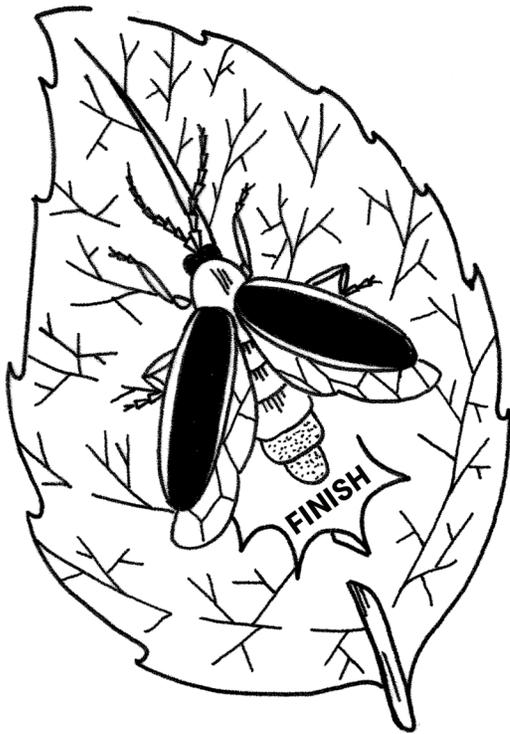


Firefly Maze

A firefly can light up when oxygen is added to the other chemicals in its light organ.

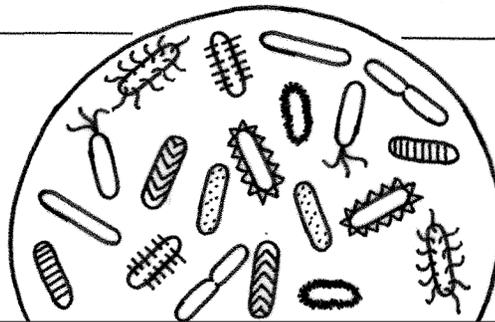
Get the oxygen to the firefly's light organ, so that it can light up!

O₂ START



EMMETT CHAPPELLE INVENTOR OF BIOLUMINESCENCE TECHNIQUES

National Inventors Hall of Fame Inductee Emmett Chappelle is a biochemist. Chappelle studied **bioluminescence**—an organism's ability to produce and emit light. He figured out how to use this super power of nature to create bioluminescence techniques that would allow us to detect life on Mars and monitor crops here on Earth.



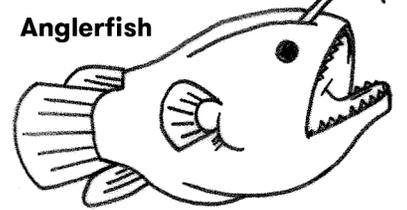
Living Light

Emmett Chappelle figured out that the number of bacteria in water could be measured by the amount of light they were giving off.

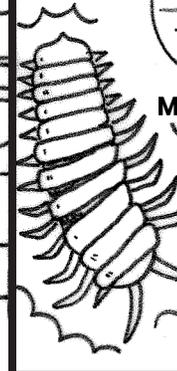
Find the 10 pairs of matching bacteria in this petri dish.

