

Curriculum Guide



IMPOSSIBLE



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The thrill and excitement of the circus dates back hundreds of years. Today, we welcome a bold new circus to the scene, one which has reimagined our need for community and unified our celebration of the vast potential of the human spirit. Audiences behold amazing feats of human strength and daring, balancing and juggling, and joy and comedy. We celebrate our diversity and honor the incredible passion and dedication of our artists and team who have created the ground-breaking adventure redefining circus for now and always.

Welcome to OMNIUM: A Bold New Circus!



How do seemingly ordinary people perform such extraordinary feats? The amazement of the circus provides a perfect platform for the study of STEAM (science, technology, engineering, art, and mathematics), literature, history, social studies, arts and physical education, adaptable to all grades and ages. We also provide conversation starters about diversity, equity, and inclusion. This curriculum guide takes students on a delightful educational journey through Omnim circus. Each entry highlights applicable core curriculum standards and provides activities, questions, and a bibliography. Please use this guide as a starting point for your own creative adventure into the world of circus education. The more you know, the more amazing the circus becomes!

Circus History

Circus performers have been entertaining audiences for thousands of years. Jugglers appeared in the courts of kings, and acrobats performed in the Greek amphitheaters. The circus as we know it today started in England in 1768 with Philip Astley. Philip Astley was a horseman in the British cavalry and served in the French and Indian War. After his service, he wanted to share his knowledge and love of horses with others, so he opened a riding school. To promote his school, he put on “displays” in a circular space so that everyone could see. This led him to discover the wonder of centrifugal force. Astley “discovered that if he trained his horse to canter in a circle at a constant speed, while both he and his horse were leaning slightly inward, centrifugal force would help him keep his balance. He also discovered that a horse cantering in a circle of a certain size would provide just the right amount of force for achieving the most graceful balance” (John Culhane, *The American Circus*). He determined that the perfect diameter for the ring was 42 feet—the same size as the circus ring today!

The display was a hit, so Astley added more acts. The first was a trick rider who jumped on and off, changed his clothes, and flipped over and under the horse all while it was cantering! As more acts were added, the display became known as a circus, based on the Latin word for ring. The circus became so popular that Astley soon opened another



one in Paris. Other show promoters, businesspeople, theater producers, and former students took the idea of a circus, created their own version, and made it the most popular form of entertainment all over Europe.



The first American circus appeared in Philadelphia in 1785. President George Washington was in the audience to see it! Soon, circuses popped up all over the United States. Since the U.S. was a new country, there were very few large cities, so in order to reach a significant number of people, the circus had to travel. At first, circuses constructed buildings to house the ring in every town they went to. This took a long time and was very expensive. In the mid-nineteenth century, circus owners replaced the buildings with tents, which they could pack up and travel with in trucks or trains. This made traveling much easier.

The circus became so efficient that both the United States military and Kaiser Wilhelm’s German army studied its methods in an attempt to improve their own logistical operations. Hundreds of different circus shows toured the country at the same time. There aren’t many touring circuses like Omnium Circus left today.

Circus History



Comprehension and Discussion Questions:

How did the circus get its name?

Why does the circus perform in the ring?

When was the first circus created?

What else was happening in Europe at this time?

When was the first circus in America?

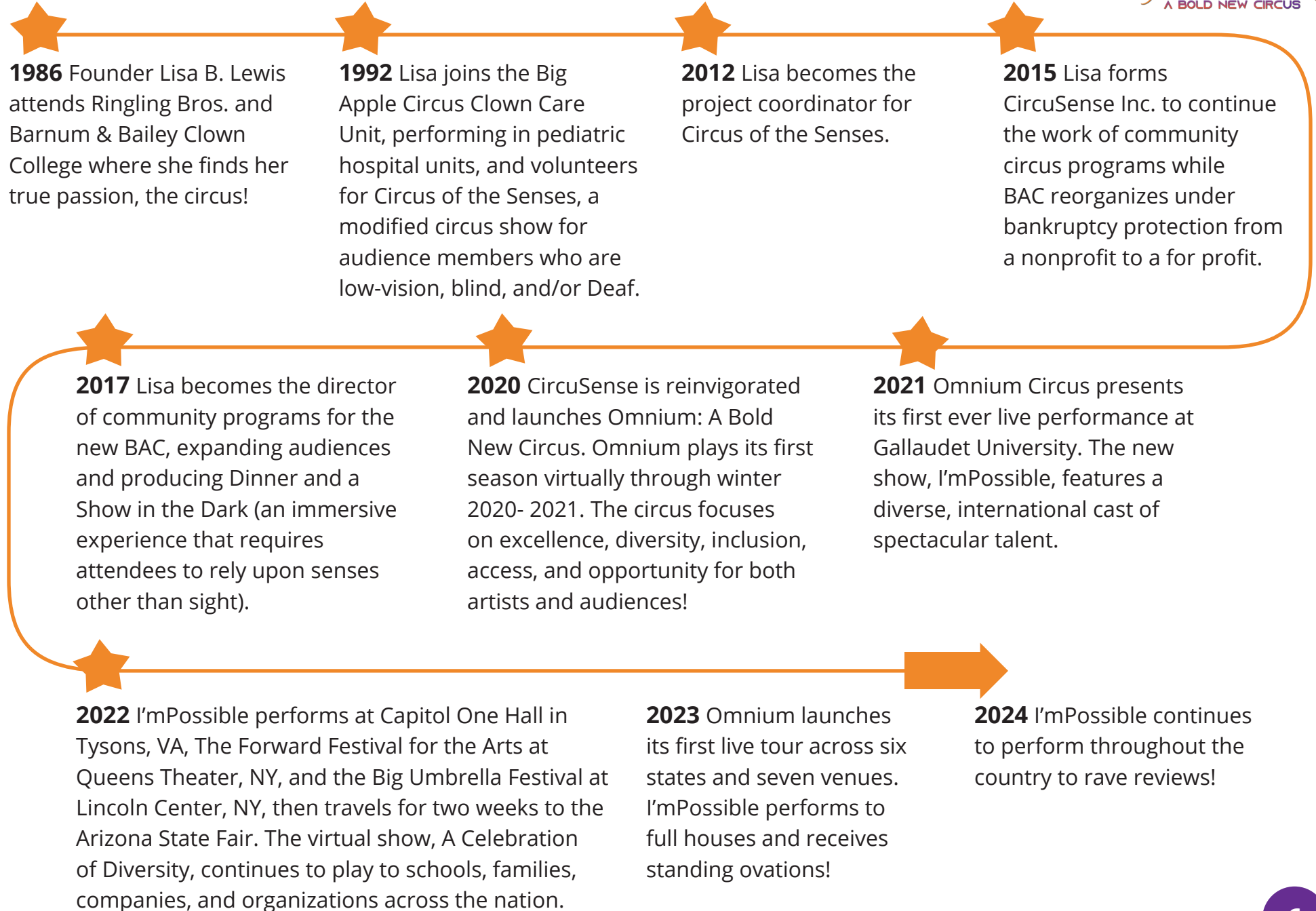
Which elements of our society at that time made it easier or more difficult for circuses?

