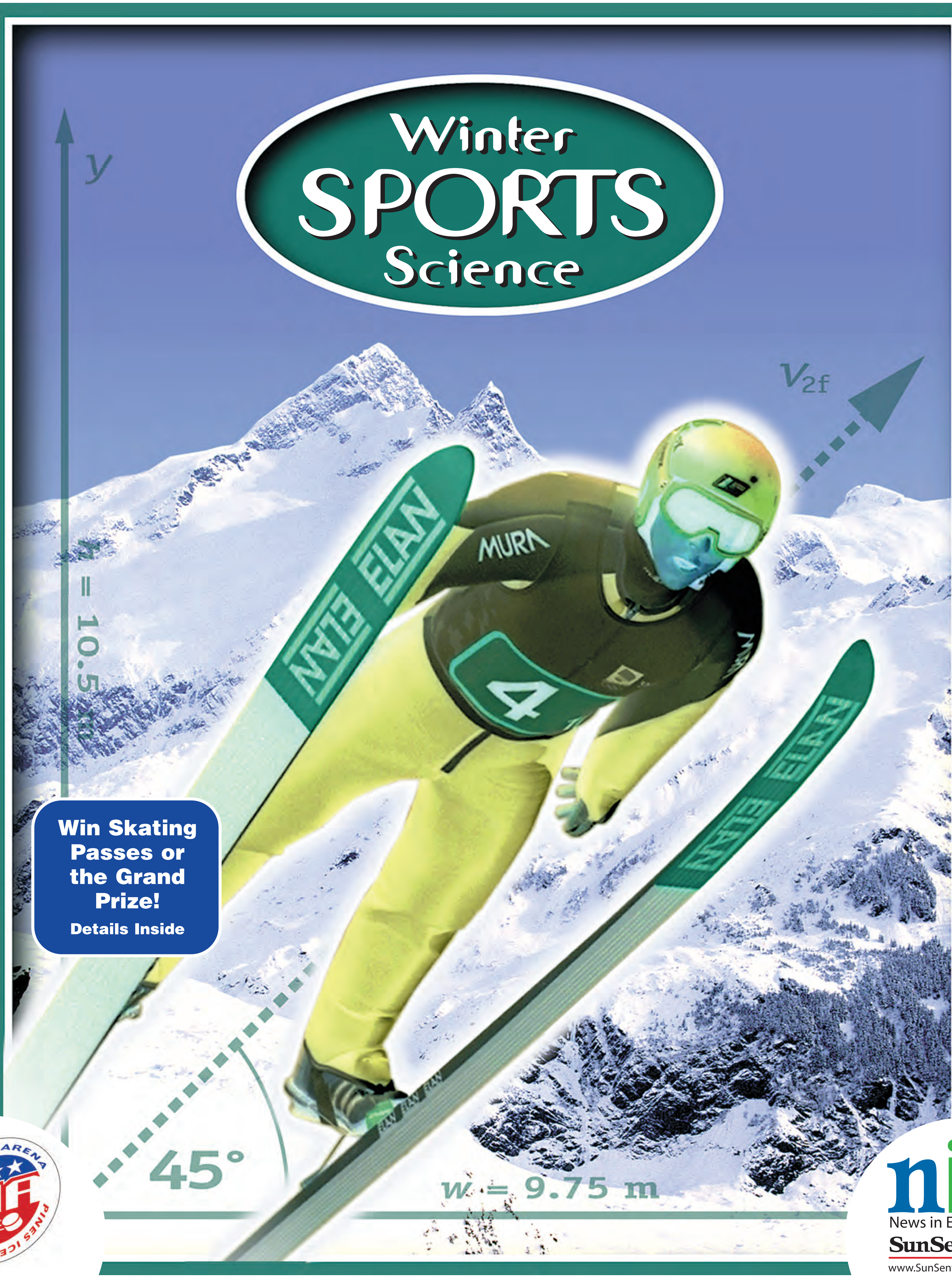
Winter SPORTS Science

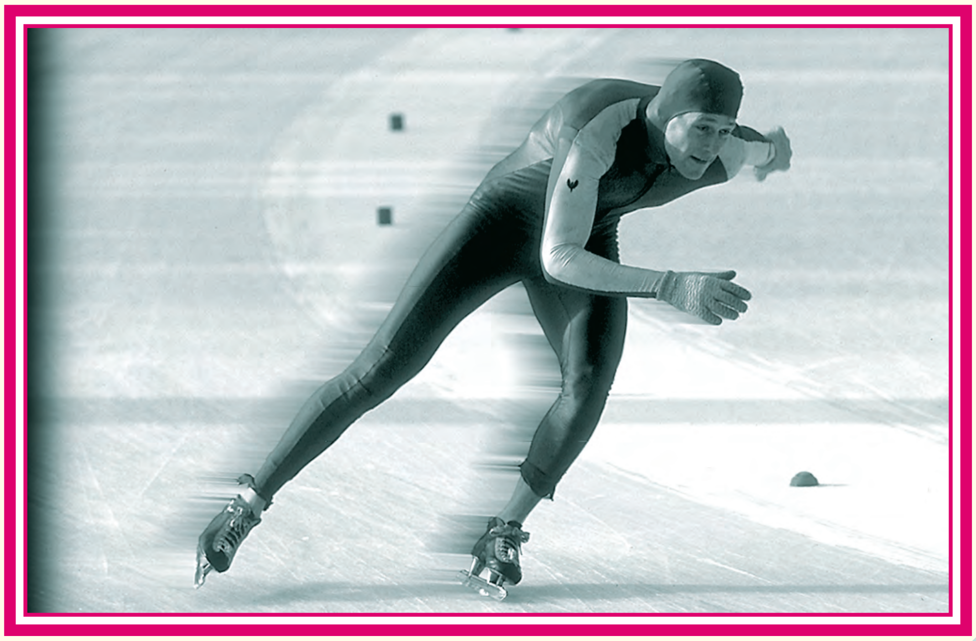


Win Skating Passes or the Grand Prize!

Details Inside

Winter SPORTS Science

INTRODUCTION



START Mention winter sports and you think of skating, skiing, sledding and hockey—fast, active sports that keep us warm in the winter air.

Though many have now moved indoors, winter sports all got their start outdoors. They were not only a test of skill, but of ability to withstand the elements of cold, ice and snow.

Because of that, the world's best winter sports athletes originally came from countries with cold weather and hard winters—places like Sweden, Canada, Germany and Switzerland.

That has all changed today. Great winter sports athletes come from everywhere and perform everywhere. From California to Vermont, and from Idaho to Colorado, people are practicing and playing winter sports. And their talents are on display in college and world-wide competition every year.

The Hows and Whys

Rules tell us how winter sports are played. But how do winter sports work?

Why do skaters spin as they do? What lets a ski jumper hang in the air for huge distances? What controls how a hockey puck bounces? Why do bobsleds look like bullets?

The answer to these and many other questions is **Science**.

Yes, the stuff you study in school, with weights, beakers, charts, experiments and textbooks.

This special newspaper section will take a close look at **Winter Sports Science**. It will explain all the fabulous feats you see by tracing them back to the science that makes them work.

Science is about the forces of nature and the energy that sets them in motion. Forces and energy are what shape sports, too. Forces propel people along the ground or over the snow. Forces lift them into the air. Forces slow them down or bring them back to the ground.

