Micro:bit: A classroom-friendly tool for sensors and data collection

Bill Siever

Outline

- Intros:
  - Me, You
  - The micro:bit & MakeCode
- Streaming & Graphing Data
  - Additional sensors & Extensions
- Logging & Storing Data

Intros: Me & You

- Questions at any time!
- Me: Bill Siever / bsiever@gmail.com
  - Background: Computer Science & Computer Engineering
  - Teaching: Computer Science & Engineering
    @ Washington University in St. Louis
- Micro:bit: Summer camps & Microbit “Champion” (supporting K-12 educators)

micro:bit CHAMPION 2021

micro:bit CHAMPION 2022

micro:bit CHAMPION 2023

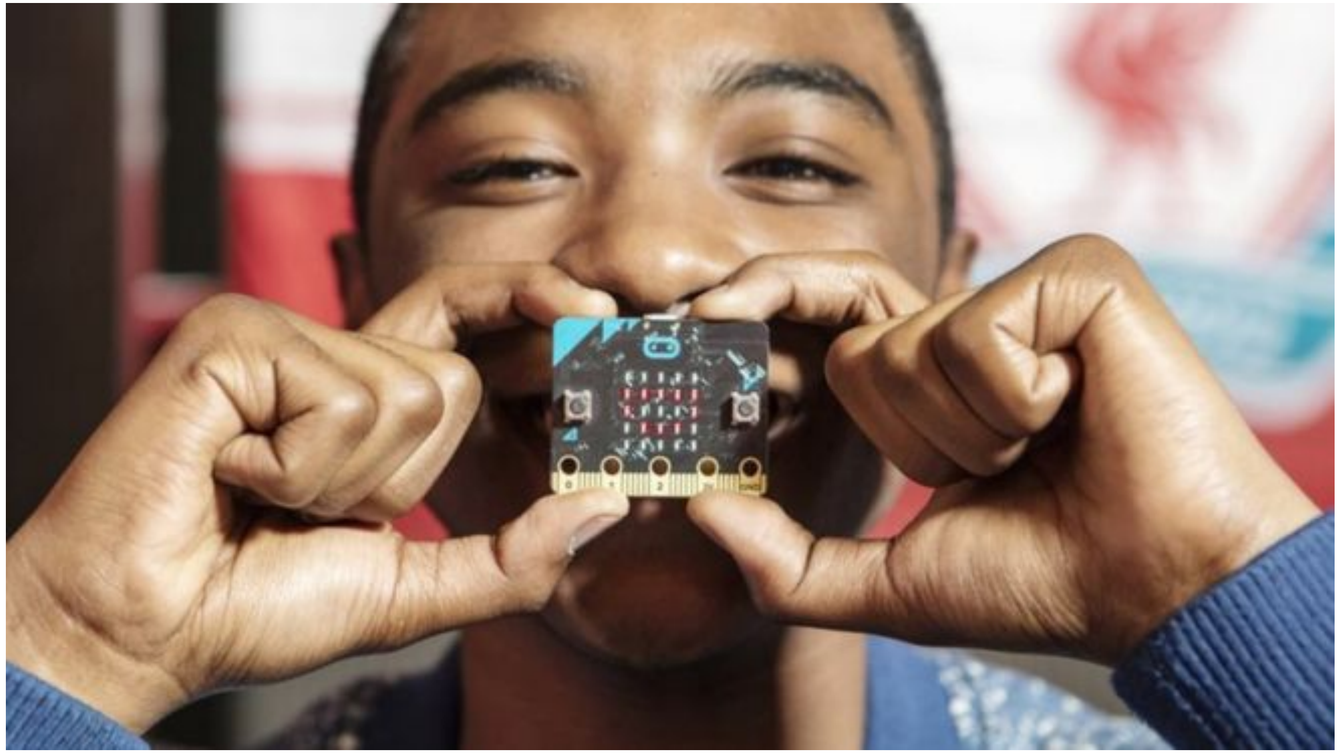
Intros: Me & You

- You
  - Name & School,
  - Topics you teach?
  - Any special interest in this session/topic?

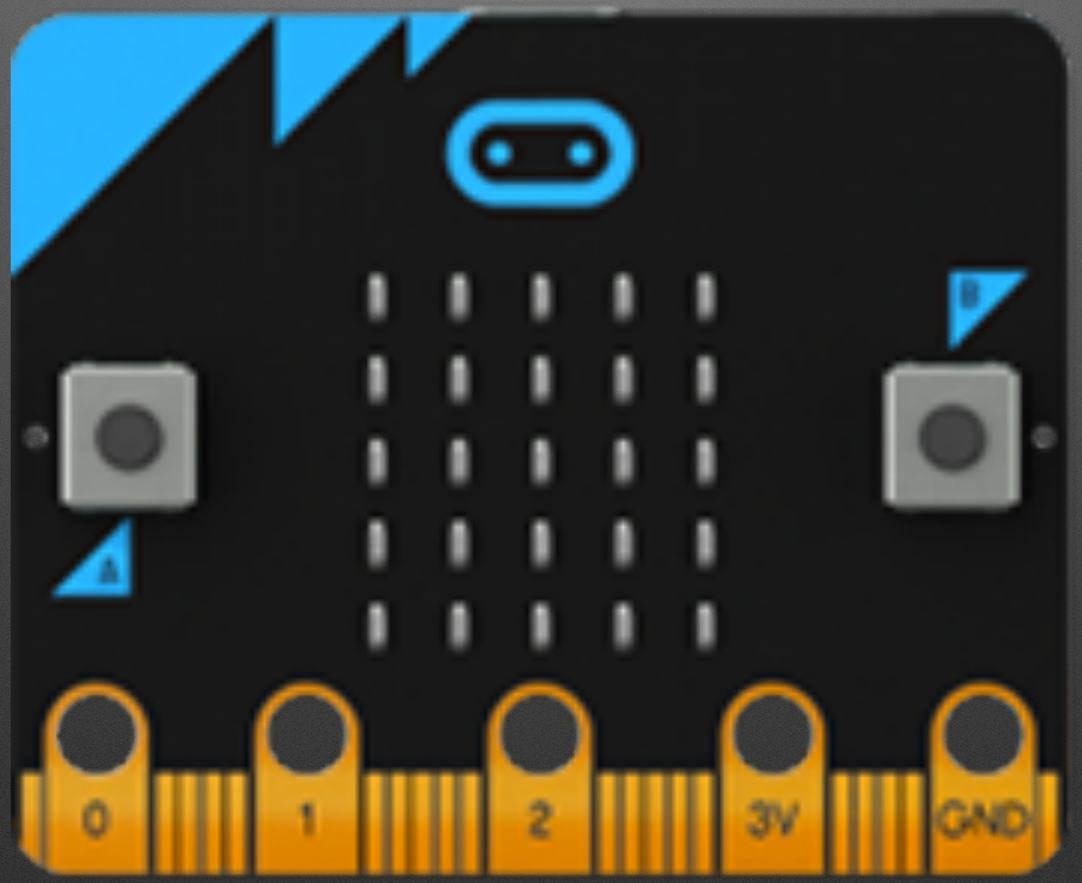
Intros: the micro:bit

Why???

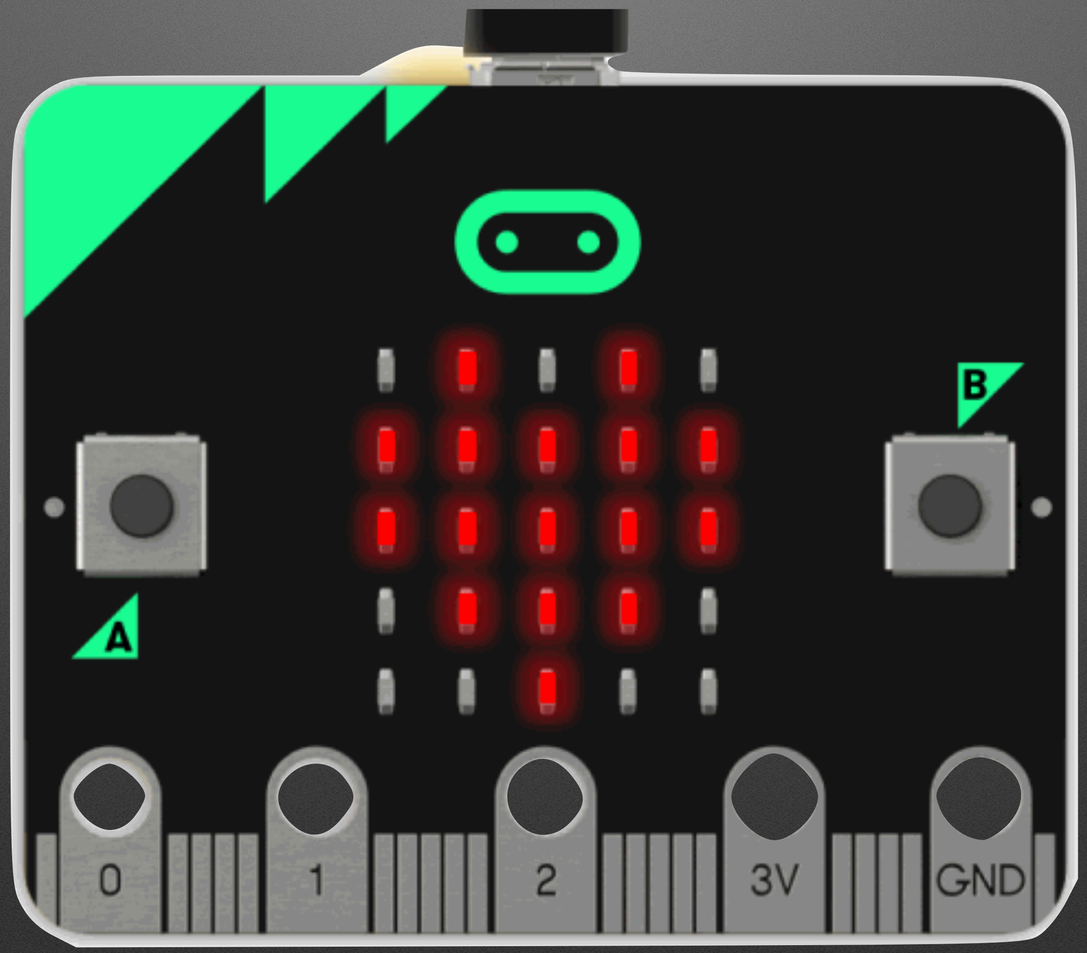
- BBC Make It Digital / 2015
- 29 partners
- “Inspire every child to create their best digital future”



