



Supercomputer  
Center

# What's So Super About Supercomputing?



activity book for kids of all ages

# About the Ohio Supercomputer Center

The Ohio Supercomputer Center (OSC) empowers Ohio higher education institutions and private industry by providing capable, accessible, reliable and secure computational services enhanced by training, consulting and research partnership. Through OSC's high performance computing resources, the State of Ohio leverages significant economies of scale resulting in better services and cost savings. OSC helps position Ohio's higher education institutions and companies as world leaders with a computationally enabled workforce and research endeavors.

OSC is a member of the Ohio Technology Consortium (OH-TECH), the technology and information division of the Ohio Department of Higher Education.

## Credits

### **Creative Director:**

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Director of Strategic Programs  
Ohio Supercomputer Center  
(Shown at right)

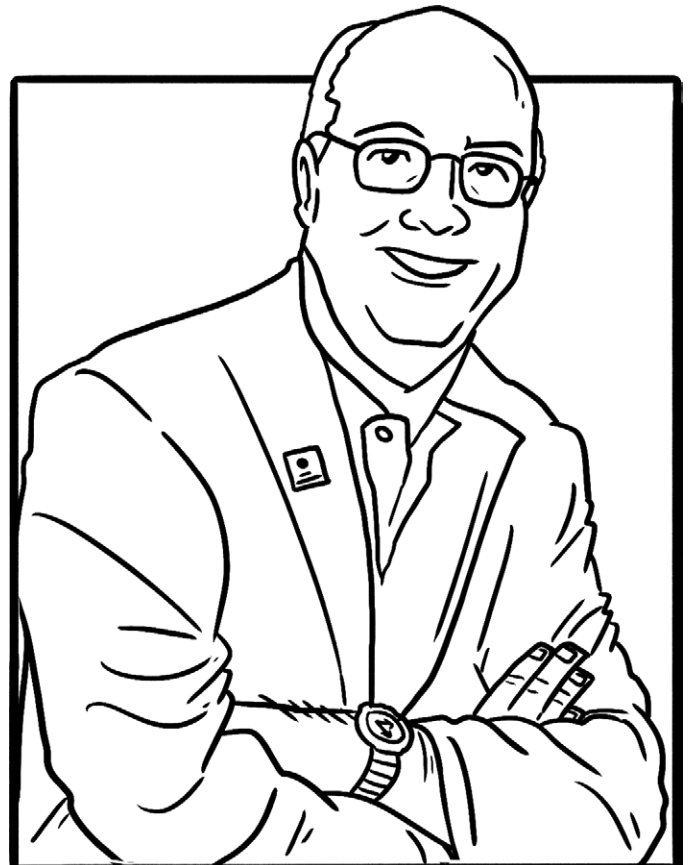
### **Editing:**

John Strawn, Andrea Gibson, Ann Draghi  
Ohio Technology Consortium

### **Illustrations:**

Curious Custom LLC

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# Big Numbers

## Compared with a U.S. Penny

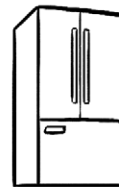


Any discussion of supercomputers involves really big numbers. Because it's hard to read and write lots of digits, scientists and engineers use special names for really large numbers. To imagine the size of these big numbers, let's compare them to a common object such as a penny.

**Draw lines to match the numbers on the left with objects that many pennies would fill up.**

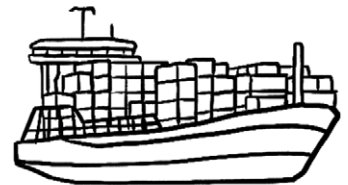
**Kilo:** 1 Thousand  
1,000

A refrigerator



**Mega:** 1 Million  
1,000,000

A container ship



**Giga:** 1 Billion  
1,000,000,000

A house



**Tera:** 1 Trillion  
1,000,000,000,000

All the trucks  
in the U.S.



**Peta:** 1 Quadrillion  
1,000,000,000,000,000

A water bottle

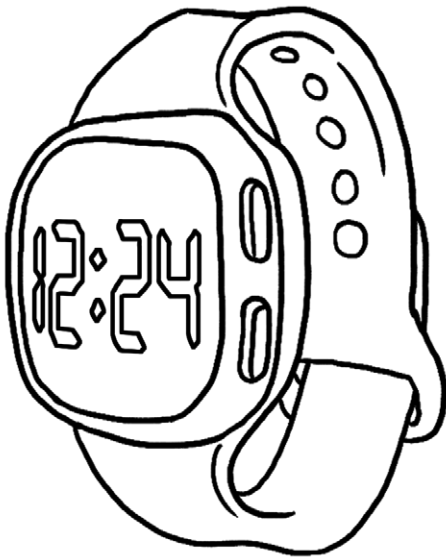


**Exa:** 1 Quintillion  
1,000,000,000,000,000,000

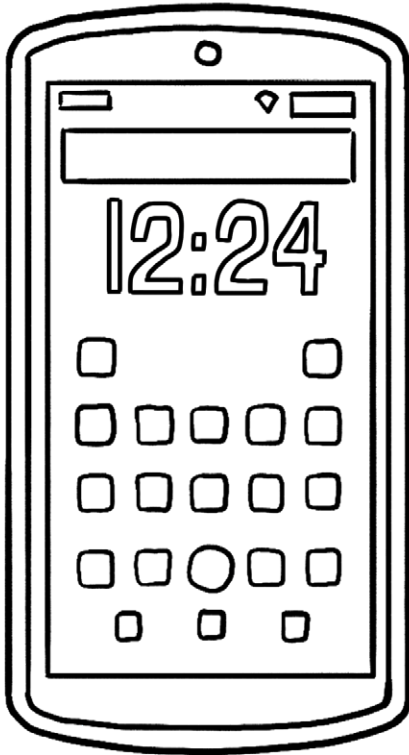
Lake Erie



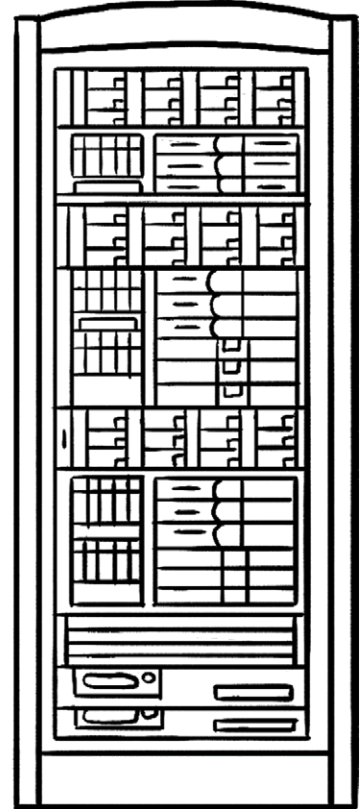
# What is a Supercomputer?