These scientific forces combine with the energy stored in muscles to create the energy of movement.

Knowing how forces and energy work can make winter sports more fun. It will give you fun facts to share with your family and friends. And if you play these sports, it may give you tips that will actually make your performance better.

Winter Sports Science is fun science. If you like it, you may want to explore ways that School Science can be fun science, too!

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, MA.3.S.7.1, MA.5.S.7.1
Activity 2 - LA.3.4.2.3, LA.4.4.2.3, LA.5.4.2.3 , SS.3.G.1.1

What Sports Are We Talking About?

Here is a list of the winter sports that will be discussed. Some of the sports may be new to you. In the course of this section, we will explain how they are played, as well as how they work.

Alpine Skiing*	Curling	Luge
Biathlon	Figure Skating	Ski Jumping
Bobsledding	Freestyle Skiing	Snow-Boarding
Cross-Country Skiing	Ice Hockey	Speed Skating

* includes downhill, slalom and giant slalom

USE THE SUN SENTINEL DIGITAL EDITION

1. **The SPORTS section of the *Sun Sentinel Digital Edition* are packed with action. Professional, college, high school and international sports are all covered, as well as recreational sports. As a class, make a list of all the sports mentioned in today's SPORTS section or look for the sports news on www.SunSentinel.com. Each student will select their "Top 10" favorite sports. Write them down. Combine all the results and make a bar graph that shows the Top 10 most popular sports in your class.**
2. **Sport stories that are covered in a newspaper often depend on where the paper is located. Pretend the *Sun Sentinel* is based in Norway, instead of Florida. Which sports do you think would be featured less frequently? Which might be covered more often? Write a paragraph explaining your answers.**

About the Sun Sentinel News In Education program:

Throughout the school year, the Sun Sentinel NIE program provides newspapers, both digital and print, to South Florida schools at no charge. Our goal has been to help teachers help their students, promote literacy, encourage hands-on learning using the newspaper, and help students stay up-to-date on the world around them. Another key focus of our program is providing curriculum materials, like Winter Sports Science, to enhance lessons in the classroom across all subject areas. These complimentary booklets are aligned with the Sunshine State Standards.

For more information about Sun Sentinel News in Education and to download educational materials, visit our website at: www.SunSentinel.com/nie

SKI JUMPING

Winter SPORTS Science

One of the most spectacular winter sports events is Ski Jumping.

In this event, skiers climb a 50-foot tower, hurl themselves 50 miles per hour down a steep ramp, launch themselves off an upturned lip and fly more than 400 feet through the air.

The goal is to see how far they can fly, without wiping out on the landing.

People who crash can be seriously injured, or even killed.

Ski jumping is not only one of the most exciting winter sports. It shows off many forces of science and nature as well.

Consider the speeding trip down the ramp. What pulls the skier? Gravity—the same thing that holds people on the surface of the Earth so they don't float off into space.

Gravity is something every planet has. In fact, it is something every object has. It is a force that draws things toward an object. The bigger the object, the stronger its gravity. The Earth is much bigger than people. When you jump off the Earth—or off a ski jump—the Earth's gravity pulls you back.

Everything that falls, or everything that moves from a higher position to a lower one, is affected by this gravity.

Perhaps you have run down a hill. It seems much easier than running across a flat field. You may even move faster. That's because gravity is pulling you down the hill along with your legs.

How Do They Fly?

Gravity is what eventually pulls ski jumpers back to the ground. But the way ski jumpers position their bodies can affect how far they fly. The leap off the upturned lip of a ski jump helps position the skier on a rising course that will increase distance.

Once off the ramp, all ski jumpers try to master the same position. The jumper seeks to balance in the air with the skis tilted upward, the tips apart in front to form a V, the body leaning forward and the hands by the side. If the ski jumper does this, air can actually pile up under the jumper and delay the landing.

The V form is fairly new for ski jumpers. Before 1988 most skiers were taught to keep the tips of their skis together while in the air. But in 1988 a Swedish jumper could not keep the tips together because of the way his legs were shaped. But this "accident" proved effective. The new form actually allowed more air to build up underneath because there was more surface to push against. This increased the length of jumps, so others quickly adopted this form. It can add up to 15 meters to a jump on Large Hill competitions.

USE THE SUN SENTINEL DIGITAL EDITION

1 **Gravity is part of the news every day, even if we don't realize it. A space shuttle comes back to Earth? Gravity brought it down. A man fell off a bridge? Gravity. Look through the stories and ads in today's *Sun Sentinel Digital Edition* and list as many examples of gravity at work as you can. Stretch your thinking!**

2 **The way an athlete positions his/her body can affect how well they succeed in their chosen sport. Look through the SPORTS section of the *Sun Sentinel Digital Edition* for sports action photos. Write a short paragraph describing what you see happening in the picture. Use details and visual clues from the photo to support your writing.**

Increased Speed

Position is also important in getting enough speed to launch a ski jump. If you watch ski jumping on TV, you will see that once the jumpers shove off at the top of the ramp, they crouch over their skis as far as they can.

The reason they do is this is to reduce the "drag" of air against their bodies. You may not be able to see the air we breathe, but it is actually loaded with molecules and atoms of different elements. Molecules and atoms are some of the smallest bits of liquids, solids and gases.

The molecules and atoms in air may not be seen, but they have power over bigger objects. When an object moves, it pushes against the invisible molecules in the air. The molecules do not move out of the way quickly and slow down the moving object.

Ski jumpers and other athletes seeking speed try to reduce the area that air can push against. Putting their bodies in a crouch lets more air pass over them and less hold them back with "drag."

Test It Yourself

Here's a way you can test the effects of "drag."

You'll need a bicycle, a paved hill away from traffic, a friend to help you and a stopwatch (or a watch with a second hand).

First, shove off and coast down the hill, sitting straight up on the seat. Have your friend time you from top to bottom and write down the result. Next, shove off and crouch low over the handle bars. Have your friend time you from top to bottom. Was there a difference in time? How much?

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.3.1.1. LA.4.3.1.1, LA.5.3.1.1SC.5.P.13.1
Activity 2 - PE.A.1.2

Winter **SPORTS** Science

FIGURE SKATING

START

Figure skating has become one of the most popular spectator sports in the world. Turn on the TV any weekend and you will find one or more figure skating shows or competitions.

Skaters like Kristi Yamaguchi, Kimmie Meissner and Johnny Weir have become sports celebrities with their flashy and beautiful routines.

Figure skating has become popular because it combines the grace and style of dancing with the strength and speed of sports. And in pairs competition, the coordination required between partners is among the greatest of any team sport.

So how does science work in figure skating?

What forces are at work?

Water Skaters?

Did you know that ice skaters and skiers don't perform on ice and snow? They really are performing on a thin layer of water.

How can this be? The answer is friction.

Friction is a force that causes heat to build up whenever two objects rub together. You may have experienced friction rubbing your hands together on a cold day, or rubbing your hands over your skin after getting out of a cold swimming pool.

The rubbing motion creates heat by activating the molecules in the objects. The energy of the rubbing increases the energy and movement in the molecules.

Friction from the surface of skates racing over ice actually causes the ice to melt slightly. Combined with a natural effect known as surface melting, this can actually create a thin layer of water between the skate and the ice.

Slow Down, Too Fast

Friction is important to any speed sport like skating, skiing or bobsledding.