Which part of the traveling circus inspired military minds around the world?

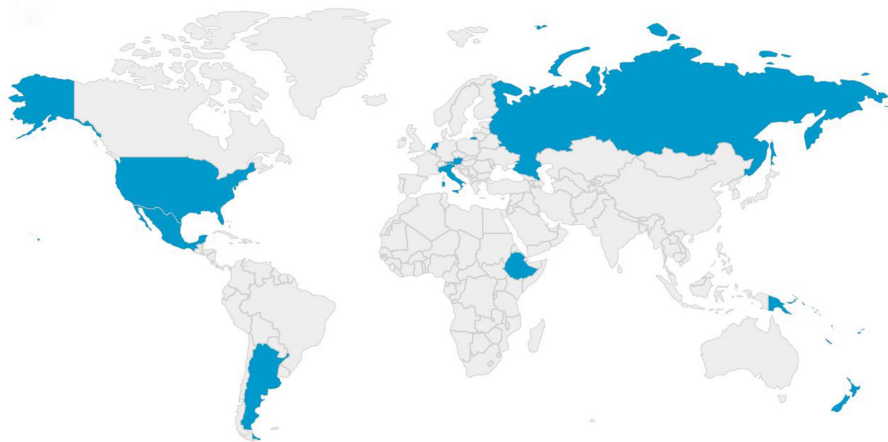
How are modern circus performances different from ones 200 years ago?

Where can you see a Circus? In a tent? In a theater? In a park?

Omnium Circus History



Omnium Circus Fun Facts



There is a beautiful rainbow of melanin levels among the company with various races and complexions represented.

The cast of I'mPossible come from nine different countries: Argentina, Austria, Ethiopia, Holland, Italy, Mexico, Pacific Islands, Russia, United States



★ Two performers use wheelchairs

- ★ One performer is Deaf.**
- ★ Three performers are from multi-generational circus families.**
- ★ Three acts are performed by married couples.**
- ★ Two performers have set Guinness world records.**

Elements of the Circus

Circus gets its name from the ring, but it is also defined by the artistry within the ring. Circus is distinct from theater, dance, and other performing arts although it incorporates aspects of many of them. Circus performance is filled with a sequence of variety acts showing the agility, grace, and strength of human and (traditionally but not always) animal performers. The acts fall into distinct categories, though individual acts often include elements from more than one category.



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Circus Vocabulary



Acrobat: A person who uses gymnastics in their act

Act: A display of skill and dexterity by a person or group of people

Aerial: An act performed on equipment hanging in the air above the ring

Aerial Silks: A piece of fabric attached to a point above the circus ring and hanging down into it for an artist to perform on. The fabric may be hung from the middle, so two pieces swing loose, or it may be folded or tied at the bottom to make a hanging loop.

Applause: When the audience claps to show appreciation

Audience: The people watching the circus

Charivari: A high-energy opening act that usually includes most of the cast performing a series of short acrobatic skills in rapid succession ("chari-vari" means noisy celebration)

Company: All of the performers, crew, and staff

Costume: What a performer wears during the show

Contortion: The art of bending and twisting one's body

Cyr Wheel: An acrobatic apparatus that consists of a single large ring made of aluminum or steel with a diameter slightly taller than the performer.

Diabolo: A circus prop, derived from a Chinese yo-yo, that consists of two cups connected in the shape of an hourglass that is spun on a string attached to two hand sticks.

Hand Balancing: An act of incredible strength and balance in which one or more acrobats use their hands to balance and perform feats of great strength and dexterity.

Juggling: The art of throwing, catching, and manipulating balls, clubs, rings, and other objects

Slack Wire: A loose wire hooked to a stand at either end. The balance is extremely difficult as the wire is constantly in motion.

Ringmaster: The person who guides the audience through the performance

Unicycle: A cycle with a single wheel.

Word Search



Search for all 19 Circus Vocabulary words here. Words can go any direction. Good luck and Have fun!

B P V
 C D P Y X M M M P
 M E V C N Q P D J G Y X L
 D R A Z R I S O C Y X U W W C A Z
 Z I C J V M W S A E N U U H G X U G H
 H K R W G N M K L O K D V D H G M E G Y K
 A O H V G D L Q M W J Y U S Z T T F C S C
 N B W C X G I G E Y G K C E A Y U D F Q Q O T
 A T G V U S P Q C K G O W C J L F A G I T S E
 T W T W O L I D Y L D V O I N D U P V N J N T J N
 L T D I A H N R Q J O P A N E H Y W P E F Q U E K
 H V V I H N W A U C T M R D I I U X W A P H M S L
 H T A R J G H O G G C F M C L D A A L G Q W S E E A B
 H C E N H E U F I X R H H J T U D Q V A D P A Q X I R
 D A R G E O Z Z D T T O A U H A N D T O H A N D R R Q
 Z D L G B Y Y U I R R V R X L U Y J S U O B U E E
 T F X A N A D I A B O L O I U W I M Z F A O T X A
 F V F D E I I M Y J J T T R V C B E X I J S P P C
 M W F C Q L N Y N M D N U G A J T J Z A C B N
 H Y D Q L U G B W A X R O E H R X M M K R L E
 P U L A F E G W N P Y V C S C I G Q U Y J
 K P Q L H T S U C K M T R Y F N G C W Z U
 N O H F I Y T J Y I O P I I V G G S M
 J L W G B L R U M Q C R Z N S R U
 E I L Q O I J Q Z N I Q U
 D W G L A G W R U
 A G N