**SMART!**  
**\$50**  
**100 Megabytes**  
**10 Apps**



**SMARTER!**  
**\$500**  
**100 Gigabytes**  
**100 Apps**



**SMARTEST!**  
**\$5,000,000**  
**100 Terabytes**  
**1,000 Apps**

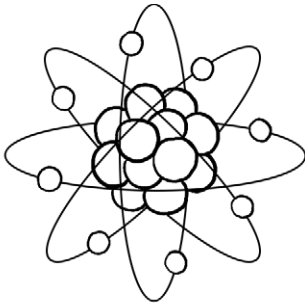
A supercomputer is just a computer that is more powerful than the majority of other computers that currently exist. In the same way a smartphone has a lot more features than a digital watch, a supercomputer has many more features than a smartphone. Just like how you get smarter as you get older, supercomputers also get smarter over time.

# Why Use a Supercomputer?

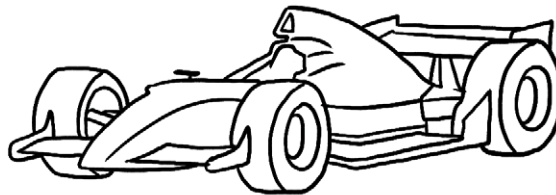
Scientists come up with theories and conduct experiments to test them. But it's hard to perform experiments on things that are **too small** or **too big** or **too remote** to see and measure, or when processes are **too fast** or **too complex** or **too dangerous**. Scientists often can solve these types of challenges by simulating the experiments on a supercomputer.

**Can you match these pictures with the terms in the word bank below?**

|                  |       |         |           |
|------------------|-------|---------|-----------|
| <b>WORD BANK</b> | small | big     | remote    |
|                  | fast  | complex | dangerous |



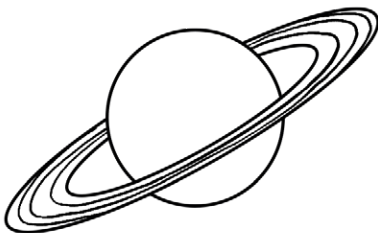
Too \_\_\_\_\_



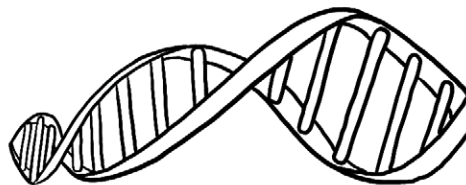
Too \_\_\_\_\_



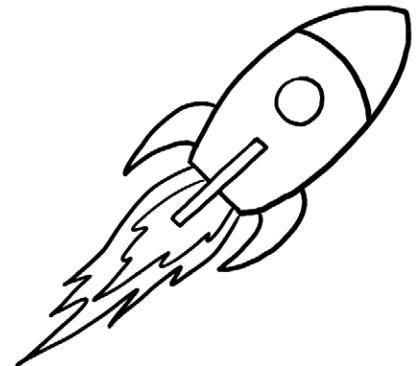
Too \_\_\_\_\_



Too \_\_\_\_\_



Too \_\_\_\_\_



Too \_\_\_\_\_

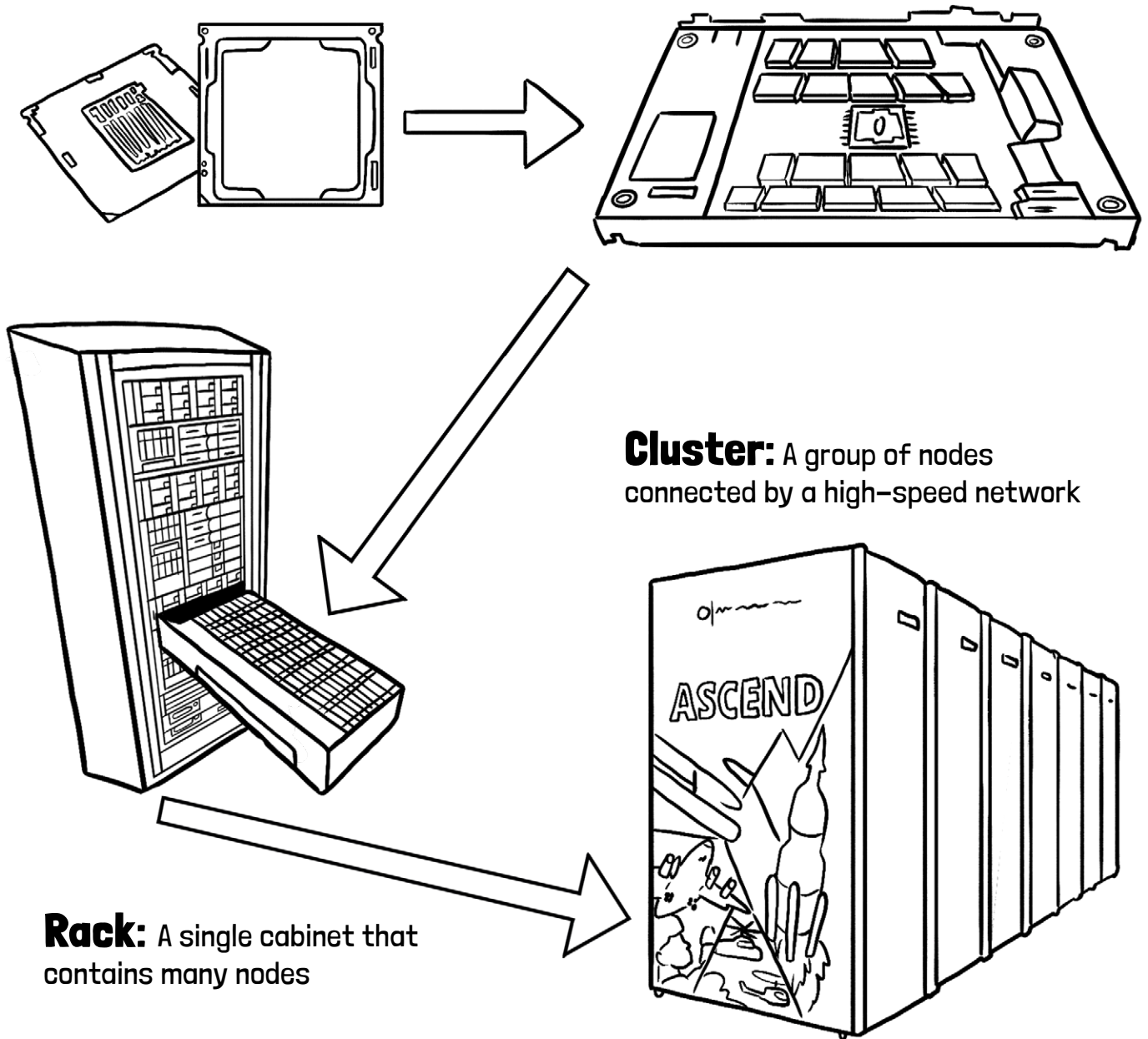


# Supercomputer Terminology

Modern supercomputers are built using the same basic components that go into commonly available desktop, laptop and tablet computers. They just contain a lot more of them! They require special buildings called data centers to house them and provide lots of space, power and air conditioning to cool them.

