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A SCIENCE
ADVENTURE
COMIC

VOL. 1: THE DIGESTIVE SYSTEM

SURVIVE!

INSIDE THE HUMAN BODY



GOMDORI CO. & HYUN-DONG HAN

ATORY SYSTEM

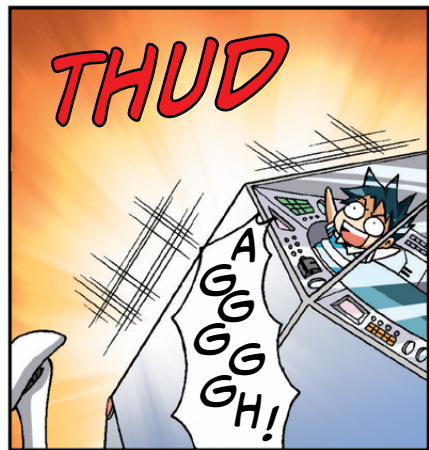
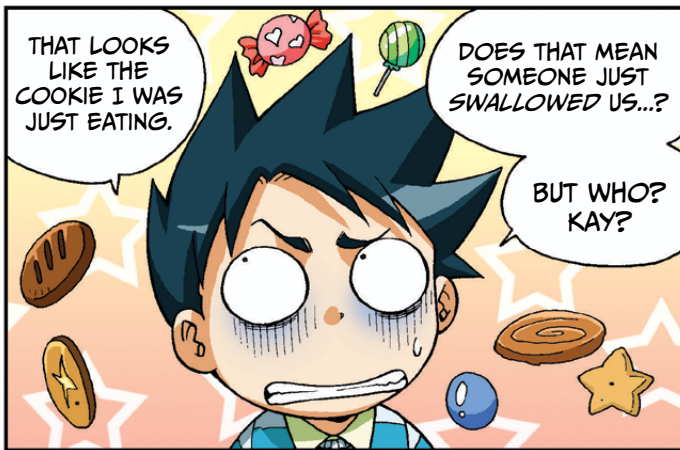
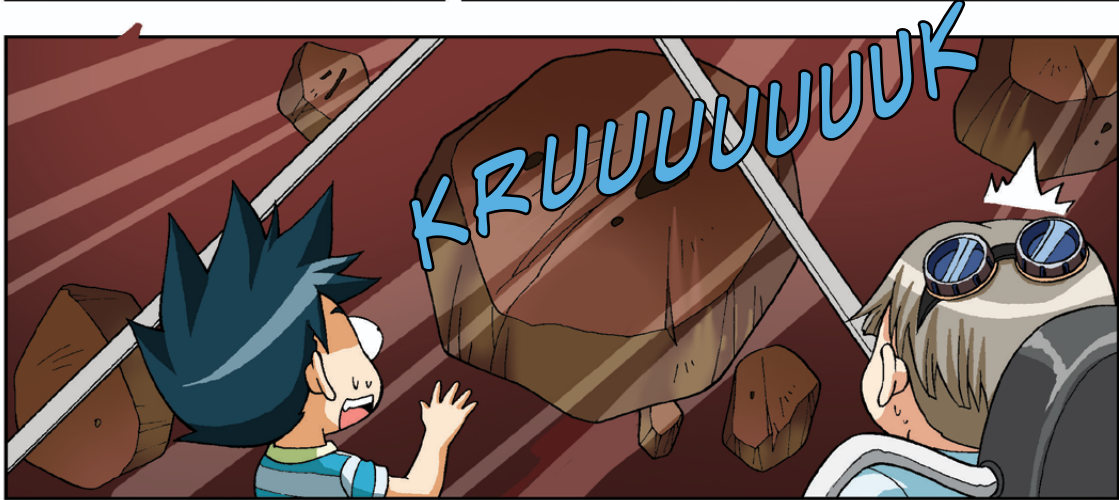
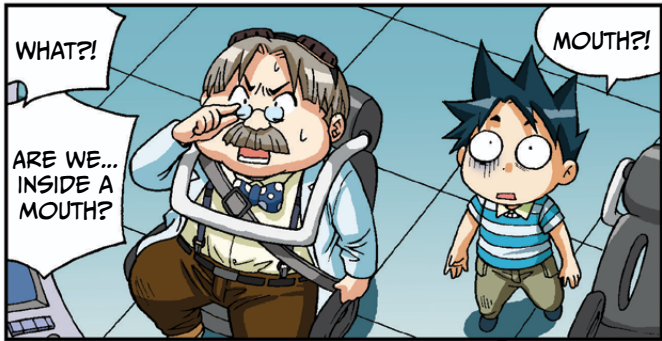
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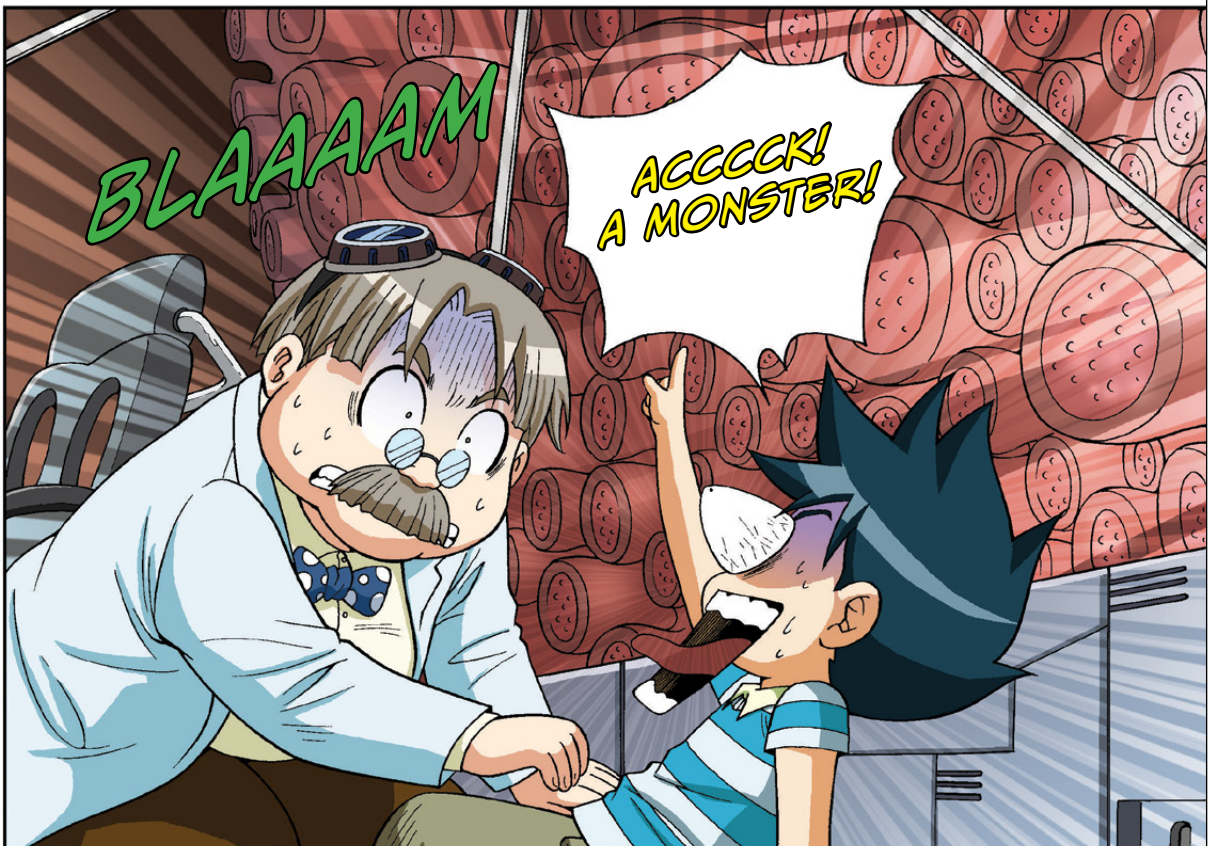
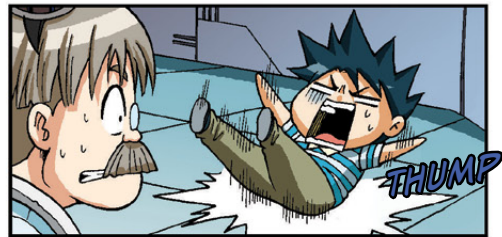
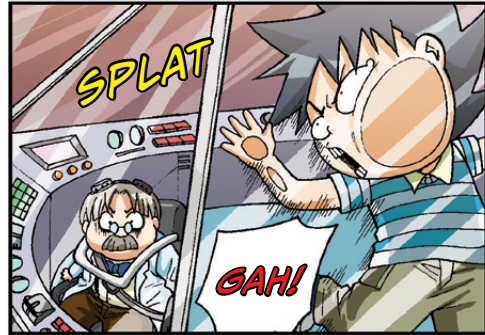
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BODY

E!

BODY

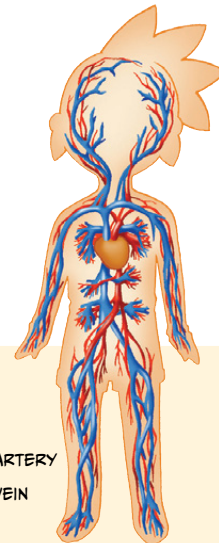






ARTERIES, CAPILLARIES, AND VEINS

Blood doesn't stay in one place. The heart constantly pumps blood throughout the entire body. Blood goes through arteries, capillaries, and veins before coming back to the heart. The tubes that make up this route are called *blood vessels*. If you connected all the blood vessels in your body, they would be more than 60,000 miles long. That's like walking across the United States 20 times!