It does more than just heat the surface. The friction of surfaces rubbing together also slows down moving objects.

Skaters and skiers train themselves to use this friction to control their speed during routines or runs. Friction, as well as the "drag" from air, is what stops them when they have finished. Otherwise they would crash!

You can go overboard trying to reduce friction. Not long ago, a designer of ski clothing made a plastic fabric so smooth that skiers who fell couldn't stop themselves from sliding down the mountain! The plastic skin was so slippery that there wasn't enough friction to slow the skiers down.

Spin City

Figure skaters sometimes finish off their routines by spinning wildly in one spot. They swoop into a spin and then get going so fast they are just a blur. Then they stick their toe in the ice, stop on the spot and take a bow.

How do they get going so fast in these spins? The answer is momentum.

Every moving thing gathers momentum. Momentum is the property of every object that tries to keep it moving once it has started in motion.

The momentum of spinning objects like tops, or figure skaters, is a combination of the size of the person, the speed, and the radius of an object (the distance from the center of the person to the outermost part). If the radius is reduced, the speed increases.

A skater creates super fast spins by pulling in his or her arms close to the body. The tighter the arms are to the body, the faster the spin. The farther out, the slower the spin.

USE THE SUN SENTINEL DIGITAL EDITION

1 **Friction is a force in every form of transportation, not just figure skating. Brakes work by creating friction that slows wheels or objects down. Look through the *Sun Sentinel Digital Edition* or www.SunSentinel.com for stories, photos and ads and make a list of as many kinds of transportation as you can. For each you find, write down the surfaces that rub together as the vehicle travels. Then write down how friction might be used to stop each kind.**

2 **Momentum can be seen in the news whenever vehicles are raced or go out of control. Look through the *Sun Sentinel Digital Edition* or www.SunSentinel.com today or for several days for stories or photos that involve momentum in daily life. Was the result good or bad?**

Maintaining a Good Balance

Balance is very important to figure skaters. It keeps them from falling over when they skate on one foot, or land from a leap, or stop a spin.

Part of figure skating, or any sport, is training and sharpening the body's sense of balance. Balance is not just for athletes. Every day our lives are a kind of balancing act.

Balance is actually controlled by your ears—and by gravity. Deep inside your ears are sacks with tiny crystals inside. The sacks are filled with jelly-like liquid and lined with microscopic hairs. Every time your body moves, gravity causes the crystals to move, pressing against the hairs. The hairs instantly send a message to your brain telling it about your change in position. Your brain then tells other parts of your body to shift position to keep your balance.

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.3.1.1, LA.4.3.1.1, LA.5.3.1.1, SC.5.P.1.3.1
Activity 2 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, SC.5.P.1.3.1

ICE HOCKEY

Winter SPORTS Science

Ice hockey has always been a rough, fast game that's as fun to watch as to play. It started on frozen lakes and ponds in cold places like Canada, Michigan and New England and more recently has moved into arenas in warm climates like Tampa Bay and Miami in Florida.

When TV networks introduced the blue and red "streak graphics" to help people follow the puck, it became even more popular.

In international competition, national teams from cold weather countries like Russia, Sweden and Germany still are considered leading powers in ice hockey. But other countries are gaining. And the ice hockey in the National Hockey League is the best in the world.

The Science of Hockey

Ice hockey offers many chances to see how science works in sports. Slapshots, goals, collisions and more are all the result of scientific forces.

Hockey, in fact, could be seen as a laboratory for the science of physics (FIZ-iks). Physics deals with how objects in the world—called "matter"—interact with energy in the world.

Consider the most exciting move in hockey—the slap shot.

With a slap shot, a hockey player raises the stick as far back as he/she can, whips it toward the puck and sends the puck screaming at the goalie. Slap shots can travel upwards of 100 miles an hour with top adult players.

But what makes a slap shot so fast? Physics. More specifically the part of physics called "mechanics." A famous scientist named Isaac Newton spent a lot of time studying how objects move some 300 years ago. He wrote out three laws of motion that still are used today.

One of these states that the rate of change in motion for an object—speeding up—is directly linked to the force applied to the object.

That is exactly why a slap shot is so much more powerful than other shots. The force of the stick has all the energy of a full swing behind it. When the stick hits the puck, it just rockets off toward the goal.

Compare that to a softer "wrist shot" or a rebound shot in front of the goal. What other sports can you think of that show this law of motion?

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.3.1.1, LA.4.3.1.1, LA.5.3.1.1, SC.5.P.1.3.1
Activity 2 - LA.3.4.2.3, LA.4.4.2.3, LA.5.4.2.3, LA..3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, SC.5.P.1.3.1

Check It Out!

Isaac Newton's laws of motion also are seen anytime a hockey game gets rough.

"Checking"—throwing your body into another player's body—is a big part of hockey. Usually it occurs along "the boards" that surround the hockey rink.

What happens scientifically when one player checks another?

The first part of the action is like the slap shot discussed at left. The checker applies force to another player, and sends that player flying in the direction the force is moving.

The second part of a check shows another of Newton's laws. This law states that for every action there is an equal but opposite reaction. When a player is checked into the boards, he bounces back off. Or sometimes players collide on the ice at high speed, and bounce off each other.

The "action" in these cases is the collision. The "reaction" is the bounce. How hard you bounce is directly connected to how hard you're hit (and how big you are).

USE THE SUN SENTINEL DIGITAL EDITION

1. Motion is all around us in the world. Look through today's *Sun Sentinel Digital Edition* or www.SunSentinel.com for stories and photos and see how many examples of motion you can find. After you have listed them, go back and label any that work like a "slap shot" or "check" in hockey.
2. Think of yourself as a photographer who has been assigned to illustrate the two laws of motion discussed on this page. What would you shoot pictures of? How would your pictures show the laws?

Bounce Passes

Another way this law is seen is in how players sometimes pass or advance the puck by bouncing it off the boards. Shooting the puck at high speed against the boards will cause it to bounce off at an almost equal speed.

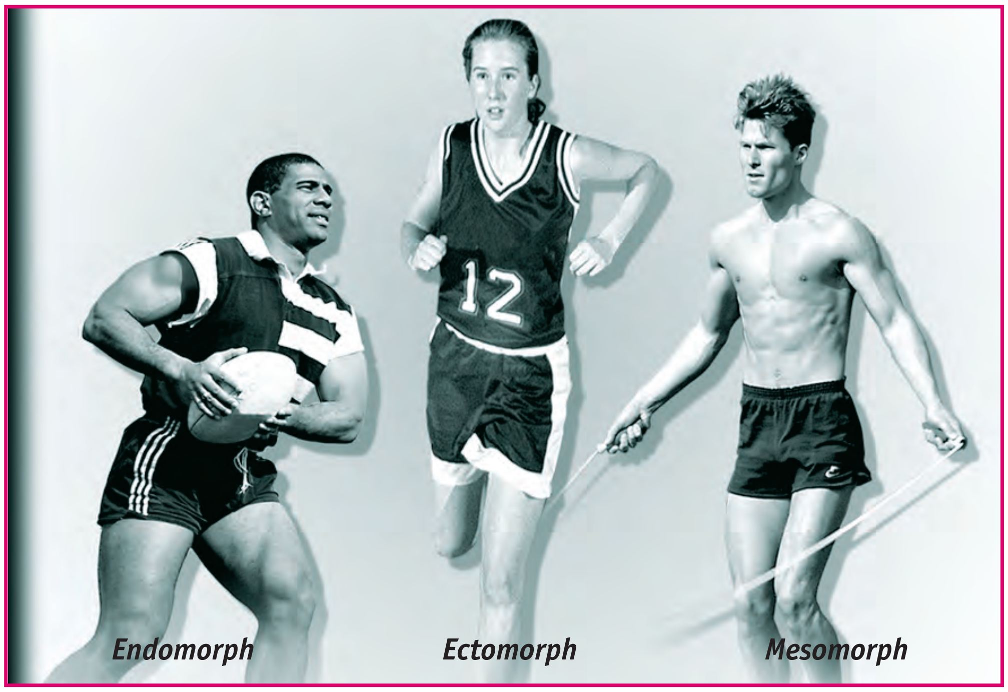
But there is more science at work with these passes than that. The angle you hit the puck against the boards will determine what direction it travels.

