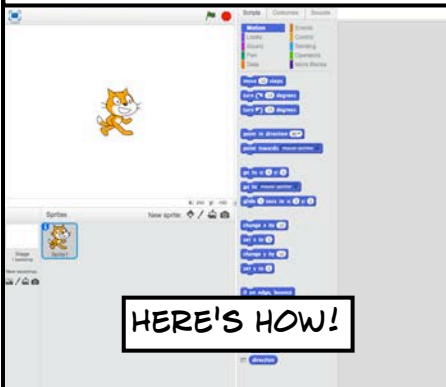


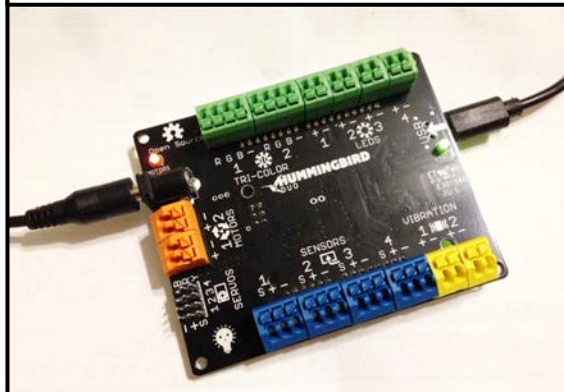
SCRATCH PROGRAMMING

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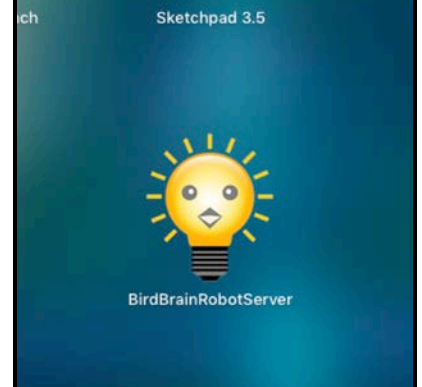
ONE WAY YOU CAN CONTROL YOUR HUMMINGBIRD IS WITH **SCRATCH 2.0!** SCRATCH IS A VISUAL PROGRAMMING LANGUAGE.



FIRST, CONNECT THE HUMMINGBIRD TO A COMPUTER AND SUPPLY POWER. MAKE SURE YOU HAVE BOTH THE USB CABLE AND THE POWER CABLE IN - THEY'RE BOTH NECESSARY.



ON THE COMPUTER, OPEN "BIRDBRAIN ROBOT SERVER".



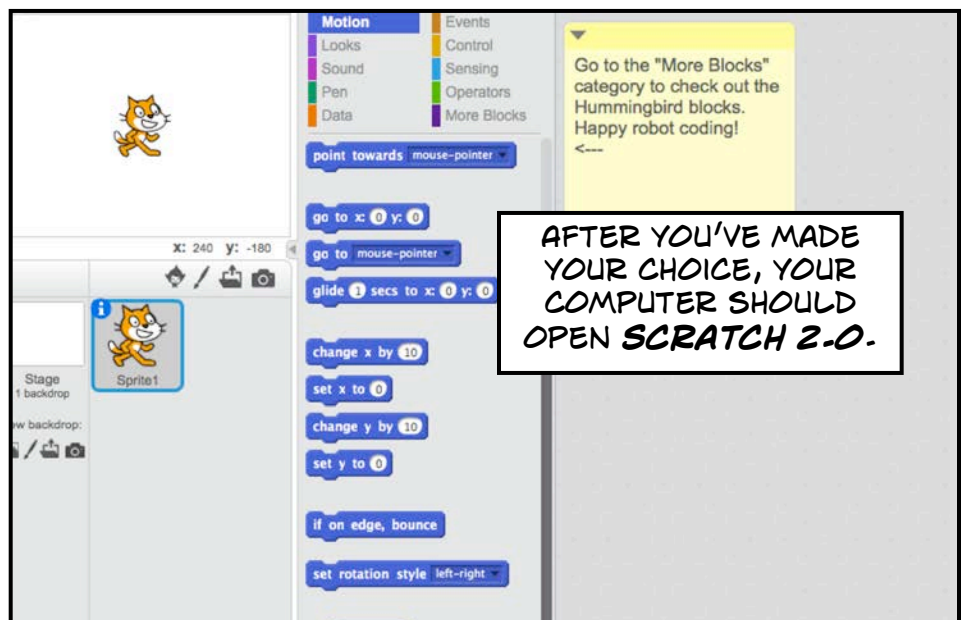
THIS WINDOW WILL APPEAR, LETTING YOU KNOW IF YOUR HUMMINGBIRD (OR FINCH!) IS CONNECTED.