**Core:** The processing chips that are the brains of a computer

**Node:** A box that is equivalent to a single high-end computer



**Rack:** A single cabinet that contains many nodes

**Cluster:** A group of nodes connected by a high-speed network

# OSC's Supercomputers

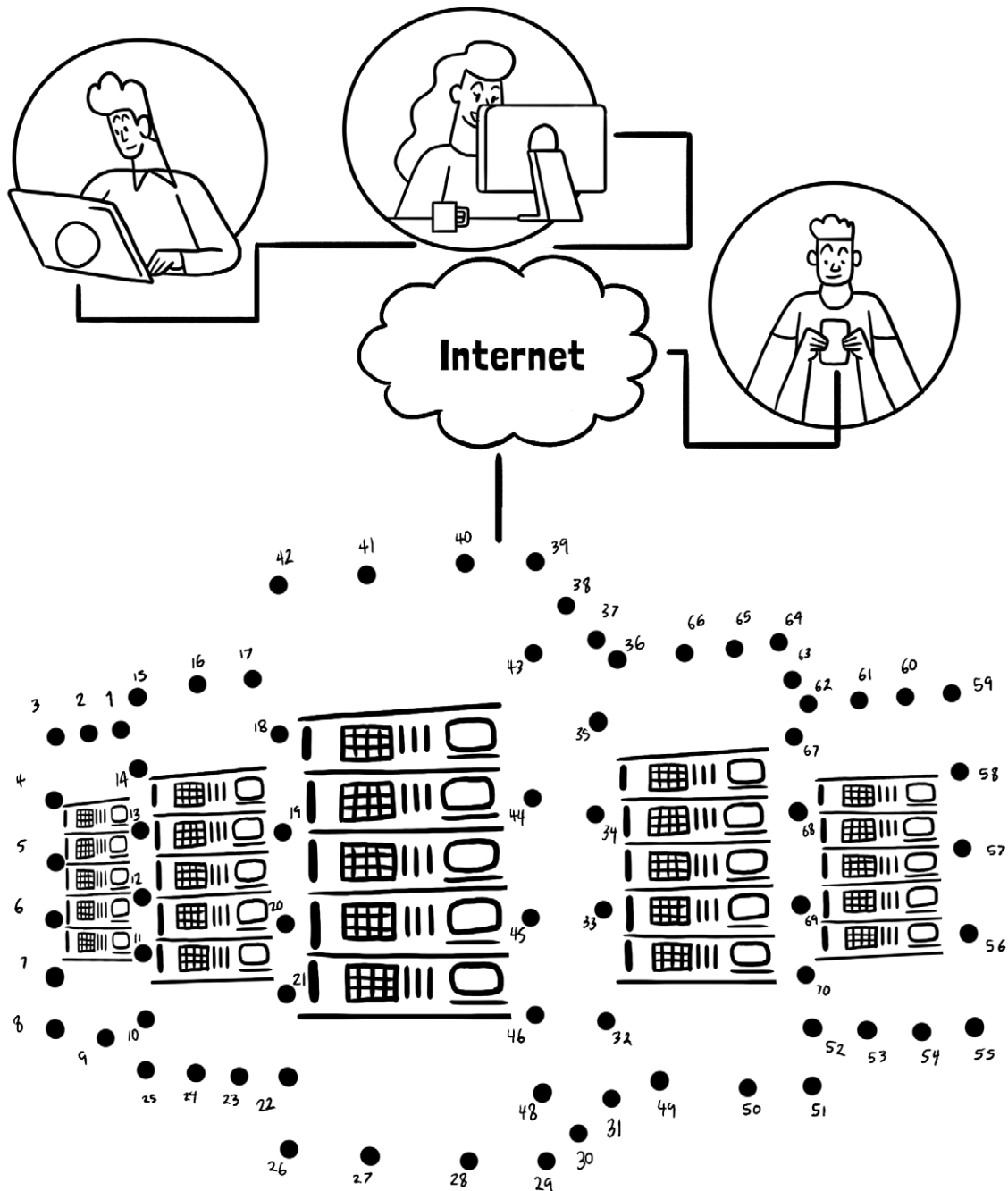
As of 2023, OSC has three supercomputers that cost more than \$16 million and contain more than 1,500 individual nodes and more than 55 thousand cores. OSC also has storage systems with a combined capacity of 20 Petabytes. OSC's newest supercomputer is called Ascend, which is inspired by Ohio's many aviation- and aerospace-related heroes and achievements.

**How many can you identify in the picture that is on the side of the supercomputer?**



# How to Use a Supercomputer

**Connect the dots!**



Researchers remotely connect to supercomputers over the internet using a standard web browser. They rely on a special software developed by OSC called Open OnDemand that is used by hundreds of supercomputers all over the world. Once connected to a supercomputer researchers use the same types of technical software they run on their personal computers.



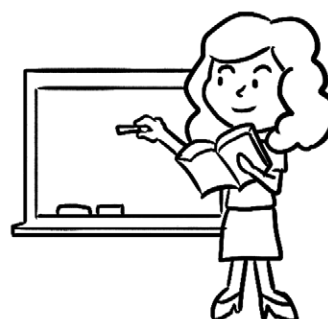
# Who Uses OSC's Supercomputers?

OSC's motto is "supercomputing for anyone, anywhere" because that represents the thousands of people from all over the world who use OSC's systems.

**Find examples of people and organizations that use OSC in the grid below.**

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | T | H | T | S | R | R | A | A | U | E | T | L | O |
| T | G | G | O | V | E | R | N | M | E | N | T | B | E |
| I | R | E | S | E | A | R | C | H | E | R | S | S | T |
| F | I | N | S | C | H | O | O | L | S | E | S | T | I |
| O | N | G | Y | T | D | S | D | N | C | S | R | U | S |
| R | D | I | T | D | S | E | H | R | O | T | E | D | T |
| P | U | N | L | A | E | K | I | D | S | D | H | E | S |
| N | S | E | U | T | N | N | E | P | I | O | C | N | I |
| O | T | E | C | C | E | S | S | B | I | F | A | T | T |
| N | R | R | A | A | E | N | O | Y | N | A | E | S | N |
| O | Y | S | F | E | D | L | S | S | N | E | T | E | E |
| S | E | I | T | I | S | R | E | V | I | N | U | O | I |
| H | O | S | P | I | T | A | L | S | T | T | S | S | C |
| Y | I | B | U | S | I | N | E | S | S | G | S | G | S |