An angle is the joint that is formed when one line connects with another. When moving things bounce, their path forms an angle at the point they hit another object. If you are directly in front of the boards and shoot the puck straight in, it will bounce right back to you. If you are off to one side, though, it will bounce off in the opposite direction because of the spin that contact with the boards puts on the puck.

y
h = 10.5 m
x
w = 9.75 m

Winter SPORTS Science

BODY TYPES



START

If you look at the athletes on the last three pages, you will quickly notice something about them. The bodies of figure skaters don't look much like the bodies of ice hockey players. And the bodies of hockey players don't look much like the bodies of ski jumpers.

There's truth in what you see: Certain sports offer an advantage to people of a certain size and shape.

Three Types of Bodies

There are three basic body types among humans.

Endomorphs (EN-doe-morfs) are solid, round and powerful.

Mesomorphs (MESS-o-morfs) are muscular yet agile.

Ectomorphs (EK-toe-morfs) are lean and long.

Few people are purely one body type, though. Most people are a mixture of all three. If you look at yourself or an athlete, you would see that. You might say a person is a lot of endormorph, almost as much mesomorph, and a little bit ectomorph.

When scientists describe human body types they do just that. They assign a rating from 1 to 7 for the amount of each type in the body mix. In this rating, 1 is the lowest amount and 7 the highest.

They write this out as a formula: 5-6-2, for example. That rating would mean an athlete was a 5 on the endomorph scale, a 6 on the mesomorph scale and only a 2 on the ectomorph scale.

Rate Yourself

Here's a way to rate your own body.

Lay sheets of newspaper on the floor and tape them together. Lie down on the sheets. Have a friend trace around you with a marker or crayon. Cut your shape out. Then rate your body with the three-number formula at the right. The first number should be endomorph, the second mesomorph and the third ectomorph.

How does your body fit into the range of body types?

—Adapted from "Sportworks," Ontario Science Centre, Addison-Wesley Publishing Co., 1989

USE THE SUN SENTINEL DIGITAL EDITION

1 **People come in all shapes and sizes. Look through the photos in today's *Sun Sentinel Digital Edition* or www.SunSentinel.com and pick out one example each of someone whose body type seems like an endomorph, a mesomorph, and an ectomorph.**

2 **Actors and actresses are often picked for roles because of their looks. Find the TV listings in today's *Sun Sentinel Digital Edition* and list the top two or three characters in five shows you watch or have watched. Rate each one by body type as you did in Question 1. Draw a bar graph showing your results. Would the graphs change if you graphed men and women separately?**

Muscles

Body type is just one factor in determining what kind of athlete a person is. Another is the kind of muscles. Men and women are not the same when it comes to muscles. Scientists have found that for the same height and weight, a man will have more muscle content and a woman will have more fat. That means men are more suited for sports that emphasize strength, and women do better at sports that require endurance.

There are more than 600 muscles in the human body, doing everything from curling your lips in a smile to raising the hair on your neck when you're scared.

Muscles go to work when they get signals sent from the brain through your nervous system. Nerves send the signal through motor neurons, triggering chemicals inside muscles to make them contract, flex, or tense up. That is when they start working for you.

Get Pumped

Some muscles are richly supplied by blood pumped from your heart. Others receive less blood from the heart.

You have probably observed this at holiday dinners.

If you eat turkey, you know that some of the meat is dark meat and some is white meat. The dark meat is the muscle rich in blood. The white meat is the muscle that gets less blood. The same is true for people.

Muscle Twitching

There is another difference between muscles besides looks. The "dark-meat" muscles are called slow-twitch muscles, which means they contract and move more slowly. The "white meat" muscles are called fast-twitch muscles, which means they contract very quickly and yield a short burst of energy.

Everyone has a mix of fast and slow-twitch fibers in their muscles. You may have 70 percent slow twitch and 30 percent fast twitch. Your friend might have 40 percent slow twitch and 60 percent fast twitch.

That would help decide what kind of athlete you are. Endurance sports like cross-country skiing or a marathon are slow-twitch events. Speed-sports like a 100 yard dash or figure skating would be fast-twitch events.

y h = 10.5 m 45° w = 9.75 m x

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1
Activity 2 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.3.1.1, LA.4.3.1.1, LA.5.3.1.1, LA.3.4.2.3, LA.4.4.2.3, LA.5.4.2.3, MA.3..S.7.1, MA.5.S.7.1

CONTEST

PINES ICE ARENA
Student Coloring Contest!

Each student who completes the coloring contest will receive a coupon for a FREE SKATE SESSION, including skate rentals! One Grand Prize Winner will receive a $175.00 gift card that may be used toward a 'Learn to Skate' class or a Birthday Party!

Instructions:

Color the Zamboni® Ice Resurfacing Machine on the next page and mail it or bring it to the address below by April 18, 2011:

Jay Delgado
Pines Ice Arena
12425 Taft Street, Pembroke Pines, Florida 33028

Contest is open to Elementary and Middle School Students in South Broward and North Miami-Dade.

Grand Prize Winner will be announced Friday, April 22nd.

For further information, please contact Sun Sentinel NIE representative, Debbie at drahamim@SunSentinel.com

Free Skating Pass!

Each student who completes the coloring project can redeem this coupon for one FREE Skate Pass. This will include skate time and skate rental.

Just color & bring this pass in!