Open Snap!

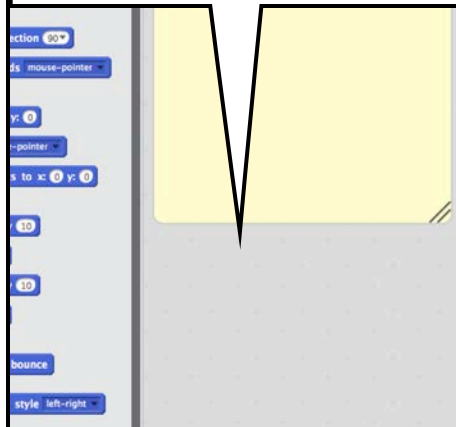
☐ Open Snap! locally (no cloud storage)

Open Scratch

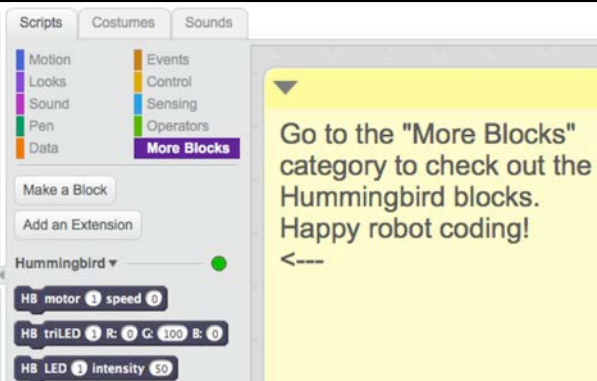
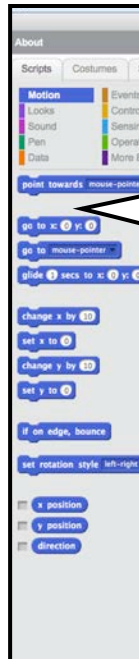
CLICK "OPEN SCRATCH"



THE BIG OPEN AREA ON THE RIGHT IS CALLED THE **SCRIPTS AREA**...ANY COMMANDS THAT YOU WANT YOUR ROBOT TO DO WILL WIND UP HERE.



TO THE LEFT ARE ALL THE **BLOCKS**. THESE ARE THE PIECES THAT YOU WILL DRAG OUT TO THE SCRIPTS AREA. EACH ONE HAS A SPECIFIC PURPOSE.



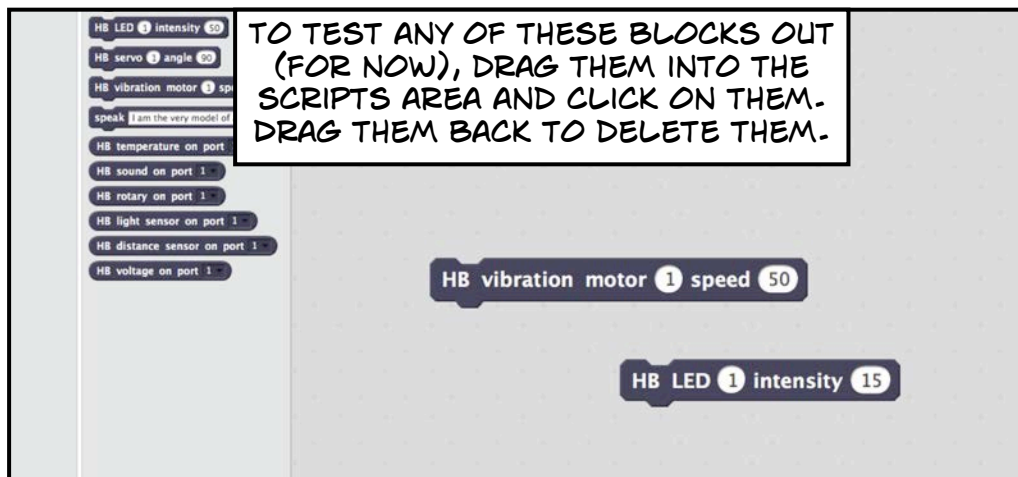
ABOVE THE BLOCKS, THERE ARE DIFFERENT MENUS, OR CATEGORIES. ALL OF THE BLOCKS THAT ARE SPECIFIC TO HUMMINGBIRD WILL BE IN THE:

"MORE BLOCKS" CATEGORY

Go to the "More Blocks" category to check out the Hummingbird blocks. Happy robot coding! <---

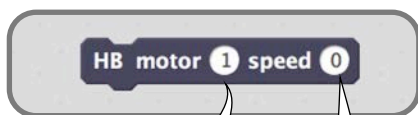
IF YOU FORGET WHERE THE HUMMINGBIRD BLOCKS ARE, THERE'S A NOTE TO TELL YOU.

TO TEST ANY OF THESE BLOCKS OUT (FOR NOW), DRAG THEM INTO THE SCRIPTS AREA AND CLICK ON THEM. DRAG THEM BACK TO DELETE THEM.



ALL OF THE HUMMINGBIRD BLOCKS START WITH THE LETTERS **HB...** BUT THEY ALL DO SOMETHING DIFFERENT!

SOME BLOCKS CONTROL MOTION, LIKE **HB MOTOR...**



THE **FIRST** NUMBER SAYS WHICH MOTOR PORT WE'RE TALKING ABOUT, #1 OR #2.

THE SECOND NUMBER SETS THE SPEED, FROM 0 (STOPPED) TO 100 (FULL), TO -100 (REVERSE FULL)

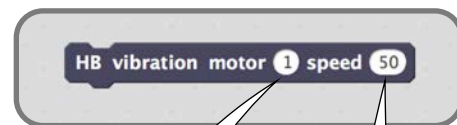
HB SERVO...



PORT NUMBER (1-4)

ANGLE (0-180)

AND **HB VIBRATION MOTOR!**



PORT NUMBER (1-2)

SPEED OF MOTOR (INTENSITY OF VIBRATION) (0-100)

OTHER BLOCKS
CONTROL THE INTENSITY
OF REGULAR LEDS...



PORT NUMBER

LIGHT (0-100)

...OR TRICOLOR LEDS!



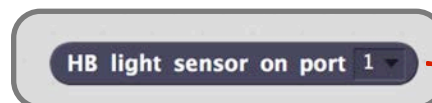
PORT NUMBER

RED LIGHT
(0-100)

GREEN LIGHT
(0-100)

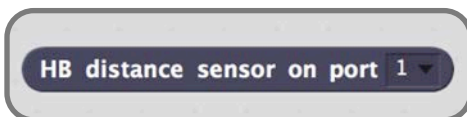
BLUE LIGHT
(0-100)

FINALLY, THERE ARE THE
SENSOR BLOCKS. THESE
GIVE YOU ("RETURN")
INFORMATION ABOUT THE
WORLD AROUND YOU.

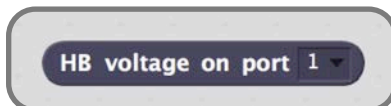


RETURNS THE VALUE OF A
LIGHT SENSOR.
(0-100)

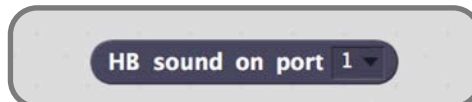
FOR EACH SENSOR BLOCK, YOU
WILL NEED TO GIVE THE PORT
NUMBER
(1-4)



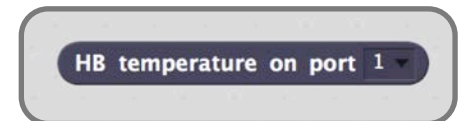
RETURNS THE DISTANCE IN
CENTIMETERS TO AN
OBJECT.