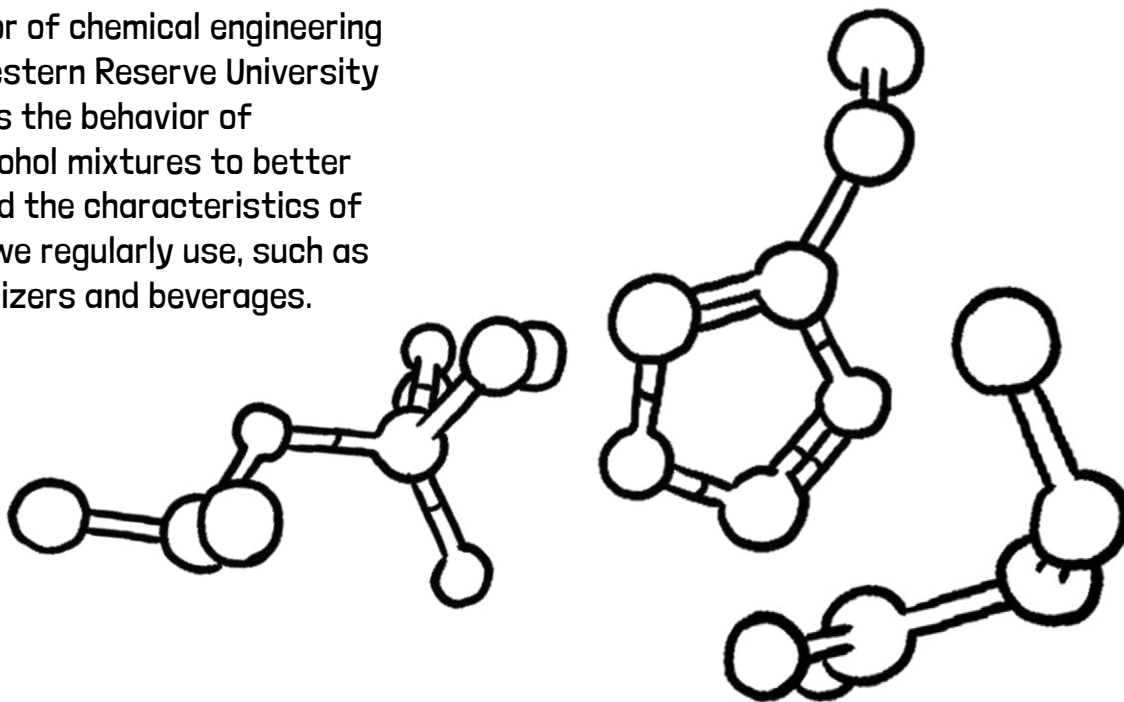
Anyone  
 Business  
 Engineers  
 Faculty  
 Government  
 Hospitals  
 Industry  
 Kids  
 Nonprofits  
 Researchers  
 Schools  
 Scientists  
 Students  
 Teachers  
 Universities



# OSC's Supercomputers in Action!

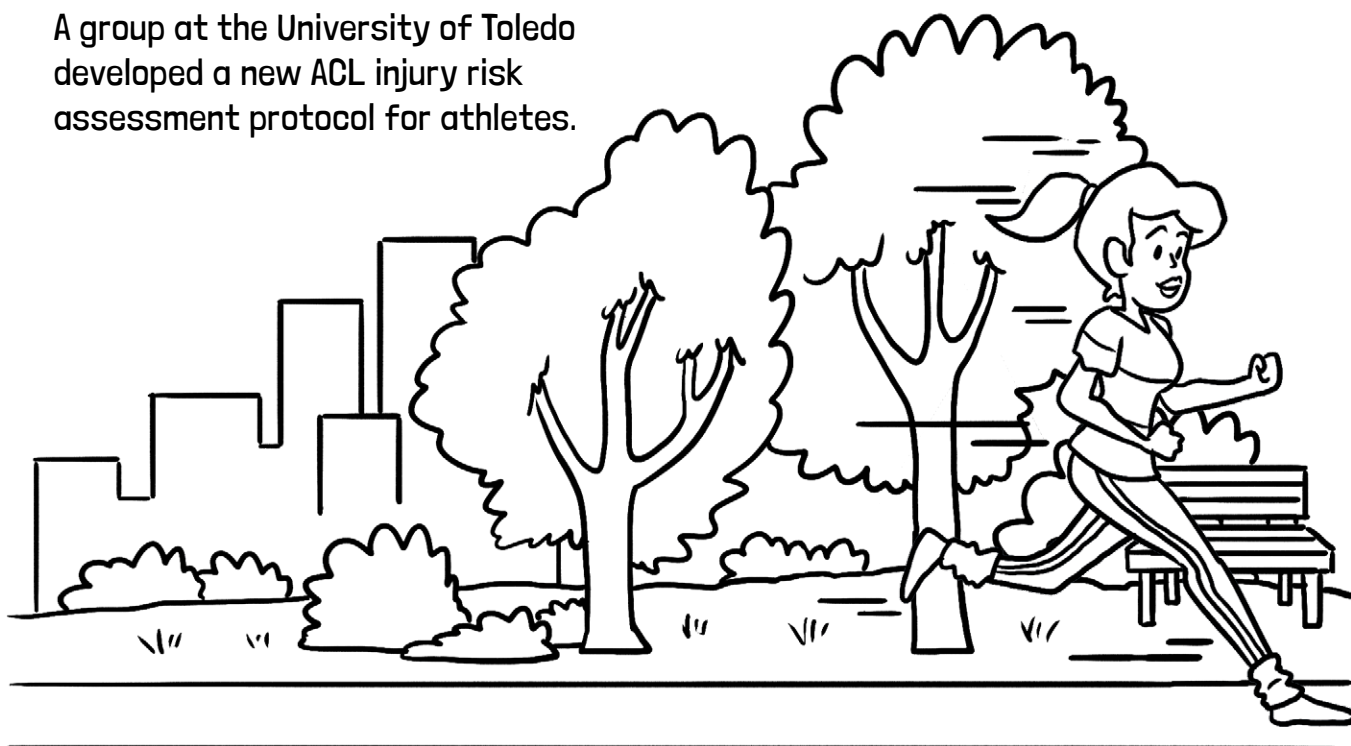
## Scientific Research

A professor of chemical engineering at Case Western Reserve University researches the behavior of water-alcohol mixtures to better understand the characteristics of products we regularly use, such as hand sanitizers and beverages.