PLEASE PRINT

Name:

____

Address:

____

____

____

Teacher:

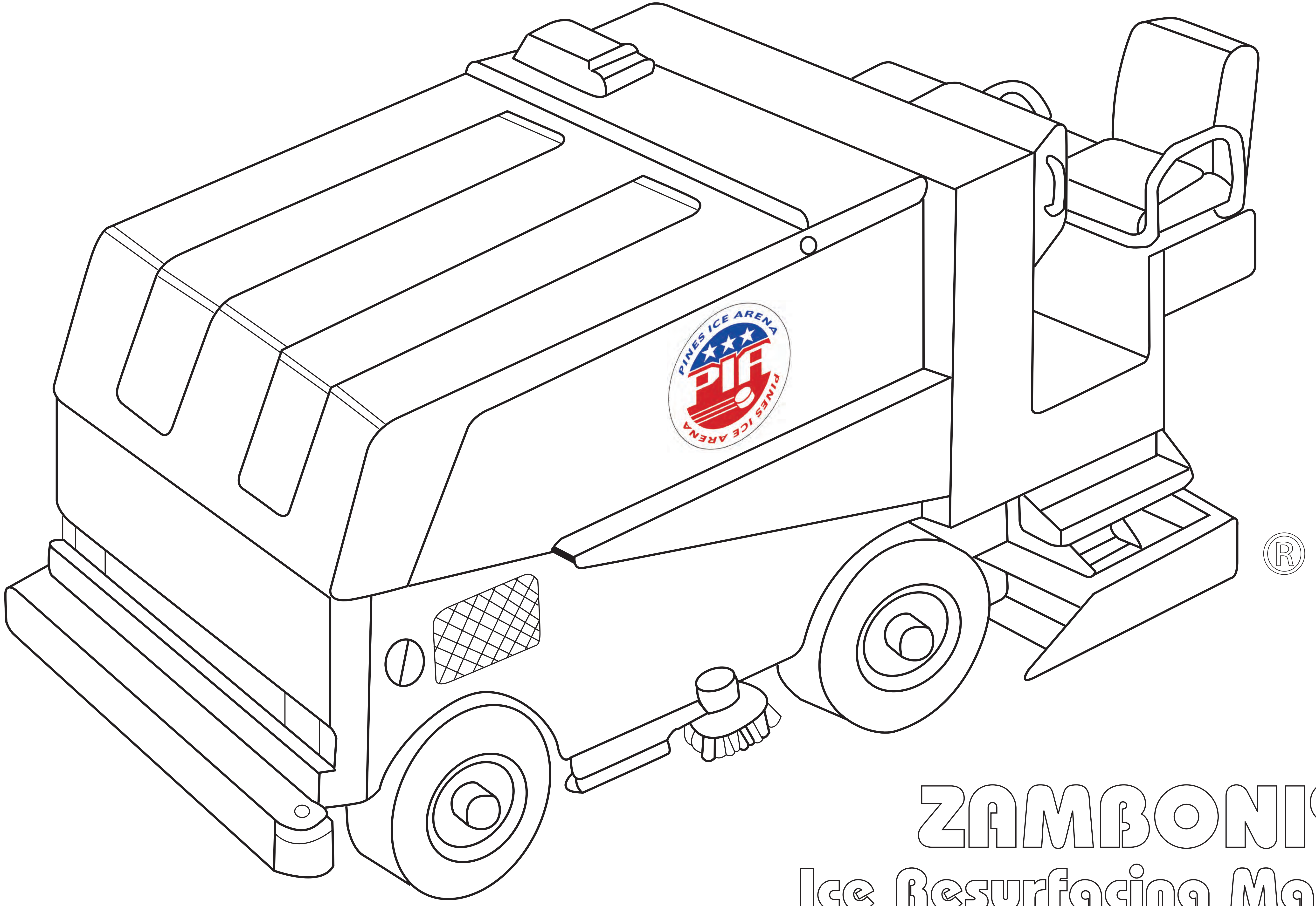
____

School:

____

Pass valid until June 30, 2011. Pass good for all public skating times. Visit www.pinesicearena.com for dates/times.

PINES ICE ARENA
PIA



ZAMBONI®

Ice Resurfacing Machine

Winter SPORTS Science

DID YOU KNOW?

The Zamboni® Ice Resurfacing Machine was invented by Frank Zamboni, in California, for use at the Paramount Iceland Skating Rink.

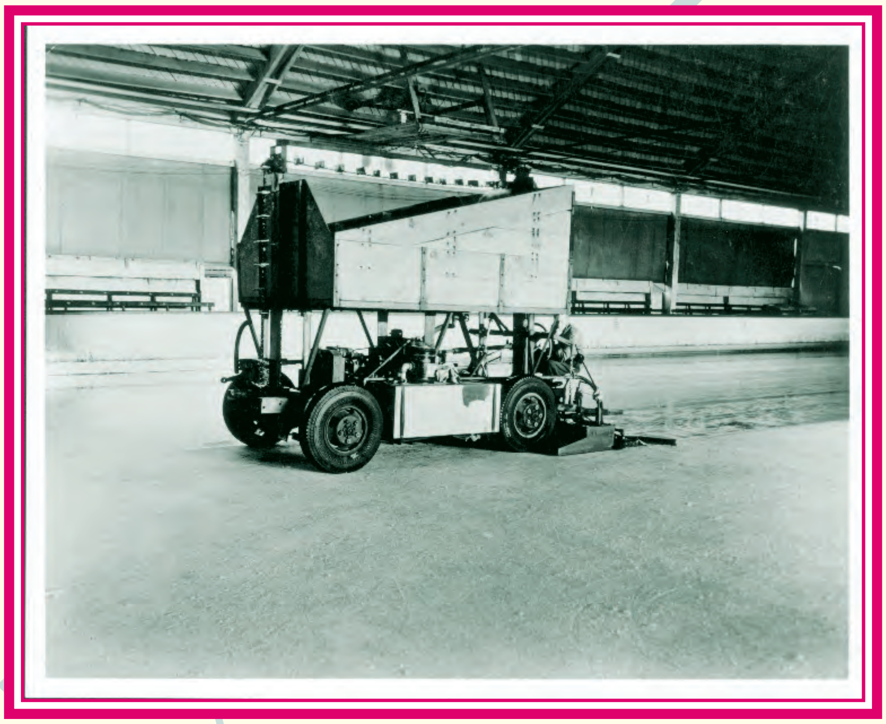
The first usable Zamboni® Ice Resurfacer (Model A) was invented in 1949. Earlier prototypes did not successfully remove enough of the "snow" or smooth the ice adequately.

Until the Zamboni® Ice Resurfacer came along, ice resurfacing took up to 1-1/2 hours to complete, even with three to five workers helping. Imagine how that would go over at a hockey game today!

The Model A introduced a "wash water" system, which allows the ice to be washed with recirculating water before applying the final coat of water. This final coat freezes the ice to a mirror finish.

A Zamboni® Ice Resurfacer smoothes an ice rink without tracing its own track by driving in slightly overlapping concentric circles.

Frank Zamboni building an early prototype of a Zamboni® Ice Resurfacing Machine



Model A Resurfacer

1954 was the first year that a Zamboni® Ice Resurfacer was used in an NHL Arena, in Boston Garden.

The Zamboni® Ice Resurfacer has gone through many improvements over the years, resulting in many different models being produced with a variety of innovations and additions. There's even a Model 100 that can be used for backyard ice rinks attached to a John Deere garden tractor!

The "Astro-Zamboni" was invented and designed to remove at least 75% of the water from a playing surface made of Astro-Turf, such as you see on professional baseball fields.

The "Grasshopper" turf-roller rolls and unrolls the turf quickly, allowing large arenas to change their floor operations from concrete to artificial grass playing fields in a matter of a few hours.

y

h = 10.5 m

w = 9.75 m

x

FREESTYLE SKIING

Winter SPORTS Science

Freestyle skiing is one of the most colorful, challenging and exciting winter sports. It combines the speed of downhill skiing with the style of skating or dancing and the acrobatics of gymnastics.

It is a sport in which skiers get to express their creativity and talents.

Freestyle skiing got started with skiers who were bored by going through the gates of slalom racing and the straight soaring of ski jumping. In 1929 a European named Fritz Reuel first tried spins and pole flips. In the 1950s a Norway skier named Stein Erickson added flying leaps and spins.