RETURNS THE RAW ANALOG VOLTAGE
READING AT THE SENSOR PORT



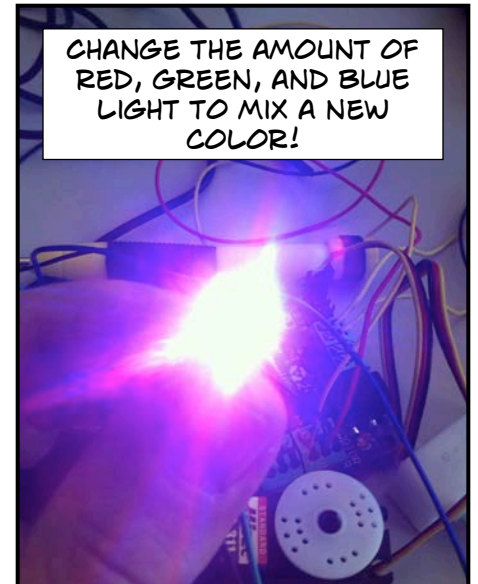
RETURNS THE VALUE OF
SOUND SENSOR.
(0-100).



RETURNS THE TEMPERATURE
VALUE IN CELSIUS (C) OR
FAHRENHEIT (F).



RETURNS THE VALUE OF THE
HUMMINGBIRD'S KNOB.
(0-100)



CHANGE THE AMOUNT OF
RED, GREEN, AND BLUE
LIGHT TO MIX A NEW
COLOR!

A QUICK CHEAT SHEET:

RED+GREEN = YELLOW
RED+BLUE = PURPLE
GREEN + BLUE = TEAL
RED+GREEN+BLUE = WHITE

BONUS BLOCK:

LUMPED IN WITH THE HB
BLOCKS, THERE'S ALSO A
"SPEAK" BLOCK, WHICH
WILL TELL THE
COMPUTER'S SPEAKERS
TO SAY WHATEVER YOU
TYPE!

BEWARE! IF YOU PUT IN A LONG SENTENCE AND CLICK IT,
THE COMPUTER WON'T STOP UNTIL IT SAYS THE WHOLE
THING! AND THE DEFAULT SENTENCE IS PRETTY LENGTHY.
DO YOU RECOGNIZE IT?

speak I am the very model of a modern Major-General, I've information vegetable, animal, and mineral, I

NOW, WHAT WE WANT TO DO IS TO WRITE **STATEMENTS** THAT SCRATCH WILL UNDERSTAND. FOR EXAMPLE, WE COULD TRY TO TELL IT:

"WHEN SOMETHING GETS TOO CLOSE TO THE DISTANCE SENSOR, FLASH THE LIGHTS AND VIBRATE THE MOTOR."

BUT IN ORDER TO DO THAT, WE NEED MORE THAN JUST THE SENSOR BLOCKS. WE'LL ALSO NEED THE **EVENTS** AND **CONTROL** BLOCKS.

BOTH THE DARK YELLOW **EVENT** BLOCKS AND THE LIGHT YELLOW **CONTROL** BLOCKS ARE USED TO MAKE STATEMENTS.

when space key pressed



FOR THIS ACTIVITY, WE'LL MOSTLY JUST LOOK AT TWO BLOCKS:
"WHEN SPACE KEY PRESSED"

AND

"IF ____ THEN, ELSE"

TO USE THIS BLOCK, DRAG IT OUT TO THE SCRIPTS AREA AND SNAP IT TO AN ACTION.

when space key pressed

HB LED 1 intensity 50

HERE'S AN EXAMPLE. WHEN I SNAP THESE TWO TOGETHER, PRESSING THE SPACE BAR WILL MAKE LED #1 TURN TO 50.

FIRST, THERE'S THE "WHEN SPACE KEY PRESSED" BLOCK. YOU CAN CHANGE IT FROM THE SPACE BAR TO ANY KEY ON THE KEYBOARD.



THE "IF __ THEN, ELSE" BLOCK IS A LITTLE MORE COMPLICATED. IT'S LIKE A LITTLE SENTENCE:

IF (SOME CONDITION IS MET), THEN DO THIS **ACTION**, OR **ELSE** DO THIS OTHER **ACTION**.

THE FIRST **ACTION** PART OF THE SENTENCE IS PRETTY SIMPLE. JUST SNAP AN ACTION BLOCK (LIKE ONE THAT CONTROLS A MOTOR OR AN LED) INTO THE MOUTH OF THE "IF __" BLOCK.



BUT WHAT GOES IN THE **FIRST** PART OF THE "IF __" BLOCK?

HB distance sensor on port 1

HB light sensor on port 1



THAT'S WHERE WE'LL PUT THE SENSING BLOCKS...AS WELL AS SOME GREEN BLOCKS CALLED **OPERATORS**.