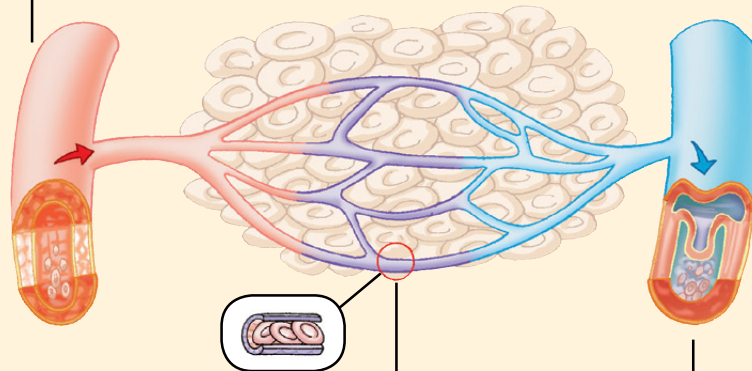


BLOOD VESSELS OF THE BODY

TYPES OF BLOOD VESSELS

ARTERY

These tubes send the oxygen-rich blood from the heart to every organ of the body. Arteries are thick enough to withstand the strong pressure from the heart. They also have a layer of stretchy muscle. Blood that flows through the arteries has a lot of oxygen and nutrients.



CAPILLARY

Capillaries are tiny blood vessels spread out like a net. They help blood from the arteries to reach every part of the body. Oxygen, carbon dioxide, nutrients, and waste travel through the capillaries' thin walls, which are only a single layer of cells thick.

VEIN

These tubes return blood to the heart after it exits the capillaries. They carry blood with carbon dioxide and waste. Far away from the heart, blood flow is weak, so many veins have valves to keep the blood moving toward the heart, not backward.

THE MANGA GUIDE™ TO

COMICS
INSIDE!

PHYSIOLOGY

ETSURO TANAKA
KEIKO KOYAMA
BECOM CO., LTD.

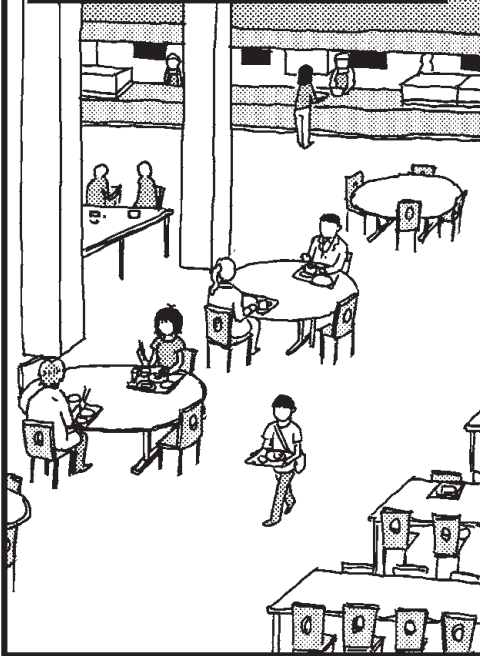


Ohmsha

no starch
press

CONTROLLING RESPIRATION

THE ON-CAMPUS KOUJO
SIDEWALK CAFÉ



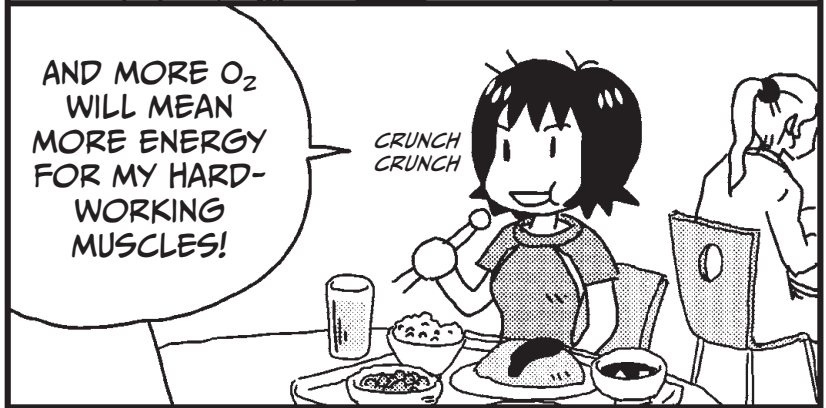
I'VE BEEN THINKING THAT ABDOMINAL BREATHING MIGHT BE EFFECTIVE FOR THE MARATHON.

WITH SOME PRACTICE, YOU COULD PROBABLY INCREASE YOUR TIDAL VOLUME,

OR YOUR "RESTING BREATH."

AND MORE O₂ WILL MEAN MORE ENERGY FOR MY HARD-WORKING MUSCLES!

CRUNCH
CRUNCH

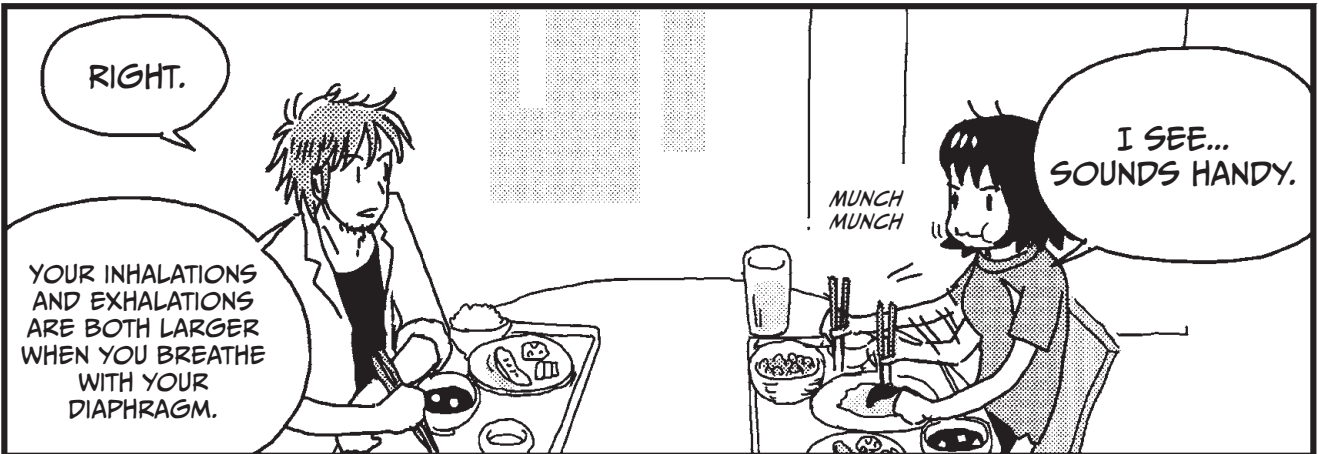


RIGHT.

YOUR INHALATIONS AND EXHALATIONS ARE BOTH LARGER WHEN YOU BREATHE WITH YOUR DIAPHRAGM.

I SEE... SOUNDS HANDY.

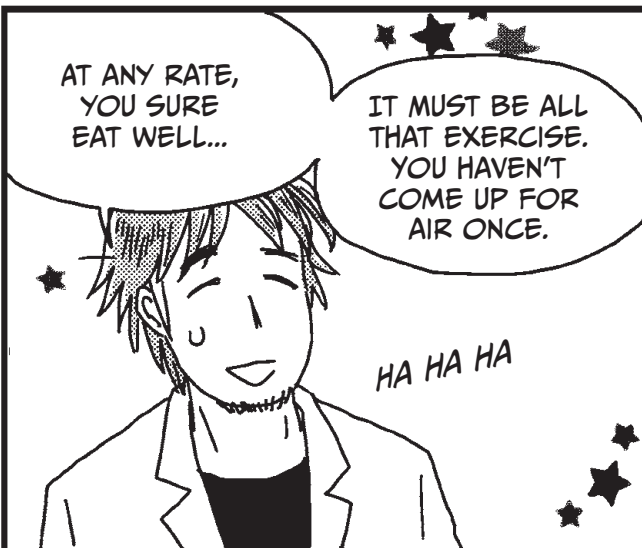
MUNCH
MUNCH



AT ANY RATE, YOU SURE EAT WELL...

IT MUST BE ALL THAT EXERCISE. YOU HAVEN'T COME UP FOR AIR ONCE.