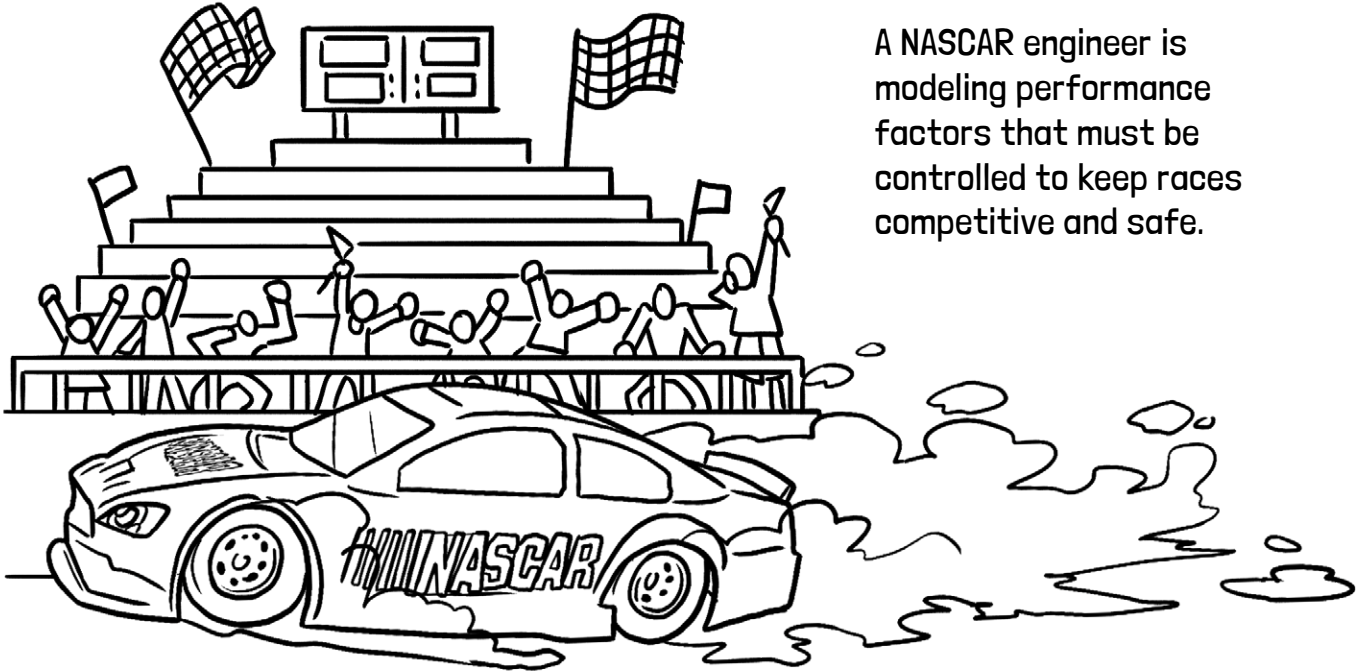
## Health Care

A group at the University of Toledo developed a new ACL injury risk assessment protocol for athletes.



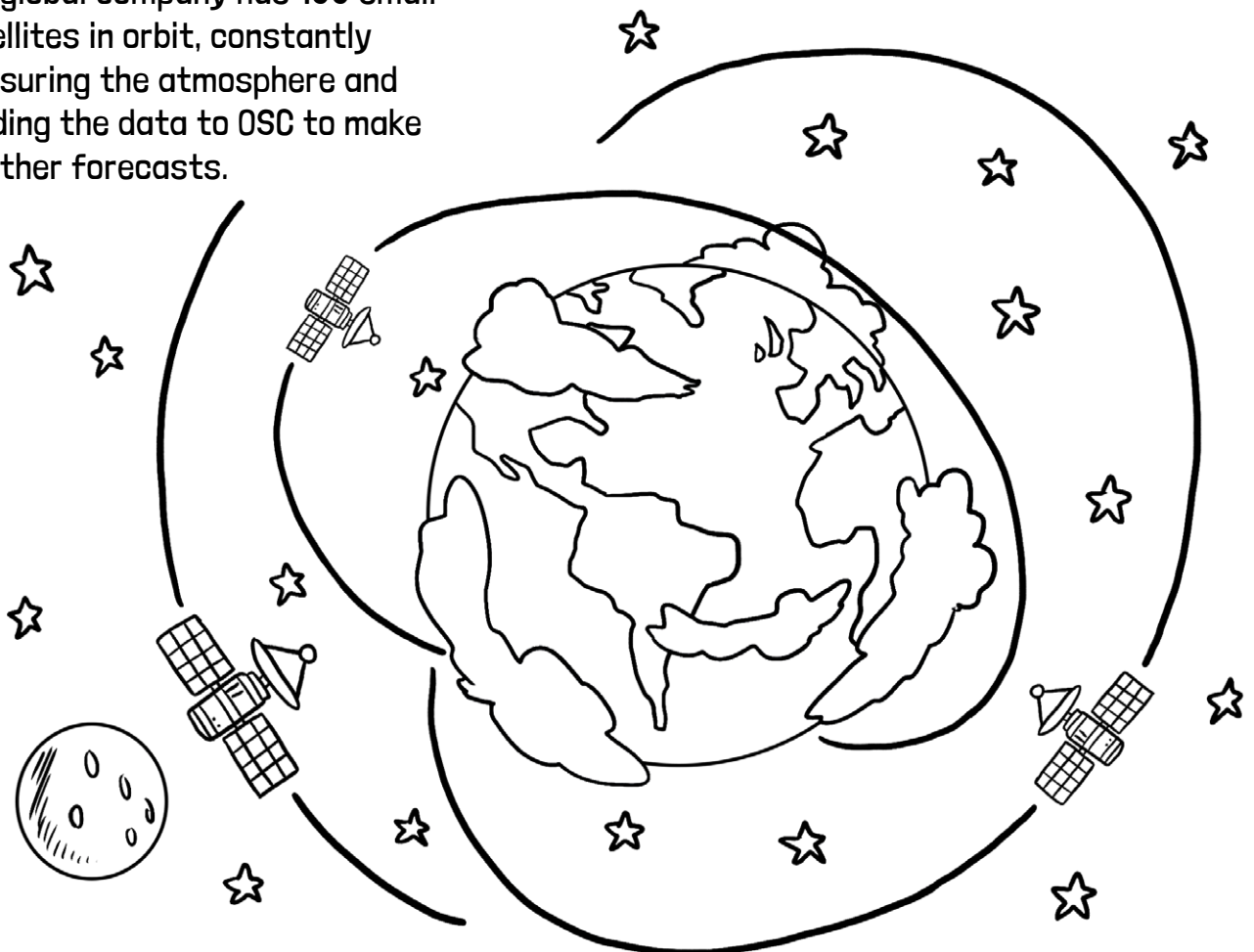
## Vehicle Design

A NASCAR engineer is modeling performance factors that must be controlled to keep races competitive and safe.