WITH THE GREEN OPERATOR BLOCKS, WE'RE GOING TO LOOK AT TWO SYMBOLS YOU MIGHT REMEMBER FROM MATH CLASS:

< (LESS THAN)
> (GREATER THAN)

9 < 10

9 IS LESS THAN 10

3 > 2

3 IS MORE THAN 2

IF YOU PUT IN SOMETHING **FALSE**...LIKE THAT 9 IS MORE THAN 10, IT WILL TELL YOU WHEN YOU CLICK ON IT!

15 < 2

false

9 < 10

WE CAN PUT OUR **SENSORS** IN THESE BLANKS!
FOR EXAMPLE, THIS IS SAYING "THE LIGHT HITTING OUR SENSOR IS LESS THAN 50"!

HB light sensor on port 1 < 50

TIP: MAKE SURE THE NUMBER HERE MATCHES THE PORT YOU HAVE THE SENSOR PLUGGED INTO!

IS THAT TRUE OR FALSE?
DEPENDS ON HOW BRIGHT THE ROOM IS!

WE CAN HAVE THE SENSOR CHECK THE LIGHT IN THE ROOM - TO DO THAT, WE'LL PUT OUR OPERATOR INSIDE THE "IF ____ THEN, ELSE" BLOCK DIAMOND.

if then
HB LED 1 intensity 100
else

DRAW THE GREEN BLOCK HERE

NOW YOU HAVE THIS STATEMENT:

IF THE LIGHT HITTING OUR SENSOR IS LESS THAN 50, TURN THE LED TO 100!

if HB light sensor on port 1 < 50 then
HB LED 1 intensity 100
else

DOES IT WORK? IF NOTHING CHANGES, TRY TURNING OFF THE LIGHTS IN THE ROOM AND TRYING AGAIN!

BUT, WHAT IF YOU TURN THE LIGHTS BACK ON? HOW DO YOU GET THE LED TO TURN **OFF** WHEN IT'S NOT NEEDED?

if HB light sensor on port 1 < 50 then
HB LED 1 intensity 100
else

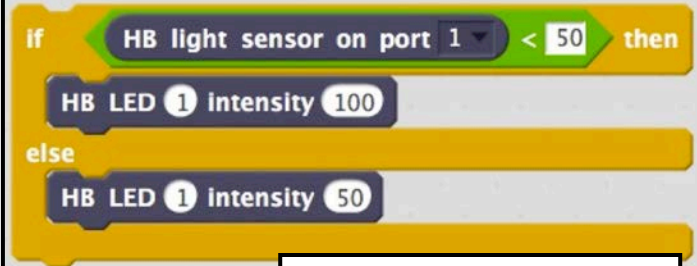
THIS IS WHERE THE ELSE STATEMENT COMES IN.

WE WANT TO
CREATE A
STATEMENT THAT
SAYS: **IF** THE
LIGHT HITTING OUR
SENSOR IS **LESS**
THAN **50**, TURN
THE LED TO 100.

OTHERWISE,
TURN THE LED TO
ZERO.

THE **ELSE** IS
THE SECOND
PART OF THIS
STATEMENT.
ELSE APPLIES
WHEN THE
FIRST **IF**
CONDITION IS
NOT MET.

ADDING THE **ELSE** ACTION IS EASY - IT'S
JUST LIKE ADDING THE FIRST **IF** ACTION.

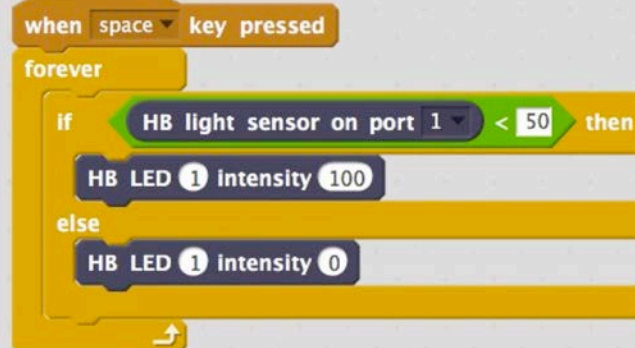


SNAP AN ACTION BLOCK
INTO THE MOUTH OF
THE "ELSE."

THIS TIME, WE'LL SET THE
LED INTENSITY TO ZERO -
COMPLETELY OFF.