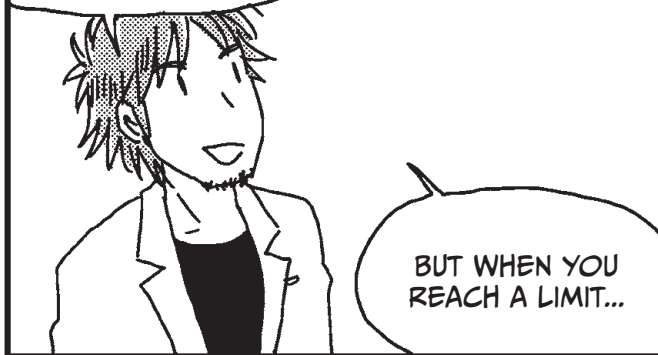
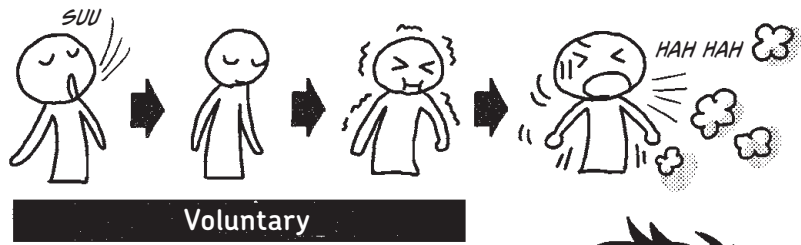
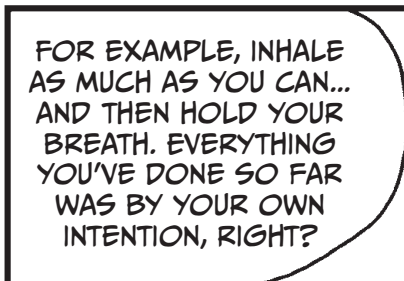
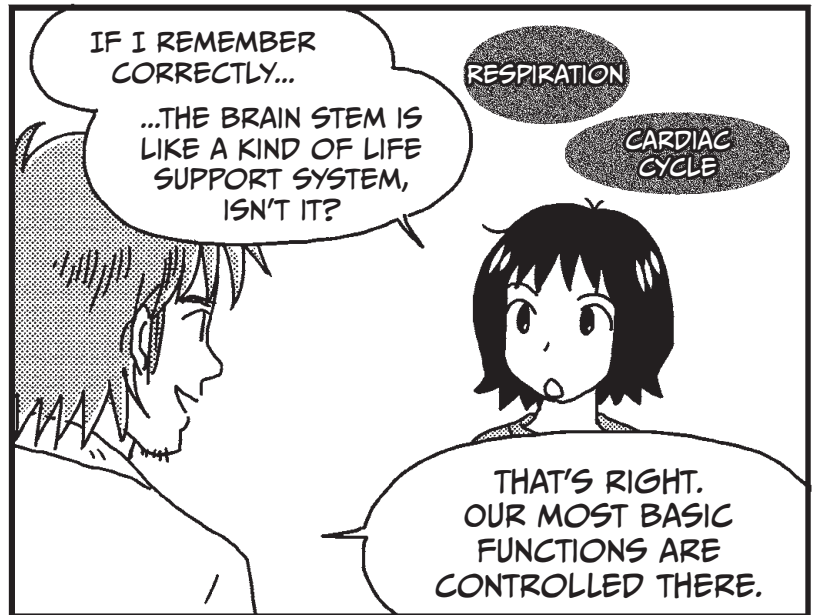
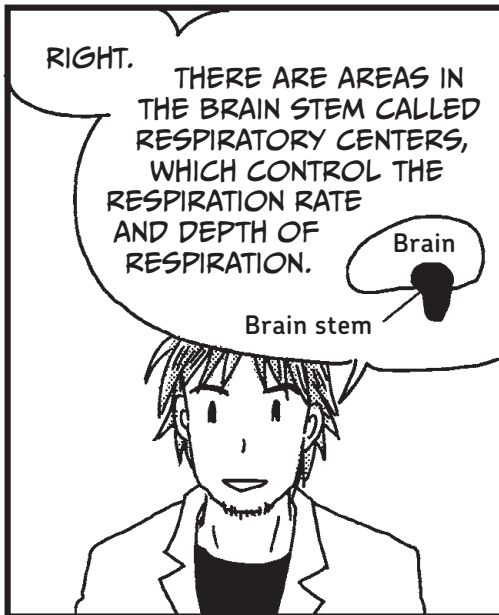
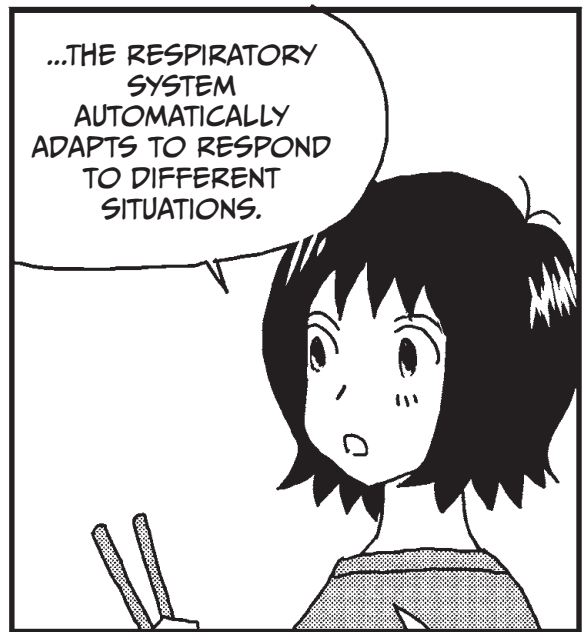
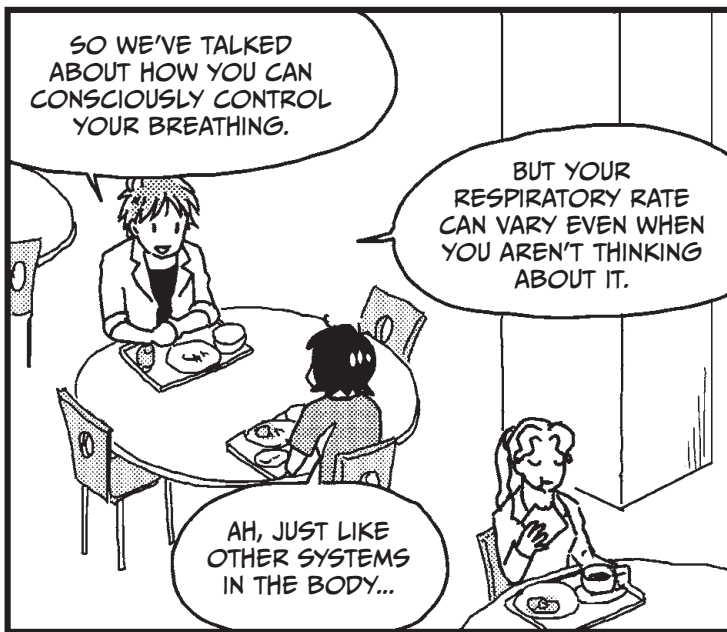
HA HA HA



YEP, I SURE CAN INHALE A MEAL!

HA HA HA





G A M E



A R T

ART FROM 40 VIDEO GAMES AND
INTERVIEWS WITH THEIR CREATORS

MATT SAINSBURY



PLAYABLE POETRY

Poirier always wanted *Child of Light* to be an accessible RPG—a game that everyone, regardless of experience, would be able to complete. Readers can't fully understand a poem without reading all the way through to the end, and the same goes for *Child of Light*. At just 12 to 15 hours of gameplay, it's a lot lighter than most role-playing games today.

"It's not as deep as other RPGs, but that's because we want all players to finish the game and enjoy the quest, and we want them to share the experience with their families." Poirier said. "RPG elements were part of the DNA of the game from the start, but at the same time, we wanted the feel of a playable poem. At one point when we balanced the game, we cut out half of the fights because

we felt it was too heavy and repetitive. We were trying to find the right balance so that the player could explore and enjoy the ride and visuals."

A FRESH TAKE ON FAIRY TALES

Poirier and his team had a distinctive vision for *Child of Light*. For one thing, they took

this opportunity to elaborate on the standard RPG tropes, bringing some mature themes into the game.

"The symbolism and simplicity of fairy tales were very appealing to us all, but we also wanted to do a modern story," Poirier said. "We didn't want a princess waiting for a Prince Charming. We wanted the opposite—

Above and opposite: In-game art from Child of Light (Ubisoft Montreal)

Following page: Concept art from Child of Light (Ubisoft Montreal)





"Then I started to think about how I would like to see the stories in these games evolve, and from then on, I always had the intention to become a game creator."

These days, Okamura is as inspired by Western RPGs as he is by other JRPGs. He's particularly attracted to the open worlds of games like *Skyrim*, *Mass Effect*, and *Dragon Age* because of the amount of control that they give players over the story, though he realizes that what makes *Skyrim* great might not work in his games.

"To a degree, I would like to take some elements from *Skyrim* and implement them in *Atelier*," Okamura said. "Perhaps we could do something that is not exactly like *Skyrim* but rather borrow elements from it and use them in a way that Japanese players would enjoy. For example, we could have the freedom of *Skyrim*, but from the Japanese point of view, we couldn't have the same extensive and violent combat. Our fans play our games, in particular, because they want the experience of characters helping others and banding together with others to achieve things."

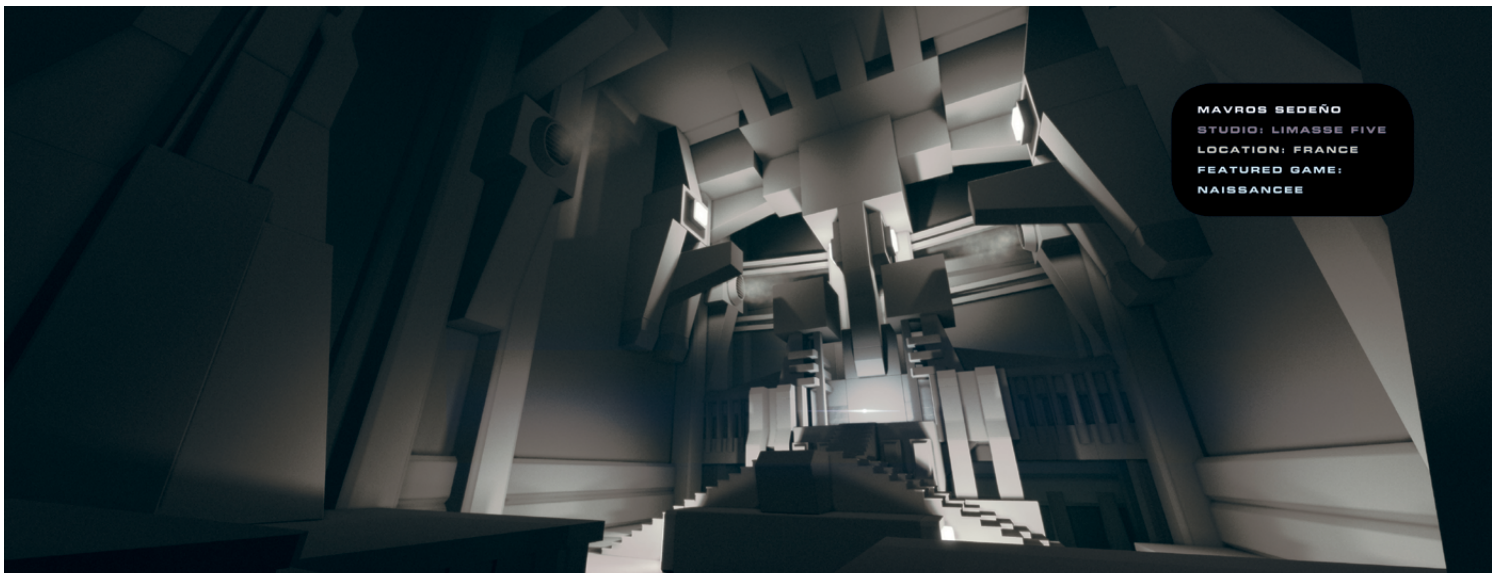
Opposite: In-game art from *Atelier Totori* (Koel Tecmo Games)

Over the years, the *Atelier* series has become Okamura's baby in a way that few game developers ever experience. But while he's on the lookout for ways to keep the series growing and evolving, at its core, *Atelier* still follows a remarkably simple and innocent concept.