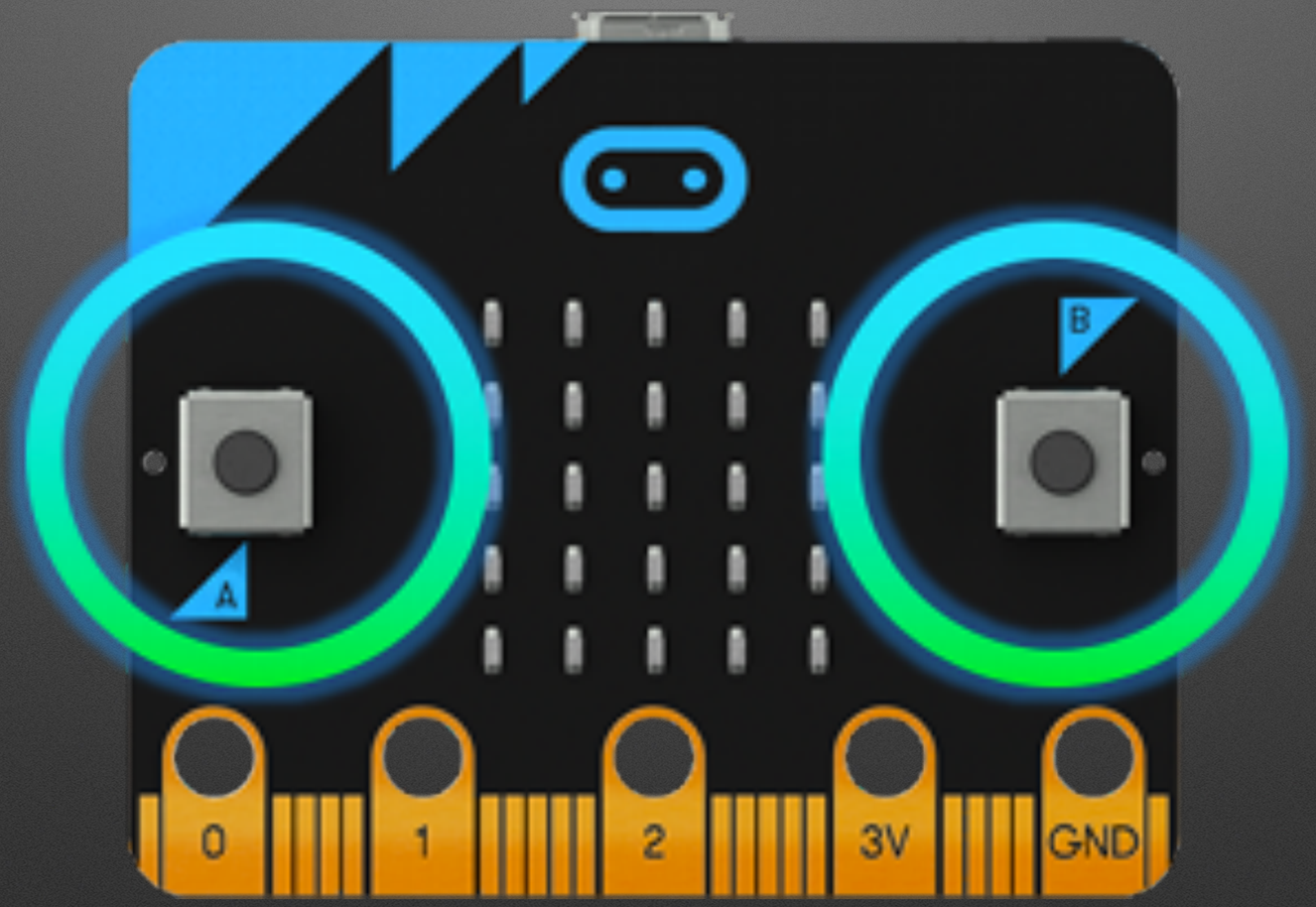
Small



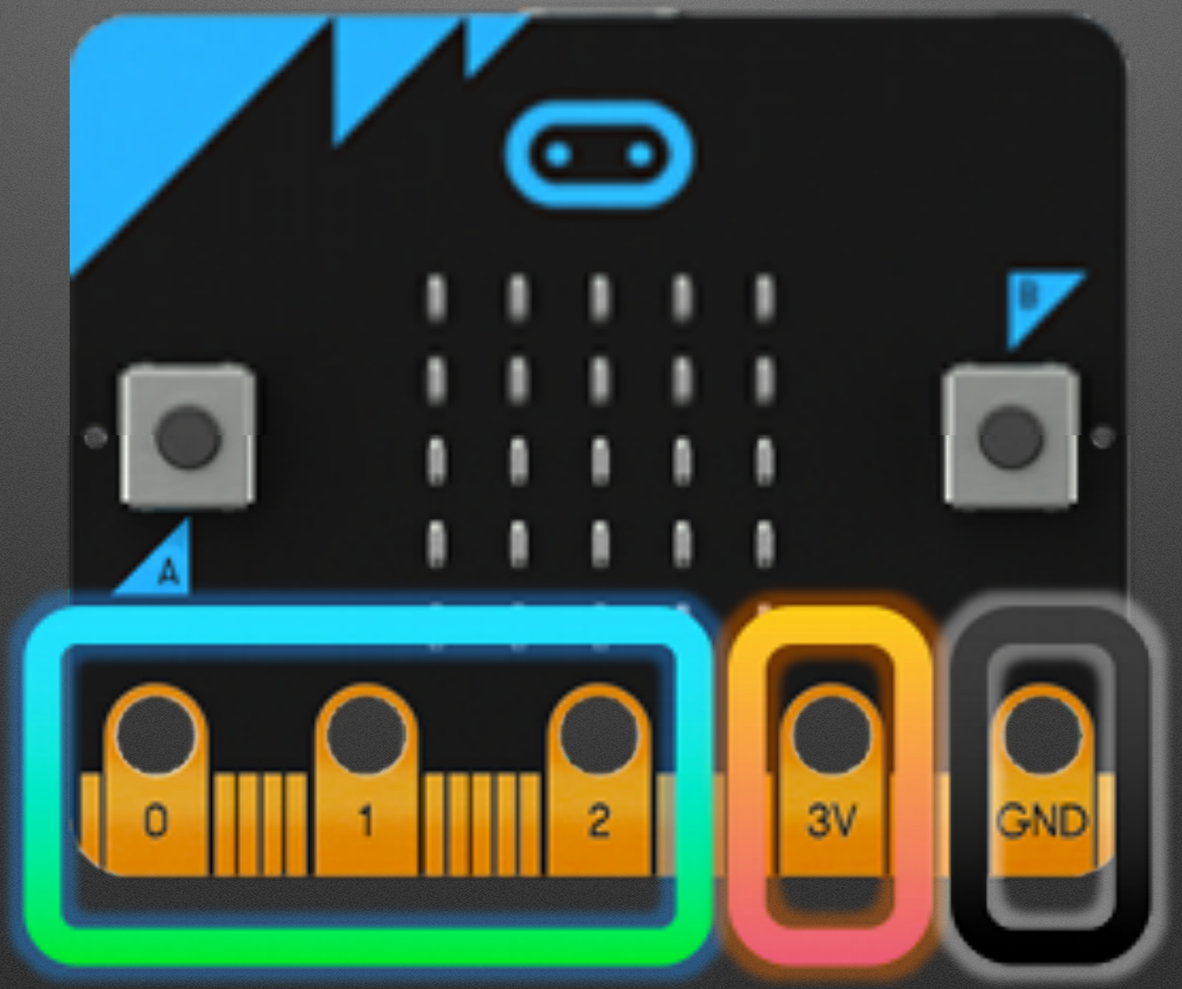
LED Grid



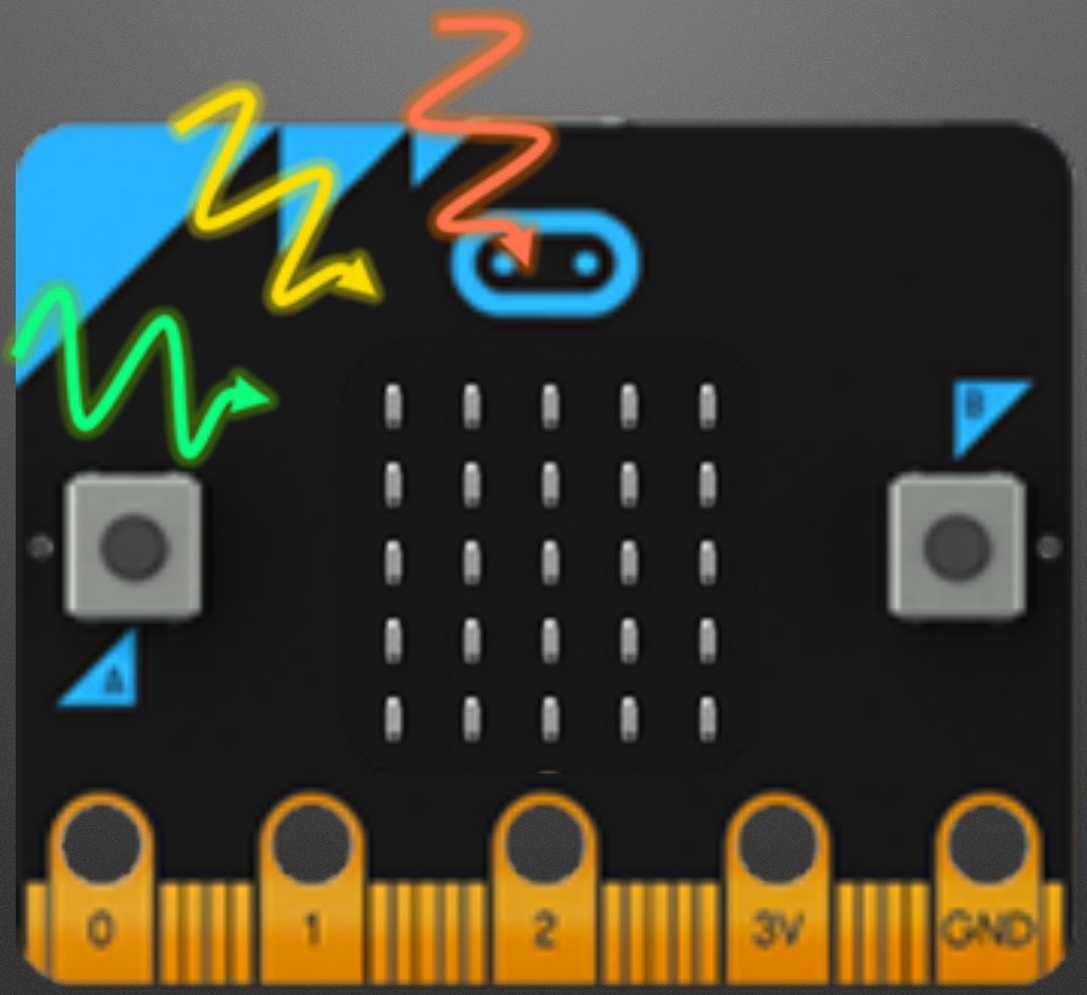
Buttons



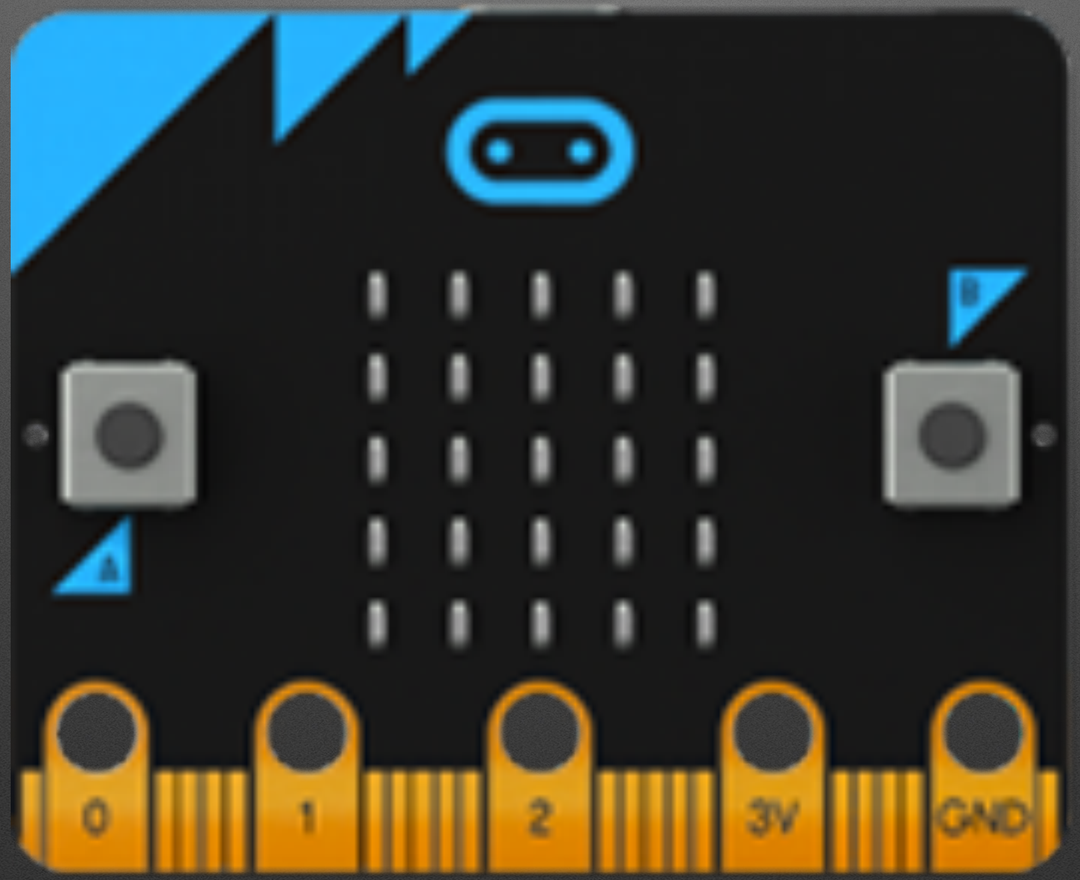
Connectors

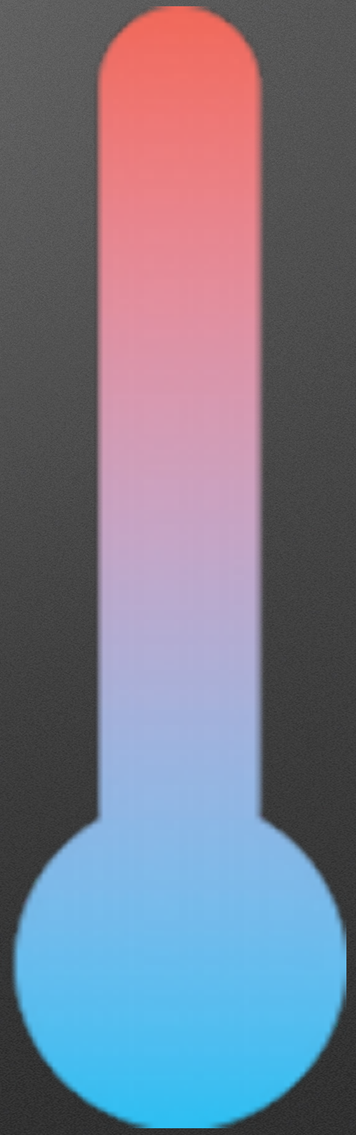


Light Sensor