In the 1960s American skiers really got interested. They were daredevils on the slopes and they gave the new sport a new name: Hot-Dogging.

Later, more serious skiers renamed the sport Freestyle Skiing.

Mogul and Aerial Skiing

Freestyle skiing competition comes in two parts: Mogul skiing and Aerial skiing.

In Mogul, skiers ski down steep slopes covered with bumps of snow called moguls. From this crazy surface the skiers must do jumps and maneuvers like twists and "helicopter" spins.

Aerial skiing involves skiers launching themselves off ramps called "kickers" and performing somersaults or twists in the air. Aerial freestyle is spectacular: great skiers may do three back somersaults and four twists in a **single** maneuver.

In for a Landing

One of the key skills freestyle skiers must learn is how to land. And that involves science.

When an object falls, it builds up momentum from the force of gravity. That momentum will continue to build up until it is stopped by a force, or by resistance.

In freestyle skiing, that force is provided by the ground, which in effect pushes against the falling object, causing it to stop.

When there is a high jump and a long fall, that can be a real collision. The bigger the object and longer the distance, the greater the momentum.

To soften the landing, skiers learn to "absorb" the force exerted by the ground. To do that, they bend their knees as they land, and bend at the hips. This spreads out the force of the impact over a longer amount of time and makes landing easier.

USE THE SUN SENTINEL DIGITAL EDITION

1. **Every athlete needs to know precisely how to land or fall in order to minimize injury. Look through the SPORTS and FIT sections of the *Sun Sentinel Digital Edition* and choose three different sports. Write a sentence or two giving advice on how to fall or land correctly. Then do research to see if your suggestions are on target.**
2. **Exercise builds strength and stamina. Look through the *Sun Sentinel Digital Edition* or on www.SunSentinel.com for photos of athletes in action or people exercising. Write a list of what each is doing. Rank each activity in order of highest to lowest benefit. Then check an exercise website to find out if you were correct. Which activities burn the most calories or are best for building strength and stamina?**

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.4.2.3, LA.4.4.2.3, LA.5.4.2.3, PE.B.2.2
Activity 2 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.2, LA.3.3.1.1, LA.4.3.1.1, LA.5.3.1.1, PE.B.1.2

Try This

Here's a way to test the force of landing. Stand on the bottom step of a staircase. Jump off and land with your legs stiff. You should feel a jolt when your feet hit the ground. Now leap from the bottom again. This time make contact first with your toes, then the balls of your feet, then your heels. As your feet make contact, bend your knees.

This is what cats do when they land softly on the ground—even when jumping from great heights. Doing this replaces one big force of landing with a series of little forces. And they bend their joints to soften the force.

After you have practiced this several times, give yourself a real test. See if you can jump off the first stair holding a paper cup of water. The goal is not to spill! If you get really good, jump off a small chair with your paper cup. Always wipe up spilled water between jumps.

An Egg Experiment

Here's another way to look at making soft landings. You'll need an egg and a bedsheet—and a place outside!

Have four students use the bedsheet to make a curved "wall," with the bottom curled up in a kind of catch basin. Then have another student throw the egg at the sheet as hard as he/she can. Amazingly, the egg won't crack. It will hit the sheet and drop unbroken to the catching area at the bottom. The sheet absorbs the egg's momentum slowly so the egg doesn't come to a full stop until about a second after it hits the sheet. But if you throw the egg against a wall, the egg stops in about a millisecond. The force of that **IS** strong enough to shatter the egg.

y h = 10.5 m w = 9.75 m x 45°

Winter **SPORTS** Science

BIATHON

Biathlon is a sport that could remind people of the James Bond movie *The Spy Who Loved Me*. Competitors ski over fields and hills and shoot rifles at targets.

The Biathlon not only tests the speed and endurance of the athletes, but their accuracy with weapons. It forces them to quickly shift from racing at full speed to calming their breathing and pulse so that they can shoot accurately. It requires that they be able to hit targets while standing up, and while lying down with their .22 rifles.

Biathlon had its beginnings in real hunting—when cold-climate people had to hunt for food. In winter, to speed their hunts, they used skis to travel over the snow.

Later, in northern Europe the same approach was tried by soldiers for military activities in cold climates.

Body Control

One of the biggest challenges for a Biathlete is learning to quickly shift from racing on skis to being so calm he/she can hit tiny targets with rifles. At peak racing, a biathlete's pulse—the rate at which blood is pumped through the body—can jump as high as 150 beats a minute. That is about double a person's pulse at rest. On top of that, a biathlete often arrives at the shooting sites breathing heavily.

Both high pulse and breathing are a problem. Shooting requires complete body calm. Even a twitch of an arm or hand can send a bullet off target. Misses result in penalties—in form of extra time added onto the score.

Take Aim Scientifically

Forces of science affect the bullet while it is in flight—and affect the aim of the shooter. Like everything else, a bullet is affected by the Earth's gravity. The farther the bullet travels, the longer gravity pulls it down toward the ground. Eventually it will be pulled down completely.

Added to gravity is the effect of friction. The friction of the air also will slow down a bullet. As friction slows it down, it makes it easier for gravity to pull it toward the ground. Long distance shooters also have to take into account the pull of gravity and friction. To do that they have to aim just a little high for long distances.

Under Pressure

Science is at work in the shape of bullets. Bullets are pointed or rounded at one end, blunt on the other. Here is a way to test why.

Put a cup on the floor and place a piece of paper over it. Hold a sharpened pencil three feet above the paper. With the eraser end down, drop the pencil on the paper and note what happens. Next drop the pencil with the pointed end down.

Compare your results. You should see more damage to the paper in one of these tests. Does this help explain why bullets are shaped the way they are?

USE THE SUN SENTINEL DIGITAL EDITION

1. **Biathletes are judged on two distinct skills—skiing and shooting. Those skills are broken out as separate parts of competition. Look through the SPORTS section of the *Sun Sentinel Digital Edition*. Can you find any other sports competitions that test different skills with different parts of competition?**

2. **All athletes have to master different skills for sports—even if they are not judged separately as in biathlon. Look through the SPORTS section today and pick three athletes you like. For each one, list as many skills as you can that the athlete has had to master to do well.**

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.4.2.3, LA.4.4.2.3, LA.5.4.2.3
Activity 2 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.3.1.1, LA..4.3.1.1, LA.5.3.1.1

How a Rifle Shoots

Review the discussion of slap shots in the ice hockey section on Page 5. You'll recall that Isaac Newton's second law of motion stated that the rate of change in motion for an object—speeding up—is directly linked to the force applied to the object.

With a hockey slap shot, that force was applied by the swing of a hockey stick. With a bullet, it comes from an explosion.

A bullet contains several parts. One is the lead (pronounced LED) that flies out the barrel of a gun. One is the casing that holds the lead. And one is the gunpowder or explosive that is packed between the casing and the lead.

When the trigger of a rifle is squeezed, it activates a firing pin in the rifle. The pin slams into the center of the casing with such force it causes the gunpowder inside to ignite. This causes gases inside the bullet to expand or "explode." The force of this blasts the lead out of the bullet, out the barrel of the rifle and off toward the target.

y h = 10.5 m w = 9.75 m x

SNOWBOARDING

Winter **SPORTS** Science

Snowboarding is like skateboarding without the wheels. Or surfing without the water. Except that it's done racing like crazy down the steep slopes of a mountain!

