Learning Resources

3-2-1 Classroom Contact Series

Draw from daily experiences, provide informal lessons for understanding basic principles, video learning resources are both instructive and fun to watch. Many include teacher lesson plans.

For more than a decade kids have watched *3-2-1 Contact* after school. Now you can use a special edition of Children's Television Workshop's popular award winning science series *in school* with *3-2-1 Classroom Contact*, a new classroom version for 4th through 6th graders.

3-2-1 Classroom Contact brings the exciting world of scientific discovery into the classroom. The series has two basic elements...thirty 15-minute television shows specially developed for in-school use and a teacher's guide. Each of these components plays a central role in the total instructional program.

3-2-1 Classroom contact television shows are designed to stimulate student interest in science. Through its live-action sequences, music videos, animations, and on-location mini-documentaries, *3-2-1 Classroom Contact* makes science instruction both engaging and accessible to kids. The Teacher's Guide also presents easy to use demonstrations, hands-on activities, and experiments students can perform in their classrooms.

3-2-1 Classroom Contact emphasizes the process of scientific investigation...the dynamic, inquiry-based methods through which we come to know our world. It portrays science as a cooperative human endeavour, open to all...including your students. The goals of the series are to:

* help children experience the joy of scientific exploration and the satisfaction of accomplishment;
* help to familiarize them with different styles of scientific thinking;
* enhance their abilities to analyze scientific and technical issues;
* motivate them to pursue further scientific activities;
* encourage all children...especially girls and minority students...to develop their scientific and technical capabilities to the utmost.

Each program and the related hands-on activities are designed to teach fundamental concepts in one of four scientific fields:

* Earth Science (7 shows)
* Physical Science (8 shows)
* Life Science (11 shows)
* Scientific Investigation (4 shows)

3-2-1 Classroom contact features young cast members, who act as your students' guides, introducing children to some of the remarkable men and women working at the frontiers of science. They pose provocative questions, conduct tabletop experiments and explore each topic, often by relating it to something concrete and observable in students' lives.

The accompanying guide includes step-by-step lesson plans, background information, program synopsis, blackline masters to accompany hands-on activities and curriculum connections.

Antarctica: Getting to the South Pole

The geographic South Pole is located on Antarctica, a huge continent covered with a thick layer of ice...nine thousand feet thick at the South Pole. Follow the route taken across this icy desert by early explorers, who risked their lives in search of the south Pole.
Code 5-4070

Crystals: They're Habit Forming

Salts, sugars, and snowflakes are crystals. Every kind of crystal has its own specific shape, or habit. But how do crystals form? *Grow* some to find out!
Code 5-4071

Erosion: Earth is Change

Earth's surface is constantly changing. Floods, landslides, hurricanes, erupting volcanoes, and soil-shifting earthquakes can cause sudden, dramatic changes. But gradual action by wind and water over millions of years can also alter the Earth's surface and shape breathtaking landscapes like the Grand Canyon!
Code 5-4072

Fossils: Remains to be Seen

How do we know what dinosaurs looked like when they lived millions of years ago? The answer is fossils...traces of past life preserved in Earth's crust. Fossils help scientists figure out how the dinosaurs lived, and possibly how they died.
Code 5-4073

Ocean Environments: 3-D Sea

Oceans may look the same from the surface, but underneath, different ocean environments offer support to spectacularly different, sea dwelling creatures. The animal life in each environment depends on conditions like the depth, temperature, salinity, and oxygen/carbon dioxide content of the water.
Code 5-4074

Volcanoes: Too Hot to Handle

What comes out of volcanoes? A lot of stuff! Some eject lava, others hot ash. The materials that come from deep within volcanoes raise Earth's surface, make mountains, and create new land masses. The Hawaiian Islands, Japan, and Iceland were all formed by volcanic eruptions. Come along and see Mauna Loa during an eruption and Mount St. Helens after it blew its top.
Code 5-4075

Water Cycle: Go With the Flow

Did you know that the water you drank today, may have been drunk by a dinosaur fifty million years ago? Well its true. All the water in the world is constantly being recycled. It is cleaned in a never-ending cycle of evaporation, condensation, and precipitation. But there's a limit to the amount of pollution the water cycle can handle. Sometimes water gets polluted even before it hits the ground...rain falling through polluted air can form acid rain that may kill plants and animals.
Code 5-4076

Animal Vision: Eye of the Beholder

Ever wondered how the world looks through a frog's eyes or a chameleon's eyes? Here's your chance to see things in a whole new light! Animal's eyes help them survive in their specific environments and basic components of the eye vary in different species. Some animals don't see colours at all; some see only a few; and some see parts of the spectrum we can't...those of infrared or ultraviolet light.
Code 5-4077

Antarctic Animals: Living on the Edge

Only a few animal species live in Antarctica. On the ice-covered land mass, air temperatures dip to below minus one hundred degrees F. Near freezing water is toasty by comparison. So most animals live in the chilly ocean water surrounding the continent. Animals like penguins and seals are specially adapted to survive in this otherwise inhospitable environment.
Code 5-4078

Australian Mammals: Life Down Under

Australia is home to many unique animals including some unusual mammals like the kangaroo, the koala, and the platypus. But why do all these strange, unusual creatures live in just one place? It all started a long, long time ago in a place called Gondwanaland.
Code 5-4079

Bioelectricity: The Shocking Truth

All living things...people, animals, and plants...produce electricity. Each cell in the human body works like a tiny battery. We use the electricity to send messages to and from our brains. Learn how scientists are using the body's own electrical impulses to help amputees utilize artificial myoelectric limbs!
Code 5-4080

Classification: The Order of Things

Living things can be grouped, or classified, according to common traits. Doing so helps us find out how species are related...the more traits they share, the closer the relationship. Knowing about such common traits even helped a scientist solve the mystery of a plane crash!
Code 5-4081

Digestion: The Inside Story

Some animals eat plants; some eat meat; and some eat plants *and* meat. Whatever an animal eats, its teeth get the digestive process underway. But where does food go from there? Find out by watching the on-camera dissection of a pig's digestive system which shows how the process works in him and in you.
Code 5-4082

Flying Animals: Winging It

How is a clam like a polar bear? Neither has wings, so neither can fly? But lots of other animals do have standard flying equipment...wings. Some are flying birds, some are flying mammals (bats), and some were flying reptiles (pterosaurs) that became extinct more than sixty million years ago. Even though these creatures may look different, their wings have a lot in common.
Code 5-4083

Food Chains: Eat and Be Eaten

All animals...including humans...depend on plants because there's a plant at the beginning of every food chain. For example, sea urchins thrive on kelp, a water plant, and sea urchins, in turn, are food for sea otters. Find out how marine biologists in California observe the kelp/sea urchin food chain and sometimes intervene to maintain this delicate balance.
Code 5-4084

Innate and Learned Behavior: How do They Know That?