Color the Glow

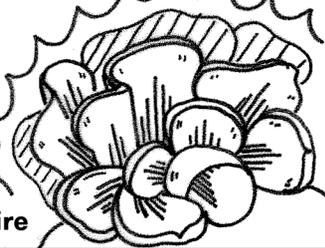
Anglerfish



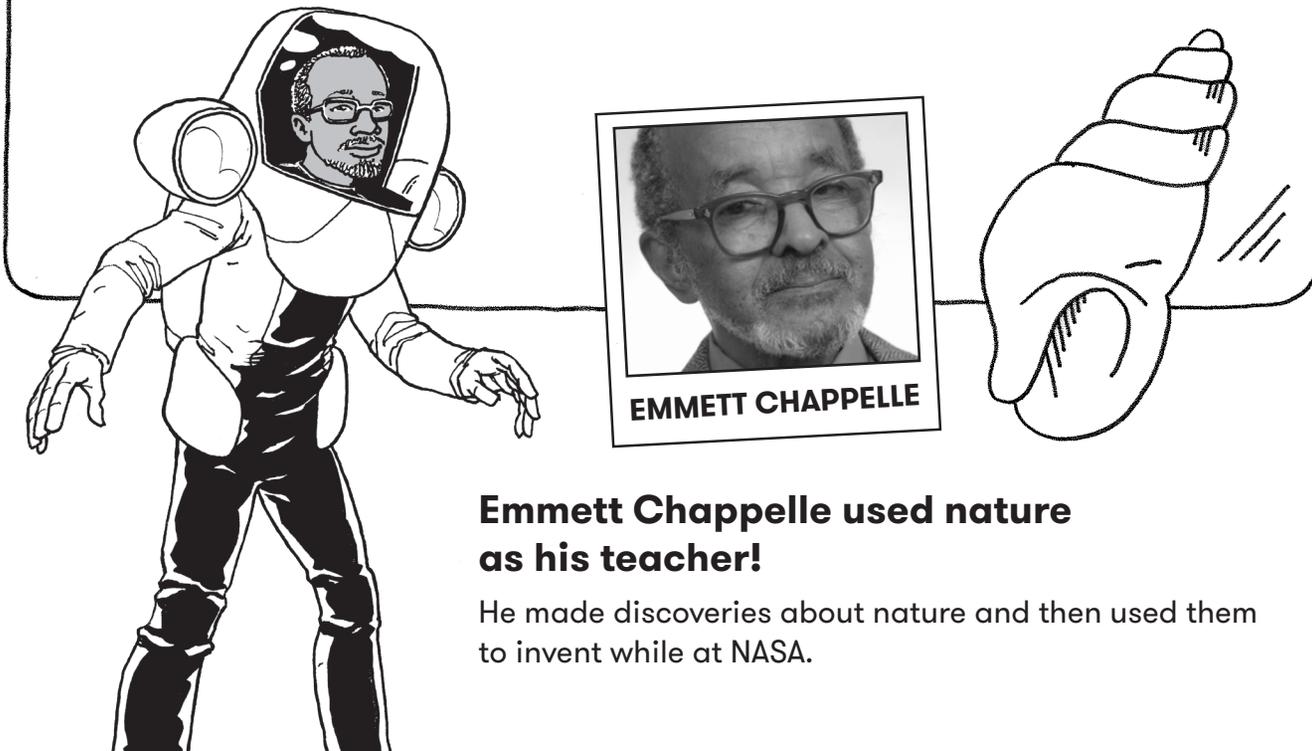
Motyxia



Foxfire



Be inspired by nature and draw a new invention prototype here!



Emmett Chappelle used nature as his teacher!

He made discoveries about nature and then used them to invent while at NASA.



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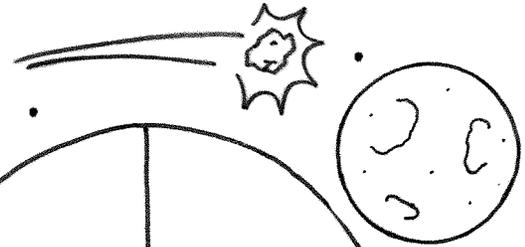
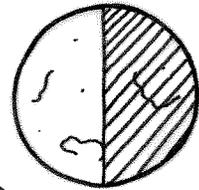
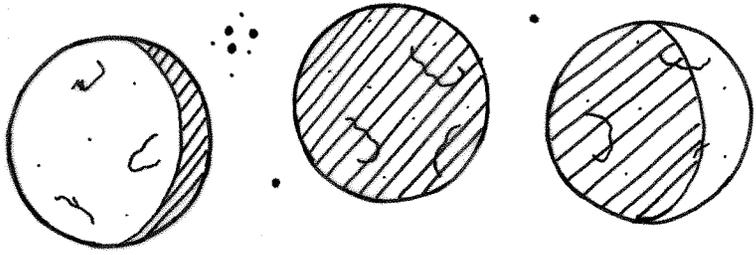
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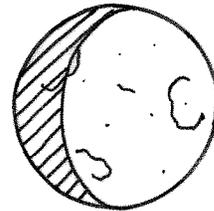
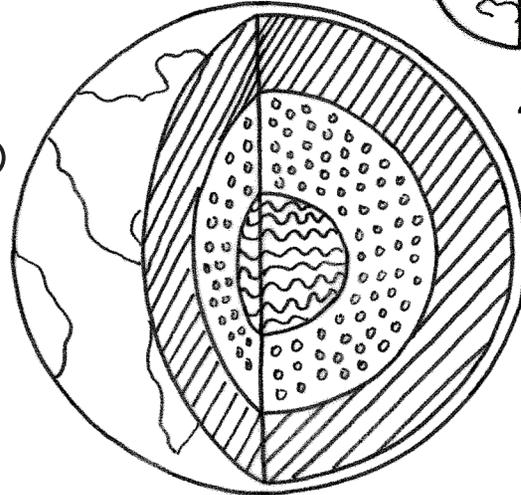