Snowboarding got its start in the mid 1960s with the invention of a small piece of plywood shaped like a surfboard. It had a rope on one end like a sled, and had a name that combined snow and surf. It was called a Snurfer.

It was not very easy to control, so footstraps were introduced. In 1981, the first snowboarding contest was held in the United States.

Snowboarding competition combines Alpine and freestyle skiing, with downhill, slalom, mogul and half-pipe events.

The half-pipe gets its name from the shape of the course, a hollowed out tube that looks like the bottom half of a plumbing pipe, or cylinder. Snowboarders do stunts on the walls the way skateboarders do them on ramps.

The best snowboarders can get great leaps — called "big air" or "monster air" — soaring as much as 10 feet off the ground. While up, they do "tweaking" for fans—stunts and twists while up in the air.

Snowboarders use different boards for different events. The slalom boards are stiff and narrow. This cuts down on friction, increases speed, and gives more support for the stress of traveling at high speed.

The half-pipe board is wide and flexible. A wide board is better for doing air tricks, because its width catches more air underneath, and helps hold the competitor up during jumps.

On Top of Things

What keeps the snowboarder from sinking into the soft snow on a mountain? The key is how scientific rules of pressure work.

You might be better able to understand the force of pressure with this illustration:

Two people who weigh the same amount are walking on deep snow. One person is wearing regular shoes and the other is wearing snowshoes, those big, wide attachments that go on your feet. The person wearing regular shoes will sink deeper into the snow.

The reason is that while their weight is the same, the snowshoes spread the weight over a larger area. As a result, the force under the equivalent portions snowshoe is weaker than under the regular shoe.

USE THE SUN SENTINEL DIGITAL EDITION

1 **Snowboarding began as a game people made up for fun, combining skiing with surfing. Choose another sport featured in the *Sun Sentinel Digital Edition;* think about how it is played. Write down some ideas on how you think the sport may have begun. Research the history of the sport online or at the library. Were your ideas correct? Why or why not? Share your findings with your class.**

2 **There is at least one sport still played today that was invented by Native Americans. Can you guess which it might be? Are there other sports that began in the United States? What are they? Research online or in the library to find as many as you can.**

Balanced Course

In competition a snowboard course is laid out symmetrically (sim-MET-ri-kal-ee). That means it is shaped the same on both sides of the middle. It is balanced in its design so that snowboarders will have equal opportunity if they put their left foot out front or their right foot. It's the same as if they were using their hands and the course were being fair to those that are left-handed as well as right-handed.

Can you find examples of five things in your classroom that are symmetrical? List them on the chalkboard. Now find five things in the newspaper that are symmetrical and list them. Then find five that are not the same on both sides, or asymmetrical (A-sim-MET-ri-kal). Draw a symmetrical and an asymmetrical shape.

Muscle Power

Great muscle condition is important to snowboarders. In half-pipe competition, they may do handstands or other maneuvers in which their head is lower than their boards. They may perform airborne twists in which they reach down and grab their boards before landing. They may do spins of 360, 540 or even 720 degrees.

These degrees are not about temperature, but are the way circles are measured. A complete circle contains 360 degrees, so a 360 degree spin would be a complete circle. A 720 degree spin would be two complete circles.

There are more than 600 muscles in the human body. About 40 percent of humans' body weight is muscle (men, on average, have a higher percent than women).

It's hard to believe but 75 percent of muscles is water! The rest is protein and salts, minerals and carbohydrates.

The muscles that help leaping ability are the Gastrocnemius and Quadriceps.

Muscles that help an exercise like a handstand are Biceps, Triceps, Pectorals and Deltoids. If those names sound Greek to you, it's partly true. Most muscles have Greek or Latin names.

Activity 1 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.4.1.1, LA.4.4.1.1, LA.5.4.1.1, LA.3.6.2.1, LA.4.6.2.1, LA.5.6.2.1
Activity 2 - LA.3.1.7.1, LA.4.1.7.1, LA.5.1.7.1, LA.3.6.2.1, LA.4.6.2.1, LA.5.6.2.1

Winter SPORTS Science

SPEED SKATING

START Speed skating first became popular in England in the 1870s. It became an international event in 1924 for men and in 1960 for women. In some competitions the skaters race in a pack. In others, only two skaters are on the track at one time. They are racing against the clock, not really each other. The skater with the best time in a competition wins.

You might think that speed skating is all about acceleration, or speeding up. When we hear the word accelerate, we think it means to speed up and in common language, it does. But in science any object that changes speed is accelerating. Even things that are slowing down are accelerating—scientists call this "negative acceleration" (commonly called deceleration).

In sports, acceleration just measures how quickly speed is increasing. How does acceleration affect speed skating?

Mass, or the size of the skater, might affect acceleration. An object with more mass needs a greater force to change speed. That's why cars with more mass are usually built with bigger engines so they can get up to speed as quickly as smaller cars. But they also use more gas in doing so.

Newton's second law of motion says that in order to accelerate, the greater the mass is, the greater the force must be. In plain words, the bigger something is, the more force you need to move it. Since skating is just a matter of force on the ice, the powerful skater will do better because he or she just powers along. Eric Heiden, a top medalist in 1980, for example, was over six feet tall and had thighs that were 29 inches around! Being so large, and in top condition, gave him enough force to be faster than anyone else.

If you watch speed skaters, you will see that they use an unusual body position when they compete. As they speed along the ice, they keep one hand behind them, and one swinging to the side.

The reason for this position is wind resistance, or "drag." Speed skaters have found that bending over with only their head and shoulders facing into the wind cuts down the amount of surface area hitting the air and is the best way to reduce drag. (The arm that swings back and forth does so to maintain the skater's balance.)

Warming Up

Warm-up exercises are an important aspect of athletics, especially for heavily muscled athletes like speed skaters. The purpose of a warm-up is to prepare specific muscles for strenuous physical activity. Slow stretching and bending give time for the body to increase blood flow to the proper muscles. This flow warms the muscles and delivers oxygen and energy that the muscles will need in a race. As a class discuss ways you could warm up and stretch your leg muscles before a race. Try spreading your legs side to side and front to back and stretching slowly. Cross your legs and slowly try to touch your toes.

Warming Down

Another activity that is often overlooked is the warm-down. Athletes do not lie down and sleep after playing a sport. If they did their muscles would take longer to recover from the strain of competition. Instead of resting immediately, they walk around or do slow exercises to allow the blood to restore their tired muscles. They do this to deal with lactic acid.

Lactic acid is a chemical that is created by the muscles when you work hard. It builds up in muscles when they do not get enough oxygen through blood to meet their demand. Your muscles will not ache after the blood removes this lactic acid. Warm-down exercises remove it for you by allowing blood to clear it from the muscles. The blood carries it to the liver, where it is broken down by the body.

USE THE SUN SENTINEL DIGITAL EDITION

1 **Not all sports are best performed by someone who is big and massive. Which sports in the SPORTS section of the *Sun Sentinel Digital Edition* or www.SunSentinel.com are best when participants are smaller? Categorize each sport by whether it is best played by larger or smaller people or if it doesn't matter. For each sport, state a reason why you chose its category.**

2 **If you only judged cars by their ability to accelerate, which would you choose? Skim the auto ads in the CLASSIFIED section or the display ads of the *Sun Sentinel Digital Edition* or www.SunSentinel.com and list at least 10 ads that talk about speed or power. Is power important in cars? Why?**

Fact or Friction

Speed skaters want to reduce the friction on the ice so they can slide along it more easily. But what about the rest of us? Most people walking, riding bikes or driving cars **DON'T** want to slide on ice.