Why does a spider always weave the same kind of web instead of getting creative from time to time? Because the web-spinning is innate...the animal knew how to spin webs when it was hatched. Humans have innate behaviours too, such as crying and swallowing, but there are lots of things animals ... including humans...must learn how to do.
Code 5-4085

Social Behavior: Living in Groups

Although most animals are solitary creatures, some live in groups: herds of bison and schools of fish live in loose assemblies of hundreds; prides of lions and troops of baboons live in small but organized groups; colonies of ants and bees live in highly organized groups of thousands.
Code 5-4086

Training Animals: Learning New Tricks

What do pigs, dolphins, and monkeys have in common? they are animals that can be trained to do things...sometimes just for fun; sometimes to help humans. And they're mammals...the animals best able to learn. When working with animals, trainers break down tasks into steps that are taught one at a time.
Code 5-4087

Air is Matter: Air is There

Air is matter that really matters. It's everywhere, throwing its weight around by holding things up or knocking them down. But wherever it is and whatever it does, air has volume and mass that make it matter!
Code 5-4088

Friction: Getting a Grip

What do bobsleds, roller coasters, motorcycles, skis, cars, planes, snakes, and people all have in common? They all need friction to get 'em going and to slow 'em down! Friction is the resistance encountered when one thing moves over the surface of another. Treads on tires and shoes create friction so people can "get a grip!"
Code 5-4089

Generating Electricity: More Power to You

How can you generate electricity? Simply. Just move a magnet past a wire or a wire past a magnet and you'll get an electric current. Huge power plants use falling water, wind or steam to rotate coils of wire inside giant magnets to create enough electricity for all of us.
Code 5-4090

Gravity/Weightlessness: Measuring G's

Gravity constantly grabs things and pulls them toward Earth's centre. In fact, that's why things have weight. But how do you get into a weightless situation? Try riding a roller coaster...or even an elevator!
Code 5-4091

Light and Color: Living Color

Why can't we see colours of objects in the dark? Because light has to hit the object and reflect its colour back to our eyes. Hard to visualize? Well watch, as simple animations and colourful experiments take us out of the dark and into the light!
Code 5-4092

Motion and Forces: Play Ball

An object can't move unless acted upon by some force that sets it in motion. We apply force when we hit a baseball or shoot a basketball through a hoop, but there's another force that's working all the time...gravity. You'd be surprised at what you can do if you know that forces like gravity work in predictable ways. For example, softball pitchers use gravity to throw pitchers that trick batters!
Code 5-4093

Refraction: Facts of Light

A ray of light ordinarily travels in a straight line, but it can be refracted, or bent, when it enters a new medium at an angle. It's important to be able to bend light. Lighthouses, for example, use lenses to bend light from one bulb and send it far out to sea to warn sailors of rocks ahead.
Code 5-4094

Surface Tension: BUBBLE-ology!

Can anyone blow a soap bubble that's non-spherical? No. Because of surface tension, soap film sticks together and always forms a sphere. Experiments with soap bubbles help kids learn more about what's holding the bubbles all together...surface tension.
Code 5-4095

How do You Know? Collect the Data

You can get a lot of information from books, data banks, and even from TV. But sometimes you just have to get up, go out into the field, and observe people and things in order to collect data. Meet some scientists collecting data deep in the woods and deep underwater.
Code 5-4096

How do You Know? Dig it Up!

How do archaeologists find out what prehistoric humans ate? The scientists become detectives, excavating ancient trash heaps and hunting for animal bones, shells, and plant pollen that give clues to what people ate. But for direct evidence, scientists analyze fossil feces. Seeds and plant pollen that are trapped and preserved in thousand-year-old dung reveal what was eaten!
Code 5-4097

How do You Know? Experiment!

Is every sound a language? Do parrots speak English? And who left that message on the answering machine? You can try to guess the answers to these questions, or you can set up controlled experiments designed to let you know when you've found the right answers!
Code 5-4098

How do You Know? Make a Model

Lots of people put together model planes or ships for fun. But models aren't just toys, they're scientific tools! Models can help us test theories, learn about things that are very small, very big, very far away, or that lived very long ago. We can even calculate a dinosaur's weight by using a model of the creature!
Code 5-4099

Friction: Getting A Grip

What do bobsleds, roller coasters, motorcycles, skis, cars, planes, snakes, and people all have in common? They all need friction to get 'em going and to slow 'em down! Film clips demonstrate friction (or lack of it) in action, and encourage comparing different surfaces.
Code 5-4089
Ages 9 to 11
450 minutes, order 5-40700-IN

3-2-1 Contact: Architecture Series

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Grade 3: Stability. Basic concepts: how forces alter the shape/strength; ways to improve the strength and stability of a frame structure; role of struts and ties.

Grade 5: Forces Acting on Structures and Mechanisms: Basic concept: identify the parts of a structure that are under tension/compression.

Grade 7 - Structural Strength and Stability: basic concepts covered: All

How can a five-story building be portable? What keeps bridges from falling down? Can animals be architects? Just what are the forces at work that make a building stand?

This series takes a unique look at principles of physics by looking at something that's all around you - architecture. This series uses music videos, animation and mini-documentaries to bring elementary and middle school students into the exciting world of architecture.