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GEORGE ALCORN INVENTED THE X-RAY SPECTROMETER

National Inventors Hall of Fame Inductee
George Alcorn is a physicist and engineer known for his work with space technologies. His invention analyzes x-ray light patterns and has been used to map planets and search for new ones.



Create A Planet

Hundreds of new planets in other solar systems are being discovered right now! Sketch a new planet of your own using the key.

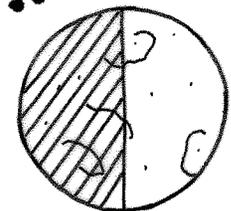
Key

-  **ROCK**
-  **GAS**
-  **ICE**
-  **LAVA**
-  **WATER**
-  **SAND**
-  **MUD**

Moon Phases

Have you ever seen a full moon? How about a moon shaped like a banana?

As the Earth rotates around the Sun and the Moon rotates around the Earth, the Sun lights up different parts of the Moon and creates the phases.



Moon Phase 101

See if you can find the Moon in each of these phases on this page.



New Moon



Waxing Crescent



First Quarter



Waxing Gibbous



Full Moon



Waning Gibbous



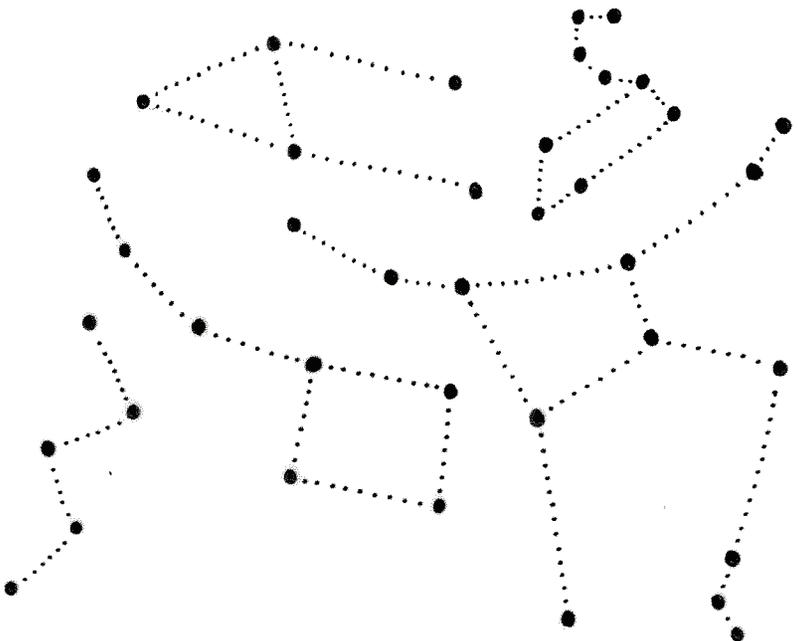
Last Quarter



Waning Crescent

Start Gazing

Connect the stars to create some of the shapes found in the night sky. Tonight, look up and see what shapes you can see!



Draw an outer space-themed invention here.



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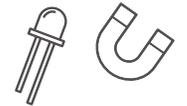
CREATE!