"What differentiates *Atelier* from a lot of the other JRPGs is that those games have huge end goals and epic challenges that need to be defeated," he said.

Though *Atelier* is a JRPG series, Okamura said he'd liken it to lighthearted farming simulator *Harvest Moon* rather than JRPG stablemate *Final Fantasy*. The *Atelier* games are about more than just combat and adventure, and in fact, players are often tasked with simply living the characters' lives.

"With *Atelier*, we want our players to connect with the characters," Okamura said. "Like most of us, in their day-to-day activities, the characters in the game are more concerned with achieving small personal goals than with changing the world."



MAVROS SEDEÑO
 STUDIO: LIMASSE FIVE
 LOCATION: FRANCE
 FEATURED GAME:
 NAISSANCEE

ROOTS IN FILM



Independent developer Mavros Sedeño originally planned to work in film, but that was before he started developing games. He participated in a group effort to release *Perfect Dark Source*, a fan remake of the Nintendo 64 classic *Perfect Dark*, using the *Half-Life 2* engine. This process of changing (or, in Sedeño's case, completely

Previous page and above: In-game art from *NaissanceE* (Mavros Sedeño)

overhauling) an existing game to bring one's personal vision to life is called *modding*.

"That experience taught me a lot about the process of game development and working with a team on a project," Sedeño said. "The *Perfect Dark Source* team was geographically dispersed, but collaborating online provided me with the skills I needed to create my own games."

His creative arts background and love of film were also great sources of inspiration. "I'm a big fan of cinema," he said, "especially films such as *2001: A Space Odyssey*, *Cube*, *Blade Runner*, and *Dark City*."

Sedeño was drawn to becoming an independent game developer by the unique artistic opportunities it offered, and his favorite

— IF —
HEMINGWAY
WROTE
JAVASCRIPT



Angus Croll

Ernest Hemingway's work is characterized by direct, uncomplicated prose and a lack of artifice. In his fiction, he describes only the tangible truths: dialog, action, superficial traits. He does not attempt to explain emotion, he leaves it alone. This is not because Hemingway doesn't want his stories to convey feeling—quite the opposite: his intent is to create a vacuum so that it might be filled by the reader's own experience. After all, emotion is more easily felt than described with words:

I have tried to eliminate everything unnecessary to conveying experience to the reader so that after he or she has read something it will become a part of his or her experience and seem actually to have happened.¹

Hemingway's prose is never showy, and his syntax is almost obsessively conventional. The short, unchallenging sentences and absence of difficult words add a childlike quality to his cadence. He assumes the role of naive observer, all the better to draw his readers into the emotional chaos beneath.

```
1 function fibonacci(size) {  
2  
3   var first = 0, second = 1, next, count = 2, result = [first, second];  
4  
5   if (size < 2)  
6     return "the request was made but it was not good"  
7  
8   while (count++ < size) {  
9     next = first + second;  
10    first = second;  
11    second = next;  
12    result.push(next);  
13  }  
14  
15  return result;  
16 }
```



*A woman must have money and a room of her own
if she is to write JavaScript.*

VIRGINIA
WOOLF

1882–1941

BEAUTIFUL LEGO® WILD!

MIKE DOYLE







(opposite)
Mike Doyle
MTR: Appalachian Mountaintop Removal 2015 (-10,000 pieces)

(above)
Chris Maddison
Wilderness Cabin 2015 (-700 pieces)

THE LEGO[®] ADVENTURE BOOK

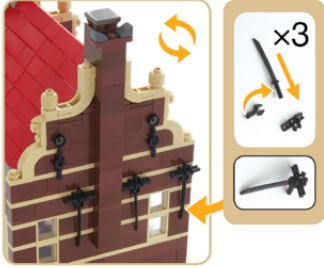


ROBOTS, PLANES, CITIES & MORE!

100 MODELS + NEARLY 40 BRICK-BY-BRICK BREAKDOWNS

MEGAN H. ROTHROCK





BUILDING JOURNAL

Patrick's LEGO buildings are awesome! He told me that he likes to base his models on real buildings. Before he builds, he does a lot of research and likes to learn about the building's history so that he can capture its character. Using elements in unconventional ways allows for lots of detail, too. Now I'm wondering what My Idea Lab might look like with some cool Dutch spires!



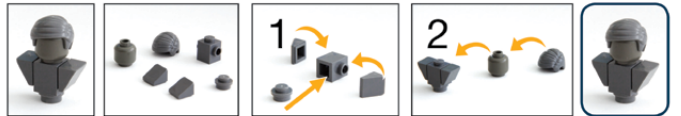
THERE, THAT'S MUCH BETTER!

WELL, FUNNY YOU SHOULD ASK, MEGS. HERE'S THE BUST FROM THE ENTRY TO THE DORDRECHT GATE.



IT'S GORGEOUS! YOU HAVE A GREAT PLACE TO LIVE AND WORK FOR SURE, PATRICK! HAVE YOU BUILT ANYTHING ELSE?

Statue

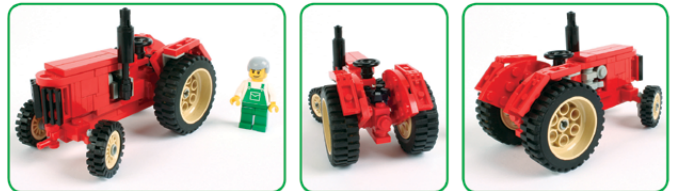


NOW THAT WE HAVE OUR RIDE OPERATOR AND COLLECTED THE TICKETS, THEY'RE READY TO GO.

WHAT A NIFTY BUILD, I'D LOVE TO SEE MORE!

NO TROUBLE THERE, MEGS, WE'VE LOTS MORE TO SEE.

Red Tractor



Traction Engine



THIS TRACTOR IS STEAM-POWERED.

OH INTERESTING, I WONDER IF THAT'S WHERE SOME OF THE INSPIRATION FOR STEAMPUNK COMES FROM?

ERHM, MAYBE, BUT THIS ISN'T STEAMPUNK, JUST REGULAR OLD STEAM!

THE ART OF LEGO® SCALE MODELING



DENNIS GLAASKER AND DENNIS BOSMAN





British Rail Class 55 Deltic
Carl Greatrix



Renault Magnum & Floor Lowboy

Renault's distinctive Magnum model was first introduced in 1990 and remained in production until 2013. Although it was not a common fleet unit, the height of the truck gave it a spacious cab, impressing many owners and drivers.

The Magnum's unique design made it a cult favorite and attracted many model builders. With its square cab, it might seem like an easy truck to re-create using LEGO bricks, but including every detail is a challenge. This model was built using as a reference an original Renault in the fleet of Dutch heavy hauler Van der Vlist. The unit is connected to an extendable step frame trailer carrying various kinds of equipment, such as a Cat D7R tracked dozer. To reproduce the vehicle accurately, measurements were taken from a Magnum in the hauler's yard.

THE LEGO® ARCHITECT



TOM ALPHIN

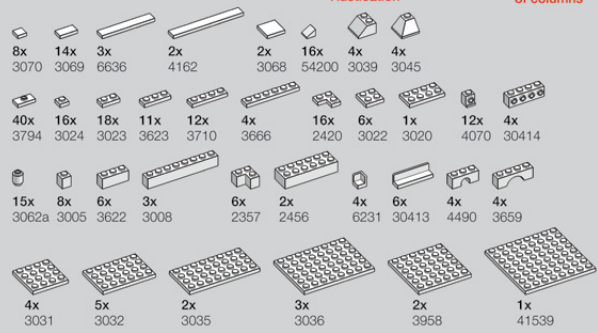
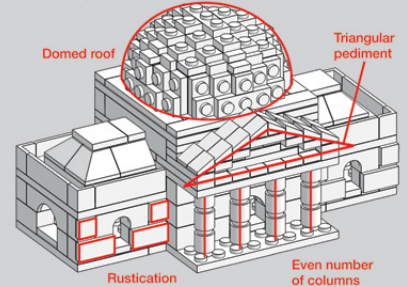




DOMED BUILDING

This model includes many iconic elements of Neoclassical architecture, including a prominent domed roof.

The overall shape is similar to Thomas Jefferson's design for Monticello. This design could be described as Palladian, as it is strictly symmetrical and includes both columns and a pediment.



MONTICELLO
Charlottesville, Virginia, 1772,
Thomas Jefferson.



ART DECO LEGO MODELS



GALAXY DINER AND EMPIRE THEATER
LEGO model by Jonathan Grzywacz.



OCEAN RESTAURANT
LEGO model by Andrew Tate.



COLONY HOTEL
Miami Beach, Florida, 1935, Henry Hohauser.
LEGO model by Daniel Siskind.

Many people assume that the name *Brutalism* comes from the architecture's angular, aggressive, and raw look, which could easily be described as "brutal." However, it is actually derived from the term *béton brut* (or "raw concrete"), which the architect Le Corbusier used in many of his buildings. Le Corbusier is probably most famous for Villa Savoye (1931), which is generally credited as a Modernist design, but his later Unité d'Habitation (1952) is a monument of concrete and a clear example of the early Brutalist style.