Produced by the Children's Television Workshop, the series brings the world of design and construction into the classroom. Students will see how many kinds of structures - including houses, skyscrapers, circus tents, sports arenas, and even birds' nests - are built.

A detailed program synopses in the teacher's guide lets you find the material you want to teach. With discussion questions and hands-on activities for each program, plus a bibliography and glossary of terms, the teacher's guide is a rich resource. It is provided free with purchase of the series.

Raising The Big Top

Welcome to the Big Top! As a circus tent is taken down, moved and then put up again, your students will learn how the force of tension can be used to make a structure stand. The analogy of skin and bones is used throughout this program to explain how the various parts of a building do different jobs.
Order 5-4357

Home

Take a close look at the variety of homes that exist around the world. Your You students will learn how different homes are built, the materials used and the purposes that the structures serve for the people and animals who created them.
Order 5-4358

Stack It Up

A cathedral is an awesome structure to look at and explore. But just how is one built? Students will learn firsthand how forces of compression are at work in the walls, foundation and arches to support these huge buildings - and how the force of tension contributes to their stability.
Order 5-4359

Made To Fit

How well do you "fit" in your classroom? Your kitchen? Your car? How well do these things work for you? Students will learn how architects use principles of "ergonomics" - making things fit people - when they design and build buildings.
Order 5-4360

Light, But Strong

How do you get the most building out of the least amount of building materials? One way is to choose materials that are light, but strong. The shape of the materials is important too. Students will see that I-beams and triangle shaped braces are just two of the tricks architects use.

Order 5-4361
30 minutes each
Ages 9-14
150 minutes, order 5-43570-IN

African Adventure: Balloon Safari, Grasslands, Maasai Mara

Newton's Apple Series

A balloon safari over Kenya. One grass feeds four species. Life in a baboon troop. Females rule in elephant society.

Ages 12 to 14
30 minutes, order 5-5002-IN

Amazing Facts Behind Bridges, Bears, Earthquakes And Tv

Newton's Apple Series

Studying the forces of compression and tension - from a pasta bridge. The "crusty" whys of earthquakes. Chromakey effect puts Knapp on weather map. Bringing a grizzly cub to bear.

Ages 12 to 14
30 minutes, order 5-5001-IN

Electrical Current And Magnetism

Grade 6 - Electricity

Through simple experiments, the basic principles of electromagnetism are explored. Electromagnets are contrasted with permanent magnets and their differences and similarities are clearly shown. Also teaches basic principles behind common electrical devices.

Available in CD-ROM and VHS

Ages 9-14
18 minutes, order 1-8381-IN

Electricity

The Real World Science Series

Because electricity is virtually unseen it is often difficult to understand just where it comes from and how it works. This program presents general information about electricity as well as concepts regarding static and current electricity, atoms and electromagnetism. After watching the video students will be able to identify objects that use electricity, distinguish between static and current electricity, label the components of a circuit and use selected vocabulary about electricity appropriately when speaking or writing.

Ages 9 to 11
18 minutes, order 1-2570-IN

Fire: Why Does It Burn?

Fire has always been a source of curiosity and fascination. This informative program for young viewers explains how humans first came to use fire and how they learned to control it. Live action and animation segments illustrate the techniques that Native Americans and early American pioneers used to start fires before the invention of matches.

The program explains the three elements necessary to make fire – fuel, oxygen and heat – using everyday items to illustrate each element. The concept of a "fire triangle" is demonstrated: unless each of the three elements is present, there can be no fire. Employing the fire triangle again, the program shows how a fire can be put out by removing one of the elements.

An illustration of the many ways fire is used in homes today leads to a discussion on fire safety.

Also available in Laser Videodisc.

Ages 6-11
12 minutes, order 1-9720-IN

Fire: Why Does It Burn?

Laser Videodisc

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Ages 6-11
12 minutes, order 1-97201-IN

Fireworks

Take a behind the scenes look at how these magnificent displays are put together, then sit back and enjoy the grand finale as the hours of preparation explode across the sky in all colours, shapes and sizes.

Ages 9-14
8 minutes, order 9-6013-IN

Heat: Molecules In Motion

Grade 7 - Heat: Basic concept: how heat is transmitted by conduction, convection and radiation.

This program examines the ways we use heat by looking in on a typical family. It follows the family through one day's activities and illustrates how heat affects their lives.

Animation is used effectively to illustrate the main points... The narrator speaks both to the audience and to the characters in the film, which works well. This film correctly and effectively presents science and would be an excellent introduction to the topic of heat. American Association for the Advancement of Science.

Available in VHS, CD-ROM and Laser Videodisc

Ages 9-14
16 minutes, order 1-9811-IN

How Paper Is Made

Grade 3 - Growth and Changes in Plants; Relating Science and Technology to the World: describe ways in which humans use plants for food, shelter, and clothing.

From the way paper was made in bygone days, to today's automated manufacturing and recycling processes, learn how paper has been created, consumed and conserved.

Ages 9-14
14 minutes, order 1-8557-IN

If You Give A Mouse A Cookie

The Reading Rainbow Series

Grade 3: Forces and Movement. Basic concept: identify force as a push or pull by one body or another; distinguish between kinds of motion; investigate the effects of directional forces and how unbalanced forces cause visible motion in objects that are cabable of movement.

Explores the delightful chain reaction set in motion when a little boy offers a cookie to a visiting mouse.

LeVar takes viewers to a bowling centre where he tries to master the chain reactions involved in the game of bowling. Program Number 97.

Ages 6-11
30 minutes, order 5-4221-IN

It's Chemical: Density In Liquids

It's Chemical Series

Grade 5: Properties of and Changes in Matter

This well structured and clear program answers questions drawn from daily experience to provide informal lessons for understanding the principles of density in liquids.

