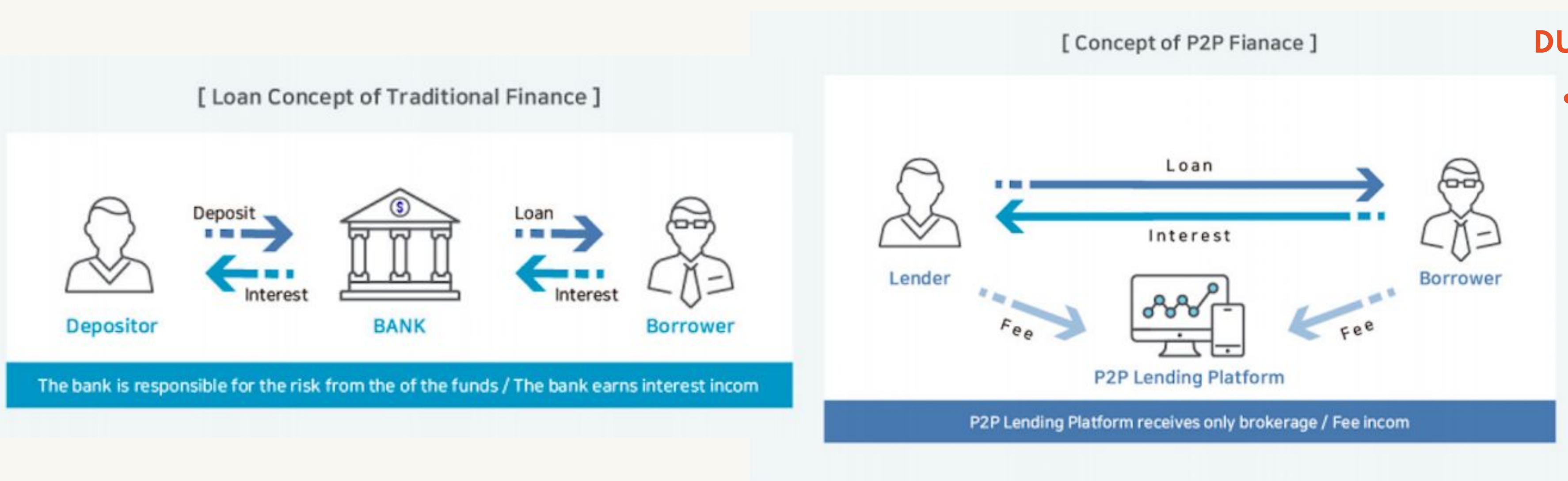
## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser

## DURATION

- 45-min lecture + 1-hr workshop

# INTRO. TO DeFi & Blockchain



## CONTENT

- Basic knowledge of DeFi & Blockchain
- Application of Blockchain
- Importance of DeFi

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser

## DURATION

- 45-min lecture + 1-hr workshop

# INTRO. TO Tokenization & Token Economy



## CONTENT

- Basic knowledge of Blockchain, Mining, PoW & PoS, Tokenization, Fungible and non-fungible tokens, and Token Economy
- Application of Tokenization
- Play-to-earn
- Importance of Token Economy

## REQUIREMENT

- Internet connected laptop with mouse and latest Chrome Browser

## DURATION

- 45-min lecture + 1-hr workshop

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