AS IT STANDS, THAT STATEMENT WILL ONLY
CHECK THE ROOM **ONCE**. TO HAVE IT
CONSTANTLY CHECK, PUT EVERYTHING INSIDE
A "FOREVER" BLOCK. THE "FOREVER" BLOCK
CAN BE FOUND IN THE CONTROL MENU.



TIP: SNAP ON A "WHEN SPACE KEY PRESSED"
AT THE TOP TO BE AN ON SWITCH!

LET'S TEST IT
AGAIN! TRY THE
FLIPPING
LIGHTS ON
AND OFF.

THIS IS JUST ONE
EXAMPLE OF THE TYPE
OF THINGS YOU CAN
DO WITH SCRATCH!

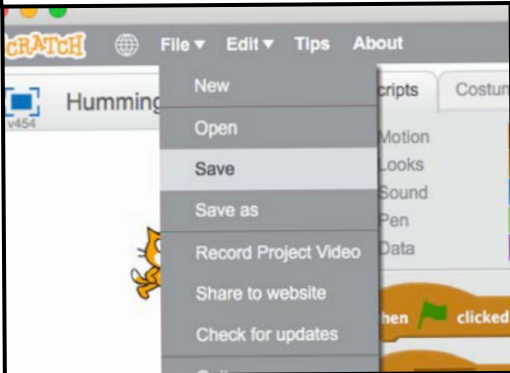


FOR MORE IDEAS, GO TO
HUMMINGBIRDKIT.COM

 **HUMMINGBIRD**
ROBOTICS KIT™

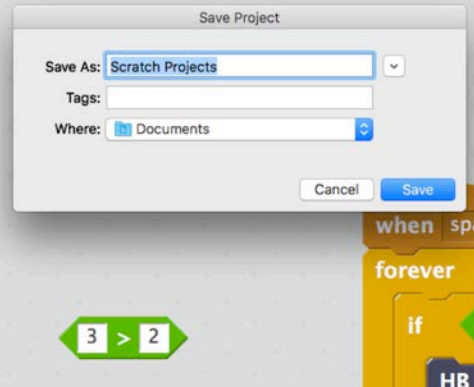
EXPLORE EXAMPLE PROJECTS
AND GET INSPIRED!

BE SURE TO SAVE YOUR WORK!

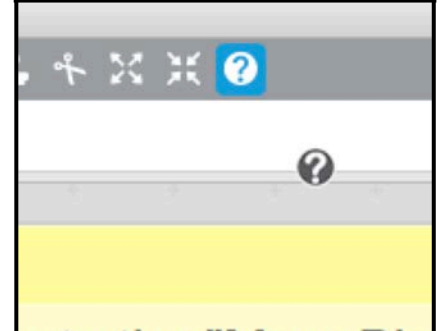


GO TO THE **FILE** MENU, AND THEN CLICK **SAVE**. (**SAVE AS** IF YOU WANT TO CHANGE THE NAME)

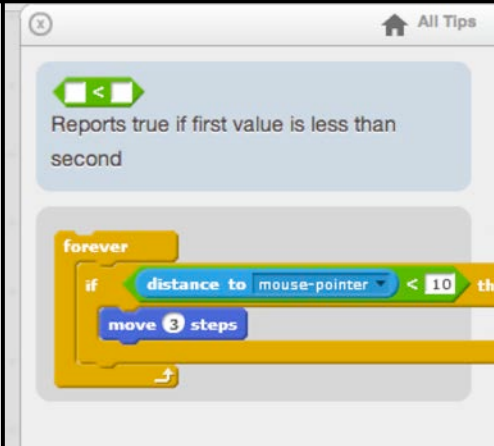
TRY TO NOTICE WHERE YOU SAVE YOUR FILE, AND GIVE IT A NAME THAT YOU CAN FIND LATER.



IF YOU GET CONFUSED BY ANYTHING, YOU CAN ALWAYS CLICK ON THE **HELP** BUTTON, A QUESTION MARK. THEN CLICK ON ANY PART OF SCRATCH YOU WANT TO LEARN MORE ABOUT.



WHEN YOU SELECT SOMETHING AFTER CLICKING THE HELP BUTTON, A **TIP MENU** ON THE RIGHT WILL GIVE YOU MORE INFO!



THAT SHOULD BE ENOUGH TO GET STARTED! WHAT CAN YOU MAKE YOUR ROBOT DO?