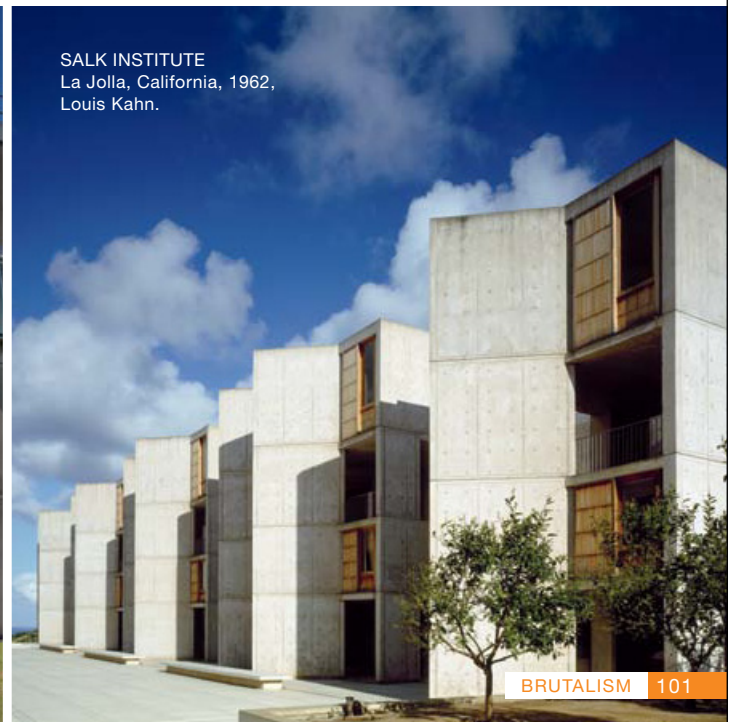
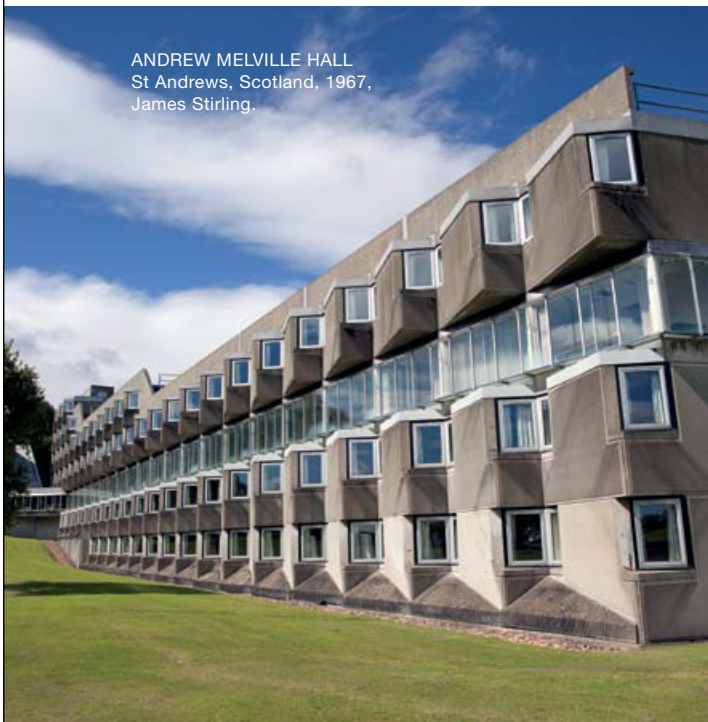
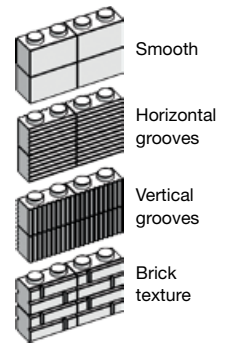
The versatility of raw concrete has allowed architects to create a wide variety of

sculptural forms. Brutalist buildings can be sharply angular as in Andrew Melville Hall (1967), employ blocky cubic forms like Habitat 67 (1967), feature smooth curves, or combine all of the above, such as with Palace of Assembly (1963) in Chandigarh, India. Many buildings follow strict symmetry, while others have more unpredictable forms. Small, oddly shaped windows are common—a frequent criticism of the style by people who live and work in these buildings.

As with most architectural movements, Brutalism's popularity has ebbed and flowed. It was a leading style throughout the 1960s,

LEGO CONCRETE TEXTURES

The grooves in these bricks mimic the textures left behind when concrete forms are removed.



MEDIEVAL LEGO®



GREYSON BEIGHTS

RICHARD THE LIONHEART ARRIVING
AT THE HOLY LAND WITH HIS ARMY



SIEGE OF ACRE

— 1189-1191 —

Acre, now a port town in modern-day Israel, was once under the control of the Crusaders, but it was lost to the Muslim leader Saladin in 1187, after the Battle of Hattin. Saladin's forces then pushed through other Crusader-held towns and cities, reversing the Crusaders' success. Only the cities of Antioch, Tripoli, and Tyre held out against Saladin's attacks.

25

THE MARRIAGE OF KING JOHN I AND PHILIPPA



TREATY OF WINDSOR

— 1386 —

Although the Hundred Years' War (1337–1453) was fought between England and France, several other kingdoms were drawn into the conflict. These smaller kingdoms included Castile, a kingdom in Spain that allied with France, and Portugal, which allied with England.

103



JUNKYARD JAM BAND



*DIY Musical Instruments
and Noisemakers*

DAVID ERIK NELSON



1

THE SLINKIPHONE

The “walking spring” is well-known for its “slinkity” sound, but that metallic ringing is far from the only music it has to offer. The humble Slinky is a veritable wellspring of great sci-fi sound effects. In fact, when properly amplified, it can even serve as a rudimentary vocal echo unit.

This project is quick, and the results are impressive, making it a great one to do with a younger assistant—whose little hands will prove very helpful when working within the confines of a disposable plastic party cup. This is also a good project for a beginning solderer of any age.

If you choose to eschew the electronics, this is a five-minute project suitable for elementary schoolers and scout troops on a

Building the Slinkiphone

- Step 1** Use your pushpin to pop two holes, roughly 3 mm apart, through the middle of the bottom of your plastic cup, as shown in Figure 1-3. We're using a cheap 16-ounce "party cup" here for two reasons: (1) it's easy to pop a hole through with a pin and (2) the thin, rigid plastic vibrates readily, making a nice diaphragm. The Slinkiphone ultimately functions as both a rudimentary microphone and an amplifier, so a relatively rigid diaphragm with a large diameter is a plus.

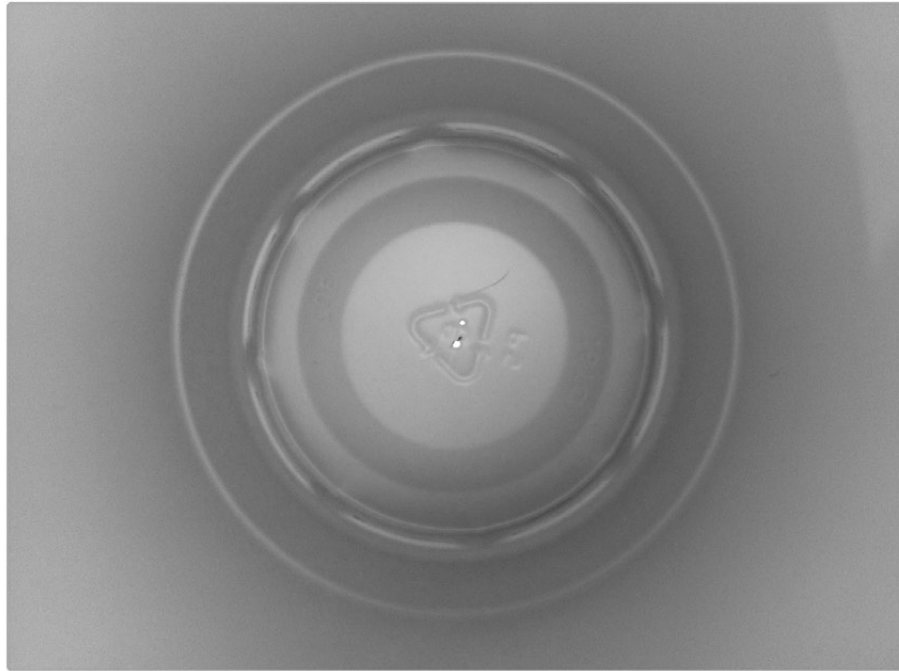


FIGURE 1-3: *The pinholes in the bottom of the disposable plastic cup*

- Step 2** Thread your needle with about 18 inches of fishing line and just let it dangle without tying a knot. (You don't actually need that much line, but you'd go insane trying to work in the cup's confined space with anything much shorter than 10 inches.) Working from the outside of the cup, run the needle through one of your holes from Step 1. Then use pliers (or the tiny hand of a tiny helper) to pull the needle through and send it back out the other hole (as in the left image in Figure 1-4). Finally, while holding one end of your monofilament, pull the needle so that the other end snakes through both holes in the cup and off the needle. The result should be a long piece of monofilament threaded through the party cup with both of its ends hanging outside the cup, as shown on the right in Figure 1-4.

THE MAKER'S
GUIDE TO THE
ZOMBIE
APOCALYPSE



DEFEND YOUR
BASE WITH SIMPLE
CIRCUITS, ARDUINO, AND
RASPBERRY PI

SIMON MONK



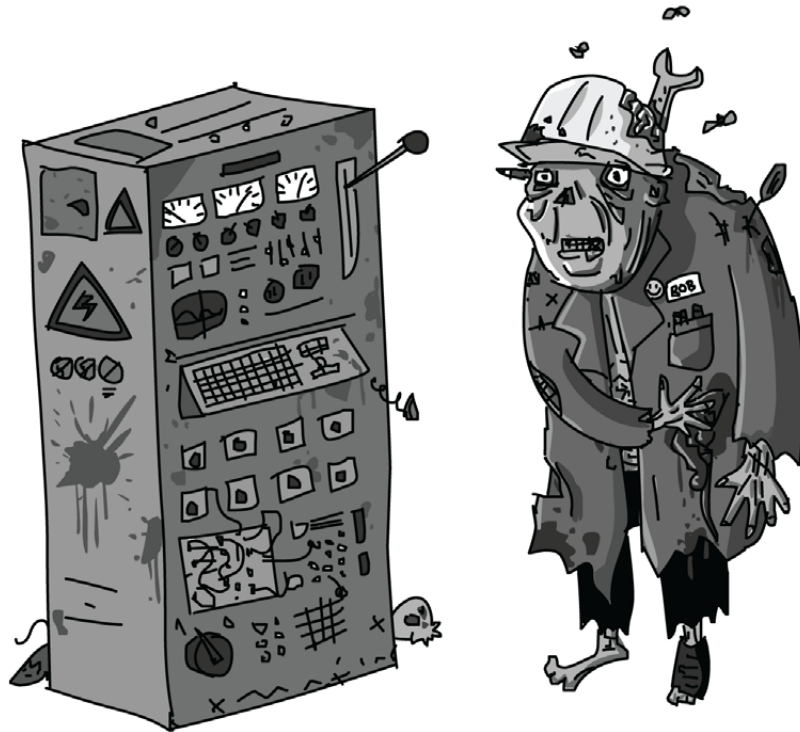


FIGURE 2-1: ZOMBIE WORKERS

POWER AND ENERGY

The words *energy* and *power* are often used interchangeably, but they're actually different. *Power* is the amount of *energy* used per unit time, usually per second. Energy is measured in units called joules (after James Joule, the English scientist and brewer). You could represent power in units of joules per second, but power is more commonly measured in watts (named for James Watt, the Scottish inventor). One watt is actually exactly one joule per second.