Ages 9 to 11
26 minutes, order 1-8148-IN

It's Chemical: Density In Gases

It's Chemical Series

Grade 5: Properties of and Changes in Matter: Basic concepts: all covered

Joan and her aunt ride in a hot air balloon, bake popovers, and conduct kitchen experiments to make a number of discoveries about the density of gases. *Also available in laserdisc*

Ages 9-14
28 minutes, order 1-8149-IN

It's Chemical: Density In Solids

It's Chemical Series

Grade 5: Properties of and Changes in Matter

Joan and her aunt use kitchen experiments to gain an understanding of the basic principles affecting density in solids. Teachers guide provides additional experiments.

Available in CD-ROM, VHS and Laser Videodisc

Ages 9 to 11
28 minutes, order 1-8150-IN

It's Chemical: Phase Changes

It's Chemical Series

Grade 5: Properties of and Changes in Matter

Introduces the property of state of matter, building on concepts discussed in previous parts. Explore what permits skaters to glide on an ice rink, how cold water can crush a can, how candles work, and why cream separates when milk is frozen.

Available in CD-ROM, VHS and Laser Videodisc

Ages 9 to 11
25 minutes, order 1-8151-IN

Learning About Science Series

Basic principles of physical science, hands-on, insightful experiments and demonstrations.

Learning About Electricity

Introduces basic principles in ways both instructive and fun to watch. Examples give form to the concepts of static electricity, polarity, conduction and circuits. Shows daily life examples of how concepts applied. *This title is available in CD-ROM and Laser Videodisc*

16 minutes, order 1-9824

Learning About Light

Properties of light are shown using magnifying glass and prism. Color composition is demonstrated in a homemade rainbow. Light is related to heat, stored light and heat in wood and coal is mentioned.

9 minutes, order 1-4044

Learning About Air

Balloons, sailboats and windmills use air for a purpose. Kids learn the properties of air and enjoy games that are really demonstrations of what air and wind do. Four Awards & Cine Golden Eagle.

11 minutes, order 1-4039

Learning About Liquids, Solids And Gases

Ice, water, steam, it's all the same thing as kids learn when they explore the properties of matter. While changing it from one state to another they learn shape, mass, weight and molecular action.
11 minutes, order 1-4045

Learning About Solar Energy

Kids find ways to heat water for an outdoor shower and cook a hamburger in miniature solar furnace. They learn how solar energy is used in many other ways. Award Winner Science, National Education.
12 minutes, order 1-4020

Learning About Sound

A diagram of the ear illustrates how sound waves are transmitted through the air to the inner ear, and experiments demonstrate how sound travels through solids, liquids and air.
13 minutes, order 1-4059

Learning About Water

Kids learn that water is a major component in our bodies, in our foods and in our world. Explore water and its various form in ice and steam and its natural source, rain. Water cycle is explained.
12 minutes, order 1-4042

All titles are available in CD-ROM and VHS formats

Ages 6 to 8, Ages 9 to 11
71 minutes, order 1-40390-IN

Mass And Density: Investigating Matter

Grade 5: Properties and Changes in Matter

Detective Will Slater conducts experiments that demonstrate the Law of Conservation of Mass, how changes in volume affect density, and how bouyancy works.

Available in CD-ROM, VHS and Laser Videodisc

Ages 12 to 14, Ages 9 to 11
20 minutes, order 1-9812-IN

Matter: Solids, Liquids And Gases

The Real World Science Series

Everything on Earth is made of matter. This program presents general information about matter, its properties, and states. Students will enhance their knowledge about solids, liquids and gases. After viewing the video students will be able to identify solids, liquids and gases in the environment, explain how matter thanges state, describe the process of vaporization, evaporation and condensation, calculate the volume and mass of various forms of matter, and list the properties of various forms of matter.

Ages 9 to 11
18 minutes, order 1-2569-IN

Newton's Apple Classics Series

Newton's Apple Classics is an appealing half-hour science series drawn from various years of *Newton's Apple,* the familiar series that has been carried by PBS. The programs are hosted by Ira Flatow with additional segments by field reporter Peggy Knapp and naturalist Nancy Gibson.

Each episode contains several short segments, each on a different science subject. The segment's activities involve the host and guest scientists in the discovery of basic scientific facts and principles.

The series covers a broad spectrum of subjects including Life Science, Earth Science, Physics, biology, Chemistry, Astronomy, Technology, Health and Medicine, Animal Science and Sports Science. The series was produced by Twin Cities Public Television.

Investigating Mummies, Bicycles, Why Helium Makes Your Voice Change, Owls

This program begins with a look at how scientists are using techniques like C.A.T. scans, X-rays and fibre optic scopes to unravel the inner secrets of mummies. Then it's the physics of bicycles, and how centrifugal force, angular momentum and inertia all help to keep them stable. Next, its the truth behind why helium makes your voice go up, and finally, we take a close up look at the unique lifestyles and adaptations of owls.
Code 5-4168

Hot Air Balloons, Hearing, Why You Get "Side Stitches" When You Run, Beluga Whales

This program begins with a ride in a hot air balloon and a look at some of the physics behind why balloons fly. Then it's a trip inside the human ear to discover the mechanism behind he and what it's like to have a hearing loss. Next, the truth behind "side stitches," (those annoying pains you get in your stomach when you run) is explored, and the show concludes with a close up look at beluga whales and how they're maintained in captivity.
Code 5-4169

Fire, Artificail Hearts, Penguins

This program begins with a discussion about fire and several graphic Temonstrations showing how fires start and maintain themselves. Then it's a detailed look inside the human heart with Dr Lyle Joyce, one of the surgeons involved with the development of the Jarvic-7 artificial heart. The show concludes at Sea World in San Diego with a group of Antarctic penguins whose special adaptations allow them to live where no bird has gone before!
Code 5-4170

Lie Detectors, Dimples on Golf Balls, Hiccups, Homemade Cold Remedies

This program begins with a discussion about lie detector tests and several demonstrations showing how polygraph machines record subtle changes in breathing, skin chemistry and blood pressure when people lie. The it's off to the golf course where the physics of golf balls is explored. Wind tunnel tests show how dimples and bottom spin make a ball go farther using Bernoulli's principle to get lift. finally, its the truth about hiccups, and a presentation of some homemade cold remedies.
Code 5-4171