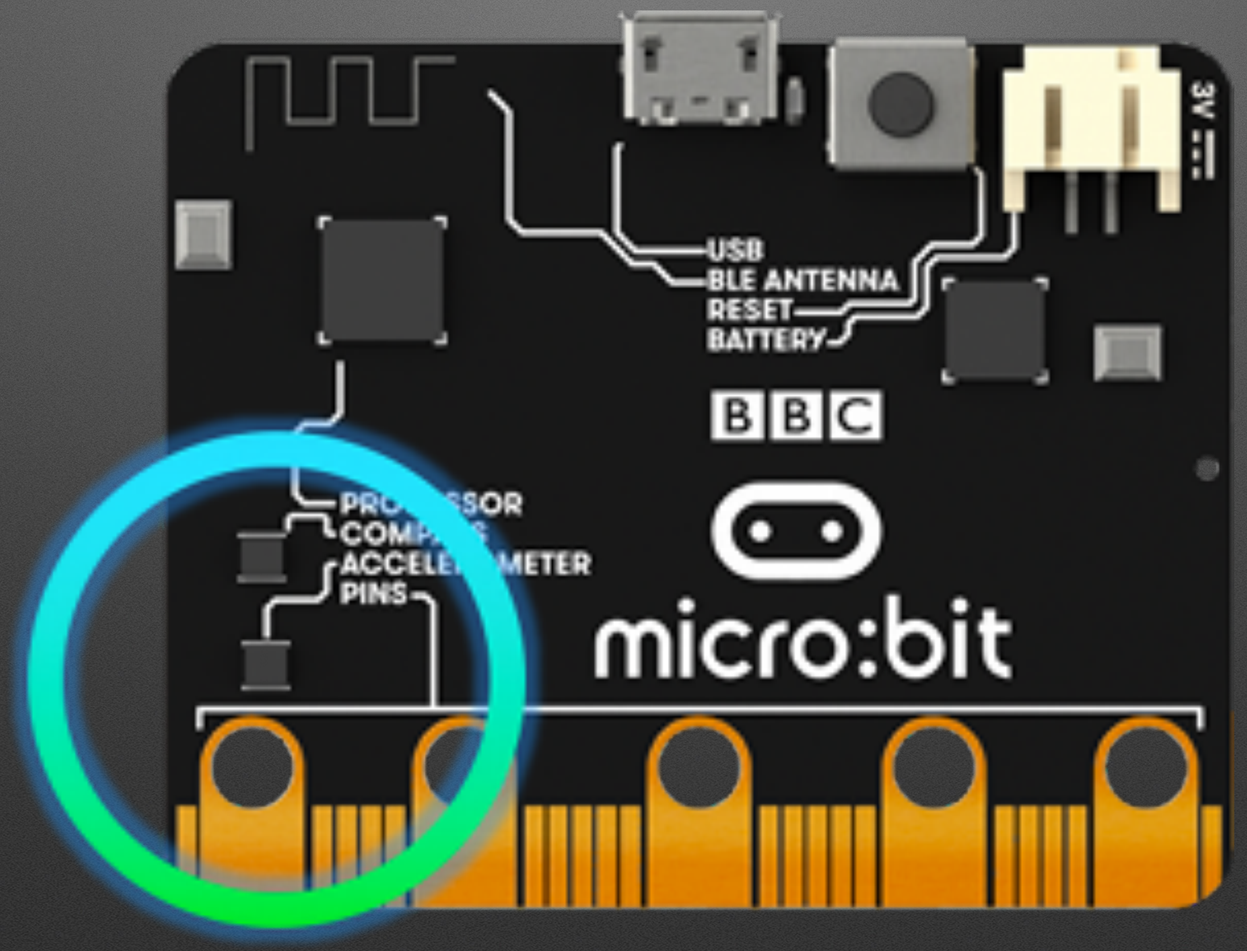


Temperature Sensor

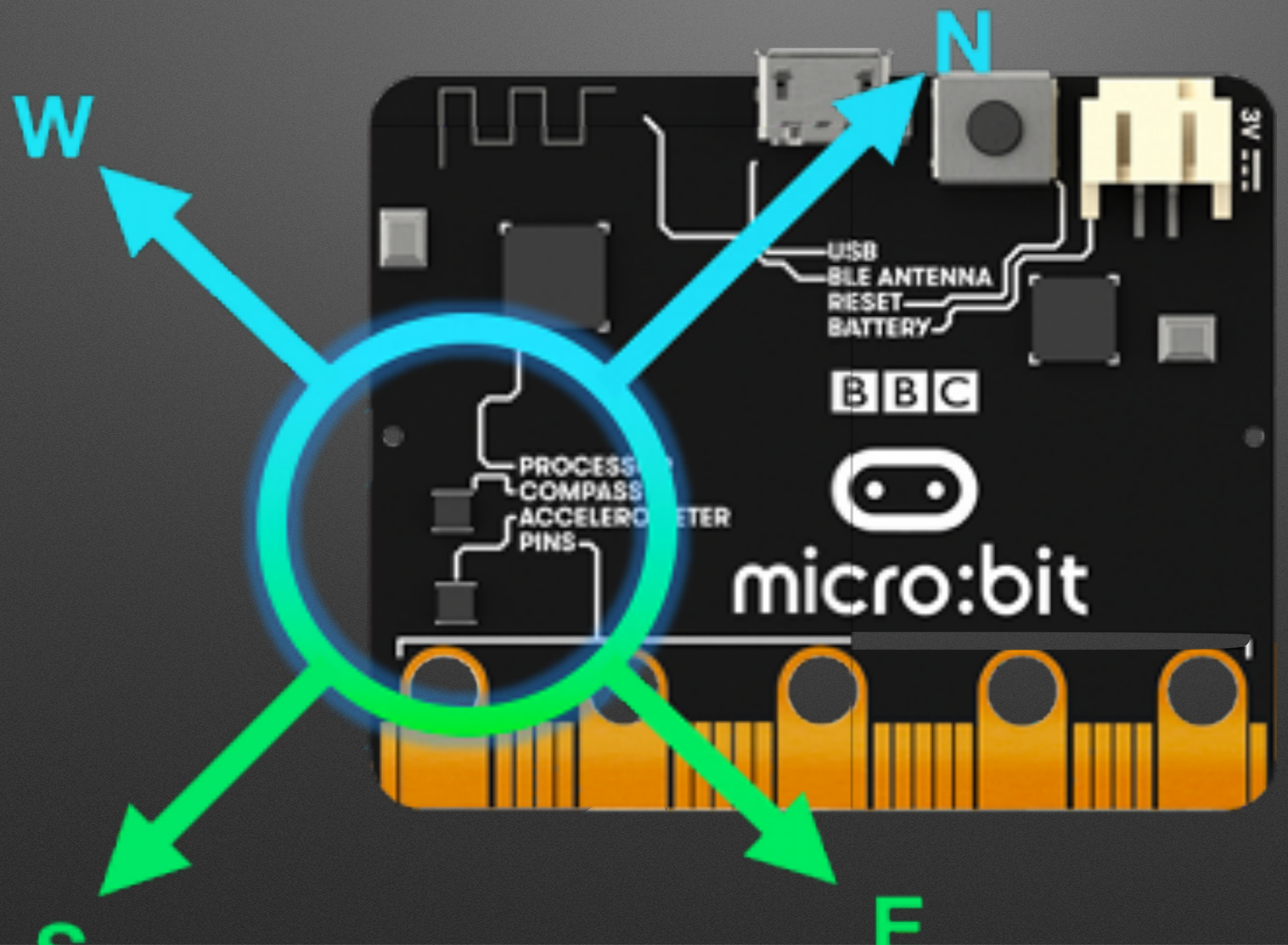




Accelerometer

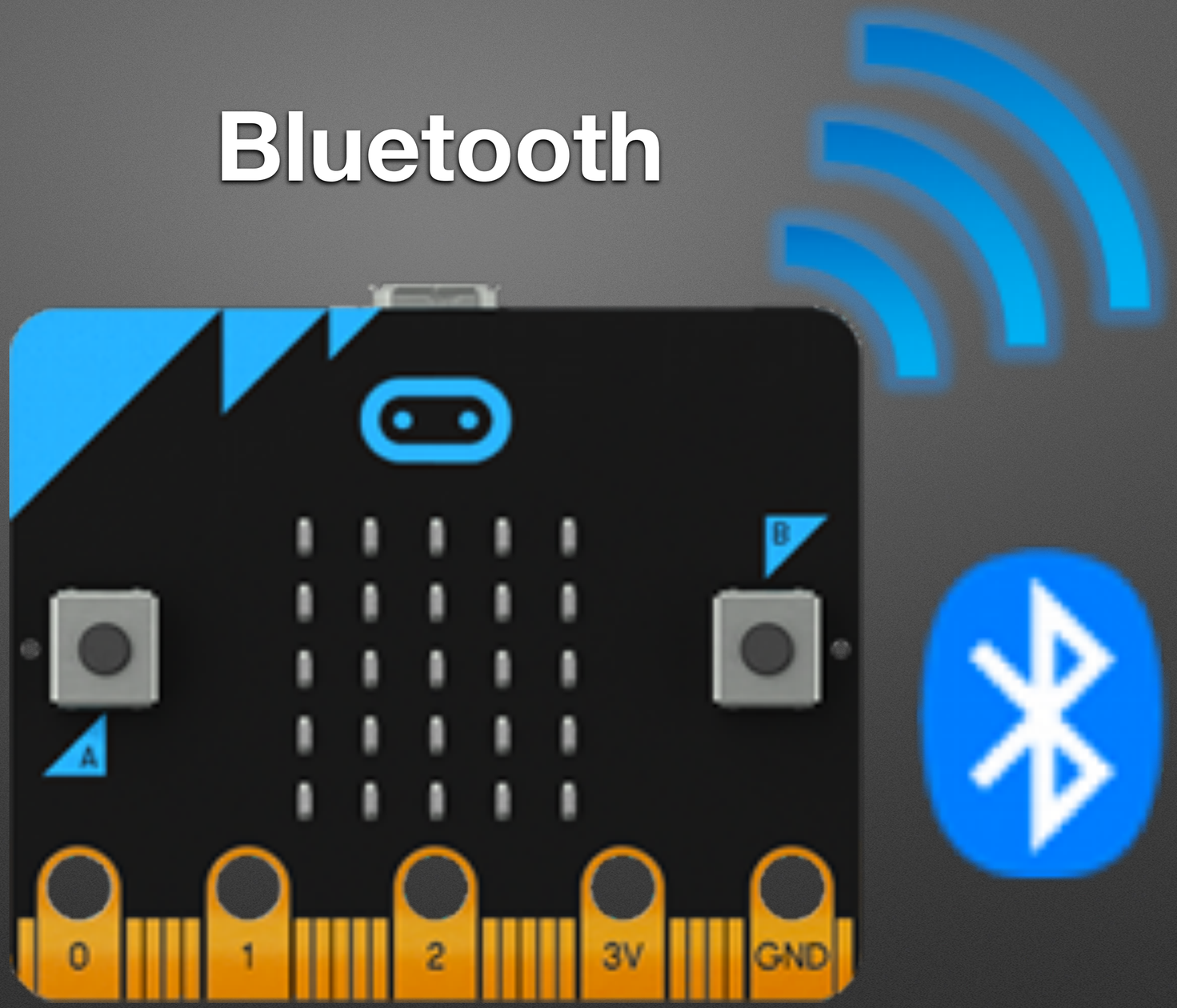


Compass

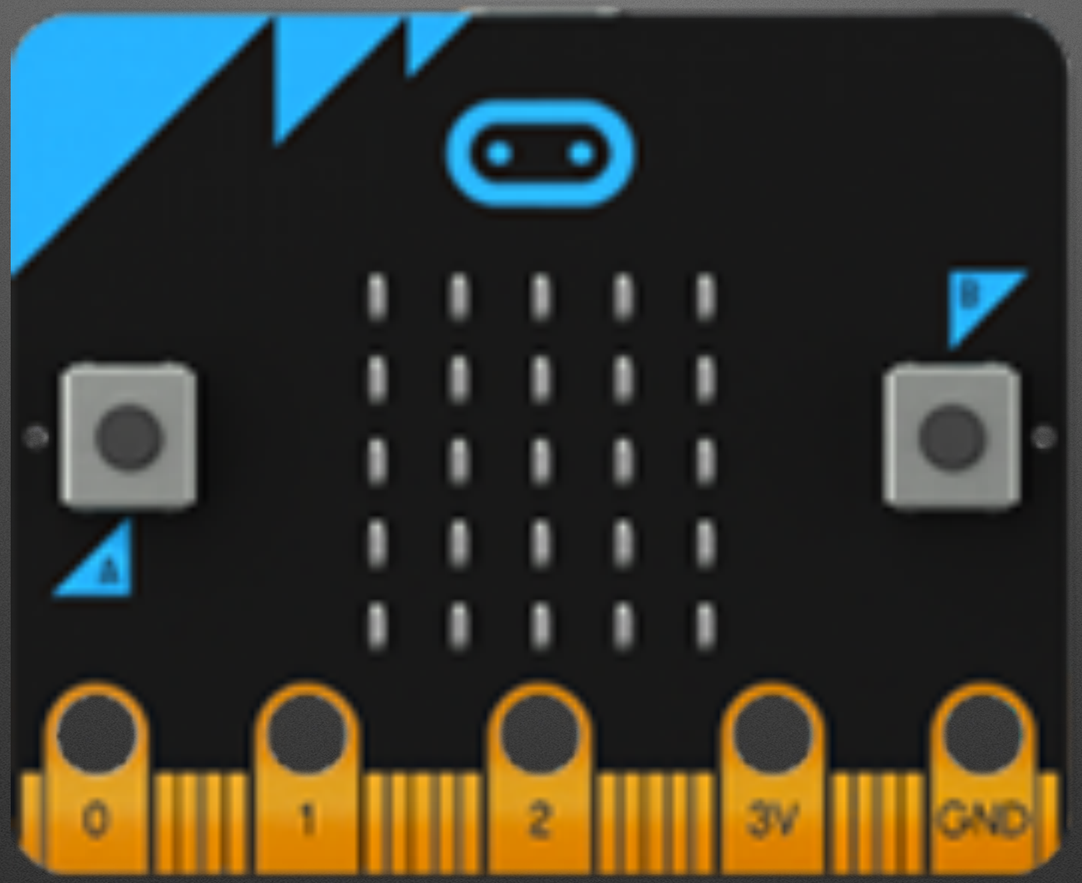

N
W
E
USB
BLE ANTENNA
RESET
BATTERY
PROCESSOR
COMPASS
ACCELEROMETER
PINS