Think of a battery as holding a certain number of joules of energy. How fast the battery empties depends on how much power you draw from it. If you attach a very low-power device, the battery will take a long time to go dead, but if you attach something high power, the battery won't last long at all.

Table 2-1 lists some electrical appliances and indicates just how much power they use.

Table 2-1: POWER CONSUMPTION OF EVERYDAY ITEMS

APPLIANCE	POWER (W)	WOULD DRAIN A CAR BATTERY IN:
Portable FM radio	2	300 hours
LED light bulb	5	120 hours
soldering iron	30	20 hours
Laptop	50	12 hours
monitor (27 inch)	80	7.5 hours
Hair dryer	1,500	24 minutes
Electric room heater	3,000	12 minutes
Electric shower (the type that both pumps and heats the water)	10,000	3.6 minutes

Cooking and heating require a lot of power. In fact, if you want hot water or hot food, you should look at burning fuel rather than using electricity.

FLAVORS OF ELECTRICITY

Although Table 2-1 lists a portable radio and an electric shower, these things need different types of electricity. Fortunately, that doesn't have to be a problem! With some constraints, it is possible to convert between these types. Note that zombies will be unable to manage this task (Figure 2-2).

Devices that use electricity fall into two categories: those that require high-voltage alternating current (AC) and those that require low-voltage direct current (DC). DC devices are often battery powered.

LOW-VOLTAGE DC

Low-voltage DC is much safer and easier to generate, use, and store than AC. *Low-voltage* generally means 12V (volts) or less. I find it helps to think

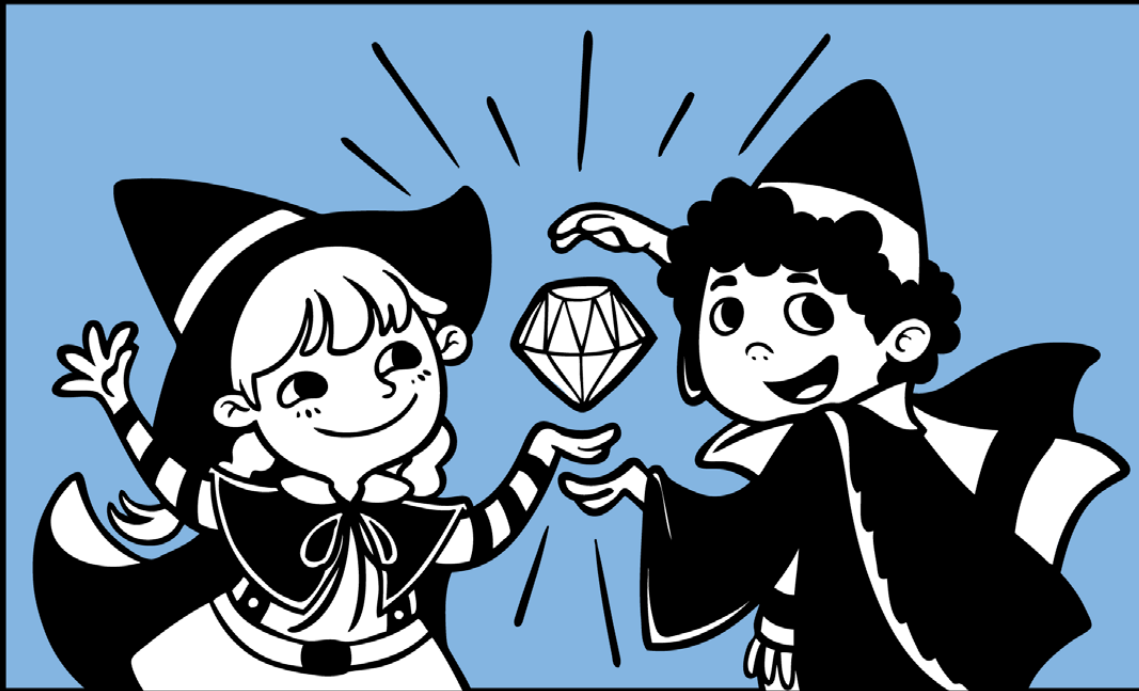


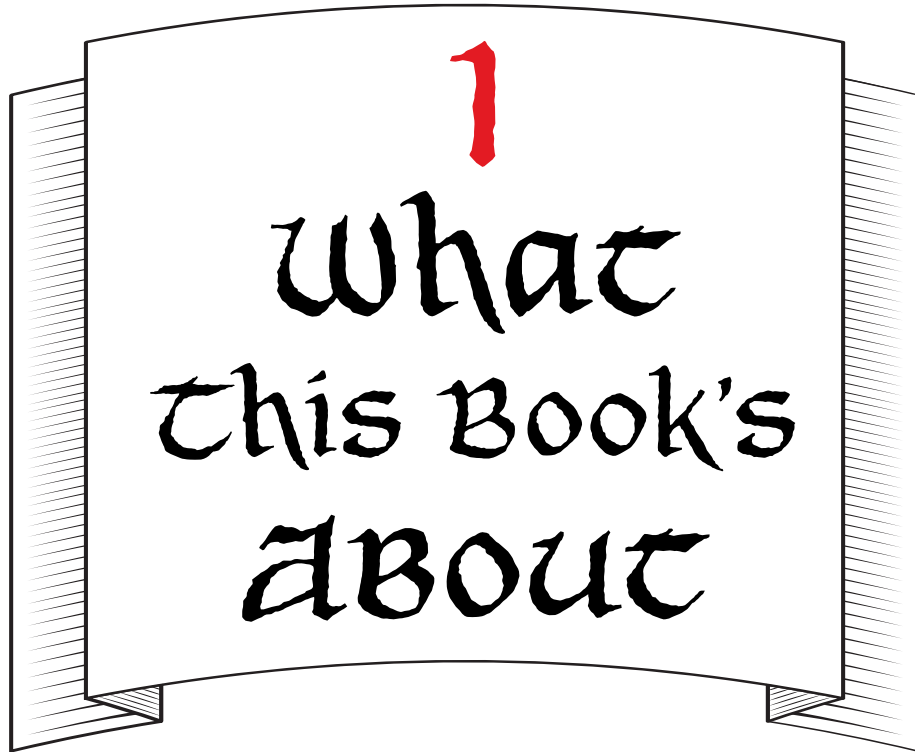
FIGURE 2-2: FLAVORS OF ELECTRICITY

RUBY WIZARDRY

AN INTRODUCTION TO PROGRAMMING FOR KIDS

ERIC WEINSTEIN

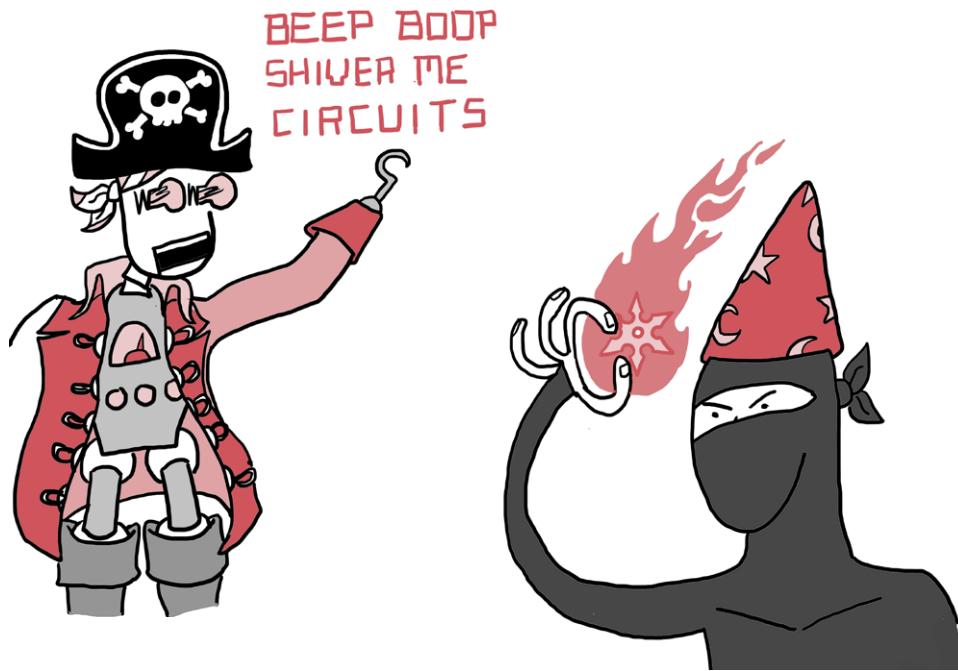




1 What This Book's ABOUT

You found this book! Okay, awesome. I was really hoping it would get to you.

Imagine someone tells you he's discovered a new way of writing. Not a new language, like French or Japanese or Elvish, but a whole new *kind* of writing that makes your stories *actually happen*. If you described a maze, people could enter—and get lost in—that maze. If you wrote about a far-away planet where robot pirates fought ninja wizards, that planet would totally exist. Not only that, but you could write dialogue like "Beep boop shiver me circuits" or cast spells like `ninja_wizard.throw_flaming_ninja_stars`. Crazy, right? And that's probably exactly what you'd say: that this is completely crazy and whoever thought of it has too much time on his hands. Too much imagination.



Well, it turns out there's no such thing as too much imagination. So! Imagine me this: not only is this crazy new way of writing *real*, but you can learn how to do it. You could, with a little practice, figure out how to make your own worlds with your own rules. You'd be in charge, and you could do pretty much anything you could think of. Not only that, but if you got really good at it, people would come from all over to experience the worlds you built and use all the amazing things you created.