- ACROBAT
- AERIALSILKS
- CHARIVARI
- COSTUME
- EQUESTRIAN
- JUGGLING
- RINGMASTER
- ACT
- APPLAUD
- COMPANY
- CYRWHEEL
- HANDTOHAND
- POLE
- AERIAL
- AUDIENCE
- CONTORTION
- DIABOLO
- HULAHOOP
- RINGCURB

Women in Circus

Circus women are a unique, strong, talented, and accomplished group. The same can be said for many circus people, but many women have had to overcome greater societal barriers to be a part of the circus. Historically, performing has been a male-dominated industry. But the circus has no place for sexism or racism, and Omnium Circus promotes inclusivity and diversity. Omnium Circus celebrates the accomplishments of circus women past and present, and we are proud to feature many talented women in every show!

Like many circus children, Annie was trained in acrobatics and other circus skills, and since her mother was a good musician, she was also given a musical education.



Annie Fratellini



As for her clowning skills, she just had to watch her large family's comedy and clown acts to learn all the basics. Annie made her performing debut at Paris's Cirque Medrano at age thirteen, entering the ring walking on top of a big, rolling globe on which she later balanced while playing the saxophone. As a clown, Annie Fratellini had a childish and rebellious character that was neither female nor male in appearance. When asked if her character was male or female, she always answered, "Clowns have no gender!" In 1975, she and her husband, Pierre Etaix, opened the École Nationale du Cirque along with the Nouveau Cirque de Paris, its high-end traveling branch that directly inspired the circus you see today!



Black Circus Performers in America



Historically, circuses tended to include primarily performers of the same nationality of the family at their helm. As Circus is an art form passed from generation to generation, the bulk of artists hailed from the same family. In the 19th century, companies grew larger and became more inclusive of international performers. Circus, however, was not immune to the systemic racism all too prevalent in The United States and other countries. In 1994, a visionary circus entrepreneur named Cedric Walker founded UniverSoul Circus, the first circus featuring an international company primarily featuring people of color from the international African diaspora. The incredible artistry of this show highlighted “American Black culture” so often overlooked by “white” society. UniverSoul has provided opportunity for many performers to share their skills and talents with the world and has provided the world the opportunity to enjoy these incredible artists. In addition, it opened the eyes of

circus owners across the world to an incredible array of untapped talent. Omnium is proud to support Cedric Walker and UniverSoul in a deliberate and conscientious expansion of opportunity for performers of color. You can learn more about UniverSoul Circus at universoulcircus.com

Realizing that the rich history of Black performers in American circuses was quickly fading, a brilliant aerialist, Veronica Blair, began to record and preserve those stories as the Uncle Junior Project. The project is named for Emanuel “Junior” Ruffin, the protégé of the world-famous wild animal trainer, Clyde Beatty. Starting out as a circus “cage boy” at the age of 13, Junior worked under Beatty “breaking” and training lions and tigers for the Clyde Beatty Wild Animal Circus. By the age of 20, Junior had worked his way up to performing center ring under the name of “Prince Bogino,” a name given to him by Beatty, who believed that white audiences would be more likely to accept Junior if he were a foreigner than if they realized he was an African American. In January 2010, Junior broke another barrier by becoming the first African American to be inducted into the Circus Ring of Fame, the highest honor a circus performer can achieve. You can learn more about his history and about many other great performers at unclejrproject.com

You will see a spectrum of skin tones in every Circus Omnium show. Do you see someone who looks like you?

Clowns in the Circus

Throughout history, many types of clowns have appeared in different cultures. The court jesters in Europe were some of the first clowns. Shakespeare's plays have lots of clowns. Jesters also entertained pharaohs in Egypt and emperors in China. Jesters were playful and could comment on policies made by the rulers without facing consequences. Their comments were taken as jokes. Hence, they were able to turn serious matters into funny situations. Many Native American cultures, including the Hopi, Iroquois, Winnebago, and Navajo, had clowns built into the fabric of their society. These clowns not only made situations funny, but they were also a big part of the religious ritual systems in their respective cultures. In the circus, the role of the clown is to transition the energy of the audience from one amazing act to the next. They accomplish this by using their comedic skill to "refresh" our appetite for even more amazing feats.

The art of clowning includes much more than makeup and costume. Especially in this circus, they are comedic characters throughout the show that help the audience follow the storyline and provide comic relief after serious moments. "Comedy is serious business" There is a true art to creating unified laughter among 1500 different people! If you like making people laugh, there are schools where you can study to be a professional clown, including the Clown Conservatory in San Francisco, CA (USA), the LeCoq school



in Paris (France), l'Ecole National du Cirque in Montreal (Canada), Circus Smirkus in Greensboro, VT (USA), and Circadium in Philadelphia, PA (USA). There are also a variety of workshops and classes across the country that can give you a taste of what it takes to create laughter for thousands of people together.



Clowns in the Circus

Omnium Circus Features a team of delightfully funny people Slappy and Monday:

Dick Monday and Tiffany Riley have been life partners and performing partners for the past twenty years, during which time they have headlined at circuses and festivals worldwide including Circus Sarasota, The Big Apple Circus, The Lone Star Circus, Hanneford Circus, Circo Atayde, and Ringling Bros. and Barnum & Bailey. They created the clown troupe The New York Goofs, Slappy's Puppet Playhouse, and the Laughter League. Today, they perform together as Slappy & Monday.



Why are people afraid of clowns?