## Weather and Climate

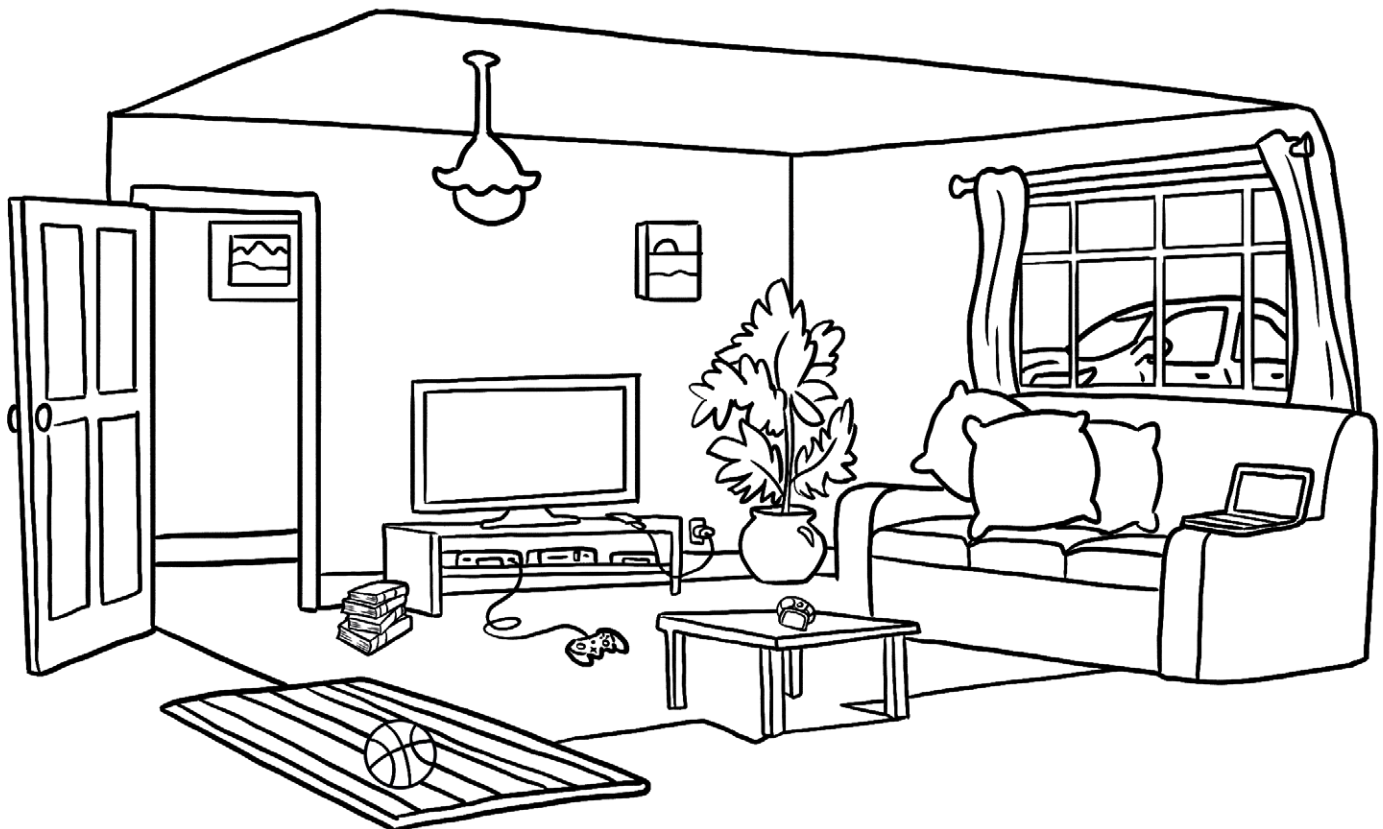
One global company has 100 small satellites in orbit, constantly measuring the atmosphere and sending the data to OSC to make weather forecasts.



# What's Next for Supercomputers?

Computer technology is constantly evolving. For example, a modern smartphone charger (just the power adapter itself) has 1,000 times the speed and double the memory of the Apollo Lunar Module that landed on the moon 50 years ago. Imagine all the amazing things everyday devices that contain computers will be capable of 50 years from now!

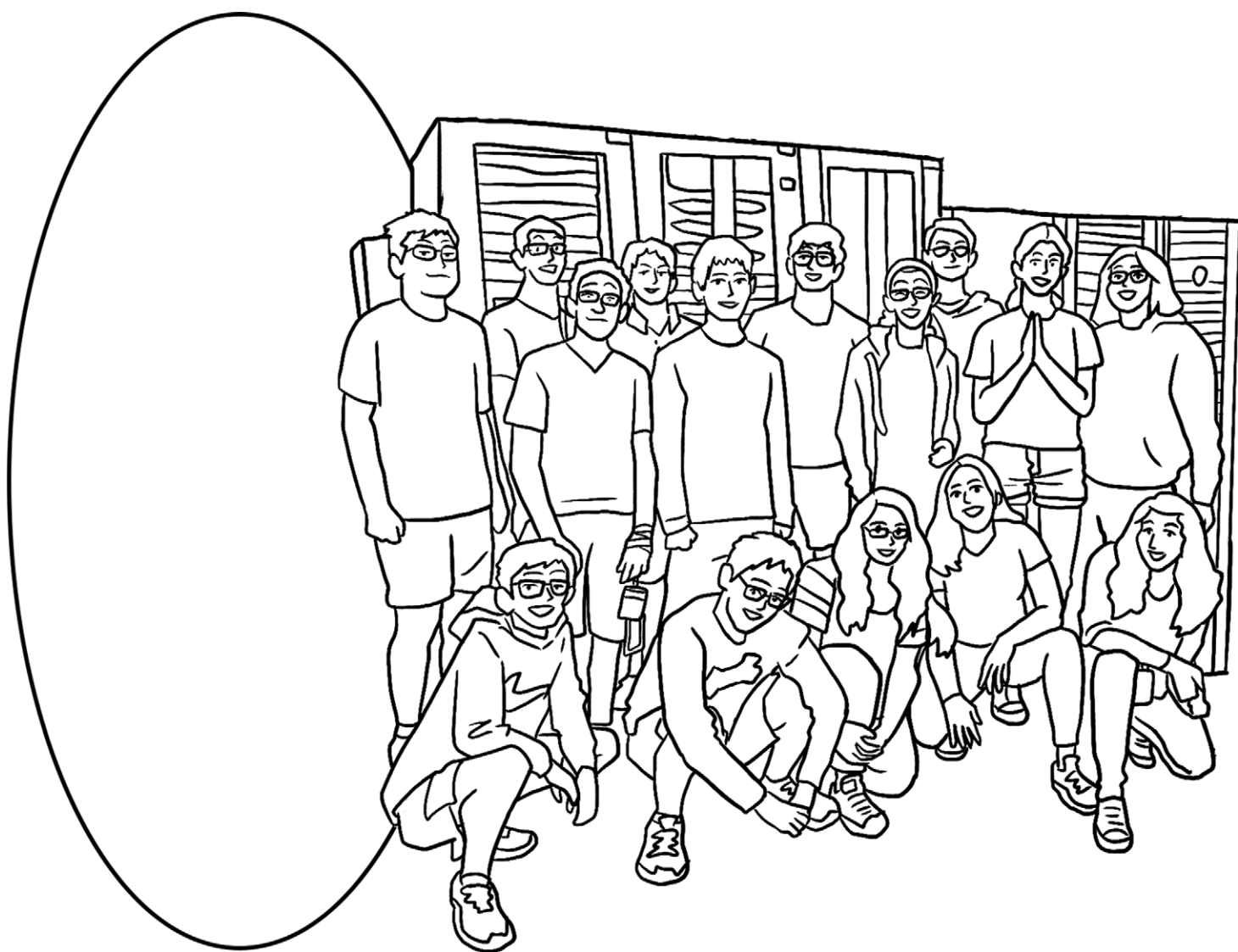
**Find common technology devices in the picture below.**