You can stop imagining (for now, at least). I'm telling you that this is true! And this book can help you do it. The pages you now hold in your hands are a guide to a *programming language* called *Ruby* that will let you do all these things, and all you need is your brain, a computer, and Ruby.

How can this be? you might be thinking. *If something this cool and powerful existed, I definitely would have heard about it by now.*

Which brings us to our next topic.

Hank twirled his mustache. “I’m not sure,” he said. “Let’s have a look at that menu you kids and Squeaky Jim cooked up.”

“Sure!” Scarlet said, and she called up the Hashery menu on the kitchen’s Computing Contraption:

```
>> hashery_menu
=> { :eggs => 2,
      :hash => 3,
      :jam => 1,
      :sausage => 2,
      :biscuit => 1..3 }
```

“This looks good—each order of food is associated with its price in a hash,” said Big Hank, “but we should put our breakfast beverages on there, too. Can you add a key with an array as a value to my menu hash?”

“Of course,” Scarlet said. “What drinks should we put in it?”

“We’ve got coffee, orange juice, and tea,” said Hank.

“Okay!” Scarlet said. She typed:

```
>> hashery_menu['drinks'] = ['coffee', 'orange juice', 'tea']
=> ["coffee", "orange juice", "tea"]
```

“Aha! So that’s how you add a key to a hash,” Hank said.

“Yup!” Scarlet replied. “You just type the hash name, then the key name between square brackets—here, we’re using ‘drinks’—and set the whole thing equal to whatever value you like. See how we updated the hashery_menu?”

```
>> hashery_menu
=> {:eggs=>2, :hash=>3, :jam=>1, :sausage=>2, :biscuit=>1..3,
    "drinks"=>["coffee", "orange juice", "tea"]}
```

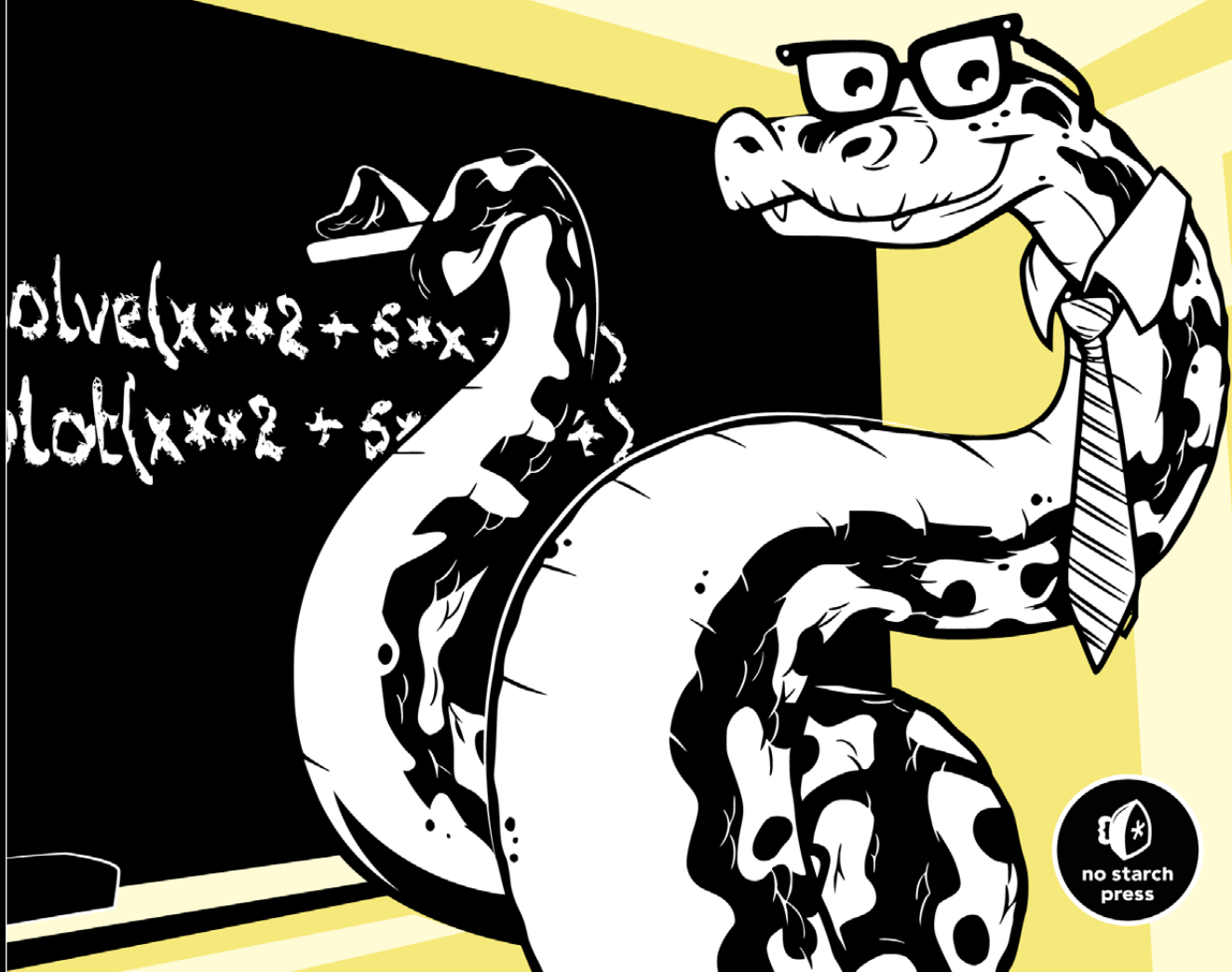
“Cool!” said Ruben, who had finally finished eating his eggs and hash. “Now we have a list of drinks on the menu.” He leaned in close to the glowing screen of the Computing Contraption. “But it looks like the drinks hash key is a string, and the rest are symbols. Does that make a difference?”

“Oh boy, *does* it!” said Squeaky Jim, who had been opening bags of potatoes and cleaning the Hashery’s enormous

DOING MATH WITH PYTHON

USE PROGRAMMING TO EXPLORE ALGEBRA,
STATISTICS, CALCULUS, AND MORE!

AMIT SAHA



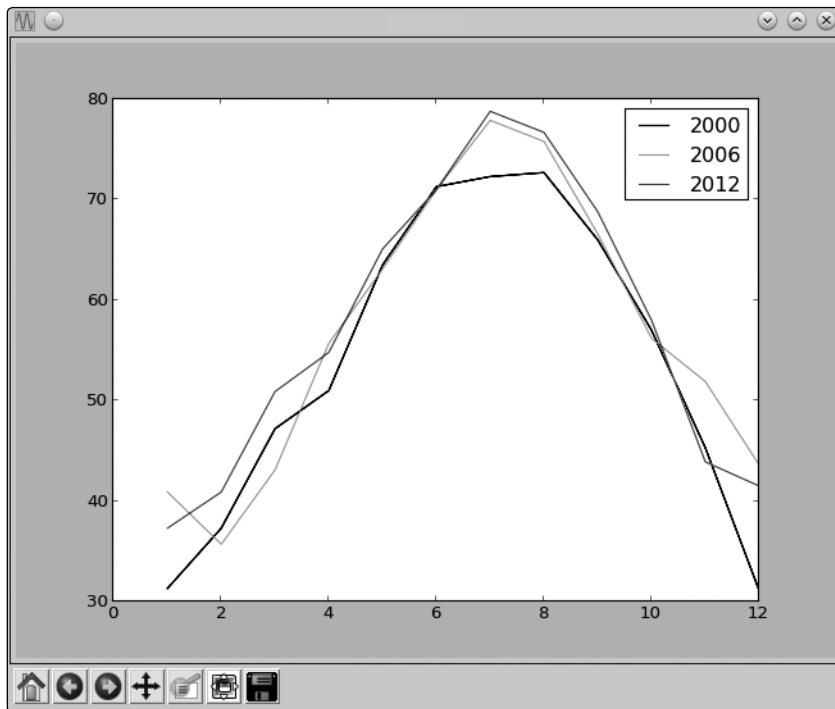


Figure 2-9: A graph showing the average monthly temperature of New York City, with a legend to show the year each color corresponds to

Customizing Graphs

We already learned about one way to customize a graph—by adding a legend. Now, we’ll learn about other ways to customize a graph and to make it clearer by adding labels to the x - and y -axes, adding a title to the graph, and controlling the range and steps of the axes.

Adding a Title and Labels

We can add a title to our graph using the `title()` function and add labels for the x - and y -axes using the `xlabel()` and `ylabel()` functions. Let’s re-create the last plot and add all this additional information:

```
>>> from pylab import plot, show, title, xlabel, ylabel, legend
>>> plot(months, nyc_temp_2000, months, nyc_temp_2006, months, nyc_temp_2012)
[<matplotlib.lines.Line2D object at 0x7f2549a9e210>, <matplotlib.lines.Line2D
object at 0x7f2549a4be90>, <matplotlib.lines.Line2D object at 0x7f2549a82090>]
>>> title('Average monthly temperature in NYC')
<matplotlib.text.Text object at 0x7f25499f7150>
>>> xlabel('Month')
<matplotlib.text.Text object at 0x7f2549d79210>
```

Programming Challenges

Here are a few challenges that build on what you've learned in this chapter. You can find sample solutions at <http://www.nostarch.com/doingmathwithpython/>.

Challenge 1: How Does the Temperature Vary During the Day?

If you enter a search term like “New York weather” in Google’s search engine, you’ll see, among other things, a graph showing the temperature at different times of the present day. Your task here is to re-create such a graph.

Using a city of your choice, find the temperature at different points of the day. Use the data to create two lists in your program and to create a graph with the time of day on the x -axis and the corresponding temperature on the y -axis. The graph should tell you how the temperature varies with the time of day. Try a different city and see how the two cities compare by plotting both lines on the same graph.

The time of day may be indicated by strings such as '10:11 AM' or '09:21 PM'.