Because clowns are an innocent and delightful part of the circus, they have sparked the imagination of novelists like Steven King who enjoy creating such a contrast between joy and horror. Clowns who performed in very large arenas exaggerated their make-up so the audience could see it from far away. These traditional clown faces were not intended to be viewed from up close.

Today, clowns tend to favor a much more “natural” look and rely upon their skilled and practiced body language along with their facial expressions to convey their comedy. The fear of clowns is called coulrophobia, with the prefix “coulro” coming from the ancient Greek word for “one who goes on stilts.” The clown team in I’mPossible have created laughter from hospital beds to arenas around the world. They are incredible humans and we don’t think there’s anything scary about them.

Clowns in the Circus



Comprehension and Discussion Questions

What are some countries and cultures that have had clown traditions?

Why have clowns often had positions close to people with political power?

Can you think of five things a person should do to practice the art of clowning?

How would someone learn to be a clown?

Who are characters in film and television that have made you laugh? Are they clowns? Why or why not?

Our Senses

How do we perceive the circus? The circus uses all of our senses.



Sight: Light travels in a straight line, bounces off objects, and enters our eyes through the pupil. Our irises change the size of the pupil to let more or less light in, depending how much we need to see. The circus tent is filled with many lights. Different colored lights create different looks for each act. Each act has different colors.

Can you name them? Why do you think the designer chose those colors?



Sound: Sound waves travel through the ear canal to the eardrum. The eardrum passes the vibrations through the middle ear bones or ossicles into the inner ear. The inner ear is shaped like a snail and is called the cochlea. Inside the cochlea are thousands of tiny hair cells. These structures facilitate hearing so that people can hear things like the music in the circus.

Each instrument makes a different sound. How many different sounds do you hear?



Smell: Your sense of smell—like your sense of taste—is part of your chemosensory system, or the chemical senses.

Your ability to smell comes from specialized cells called olfactory sensory neurons, which are found in a small patch of tissue high inside the nose. Each olfactory neuron has one odor receptor.

How many different smells can you name? Which ones are your favorites?



Touch: Our sense of touch is controlled by a huge network known as the somatosensory system that consists of nerve endings and touch receptors in the skin. This system is responsible for all the sensations we feel—cold, hot, smooth, rough, pressure, tickle, itch, pain, and vibrations to name a few.

How many different things did you touch at the circus?



Taste: If you look at your tongue in the mirror, you can see that it is covered in little bumps. Inside of those bumps are taste buds. When you put something in your mouth, your taste buds send a message to your brain to give you information about whether the food is salty, sweet, sour, bitter, or umami (a meaty, savory taste).

Can you name a circus food that is sweet? Salty? Sour? Bitter? Umami? Which is your favorite?

Our Senses

Every day has sights, sounds, smells, tastes, and textures—input for all the senses. Some may be overwhelming, like the sound of a siren close by, the smell of dog poop, or a very bright light directly in our eyes and some may be delightful, like the smell of a rose, music we like, or the feel of a cool summer breeze. Each person experiences their senses in a way unique to them. Not everyone experiences that input the same way. Omnium Circus welcomes audience members with a wide range of sense differences, and we encourage everyone to enjoy the circus in the way that makes it best for them.

Some people don't see, or don't see very well, with their eyes. They are blind or have low vision. At Circus Omnium performances, we share the visual parts of the show in two ways, one visual, one auditory. It is called audio description. People called audio describers describe the show in great detail so those listening create the imagery in their mind's eye. These guests can "see" it through their ears. At our live shows, we also invite audience members to touch many of the props before the performance. This adds another sense, the sense of touch, to enrich the experience.



Our Senses

Some people do not hear vibrations with their ears. People who are Deaf have a visual language, called sign language. The first American school for the Deaf was established in 1817 by Laurent Clerc and Thomas Hopkins Gallaudet. Laurent Clerc arrived in Hartford, CT, in 1816 and brought with him the sign language of Paris, a city with a large Deaf community. He taught this visually sophisticated language to Gallaudet and other teachers. Students at the school brought other sign languages with them—from New York City, Philadelphia, and a tiny island off the coast of Massachusetts, Martha’s Vineyard, which at the time had an unusually large population of Deaf people. Out of this mix came what was called “the natural language of signs,” known today as American Sign Language (credit Gallaudet university). There are different sign languages around the world, just as there are different spoken languages.



In I’mPossible, “the poet” character only communicates in sign language. The role is played by Malik Paris, who is Deaf. Malik dances and performs Omnimium Circus in American Sign Language. He uses incredible creativity and nuance in sharing this interpretation with the audience. As we have a writer for the English language of our story, Omnimium Circus also has a “Director of ASL” Monique Holt, who is a performer, director, and assistant professor at Gallaudet University.



The Poet: Can you tell what he is signing?

Omnium Embraces Autism



We all process sensory information differently. Some people can find it overwhelming to receive information from multiple senses at the same time. This is called “sensory overload.” It can happen to anyone, but it is particularly common for people on the autism spectrum. People with Autism Spectrum Disorder often have very strong reactions to sensory input. Sometimes, too much sound or too many lights can be frightening, or a rapid change between dark and light, quiet and loud. Omnium offers several options for those who need or prefer a modified sensory experience. We always leave the house lights on slightly. This reduces the contrast between light and dark, it also allows for safety if anyone needs a sensory break during the show We also have a quiet area where you can go to relax if you feel

overwhelmed. This access supports those on the autism spectrum and many others with sensory sensitivities.

We are each unique and wonderful in our own way. We want to bring the magic of circus to every person; however you use your senses!



Inclusion: Circus Culture

We are born diverse, we chose inclusion.

The most vital element of circus is the human element. The trust between partners is built over years of training, traveling, living and working together. Each performer trains to hone their physical ability and their confidence. Learning each skill takes hours and hours, days, months, and years to learn and perfect.

Circus performers do not give up! Because we all understand the dedication and trust necessary to make the



circus work, we value, honor, and respect each other and our accomplishments. In the real world, this is a challenge for most of us at one time or another in our lives.