What controls whether you slide? Think of a car when its tires are spinning on an icy surface. Tires lose their grip—or "traction"—if they break away from the surface and start sliding. The car can move only if the wheels move very slowly so that they stick to the ice. Traction is created by using the natural friction between the tire and the ice.

Activity 1 - LA.3.6.2.3, LA.4.6.2.3, LA.5.6.2.3, LA.3.5.2.2, LA.4.5.2.2, LA.5.5.2.2
Activity 2 - LA.3.3.1.1, LA.4.3.1.1, LA.5.3.1.1, SC.4.P.12.2, SC.5.P.13.3

y h = 10.5 m v_{2f} 45° w = 9.75 m x

WRAP & REVIEW

Here are some more sports science facts —and experiments to try.

Ski Skills Test

Downhill and slalom skiers have to have good balance. You can try this test of the balance they use called “dynamic” balance.

Put on running shoes and stand on a hard surface (not a rug). Stand on your strongest leg (the one you kick with) and press your other foot against the side of the knee of the leg you’re standing on. Put your hands on your hips. Have a friend time you with a watch with a second hand. When five seconds have gone by, make a half turn by swiveling on the ball of your foot. Keep turning every five seconds until you take your hands off your hips or your foot off your knee.

This “dynamic” balance test shows how fine-tuned the muscle receptors in your legs are. If you did well, you might make a good downhill skier—or a surfer.

For a real challenge, try to stay balanced with your eyes closed!

Don’t Get Up!

You can use someone’s center of gravity to keep him or her in a chair.

Get a friend to sit with feet flat on the floor and back against the back of the chair. Put a finger against your friend’s forehead, preventing the head from moving forward.

Challenge your friend to stand up. He/she won’t be able to do it because as soon as your friend starts to stand there will be no support under his/her center of gravity. Your friend will fall back.

In order to stand up we need to put our center of gravity over our feet. Your finger keeps your friend from doing this.

Slow-Twitch Experiment

Your class can compare slow-twitch muscles by doing an experiment. Everyone will need two school or library books, one for each hand. Try for something heavier than paperbacks.

Take hold of the books and raise your arms until they are straight out from your shoulders.

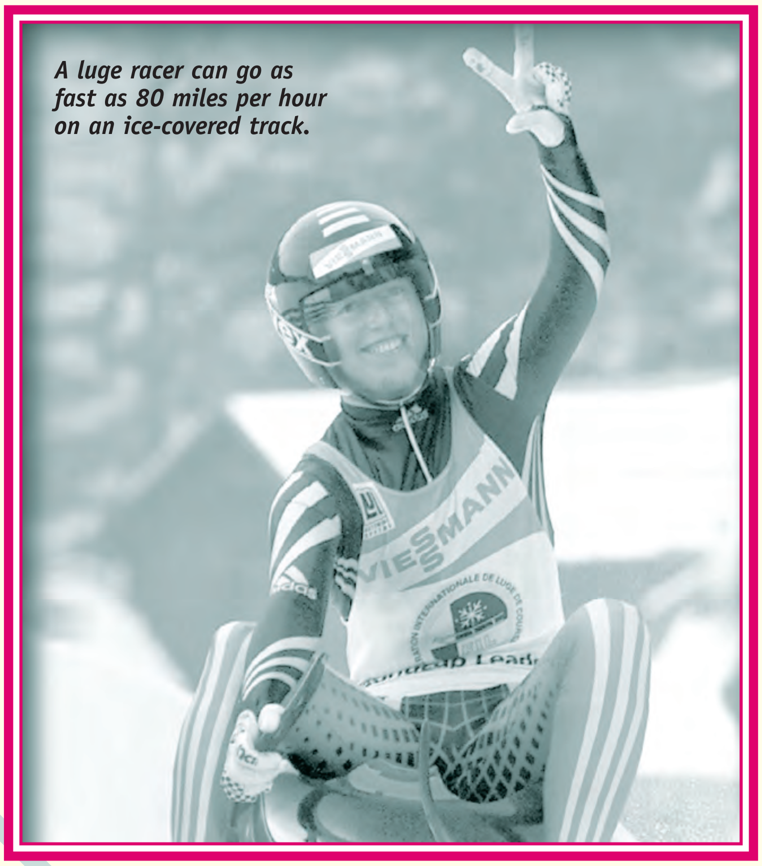
The kids who can keep their arms out straight the longest have more slow-twitch muscles than the others in the class. Those who could not hold the books out for very long would probably be better at fast-twitch activities that require strong but short bursts of energy.

Penny Traction

Here’s an experiment you can do to test traction by using a penny. You will need a book, a protractor and a penny. Lay the penny on the book and slowly raise one end of the book. Using the protractor, measure the angle at which the penny begins to slide off the book.

After the first time you do this, repeat the experiment. This time give the penny a slight nudge at each angle. Which test penny had the greatest traction?

Finally, wet a piece of paper and then freeze it. Place it on the book and repeat the experiment. Does this reduce the traction?



A luge racer can go as fast as 80 miles per hour on an ice-covered track.

Dizzy?

So why don’t spinning figure skaters get dizzy?

The answer is: They do! But they train themselves to not fall over.

Dizziness, like balance, is controlled by your ears. The fluid in the inner ear that has the tiny hairs moves when you start a spin. Only it lags a little behind. When you spin and then stop, you feel dizzy because the fluid is still moving.

How do skaters not feel dizzy the way everybody else does?

They use their eyes. They train themselves to focus instantly on a non-moving object as soon as they stop. This helps the brain sort out the signals it gets from the fluid in the inner ear.

CREDITS

“Winter Sports Science” was created for syndication as a Newspaper In Education section by Hollister Kids, 3 E. Wynnewood Rd., Wynnewood, PA 19096.

The writer was Peter Landry.
The designer was Jeff Lyons.

The material was reviewed for scientific accuracy and age appropriateness by the following teachers: Thomas M. Conway of Elkins Park, PA., Middle School, Roger Demos of Haverford, PA., High School, Michelle Downs of Haverford, PA., Middle School, Burt Horn of Cheltenham, PA., High School, David Woods of Indian Lane Elementary School, Media, PA. Resource material included the books: “Sportsworks,” Ontario Science Centre, Addison-Wesley Publishing Co., 1989; “Science Spotlight Sports,” Ian Graham, Raintree Steck-Vaughn Publishers, 1995; and “Hotdogging and Snowboarding,” Robert W. Guthrie, Capstone Press, 1992. Thanks also to the Franklin Institute science museum, Philadelphia.

The Hollister Kids website is www.hollisterkids.com.

Pines Ice Arena

is a proud sponsor of Sun Sentinel News in Education

Look inside this booklet for details on a student coloring contest!

Each student who completes the coloring contest will receive a coupon for a FREE SKATE SESSION, including skate rentals! One Grand Prize Winner will receive a gift card that may be used toward a 'Learn to Skate' class or a Birthday Party!

PINES ICE ARENA

12425 Taft Street, Pembroke Pines • For information call 954-704-8700 • www.pinesicearena.com