Thermography, How Your Voice Works, Why You Yawn, Pronghorns

This program opens with a demonstration of thermography, a picture which is made using an infra-red scanner which picks up heat rather than light from an object. Following a discussion of some of the uses of thermography, we discover how the human voice works and why people are capable of making so many different sounds. Next we learn some of the theories scientists use to explain yawning, and the show closes with a look at pronghorns, one of the fastest species on Earth.
Code 5-4172

Science and Athletic Training, Radioactivity, Pimples, Siberian Tigers

This program begins with a look at how scientific testing and training using computers and video cameras have helped athletes to perform better. Next, we take a look at the various forms of radioactivity and some common sources found in everyday life. The discussion shifts to pimples and the reasons we get them, and the show concludes with a trip to the zoo to take a close up look at Siberian tigers, the largest member of the cat family.
Code 5-4173

Dinosaur Fossils, Bullet-Proof Vests, the Causes of Heartburn, Killer Whales

This program begins with an investigation of dinosaur fossils and the variety of clues which scientists use to piece together information about the anatomy and lifestyles of these fantastic creatures. Then the focus shifts to bullet-proof vests and glass where demonstrations show how these unique materials dissipate energy from the impact. Finally, we learn the truth about what causes heartburn, and on location at Sea World in Florida, we take a close look at killer whales and learn about their habits and behaviours.
Code 5-4174

Boomerangs, the Science of Cooking, Hibernating Bears

This program opens with some graphic demonstrations on the proper way to throw a boomerang. Back in the studio we discover how Bernoulli's principle and gyroscopic stability couple to control the flight of these unique devices. The it's off to cooking class where the science behind well mixed salad dressing, no-stick pasts and lump-free sauces are discussed. The show closes with a team of scientists tracking and collecting data on hibernating black bears in the Minnesota woods.
Code 5-4175

Comets, Perpetual Motion Machines, Warts, Sharks

This program begins with a demonstration showing the nature and composition of comets. With the help of models, we get the inside story on how these dirty snowballs from space form tails and why scientists are so interested in them. Then, its a look at perpetual motion machines, those devices that are supposed to run forever and supposedly defy the laws of physics. After a brief discussion on the truth about warts, the show closes with a trip to Sea World in Florida where we take a close up look at sharks and learn some of their habits.
Code 5-4176

FBI Crime Lab, The Stomach, Llamas

This program begins with a staged bank robbery to demonstrate methods used by the FBI lab to solve the crime. Some of the techniques used include latent finger prints, magnetic imaging and electron-microscopy. Then its a look at how the human stomach combines chemical and mechanical action to digest food and the show closes with a close-up look at llamas and how they are particulalry adapted to life at high altitudes.
Code 5-4177

How Muscles Work, Einstein's Theory of Relativity, Shooting Stars, Raptor Rehab

This program begins with a look at your muscles and how they use leverage to get a great deal of lift out of a little movement. Host Ira Flatow then has a down-to-Earth chat with Albert Einstein about his Theory of Relativity and how the curvature of space affects our perspective. While on the topic of space, we take a look at the origin and composition of meteors, those “shooting stars” that light up the night sky. The show closes with an on-site visit to the Raptor Rehab Centre to learn how injured birds of prey are prepared to go back into the wild.
Code 5-4178

Sounds in the Shower, Calories in Food, Suntans, Cavies

The show begins with a close up look at why certain sounds seem to become more intense in the shower. Through a series of demonstrations, we learn about resonance and how vibrating air can be manipulated. Then it's time to count calories as we make an in-depth analysis of what a calorie is and how our body uses food as a fuel source. Next, we discover why some people tan in the summer while others burn...and the truth about why beach blondes get lighter hair. Finally, with the help of some live specimens, we learn some of the habits and habitats of the Cavy, the largest rodent in the world and a close relative of the Guinea Pig.
Code 5-4179

Flight Simulators, Venomous Snakes, The Common Cold, Hedgehogs

This program begins with an on-site look at how flight simulators work at the Minneapolis Airport and discusses why they are so important in modern day pilot training. Then it's back to the studio to discuss several types of poisonous snakes and the dangers of snake bites. Next, we take a close up look at hedgehogs learning about their habits and habitats and finally, we explore the truth about the common cold...how its transmitted, what researchers are doing to study it and how some people have tried to cure it in the past.
Code 5-4180

Caves and Cave Life, Lasers, Why Skin Wrinkles When Wet, Birth of a Killer Whale

This program begins on location in Puerto Rico where we get the inside story on how caves and cave structures form in limestone. We go back to the studio for a demonstration on how lasers are used to seal blood vessels and vapourize tumours during surgery. The it's the truth about why your skin wrinkles when it soaks in water. The show closes with a trip to Sea World in Florida to witness the birth of baby Shamu, the first killer whale ever born in captivity.
Code 5-4181

Hypothermia, Moon Phases, Changing Voices During Puberty, Yaks

This program begins with a look at the causes and effects of hypothermia on the human body and what can be done to prevent this life-threatening condition. Using a special camera, we see a demonstration of why the Moon changes phases followed by a down-to-Earth explanation on why boys voices change as they go through puberty. The show closes with a close-up look at Yaks and their special adaptations for life at the "top of the world."
Code 5-4182

Sponges, Bed of Nails, Probability, Pelicans

This program features an on-site look at sponges growing in the waters of the Caribbean Sea. We discover how these unique creatures feed and grow in their ocean environment and learn some of the uses which they have in modern society. Back in the studio we get a graphic demonstration of the physics involved with a bed of nails. Next we discover how to calculate the odds at winning the jackpot on a slot machine. The show closes on location in Florida with a close-up look at pelicans in their natural environment.
Code 5-4183

How Bees Make Honey, High Blood Pressure, Bruises, Hiccups

This program begins with a look at how bees make honey by collecting nectar, bringing it back to the hive and chemically changing it in the comb. We see a demonstration on how bees communicate with each other by using a special dance. The we learn about the dangers of high blood pressure, what effects it has on the heart and blood vessels and what can be done to reduce the risks. The show concludes with a look at how bruises form and what causes hiccups.
Code 5-4184