Circus culture shows us strength of character, perseverance, and courage.



Inclusion: Circus Culture



Diversity, Equity and Inclusion conversation starters for the classroom:

Teachers please note: These are only beginning questions based on the performance you have just seen. We hope to start a much broader conversation.

Take a moment to think about what diversity means to you. Do you think it means the same thing to other people? How would you describe the diversity in Omnum?

Have you ever made assumptions about people because of the color of their skin or any characteristic over which they had no choice? If so, what did you think before you met them? Did your opinion change after you got to know the person? Please share your experience(s).

Do you think that the color of someone's skin or the shape of their body says something about their character? Why or why not? After seeing Omnum, has your perspective changed? If so, how?

Has anyone ever made an assumption about you based on your race or physical attributes? How did that make you feel?

How has your experience in life been influenced by things over which you have no control?

Can you think of three ways you can be more inclusive in your life?

Footnote: these question are adapted from: <https://www.mentoring.org/wpcontent/uploads/2020/03/Diversity-Discussion-Starters.pdf>

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Omnium Circus Stars



Tersit Asefa Dersu, Juggler

Born and grew up in Ethiopia, Tersit has been involved in professional circus arts since early childhood. She may be the fastest female bounce juggler in the world.



Malik Paris, Poet, Acrobat, Dancer

Malik is a Deaf actor and performance artist based in Philadelphia, PA. He is also a teaching artist.



King Charles Troupe, Unicycle Basketball Players

Formed in the South Bronx in 1958, KCT was the first African-American group ever to perform in Ringling Bros. and Barnum & Bailey Circus. In 2021, the Bronx honored KCT by naming a street “King Charles Unicycle Troupe Way”!



Jen Bricker-Bauer & Dominik Bauer, Aerialists

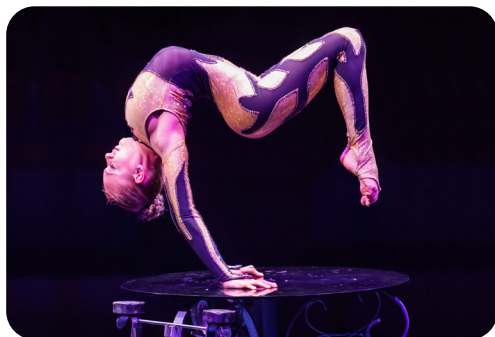
Born without legs, Jen was placed for adoption by her birth family. She was adopted by a loving family who supported her monumental efforts to become her best self. Besides his aerial skills, Dominik is also an accomplished musician, specializing in trombone and opera. Jen is American, and Dominik is from Austria.

Omnium Circus Stars



Rik Daniels, Dancer

Born in the Bronx, Rik was the poster child for the March of Dimes and a champion high school and college gymnast. Rik seeks to enlighten and inspire through modeling, dancing, and performance art.



Elayne Kramer, Contortionist

Elayne is the sixth generation of an Argentinean circus family. She started training at age four and was performing professionally by the time she was seven years old. She is one of the top hand-balancers of her generation and has won international circus awards.



Ottavio & Naomi Gesmundo (Mr. and Mrs.G.)

In addition to presenting their world-famous crossbow act in the show, Ottavio and Naomi are also resident directors and choreographers for Omnium Circus. Ottavio hails from six generations of circus performers and is the co-author of an award-winning memoir. Naomi's family comes from the Pacific Islands. She was born in Holland, where she began her martial arts training at the age of three.



Dick Monday (Monday) & Tiffany Riley (Slappy), Clowns

Tiffany and Dick have been life partners and performing partners for the past twenty years, during which time they have headlined at circuses and festivals worldwide.

Omnium Circus Stars



Owen Sanchez, Hand Balancer

Owen is a fourth-generation circus performer. He practiced gymnastics from ages nine to fourteen, winning a medal in the Mexican nationals. He made his circus debut at age 15, performing a trampoline act and comedy acrobatics. He has been performing the high handstand since age 18.



Evgeny Vasilenko, Wire Walker, Cyr Wheel Artist

Evgeny is the new representative of a known circus family in Russia. In 1992 he started training as a circus performer in the National Circus School of Moscow. After graduating, he was employed by the Old Moscow Circus where he continued to improve his professional skills in a variety of dance styles and acting.



Danette E. Sheppard-Vaughn, Ringmaster

The first featured female vocalist in the history of Ringling Bros. & Barnum and Bailey Circus, Danette is from New York City. She loves bright colors and anything glittery and sparkling, so she's a perfect fit for an impressive career in musical theater and circus!

Learn more about our performers at omniumcircus.org/our-stars/

Circus Science



The acts you see in the circus require a lot of skill. The performers have practiced for years. The performers must master the science of their skill in order to accomplish these feats.

Teachers, please note: The following descriptions include elements of the science curriculum for kindergarten through 12th grade. As many concepts overlap and are taught with different depth at various grade levels, this study guide is organized by circus acts and concepts most clearly demonstrated within each. Please cull appropriate information for your age group.

Contortion: Elayne Kramer

Elayne is able to move her body in seemingly impossible ways. We can use biometrics, the science of how the body moves, to understand how she does it. Elayne has spent years stretching her muscles and tendons to make them more elastic and flexible. This gives her joints, tendons, ligaments, and muscles a much wider range of motion. If you stretch regularly in a controlled and consistent manner, your hips, shoulders, and spine can become much more flexible over time. Knee and elbow joints cannot become more flexible through stretching. You will also see Elayne balance in different positions. As she moves, she keeps her balance by finding her center of gravity.



Circus Science



Aerial Silks: Jen Bricker-Bauer and Dominik Bauer

In this daring and beautiful silk act, Jen and Dominik perform above the circus ring on two long pieces of fabric suspended from the top of the tent. Like a human spider, Jen climbs and spins, twirls and twists, as she ascends higher and higher.



She wraps the shiny silks around her arms and torso and then suddenly falls as the silks unwind. She catches herself just before she hits the ground.