BBC
micro:bit
3V

Radio

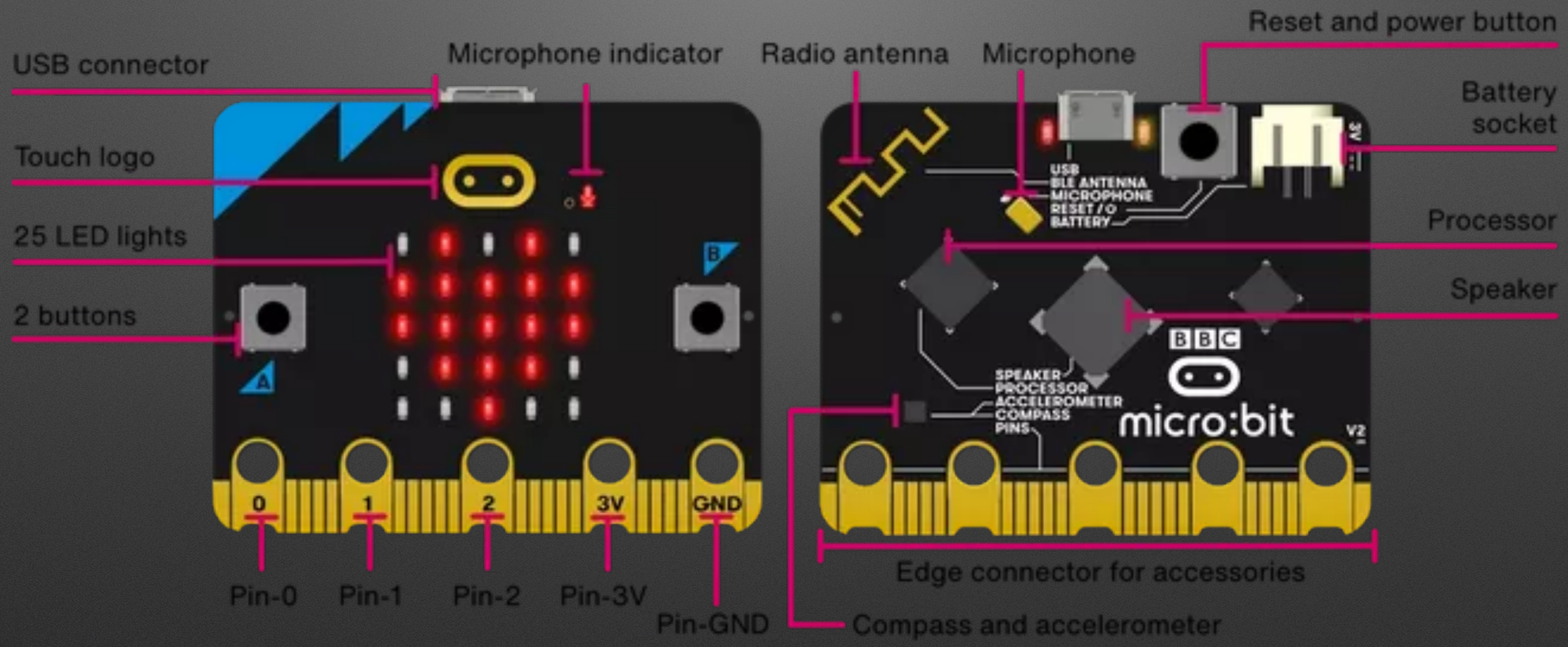
Bluetooth



Low Cost: ~$20 US

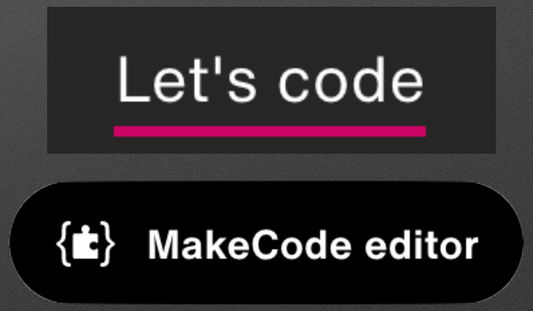


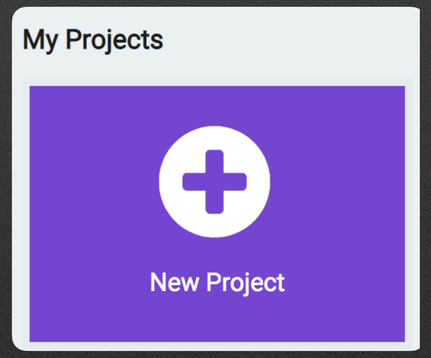
Micro:bit v2


USB connector
Touch logo
25 LED lights
2 buttons
Microphone indicator
Radio antenna
Microphone
Reset and power button
Battery socket
Processor
Speaker
Edge connector for accessories
Compass and accelerometer
Pin-0
Pin-1
Pin-2
Pin-3V
Pin-GND
0
1
2
3V
GND
USB
BLE ANTENNA
MICROPHONE
RESET / O
BATTERY
SPEAKER
PROCESSOR
ACCELEROMETER
COMPASS
PINS
BBC
micro:bit
V2