EXPLORE!



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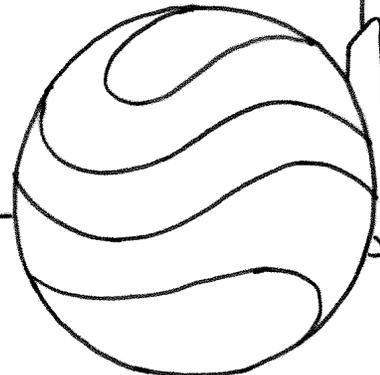
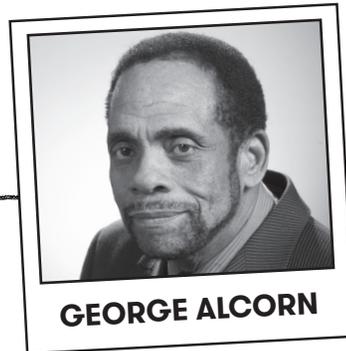
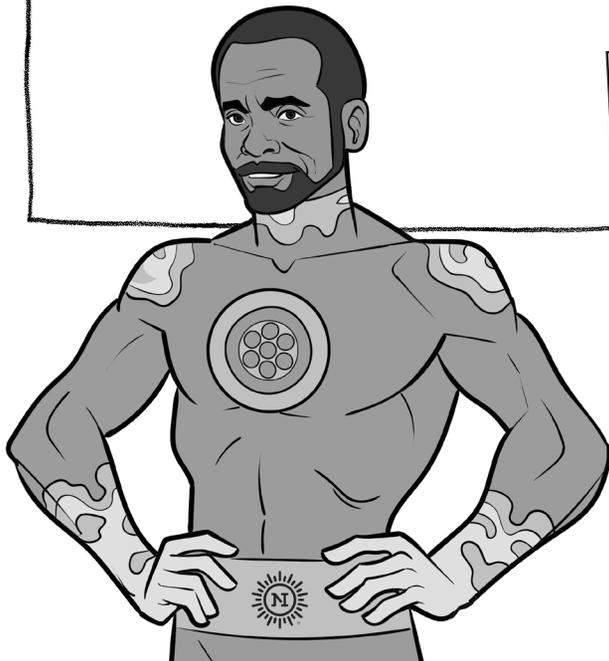
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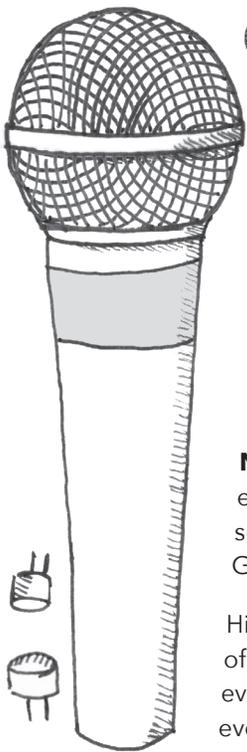


National Inventors Hall of Fame®



George Alcorn got an early start!

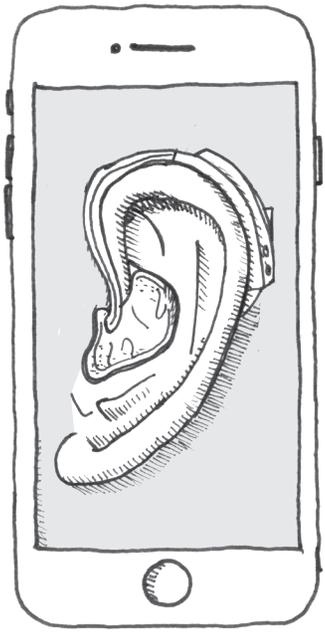
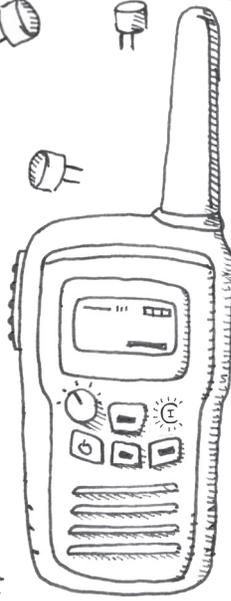
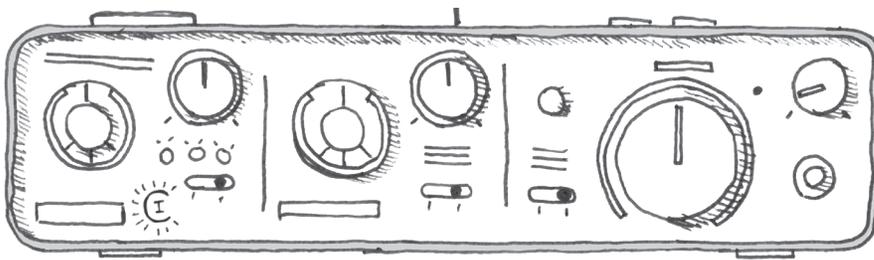
He spent hours under hoods of cars with his father, who was an expert mechanic. This helped George begin to understand how machines work.