Telescopes, Food Facrs, Manatees

This program begins with a look at a variety of telescopes and how they all use different methods to collect data from distant objects. We go on location to the Kitt Peak four-meter optical telescope in Arizona, the Arecebo radio telescope in Puerto Rico and the Very Long Array in New Mexico. Then it's back in the studio to discuss some food facts including when mayonnaise can make you sick, why warm milk puts you to sleep and the truth about aphrodisiacs. The show closes on location in Florida to take a close up look at manatees in their natural habitat. We learn why these gentle creatures are called the "cows of the sea" and why they are an endangered marine mammal.
Code 5-4185

The Human Immune System, the Physics of Skis, Gas Laws and Blimps, Beavers

The program begins with a look inside the human immune system. Using a variety of models we see how the various components of this system work together to fight off a sore throat. Next it's off to the slopes where we discover the physics behind the construction of skis and how they have changed over time. Then, it's up into the air with a group of students who compete to figure out how much helium is in the Goodyear Blimp. The show closes with a look at beavers, the largest North American rodent whose special adaptations make it the construction champ of the animal kingdom.
Code 5-4186

Aluminum Baseball Bats, Polarized Sun Glasses, Dreams, Peregrine Falcons

This program opens at the ball park where baseball superstar Kirby Puckett gives us a lesson on the mechanics of batting. Back in the studio, we learn about the physics of baseball bats and why aluminum bats make the ball go farther than wood. Next are some demonstrations featuring polarized sun glasses showing why they are so effective at cutting out sun glare. Next, we learn what happens in our brain during dreams and the show closes with a look at peregrine falcons and some of the ways this endangered species is being reintroduced to urban environments.
Code 5-4187

Plastic Surgery, Aerodynamic Bicycles, Ailing Whales

This program begins with a detailed look at plastic surgery and how it's used for both cosmetic as well as reconstructive purposes. Using video imaging we learn how surgeons can see what the finished product looks like before the operation takes place. Then it's on location to Reno, Nevada, to discover how engineers have been able to use aerodynamic design to minimize wind resistance and create a bike that has a top speed of over sixty five MPH. The show closes with a look at how sick whales are treated at Sea World in San Diego.
Code 5-4188

Getting to the North Pole, Future Inventions, Sea Otters

This program opens with video footage from the Steger Expedition, a two-month dog sled journey to the North Pole. Ann Bancroft, the only woman on the eight-person team, describes what they had to endure on their fifty-five-day trek, and demonstrates some of the unique clothing and equipment she used. Then on location at the Science Museum of Minnesota, we meet a group of young inventors and see some of the technology they've dreamed up for the future. The show closes at the Monterey Bay Aquarium in California to take a close up look at sea otters in their natural environment.
Code 5-4189

Tornadoes, Light and Vision, Laryngitis, Beach Facts

This program begins with an investigation into the causes of tornadoes. With the help of several different models, we see how these storms develop and what makes them so destructive. Then it's off to the Exploratorium in San Francisco to get some insight on how light travels, why we see optical illusions, and how mirrors turn the world inside out. Back in the studio, we discover the causes of laryngitis and then it's off to the beach where host Ira Flatow explains why sea shells sound like the ocean, and the physics of footprints in the sand.
Code 5-4190

Neon Lights, Rube Goldberg Awards, Aspirin, Atlantic Puffins

This program begins with a demonstration of some of the methods that "benders" use to create neon lights. In the studio, we explore the physics of why different gases give off different coloured light and how this property is used to determine the chemistry of the stars. Then its off to Purdue University for the annual Rube Goldberg competition and the creation of some wild and egg-citing machines. Back in the studio, we discover how aspirin works to block pain and then it's off to the coast of Maine for a close up look at Atlantic Puffins, and endangered species of bird that's making a comeback with the help of some dedicated humans.
Code 5-4191

Cavities in Teeth, Snowflakes, Human Reflexes, Arctic Fox

This program begins with a trip inside the human mouth to take a close up look at some of the common causes of cavities and what can be done to prevent them. Then it's off to the Science Museum of Minnesota to analyze the structure of snowflakes. We take a look at how they can all be different yet all have the same six sided symmetry. Back in the studio, we learn the truth about reflex reactions and why doctors test your knee jerk and finally, we take a close up look at the Arctic Fox, a small mammal whose body is uniquely adapted to living in the arctic tundra.
Code 5-4192

Cocaine Addiction, Laundry Questions, Racing Sled Dogs

This program begins with a detailed look at the way cocaine works in the human nervous system and the psychological effects that it has on the brain. Then it's off to the laundry where host Ira Flatow explains how soap and detergent work and why clothes shrink. Finally, it's on location in the north woods to take a look at racing sled dogs. We discover what physical features set these dogs apart and learn some of the ways these unique animals are trained.
Code 5-4193
Ages 12 to 14
780 minutes, order 5-41680-IN

Newtons Laws Of Motion: Demonstration Of Mass Force Momentum

Grade 3 - Forces and Movement

In the classroom, Mr Dexter gives a lesson on mass, force, and momentum. With the help of simple but memorable demonstrations, he teaches the principles and vocabulary associated with Newton's laws of motion. *The actual physics that is being taught is clearly stated, and he demonstrations are well chose. Students will find the content helpful in understanding the laws of motion.* Science Books & Films, American Assoc for the Advancement of Science.

Available in CD-ROM, VHS and Laser Videodisc.
Ages 12 to 14, Ages 9 to 11
17 minutes, order 1-9777-IN

Opt: An Illusionary Tale

The Reading Rainbow Series

Seeing is not always believing, especially when you're looking at an optical illusion.

Seeing isn't always believing, especially in a book called *Opt: An Illusionary Tale* by Arline and Joseph Baum. Join LeVar as he enters the pages of *Opt* and walks through a world made up of optical illusions. Viewers will see for themselves how the eye can be fooled and meet a talented painter who specializes in art that tricks the eye. Program Number 76.