# Who Will Use OSC in the Future?

It could be you! Want to get started? OSC runs educational programs for students of all ages, including our summer programs for middle school and high school students, the Young Women's Summer Institute and Summer Institute. We also offer group tours of our facilities. Many of the students who participate in these programs will pursue careers that involve using supercomputers!

**Draw yourself here!**



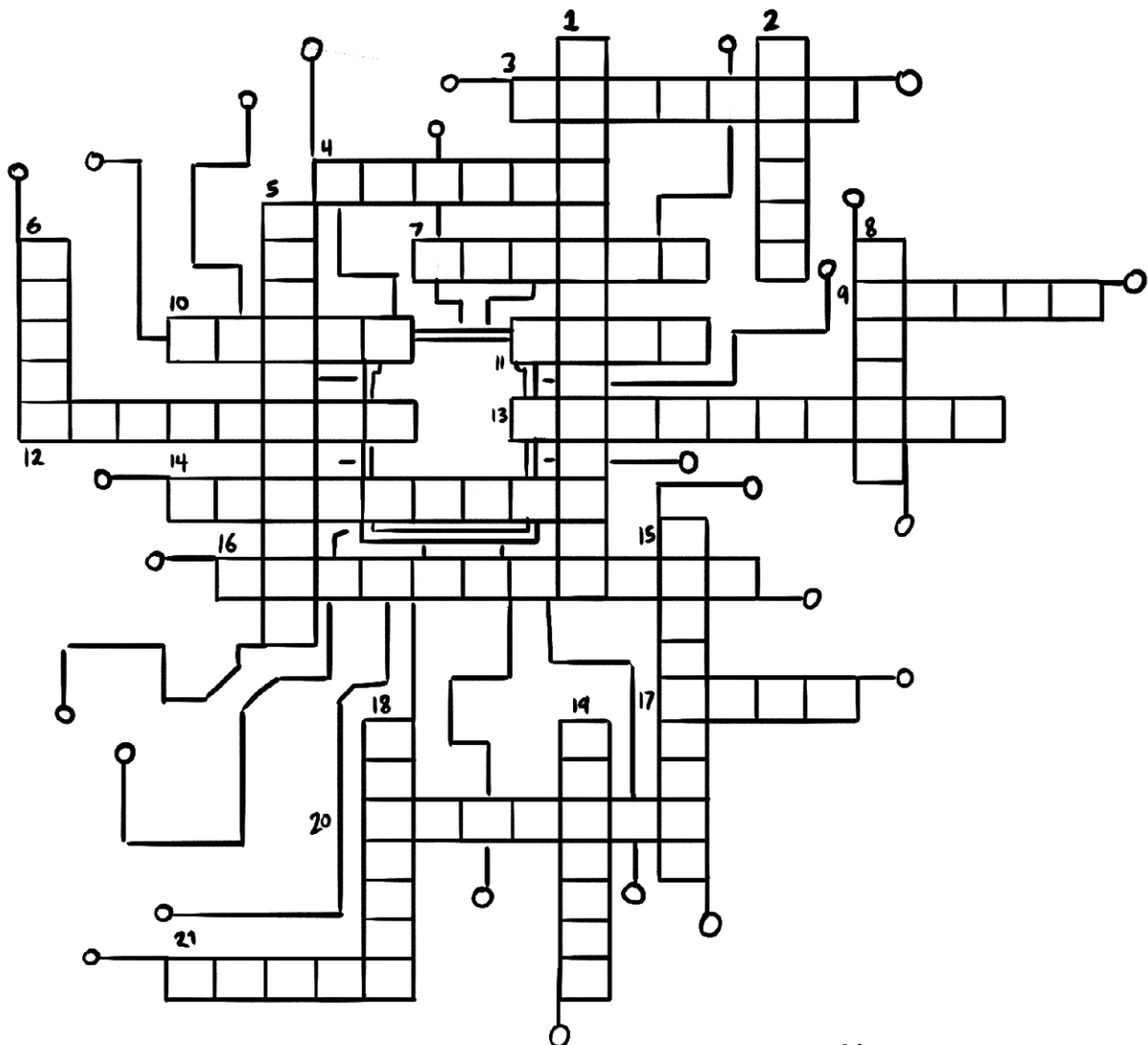
**Visit [osc.edu/summer](https://osc.edu/summer) to apply for one of OSC's programs and be part of the next group!**



# Technology Quotes

Use the bold words in the quotes below to fill in the crossword puzzle.

- Arthur C. **Clarke**: "Advanced **technology** is indistinguishable from **magic**."
- Isaac **Asimov**: "I do not fear **computers**. I fear the **lack** of them."
- Grace **Hopper**: "To me **programming** is more than an important practical art. It is also a gigantic undertaking in the foundations of **knowledge**."
- Bill **Gates**: "The **microprocessor** is a **miracle**."
- Stephen **Hawking**: "To pursue a **career** in the 21st century, basic computer programming is an essential **skill** to learn."
- Katherine **Johnson**: "There will always be **science**, **engineering**, and technology."
- Steve **Jobs**: "Computers themselves, and **software** yet to be developed, will revolutionize the way we **learn**."