JIM WEST INVENTED THE ELECTRET MICROPHONE

National Inventors Hall of Fame® Inductee Jim West is an expert in acoustics – the branch of physics that studies the science of sound and how it travels. He and his coworker, Gerhard Sessler, invented the **electret microphone**.

His microphone is tiny, lightweight and inexpensive. Ninety percent of today's microphones are electret microphones. They are used in everyday items like phones, tablets and hearing aids. In fact, almost everything on this page has an electret microphone in it!



SOLVE THE CODE!

⋮ ○ ▷ ○ ▷

⋮ ▷ Ⓞ ☺ ▷ ▮ + Γ

KEY:

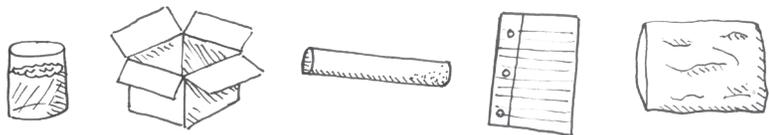
A	B	C	D	E	F	G	H	I
○	⊙	◎	⊘	☺	⚡	⊖	⊕	⋮
J	K	L	M	N	O	P	Q	R
⊣	⊢	≡	▷	▷	+	/	└	Γ
S	T	U	V	W	X	Y	Z	
•	▮	x	Ⓞ	⊕	⚡	⊖	⊖	

MAKE SOME NOISE!

Visit each room in your home. What objects do you see that could make noise? How could you combine them to make interesting sounds?



Experiment with materials in your house to amplify or quiet the sounds you make. How can you make them louder or softer?



Sound waves bounce all around a room! Did you know that our ears funnel sound, squeezing it into a small space to make it louder?

Electret microphones look like this. → 
Circle all the electret microphones you can see on the page! How many can you find? (answer on reverse side)

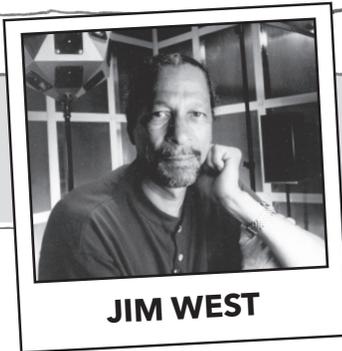


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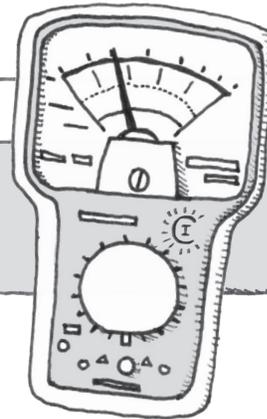
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Answer: There are 17 electret microphones!

Design a brand new invention that uses an electret microphone!



JIM WEST



Jim West's passion for the science of sound comes through loud and clear!

As Jim is out and about in his daily life, it is not uncommon to see him using an app on his phone to measure the levels of sound in a room. For Jim, the world is a symphony, and he invites us all to tune in and be instruments of innovation.