★ Programming: MakeCode

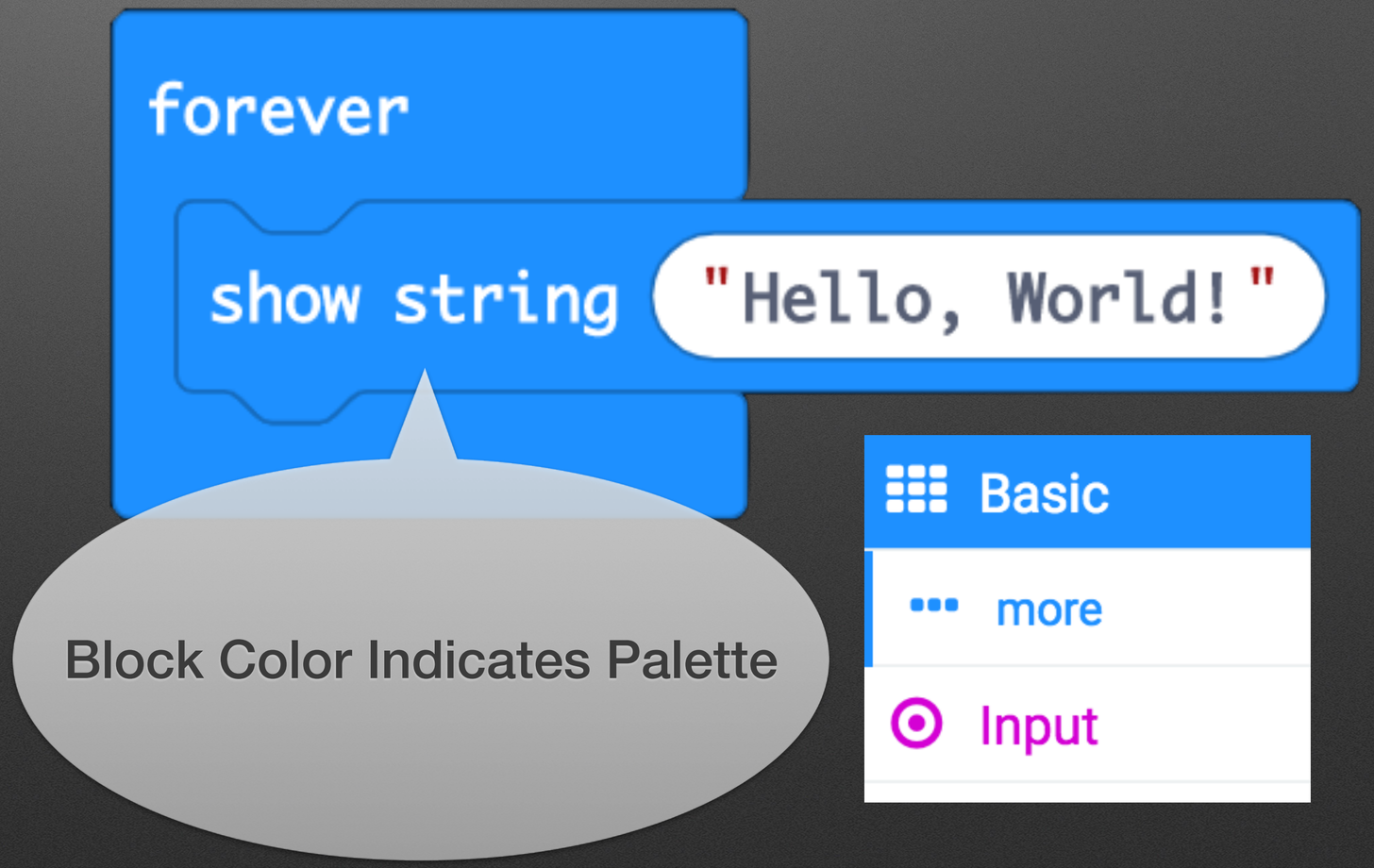
- Browser
  1. Open microbit.org (Chrome or Edge preferred)
  2. Select “Let’s Code”
  3. Click “MakeCode editor” button
  4. Select “New Project”





★ “Hello, World!”: First Program

- Block-based editor
- Built-in simulator
- Deployment to Micro:bit

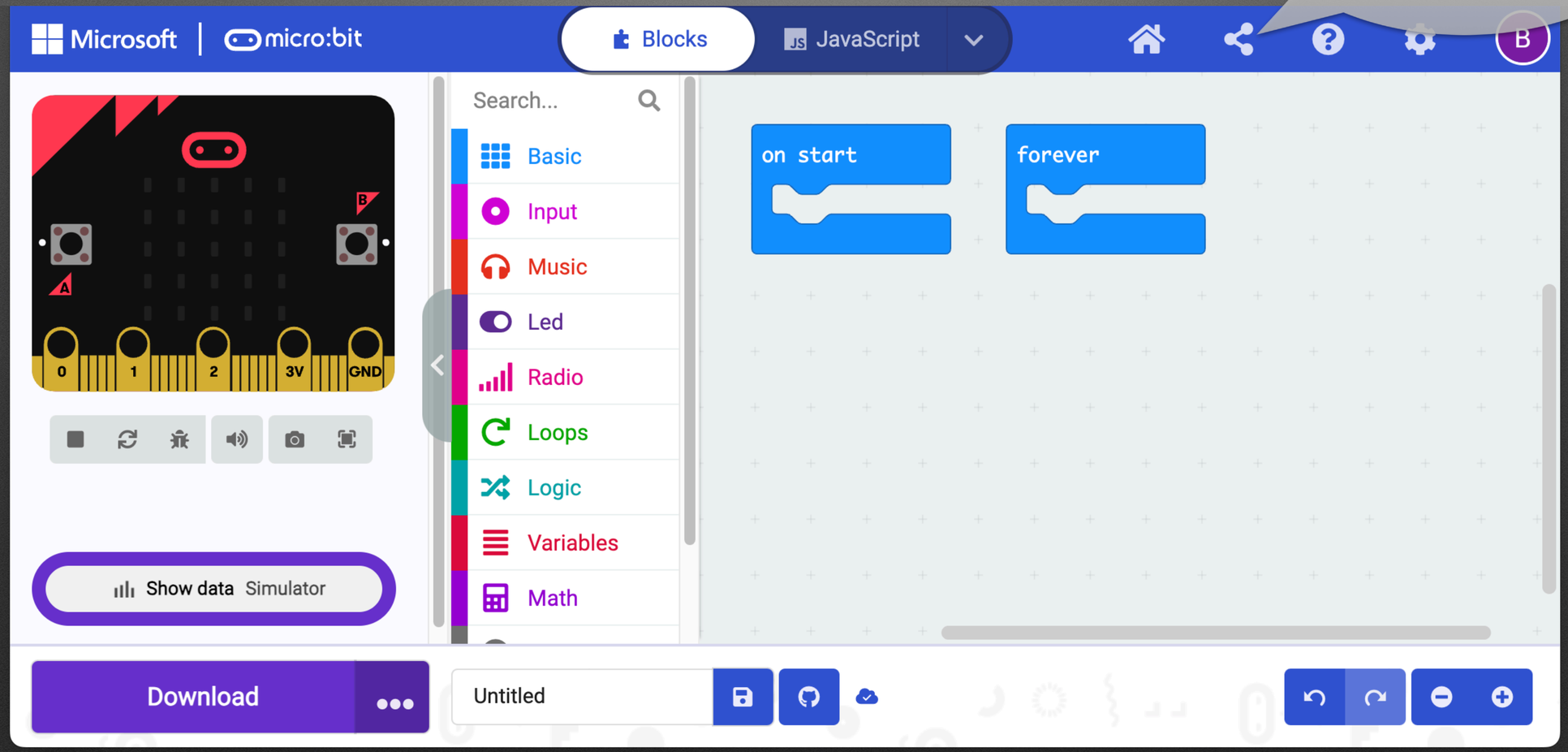


Aside: Storage

- No accounts by default — Projects stored on *machine you're on*!
  - But…Downloaded files can be restored via Drag & Drop!
- Google Cloud or GitHub repositories can be used
- URLs can be shared

Sharing via URL

Share: Create a URL to share a *copy*



Setup

- Hardware Handout
  1. Open Box
  2. Pull out micro:bit
  3. Pull out micro USB cable (under cardboard)
  4. Connect via USB cable