# Activity Answers

## Page 1

Kilo : Bottle  
Mega : Refrigerator  
Giga : House  
Tera : Ship  
Peta : Trucks  
Exa : Lake

## Page 5

Astronaut: Kathryn Sullivan  
Cargo Plane: U.S. Airforce C-17  
Helicopter: U.S. Navy HRS-1  
Pilot: Colonel Benjamin O. Davis, Jr.  
Plane: 1908 Wright flyer  
Rocket: NASA Orion capsule / SLS  
See [osc.edu/ascend-launch](http://osc.edu/ascend-launch)  
for more details

## Page 12

Across

3. Miracle  
4. Career  
7. Hopper  
9. Skill  
10. Magic  
11. Jobs  
12. Software  
13. Technology  
14. Computers  
16. Engineering  
17. Lack  
20. Hawking  
21. Learn

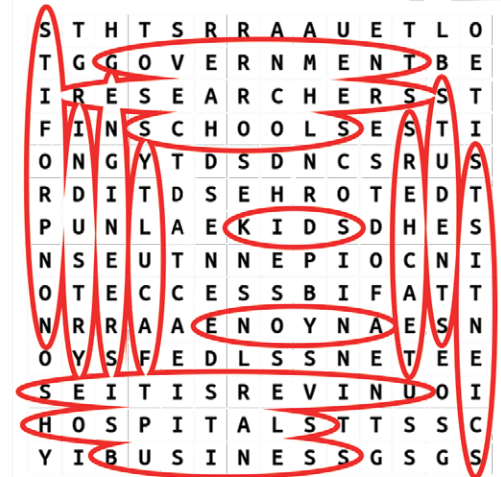
Down

1. Microprocessor  
2. Clarke  
5. Programming  
6. Gates  
8. Asimov  
15. Knowledge  
18. Johnson  
19. Science

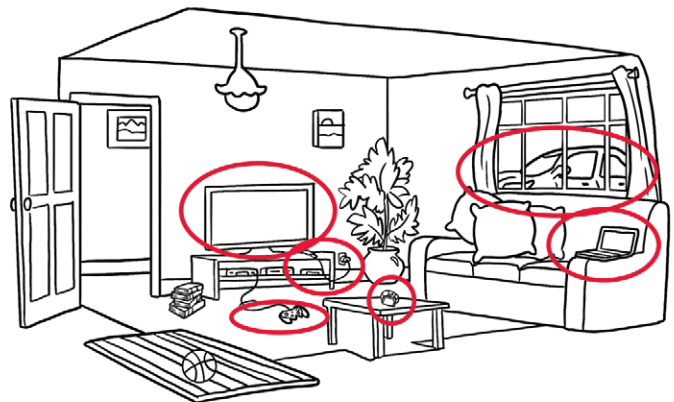
## Page 3

Atom : Small  
DNA : Complex  
Racecar : Fast  
Rocket : Dangerous  
Saturn : Remote  
Tornado : Big  
  
There are other possible solutions

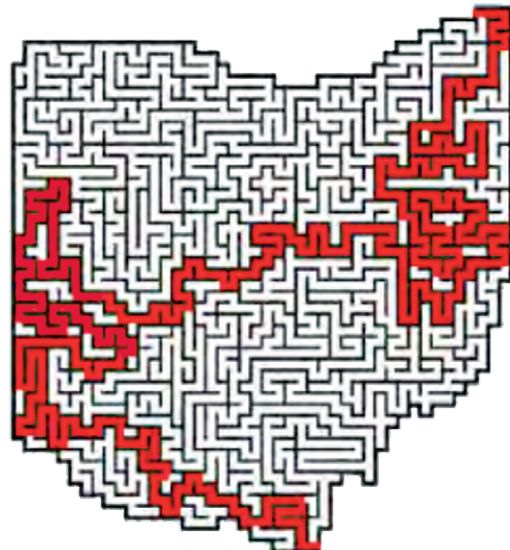
## Page 7



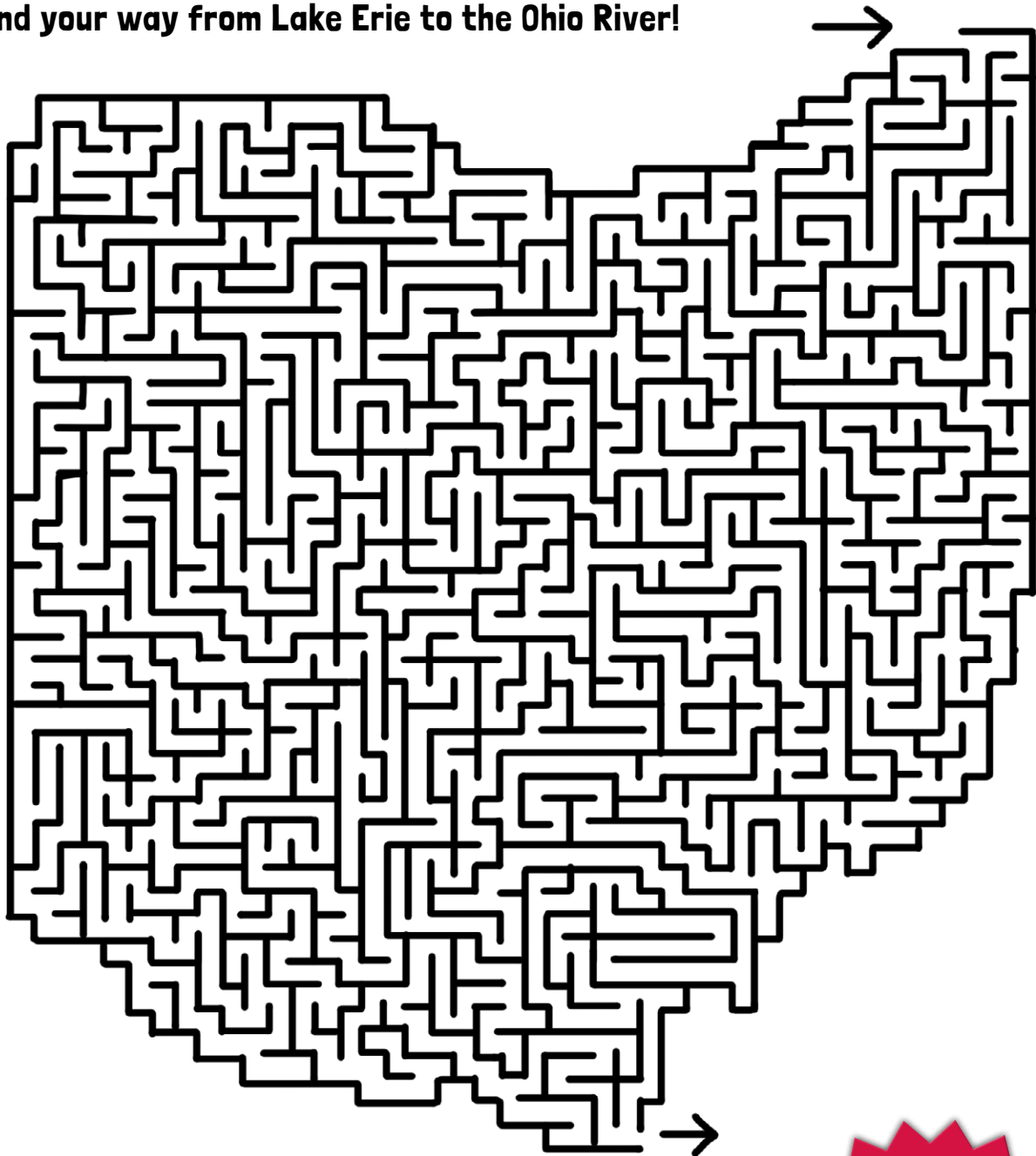
## Page 10







## Back Cover



**Find your way from Lake Erie to the Ohio River!**



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