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MARSHALL JONES INVENTOR OF THE INDUSTRIAL LASER

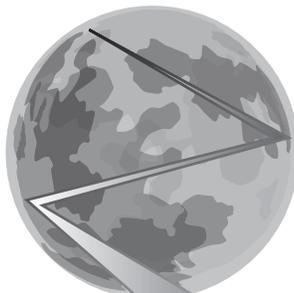
Industrial lasers emit precise, high-energy light and have helped shape our world in more ways than one. From cutting and welding machine parts in a factory, to surgery that improves our vision, to scanning DVDs and unlocking their stored data, lasers are paving the way for future innovation.

BARCODE KEY

Match the letters with the corresponding number in the barcode below.

A = 1 B = 2 C = 3
 D = 4 E = 5 F = 6
 G = 7 H = 8 I = 9
 J = 10 K = 11 L = 12
 M = 13 N = 14 O = 15
 P = 16 Q = 17 R = 18
 S = 19 T = 20 U = 21
 V = 22 W = 23 X = 24
 Y = 25 Z = 26

MOON BEAM



Did you know astronauts put mirrors on the moon? Back on Earth, scientists bounce lasers off the mirrors to calculate the distance to the moon and gather data on the ocean's tides.

What might you invent to explore the moon and beyond?

Unscramble the letters below cut out by the **Industrial Laser**, invented by National Inventors Hall of Fame® Inductee, **Marshall Jones!**

(Answer on Back)

**PCMA
ONINEIVTN**



14 5 22 5 18 7 9 22 5 21 16

Can you decode the barcode to reveal Marshall Jones's hidden message?

(Answer on Back)

STRAIGHT TO THE POINT

Did you know Industrial Lasers have been used to:

Weld metals together



Cut through titanium and steel



Move microscopic particles with an optical tweezer



Read bar codes





The Industrial Laser has just cut out an amazing _____
 (Fill in the blank)
 that is going to be used to _____
 (Fill in the blank) Sketch your invention here!

“NEVER GIVE UP”



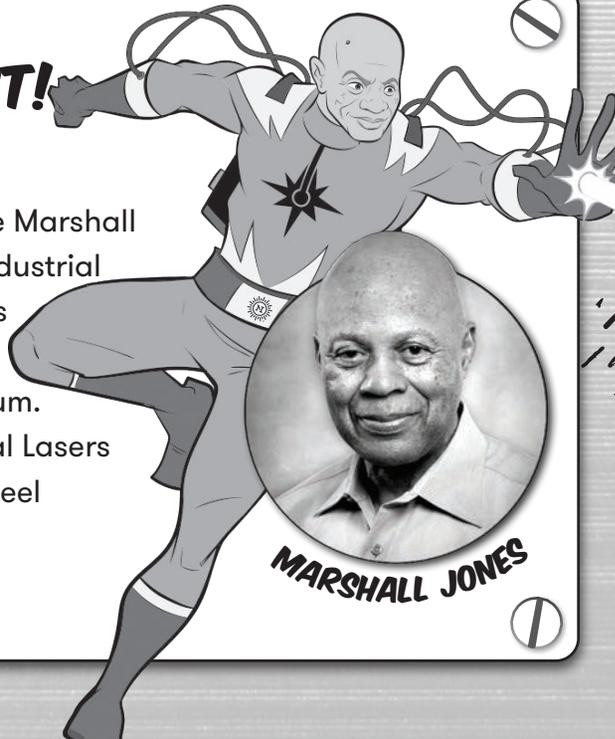
Barcode Answer:



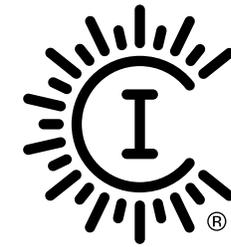
A CUT ABOVE THE REST!

Lasers use light in powerful ways.

National Inventors Hall of Fame Inductee Marshall Jones invented new methods of using Industrial Lasers. Thanks to Jones, Industrial Lasers can be used to weld different types of metals together, like copper and aluminum. His research also led to making Industrial Lasers so powerful that they can cut through steel and titanium!



MARSHALL JONES



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 Congratulations!



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