Review Books: *Lenses! Take a Closer Look* by Siegfried Aust, illustrated by Helge Nyncke; *Hide and Seek* edited by Jennifer Coldrey and Karen Goldie-Morrison; *If At First You Do Not See* by Ruth Brown.
Ages 6 to 8, Ages 9 to 11
30 minutes, order 5-2337-IN

Phantastic Physical Phenomena Series

The goal of this series is to foster a positive attitude toward science in upper elementary children with particular focus on girls in grades three to six.

Presents positive role models, emphasizes hands-on science exploration, encourages the development and use of critical thinking skills and provides insights into science-oriented careers.

Dr. Dad's real identity is Stephen Tomecek, respected science consultant for Newton's Apple and programs produced by Children's Television Workshop.

The 46 page Teacher's Guide is available free with series purchase.

Polymers: Stretching a Point and Bouncing Back

Dr Dad and the kids explore some of the properties of polymers including their strength and flexibility. Using an old family recipe, they whip up a glue-based polymer right in the garage. Chemist Joyce Morningstar shares some facts about polymers and shows how these amazing materials are made and refined.
15 minutes, order 5-4381

Buoyancy: Sink, Float or Boat

In the garage, Olivia and the neighbourhood kids discover how the shape of an object affects the amount of water it displaces and how the weight of that water actually helps to hold the object up.
15 minutes, order 5-4382

Electromagnetism: Generating Some Interest in Electricity

In the garage, Dr Dad and the kids discover the relationship between magnetism and electricity and how electric motors and generators are based on the same principles. They also experiment with building a simple homemade generator and make some power of their own.
15 minutes, order 5-4383

Sound/Radio Broadcasting: Good Vibrations

Dr Dad and the kids explore the basics of radio communication and discover how mechanical sound energy can be converted into electromagnetic waves and back again.
15 minutes, order 5-4384

Gas Laws: What Goes Up

Olivia and her friends discover some "hot" facts about air as they prepare to shoot some hoops. Using some simple props, they demonstrate why hot air balloons go up and what puts the bounce in basketballs.
15 minutes, order 5-4385

Alternative Energy: Let the Sun Shine In

In the garage, Olivia and her friends team up to design an energy efficient home. They discover the benefits of reflective insulation and why the albedo effect plays such an important role in heating and cooling.
15 minutes, order 5-4386

Oil Spills: Slime Time, Big Time

Olivia and her friends learn about cleaning oil spills the hard way when they accidentally create an environmental disaster of their own. They discover how sorbants work and how oil and water really don't mix. At the site of an industrial spill, Dr Ralph Portier gives Dr Dad a first-hand look at how microbes are used to clean up a land spill.
15 minutes, order 5-4387

Optics: Beginning to See the Light

Following a "fuzzy" tennis match, Olivia and the girls discover how a beam of light can be bent and why the curve of a lens will change its focal point. Dr Dad and the girls experiment with both prisms and Fresnel lenses to discover how each one changes the light. In the end, they conclude that you need different lenses for different jobs.
15 minutes, order 5-4388

Flight: Winging It

Long before the Wright brothers made their historic flight, people have dreamed of flying. Olivia and her friends are busy building a model airplane when Dr Dad arrives and gives them the scoop on Bernoulli's concept of lift. They see his principles in action as they get the inside story on airplane construction. Students learn about lift and experience the effects of various surface shapes by building and flying cardboard and clay boomerangs.
15 minutes, order 5-4432

Animal Architecture: Building Their Lives Away

Your students discover the basics of animal architecture as Olivia and her dad explore a variety of animal building sites: a beaver dam, a coral reef, bird and bee nests. The Teacher's guide provides detailed instructions for kids to design and construct their own bird's nests using a variety of "nesting" materials.
15 minutes, order 5-4433

Soil and Agriculture: The Dynamics of Dirt

Students will learn about soil components and nutrients and the impact of climatic conditions as Oliva and Dr Dad visit an organic specialist and a large commercial farm operation. Through a variety of hands-on classroom activities, your students learn how soil texture affects soil structure, chemistry and moisture retention.
15 minutes, order 5-4434

Nutrition: You Are What You Eat

As Olivia and her friends search for a healty snack food, they discover the secret of the calories, the problems with cholesterol and how the answer to eating well is often "in the bag." Have your students compare a banana, a hard-cooked egg, four marshmallows and two sugar cookies - the calories are nearly the same for each, but what about the nutritional content? Additional classroom activities help kids become familiar with nutritional labels, the differences between protein, fats and carbohydrates, and how to combine foods for a balanced diet.
15 minutes, order 5-4435
Ages 9 to 11
120 minutes, order 5-43810-IN

Robotics - The Future Is Now

Hosted by William Shatner. This program teaches students about robots and the roles they play in industry. Through graphic illustrations we see how they are used now and their future possibilities.

It introduces the concepts, capabilities, and applications of industrial robots. A variety of demonstrations illustrate their range of motion, systems of "vision" and "touch", as well as problem-solving abilities developing parallels between human and robots.

Gold Circle Award, American Society Of Association Executives
Ages 12-18
20 minutes, order 1-9778-IN

Robots: The Computer At Work

In what ways are robots different from automated machines? Designed to answer such basic questions, this film takes its examples mainly from Japan where more robots are currently in use than in any other country.
Ages 12 to 14, Ages 15 to 18
22 minutes, order 1-8027-IN

Serendipity And Stuff Series

Sound and Music

Grade 4 - Light and Sound Energy; Basic concept: group a variety of sounds according to pitch and loudness; recognize that sounds are caused by vibrations; describe how the human ear is designed to detect vibrations.

Visit a physics lab and a music department to take a look at sound - how it is producdd and how it relates to music. All sounds are created when something vibrates and this in turn causes air molecules to vibrate which sets our eardrum in motion. Covers sound waves, medium, speed, vibrations through liguids, solids, etc.
20 minutes, order 5-4506

The Art and Science of Folk Toys

Structures and Mechanisms: Grade 2: Movement: Basic concept: characteristics and movements of simple mechanisms.