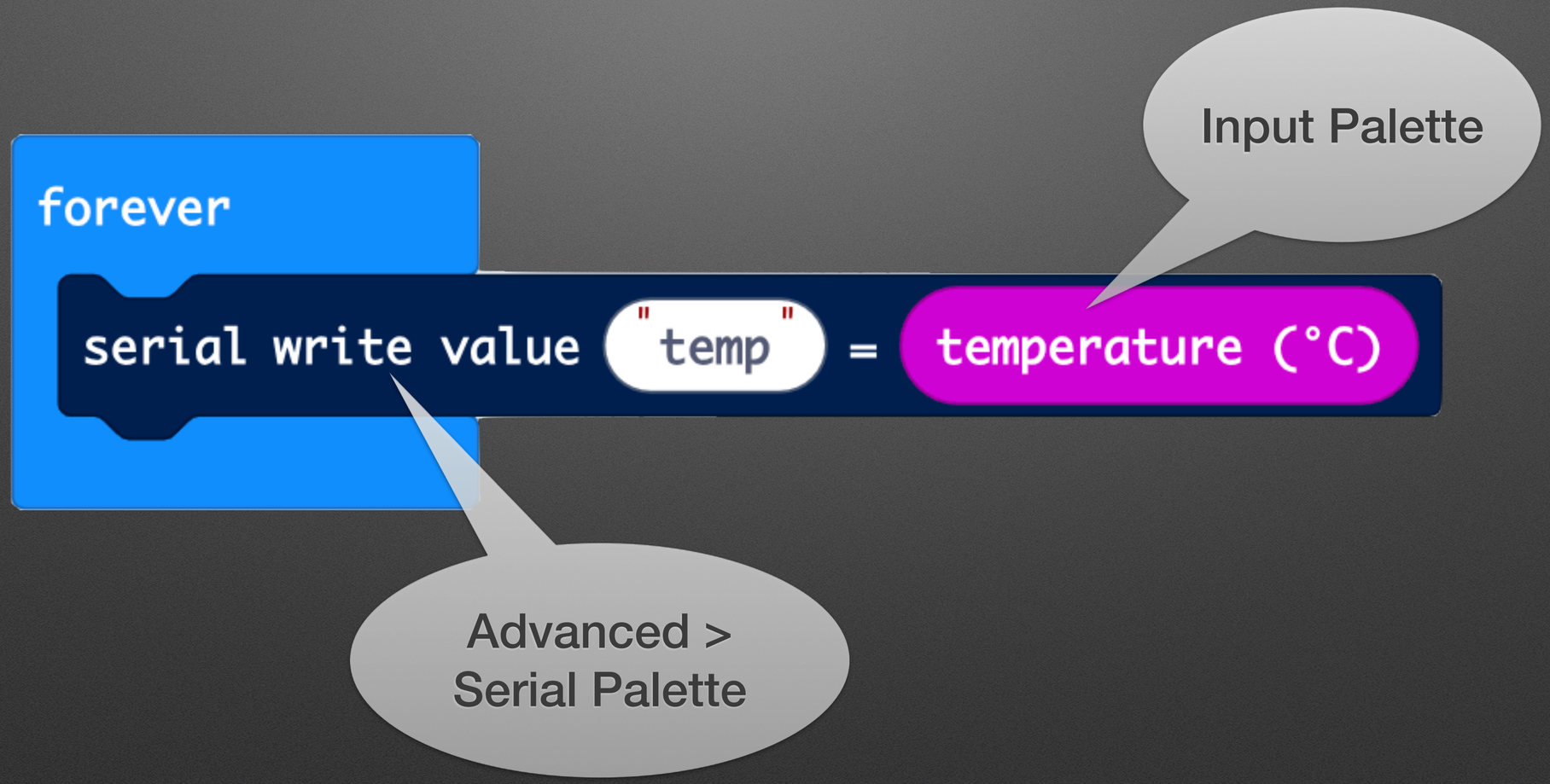
Direct Transfer

https://makecode.com/blog/microbit/2023-release

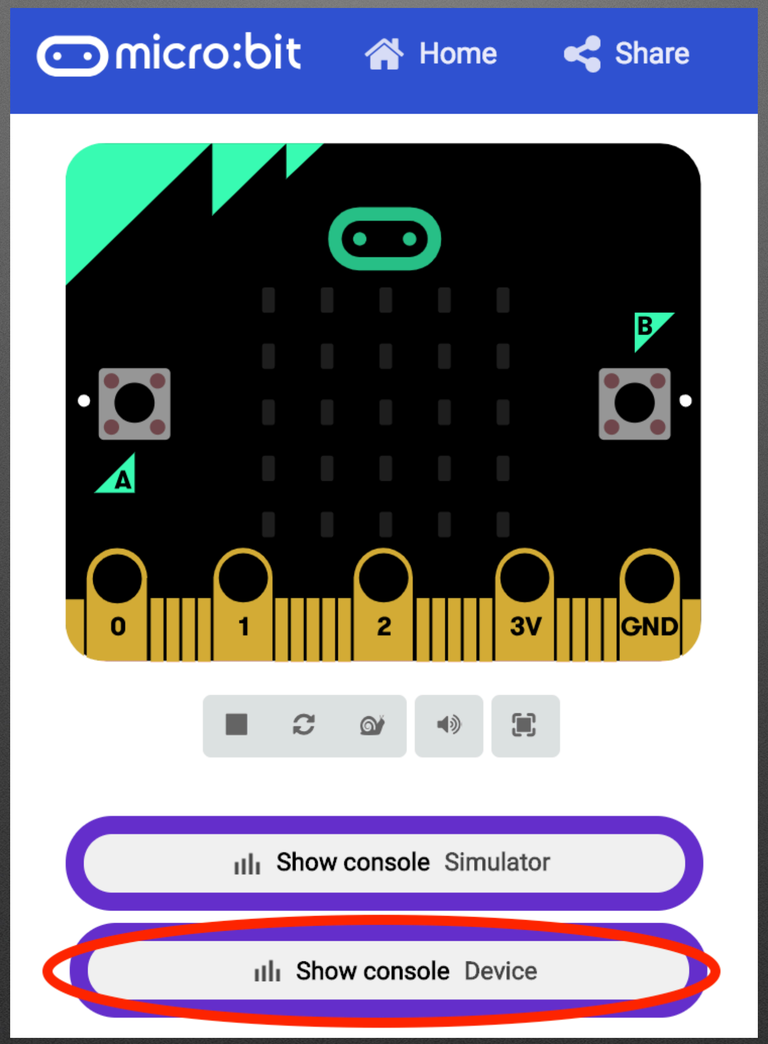
Temperature Over Time

TIME (SECONDS)	TEMPERATURE (CELSIUS)
1	26.6
2	26.7
3	26.9
…	…

Collecting Data



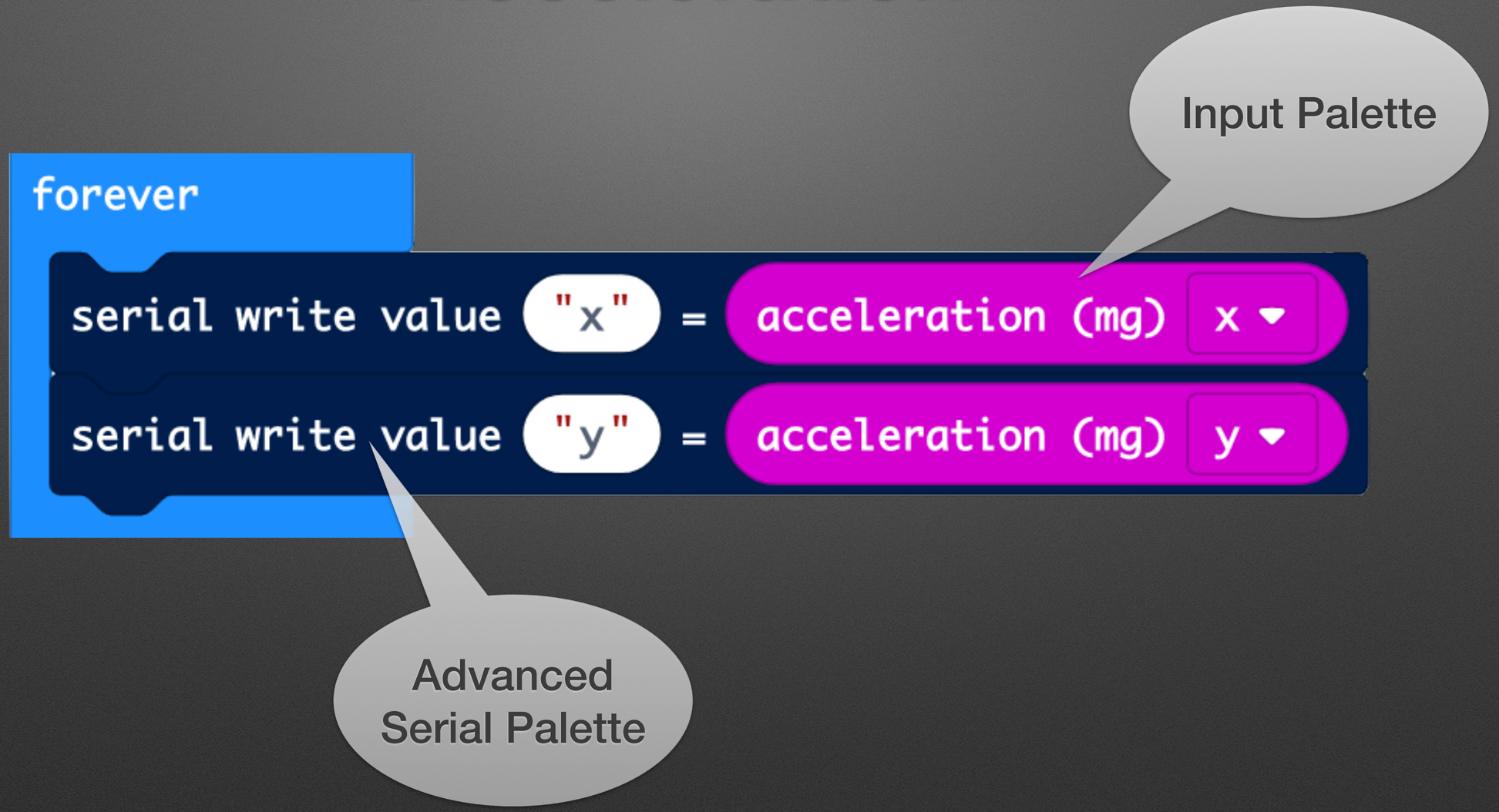
Graphing


micro:bit
Home
Share
B
A
0
1
2
3V
GND
Show console Simulator
Show console Device

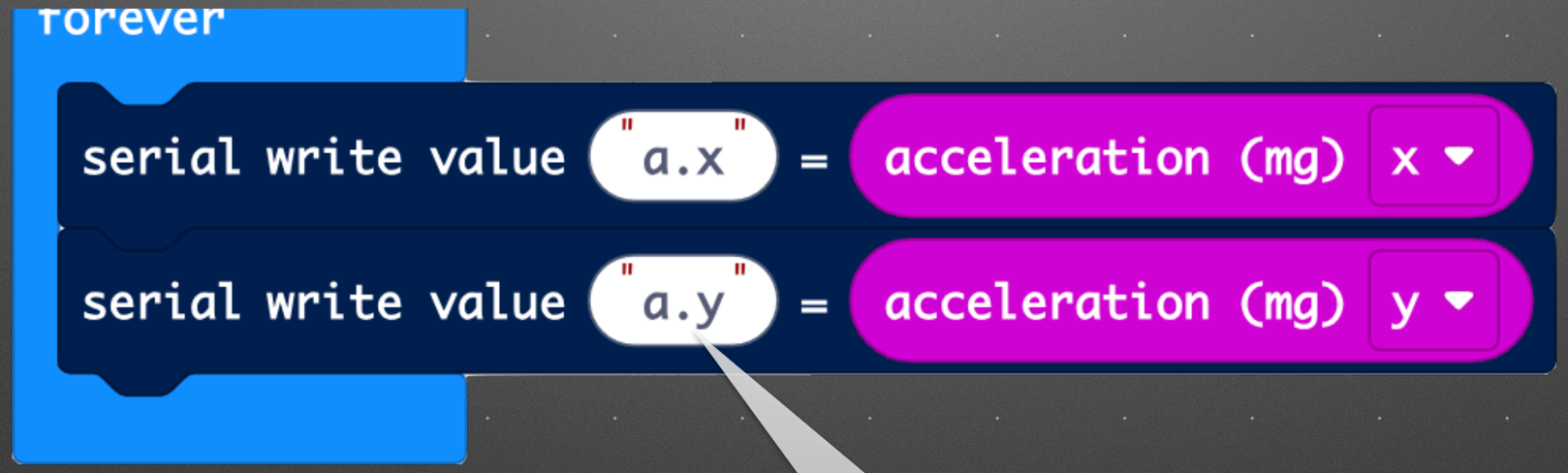
Temperature

- Not super satisfying…
  - Slow
  - “Die” temperature, not ambient
- So: Light level & Accelerometer data!

Acceleration



Acceleration 2: Single Graph



Dot notation:
Graph Name . Series name

Temperature Take 2: https://vimeo.com/445128371

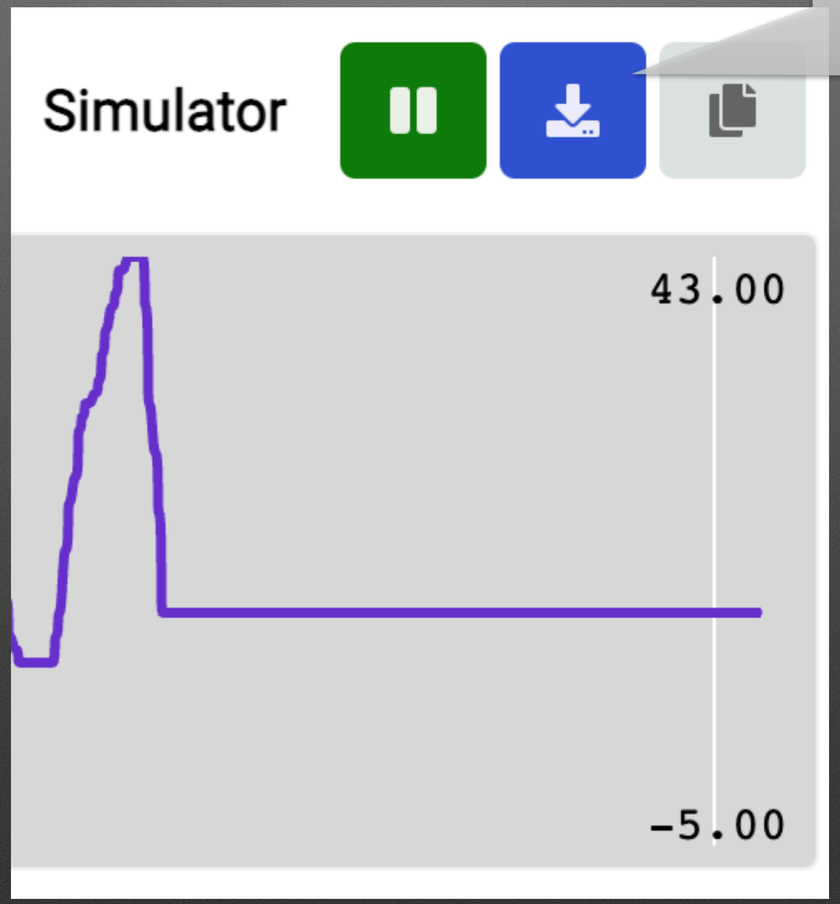
my Sci

Mass	Trial	Temperature of the Material Over Time (°C)											
		0 sec	30 sec	60 sec	90 sec	120 sec	150 sec	180 sec	210 sec	240 sec	270 sec	300 sec	After cooling 300 s
50g	1	21.9	22.2	22.6	23.0	23.4	23.8	24.2	24.6	24.9	25.3	25.6	24.6
	2	22.6	23.1	23.6	24.2	24.7	25.2	25.7	26.2	26.6	27.1	27.4	26.2
	3	19.9	20.1	20.6	21.2	21.7	22.2	22.7	23.2	23.8	24.2	24.7	24.4
	Avg												
150g	1	21.4	21.4	21.4	21.6	21.7	21.9	22.0	22.2	22.4	22.7	22.9	23.5
	2	21.3	21.6	21.9	22.2	22.5	22.9	23.2	23.5	23.8	24.1	24.4	24.5
	3	19.9	20.0	20.2	20.6	20.9	21.3	21.7	22.1	22.4	22.3	23.1	23.5
	Avg												