Challenge 2: Exploring a Quadratic Function Visually

In Chapter 1, you learned how to find the roots of a quadratic equation, such as $x^2 + 2x + 1 = 0$. We can turn this equation into a function by writing it as $y = x^2 + 2x + 1$. For any value of x , the quadratic function produces *some* value for y . For example, when $x = 1$, $y = 4$. Here’s a program that calculates the value of y for six different values of x :

```
'''
Quadratic function calculator
'''

# assume values of x
❶ x_values = [-1, 1, 2, 3, 4, 5]
❷ for x in x_values:
    # calculate the value of the quadratic
    # function
    y = x**2 + 2*x + 1
    print('x={0} y={1}'.format(x, y))
```

At ❶, we create a list with six different values for x . The for loop starting at ❷ calculates the value of the function above for each of these values and uses the label y to refer to the list of results. Next, we print the value of x and the corresponding value of y . When you run the program, you should see the following output:

```
x=-1 y=0
x=1 y=4
x=2 y=9
```


THE SPARKFUN GUIDE TO PROCESSING

DEREK RUNBERG




sparkfun



PIXEL ART

YOU'VE ALREADY DRAWN YOUR FIRST LINE IN PROCESSING, BUT THAT WAS JUST THE BEGINNING. IN THIS PROJECT, YOU'LL USE BASIC RECTANGLES TO CREATE SOME AWESOMELY LOW-RESOLUTION GRAPHICS, SO LOOK TO YOUR FAVORITE RETRO VIDEO GAME SPRITE (OR ANY SIMPLE, BLOCKY IMAGE) FOR INSPIRATION. WE'RE MAKING PIXEL ART!

GATHER YOUR MATERIALS

- Graph paper
- Colored pencils
- Felt-tip pen

DRAFTING YOUR PIXEL ART

First, you'll draft your pixelated masterpiece in the physical world. Using your colored pencils, draw a square that is 20 boxes by 20 boxes on a piece of graph paper to represent your sketch window in Processing, and create your image inside that square. Follow these rules to make your image easier to translate into code:

Rule 1 Use only full squares of color—no angles, arcs, or partial squares!

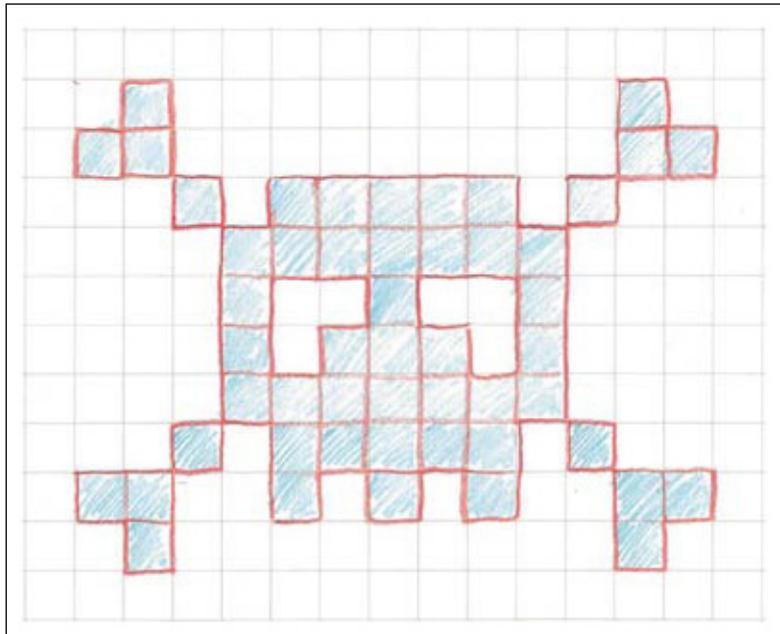
Rule 2 Start by creating something simple, like a smiley face or a house.

Rule 3 Try to use contrasting colors at first. Some subtler shades may not be noticeable when transferred to the computer.

To spark your creativity, Figure 1-1 shows an example of the “unplugged” version of this project that follows the rules just given.

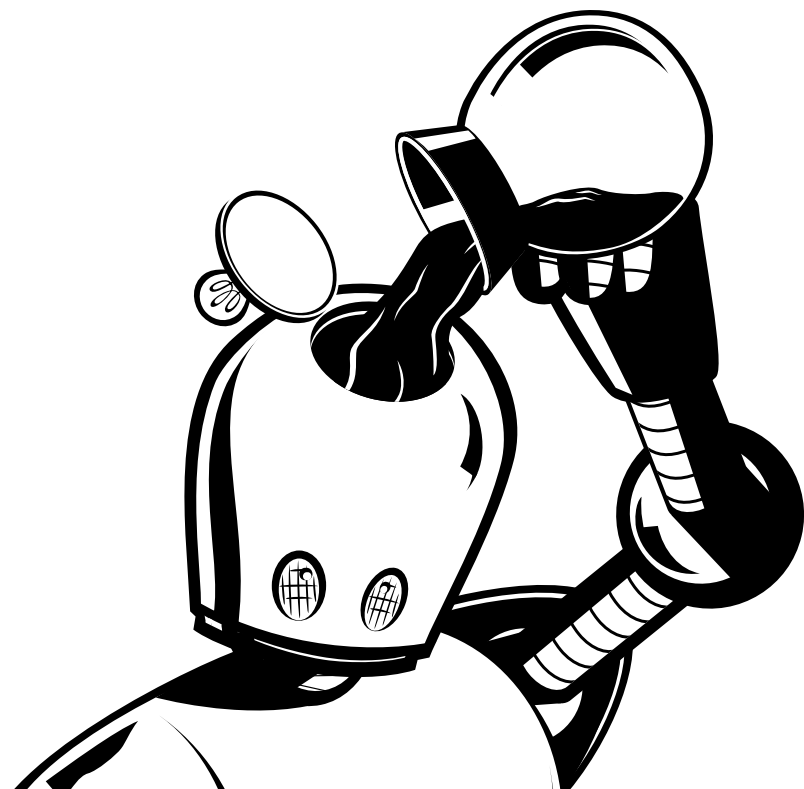
FIGURE 1-1:

A sketch of my pixel art, ready to be programmed in Processing

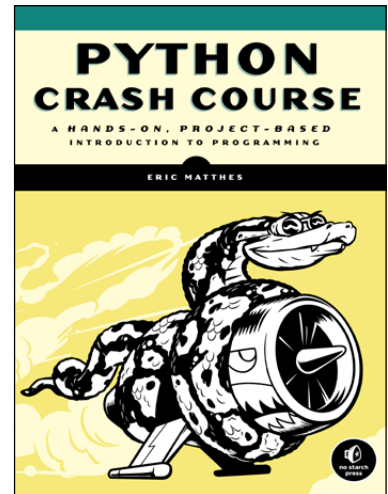
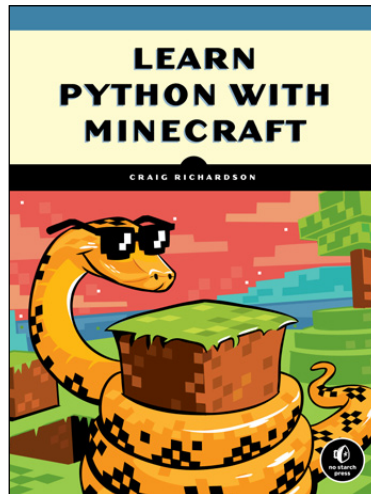
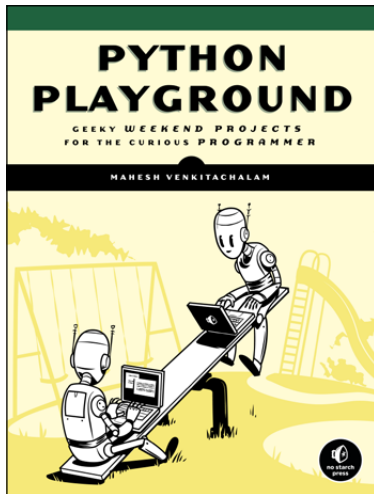
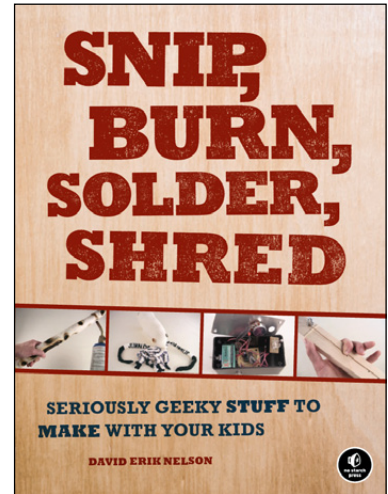
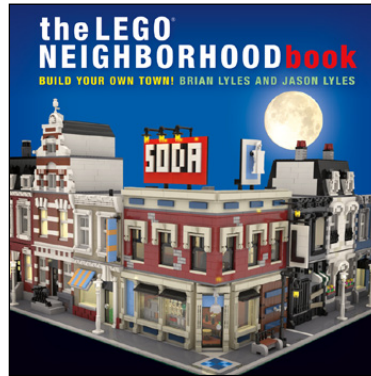
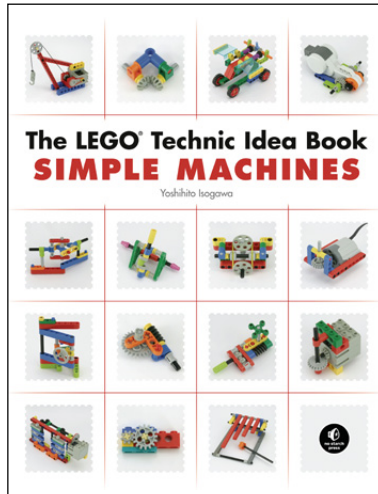
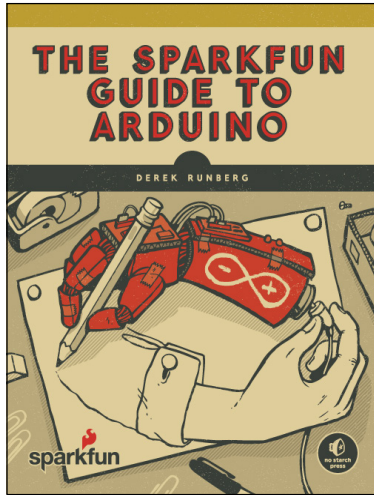


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MORE SMART BOOKS FOR CURIOUS KIDS!



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