Matter and Materials: Grade 6: Properties of Air and Characteristics of Flight; Basic concept: Bernoulli's principle.

Regardless of what they are made from or how they work, folk toys share something in common - creativity. Terms to look up: Friction, lever, momentum, Newton's First law, resonance, Bernoulli's principle.
20 minutes, order 5-4505

Behind the Scenes: How "Stuff" is Made

Join us in the studio and control room to find out how the show you are watching is made. You'll learn about the equipment used in the field and the studio as well as how the show is edited to tape. In the lab section, you will discover how to make your own moving pictures and find out why we see motion from still images.
20 minutes, order 5-4507

From Place to Place: Transportation

Grade 5: Conservation of Energy: ways energy can be stored and transferred in a device or system.

Grade 6: Electricity

Translating energy into motion is the real story of transportation. In this episode, you will learn about electric powered transportation, three different forms of mass transportation and examine an electric car. Covers the history of vehicles - electric, steam, gasoline.

Build an electric motor using the accompanying student/teacher guide. Terms to look up: lead-acid battery; LIM, PRT, retrofit, transportation system, maglev, rotor, stator.
20 minutes, order 5-4508

A Yellowstone Adventure
Explore and discover the animals and geologic wonders of the world's first national park. It contains the world's largest geyser area, and a diverse population of plant and animal life.
20 minutes, order 5-4509

Earning Your Wings: Investigating Flight

Grade 6: Properties of Air and Characteristics of Flight; basic concepts: gases expand to fill a space; air expants when heated; the role of lift; sources of propulsion; demonstrate and describe methods used to alter drag in flying devises.

How can an airplane fly? Learn about plains, balloons and kites by stepping into the world of flight. Visit an airport and talk with a pilot; take a hot air balloon ride. Learn of the invention of the kite and their uses. Terms to look up: aeronautics, density, drag, envelope, lift, pitch, yaw.
20 minutes, order 5-4510

What You See Is: Investigating Vision

We live in a world full of colour and motion so our sense of vision is very important to us. In this episode, you will learn about vision and the eye by visiting an optometrist for an eye exam and an optician will show how a pair of glasses is made.

In the lab section, test your peripheral vision.
20 minutes, order 5-4511

The Great Sky Show: Radio Astronomy

Grade 6 - Space. Basic concepts: identify the bodies in space that emit light; recognize major constellations

Listen to the stars? How can that be possible? In this episode, two students take us on a tour of a radio astronomy observatory. In the lab section, you'll find out how to make your own radio waves which are part of the electromagnetic spectrum just as visible light is. Our eyes are not sensitive to the wavelength of radio waves so astronomers use telescopes equipped with radio receivers to investigate the sky.

Terms to look up: astronomy, electromagnetic radiation, electromagnetic spectrum, galaxy, Milky Way, neutron star, radio telescope.
20 minutes, order 5-4512

Frontier Science: Technology of the Pioneers

Take a trip back in time to the 1820's. In this episode we will visit a settlement on the frontier adn meet several of the settlers who practice the current technology of their times ... spinning, making yarn, dyes, clothing, tools for use in and outside the home, blacksmith, etc.
20 minutes, order 5-4513

Start With Sand: Glass and Marble Making

Matter and Materials: Grade 4: Materials that Transmit, Reflect, or Absorb Light or Sound: Basic concept: classify materials as transparent, translucent, or opaque.

Energy and Control: Grade 3 - Forces and Movement; Basic concept: Distinguish between kinds of motion and indicate whether the motion is caused indirectly, or directly.

Glassmaking, and different forms of working withglass. Tour a stained glass factory, a marble factory, and hand-blown galss demonstation. In the lab sectino you will learn how to play a game of marbles and study the laws of motion.
20 minutes, order 5-4514
Ages 9-14
200 minutes, order 5-45050-IN

Simple And Compound Machines: How They Work

Grade 4: Pulleys and Gears; Basic concept: functions of pulleys, gears

No matter how "high tech" our world becomes, much work continues to be accomplished by simple machines – the lever, wheel and axle, pulley, wedge, inclined plane, and screw. This program turns everyday activities into opportunities to see physics at work.

Two students show up at a local equipment rental shop seeking help with their science fair project. The woman who runs the shop gives them the help they need, along with a lesson in basic physics.

Available in CD-ROM and VHS formats

Ages 9 to 11, Ages 12 to 14
22 minutes, order 1-9776-IN

Simple Machines

The Real World Science Series

Students learn to define and recognize the six simple machines: the inclined plane, the wedge, the screw, the lever, the wheel and axle, and the pulley. Real life situations demonstrate the function and purpose of each machine.

Ages 9 to 11
minutes, order 1-2289-IN

Sunken Treasure

The Reading Rainbow Series

A treasure hunt is exciting and fun, and there are many kinds of treasures to discover.

An old treasure map leads LeVar on an exciting treasure hunt at "Pirates Cove" in California. Inspired by *Sunken Treasure*, by Gail Gibbons, read by Robert Morse, he uses every device known to find a treasure, including a trusty bloodhound. Viewers also meet Dr. Robert Ballard of the Woods Hole Oceanographic Institution who, by using science and technology, located and explored the most famous shipwreck in history – the Titanic. Program Number 70.

Review Books: *The Titanic: Lost...and Found* by Judy Donnelly, illustrated by Keith Kohler; *A Day Underwater* by Deborah Kovacs; *What's in the Deep? An Underwater Adventure for Children* by Alese and Morton Pechter.

Ages 6-11
30 minutes, order 5-2264-IN

Women In Science

Meet three accomplished scientists as they describe their work activities, goals, educational backgrounds, professional responsibilities and personal insights that led them into their respective fields of marine biology, industrial forestry, and astronomy.

Red Ribbon Winner, American Film & Video Association.

Ages 12-18, Adult
20 minutes, order 1-8517-IN

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