mySci is a project of
Washington University in St. Louis
Institute for School Partnership

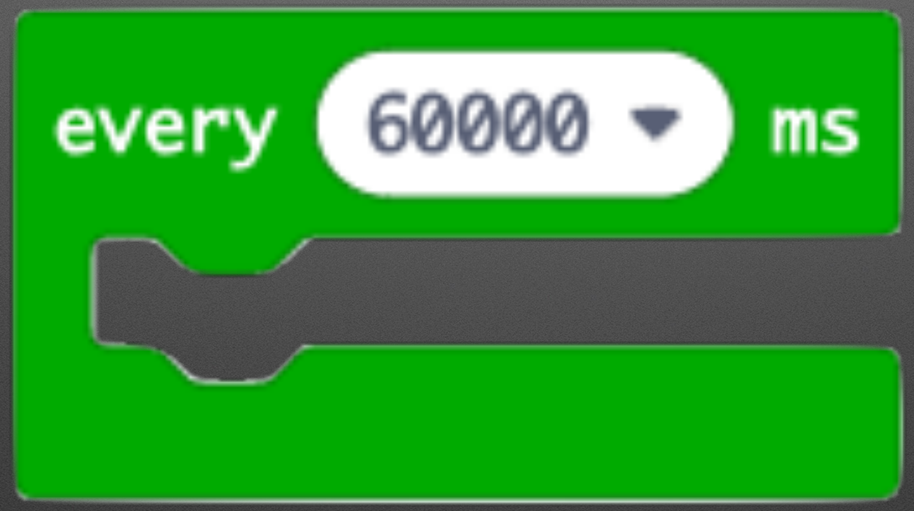
with generous support from
Bayer Fund

Data Download



Download a "CSV"

Pacing Data: Periodic Loop



Extensions & Alligators

mySci Do: Instructions

http://bit.ly/MicroBitTempGraph

Other Sensors / Extensions / Accessories

https://makecode.microbit.org/extensions

Streaming

- Streaming: Data “streams in” in real-time
  - Wired vs. Wireless Streaming
    - Wireless: Two micro:bits vs. Bluetooth*
- Pros/Cons
  - Pros: responsive; fast / can handle lots of data
  - Cons: requires PC to be on/listening

Streaming: Two Microbits

Demo

Logging Data

- Logging: Saving data on the micro:bit
- A quick tour https://microbit.org/get-started/user-guide/data-logging/
  - Demo
- Pros/Cons
  - Pros: Can “deploy” micro:bit for data collection
  - Cons: Micro:bit V2 only; Limited data collection / Space ; Slower

Misc.

- “Data Streamer” Excel Plugin: https://learn.microsoft.com/en-us/microsoft-365/education/data-streamer/using-microbit-and-makecode
- My stuff
  - External websites to plot data (other than MakeCode)
  - Easier bluetooth remote Log access / webpage / app (in progress)

Questions???

SWAG

Contact Info: bsiever@gmail.com
(Anything micro:bit or computing!)