As aerial performers, Jen and Dominick know that two scientific principals are especially important to their safety. The first is friction. Friction is the force that prevents things from moving smoothly over another surface. As the silks are very slippery, they do not provide much friction against the performer's body. For that reason, silk performers must have tremendous upper body strength and a vice like grip to hold the fabric tightly and prevent slipping.

The second scientific principle to be considered is the plumb bob. Plumb is the Latin word for the metal, lead. The plumb bob is an ancient tool that is nothing more than a string with some weight tied to one end. When the other end of the string is tied to the ceiling, the plumb bob will always hang straight down. When the two silks are hung from the top of the tent, they will also hang straight down. So aerial silk performers must always be aware of the relationship of one silk to the other so that they can adjust accordingly to maintain their center of gravity.

Circus Science



Juggling: Tersit Asefa Dersu

In the mind boggling and beautiful juggling act, the lithe and lovely Tersit bounces and juggles as many as seven balls at the same time. How does she do it? She practices every day, and she understands and applies important scientific principles. These principles are gravity, terminal velocity, and Sir Isaac Newton's third law of motion.

Everything falls because of gravity. Anything released on Earth will start falling at a rate of 32 feet per second and will accelerate (get faster) by 32 feet per second every second. This means that if you drop any object from high enough, it will fall 32 feet in the first second after you let go, and in the second second, it will fall 64 feet. In the third second it will fall 96 feet. It will continue to fall faster and faster for about twelve seconds until it approaches terminal velocity. After that, it will continue to fall, but it will not keep falling faster. The terminal velocity of a juggling ball—or any other falling object—is about 120 miles per hour! The higher she throws the balls up, the more time she will have to catch them.

Tersit also bounce juggles up to seven balls. Bouncing demonstrates Sir Isaac Newton's third law of motion: For every action, there is an equal and opposite reaction. The harder Tersit throws the balls, the faster they will ricochet

back to her.

In Tersit's amazing seven-ball bounce juggling act, she will be catching and throwing three balls every second.



Circus Science



Hand Balancing: Owen Sanchez

Not all of Owen's balancing tricks are vertical, or straight up and down. Some of his positions are beautifully "off center." He is able to accomplish these feats by counterbalancing his weight, which allows him to accomplish more than would be possible based on size and strength alone.

Counterbalance occurs when two objects of unequal weight are balanced on a pivot point. Measuring scales demonstrate the principles of counterbalance. They have been used for thousands of years. Owen is a master of counterbalance!



Circus Science



Cyr Wheel: Evgeny Vasilenko

The Cyr wheel is a large shiny hoop. Evgeny stands inside that hoop and begins to perform increasingly difficult and seemingly impossible spins, rolls, somersaults, inversions, and pirouettes.

The science involved in the act is based on the flywheel effect. The flywheel is an off-center wheel that uses momentum to create energy and motion. To use the Cyr wheel, the performer must stand inside it and hold it with his hands above his head in the 10 and 2 o'clock positions. He will then tip the wheel slightly forward. His center of gravity will now be in the center of his chest, not in the center of the hoop.

The flywheel effect occurs when the performer leans to his right or left, and the weight of his upper body creates momentum that carries the performer in a circle. The wheel begins to lose energy when the performer is upside down and continues to lose energy until he is right side up again. Once he is back to his original position, the wheel will once again gain momentum each time it turns. Because the wheel is off center it will “kick start” more energy every time it rotates.

The Cyr wheel was invented and developed by Canadian circus artist Daniel Cyr, co-founder of Cirque Éloize. In 2003, he introduced this new apparatus to the world in competition at the Worldwide Festival of the Circus of Tomorrow in Paris, France and was awarded the silver medal in recognition of his revolutionary new act. Mr. Cyr toured the world performing Cyr wheel and other acts for many years.





Science Vocabulary

Acceleration: An increase in speed.

Angular Momentum: The rotational velocity of a spinning object in relationship to its inertia.

Apex: The top or highest part of something, especially if it forms a point.

Balance: When the downward pull of gravity is equal on all sides of an object, so it does not fall.

Biometrics: The study of how the human body moves.

Cantilever: A long-ridged structure that extends sideways and is only supported at one end. An airplane wing is a cantilever.

Center of Gravity: The point of an object where gravity can pull equally on all sides. All of the weight is centered on that point.

Centrifugal Force: From the Latin “fleeing the center,” anything that pulls a moving object away from a central point. Anything that is not attached to a spinning object will fly off in a straight line.

Centripetal Force: from the Latin “seeking the center,” anything that pulls a moving object towards a central point, causing the object to move in a circular motion.

Curvilinear: A description of a curved path.

Equilibrium: A state in which opposing forces are balanced. The equilibrium position in a pendulum is the point where a suspended object hangs and does not move.

Flywheel: An off-center wheel that uses momentum to create energy and motion. First used in potter wheels and grinding wheels.

Force: A push or pull on an object.

Friction: The resistance to motion between objects that touch. This is what causes a moving object to slow down or stop.

Gravity: The invisible force that pulls everything on or near the surface of the Earth. Gravity pulls everything down, towards Earth at an initial rate of 32 feet per second. Gravity is much stronger on Earth than it is on the moon.



Science Vocabulary

Inertia: The resistance to change in motion. An object at rest stays at rest unless some force moves it. A moving object will continue to move unless some force stops it.

Kinetic Energy: Energy in motion.

Linear: A description of a straight line.

Matter: Any object that takes up space and has weight. **Momentum:** The quantity of motion of a moving body measured as a product of its mass and velocity.

Pendulum: An object suspended from a fixed support so that it swings freely back and forth under the influence of gravity.

Physics: The study of matter, energy, motion, and force.

Pivot Point: The fixed point from which a suspended object hangs.

Plumb Bob/Line: An ancient tool consisting of a string with a weight (the bob on one end. When the string is attached to a fixed point above the ground and the weight is allowed to hang freely, it will indicate a perfectly vertical line.

Potential Energy: Energy that is stored up.

Speed: How fast something moves through space.

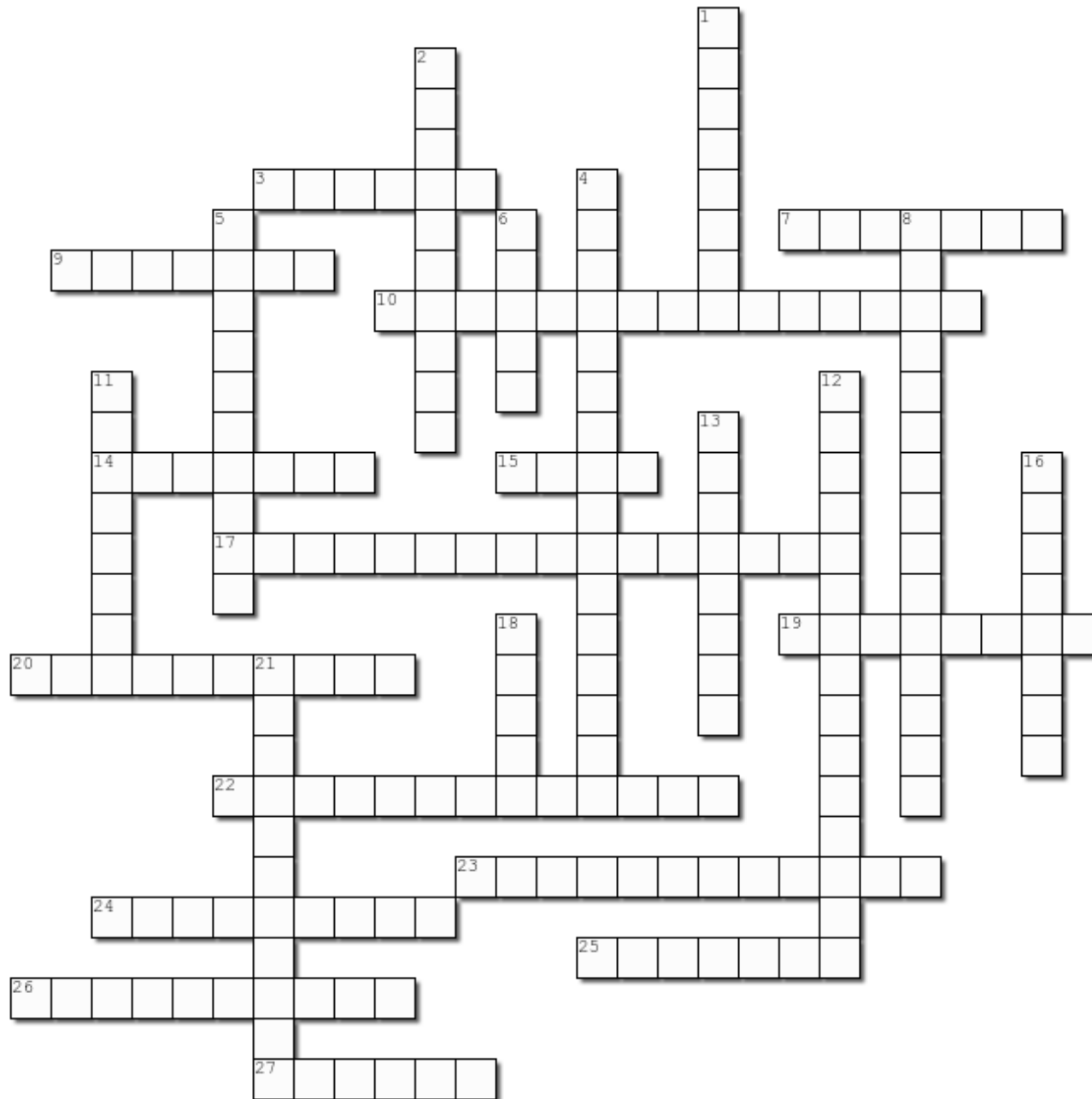
Terminal Velocity: The constant speed that a freely falling object eventually reaches when the resistance of the medium through which it is falling prevents further acceleration.

Velocity: The rate of speed and direction of motion with which something happens.

Crossword Puzzle



Complete the crossword puzzle below



Across

- 3. A change of position wherein an object comes closer or moves further away from another object.
- 7. When the downward pull of gravity is equal on all sides of an object
- 9. The study of matter, energy, motion, and force
- 10. Energy that is stored up
- 14. The resistance to change in motion
- 15. the top or highest part of something
- 17. from the Latin "fleeing the center"
- 19. The tendency of a body to maintain its inertial motion
- 20. A long ridged structure that extends sideways and is only supported at one end
- 22. Energy in motion
- 23. To increase speed or velocity
- 24. An ancient tool that is a string with a weight on one end
- 25. The invisible force that pulls everything on or near the surface of the Earth
- 26. A scientist who specialized in physics
- 27. y object or anything that takes up space and has weight

Down

- 1. An off center wheel that uses momentum to create energy and motion
- 2. The fixed point from which a suspended object hangs
- 4. from the Latin "seeking the center"
- 5. The study of how the human body moves
- 6. How fast something moves through space
- 8. is the rotational (spinning)equivalent of linear momentum.
- 11. The resistance to motion between objects that touch
- 12. The point of an object where gravity can pull equally on all sides
- 13. The rate of speed with which something happens
- 16. an object suspended from a fixed support so that it swings freely back and forth
- 18. A push or pull on an object
- 21. a state in which opposing forces are balanced

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Recommended Circus Reading



For Older Students:

American Circus: An Illustrated History, *John Culhane*

Be a Clown: Techniques from a Real Clown, *Ron Burgess*

Big Apple Circus, *Peter Angelo Simon*

Circus Science Series, *Marcia Amidon Lusted*

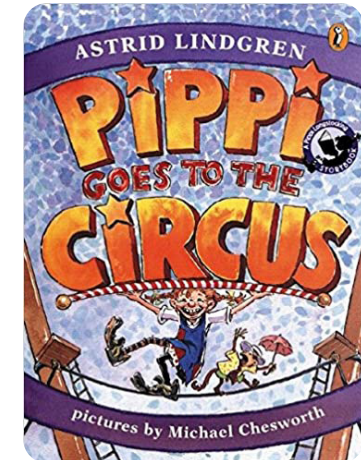
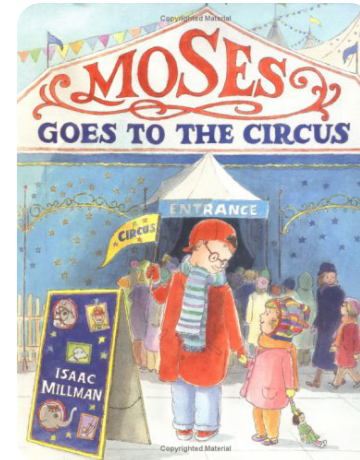
Circus Techniques, *Hovey Burgess*

The Fabulous Showman, *Irving Wallace*

Rose's Royal Midgets and Other Little People of Vaudeville, *Trav SD and James Taylor*

Two Hundred Years of the American Circus, *Tom Ogden*

The Uncle Junior Project, *unclejproject.com*



For Younger Students:

The Circus Alphabet, *Linda Bronson*

Circus Family Dog, *Andrew Clements, Sue Truesdell (Illustrator)*

Circus Fun, *Margaret Hillert*

Circus Train, *Joseph A. Smith*

Clifford at the Circus, *Norman Bridwell*

Emeline at the Circus, *Marjorie Priceman*

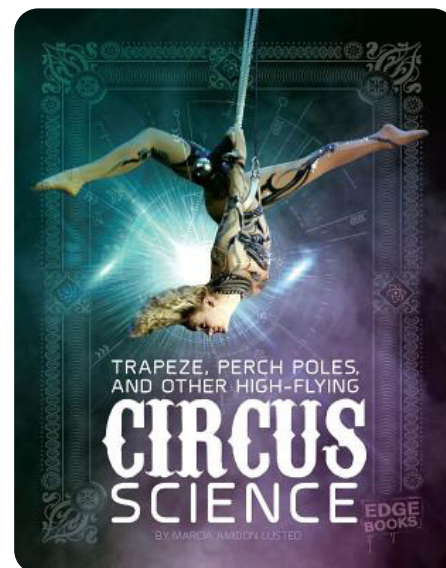
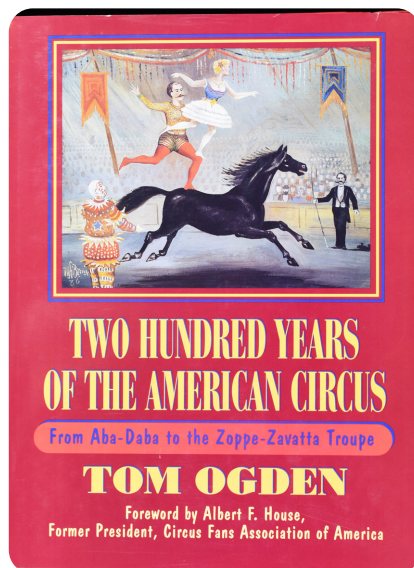
If I Ran the Circus, *Dr. Seuss*

Moses Goes to the Circus, *Isaac Millman*

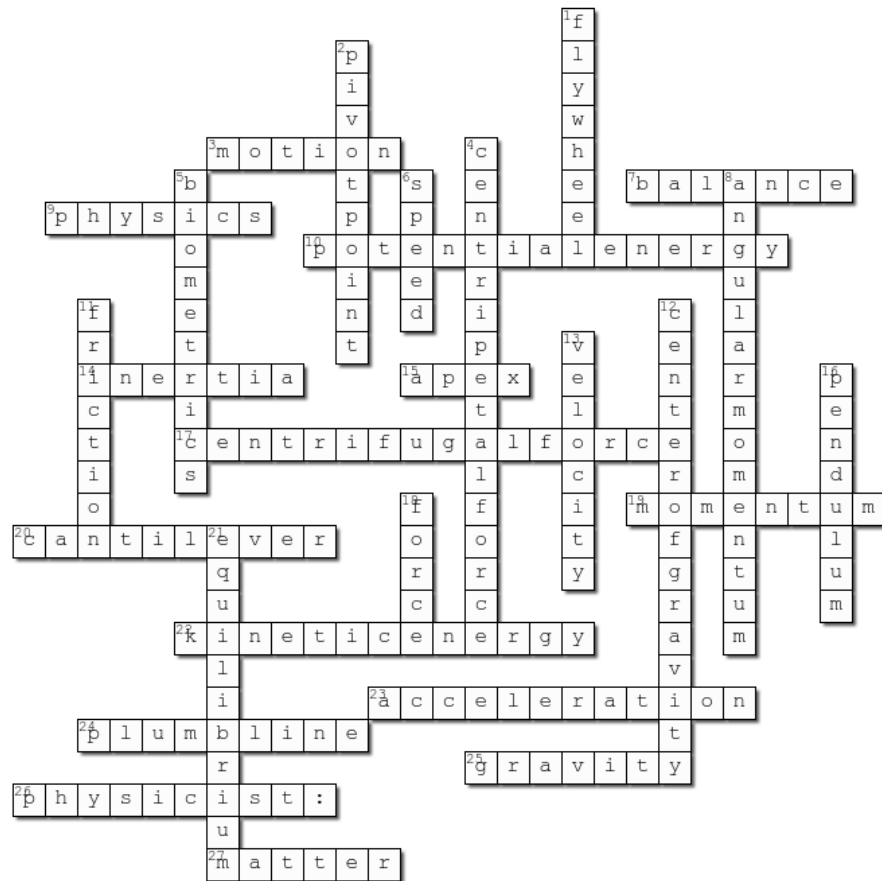
Peter Spier's Circus!, *Peter Spier Tengren (Illustrator)*

Pippi Goes to the Circus, *Astrid Lindgren*

Starring Mirette and Bellini, *Emily Arnold McCull*



Puzzle Answers



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