ROCKY MOUNTAIN EXPRESS

TEACHER'S GUIDE

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A POSTCARD TO THE EDUCATOR

1.

Dear Educator,

Welcome to our Teacher's Guide, which has been prepared to help educators integrate the IMAX® motion picture ROCKY MOUNTAIN EXPRESS into school curriculums. We designed the guide in a manner that is accessible and flexible to any school educator. Feel free to work through the material in a linear fashion or in any order you find appropriate. Or concentrate on a particular chapter or activity based on your needs as a teacher. At the end of the guide, we have included activities that embrace a wide range of topics that can be developed and adapted to different class settings. The material, which is targeted at upper elementary grades, provides students the opportunity to explore, to think, to express, to interact, to appreciate, and to create.

Happy discovery and *bon voyage*!

Yours faithfully,
Pietro L. Serapiglia
Producer, Rocky Mountain Express


2. Moraine Lake and the Valley of the Ten Peaks, Banff National Park, Alberta

The Film

The giant screen motion picture *Rocky Mountain Express*, shot with authentic 15/70 negative which guarantees astounding image fidelity, is produced and distributed by the Stephen Low Company for exhibition in IMAX® theaters and other giant screen theaters. *Rocky Mountain Express* is also **available soon** on DVD in store and online for home viewing. For more information about this giant screen experience and the work of The Stephen Low Company, visit:
www.stephenlow.com.

1 ALL ABOARD!

THE FILM

Produced for the IMAX® screen, *Rocky Mountain Express* takes viewers on a kinetic steam train journey through the breathtaking views of the Canadian Rockies. The film presents an alpine odyssey of heroic human drama and epic engineering involved in the conception and construction of the Canadian Pacific Railway (CPR), the nation's first transcontinental track way, through some of the most beautiful and rugged terrains on earth, a nearly impossible wilderness railway that united people from coast to coast, shaped a new nation, and changed forever the face of the North American continent.

The Canadian Pacific Railway, completed in 1885—six years ahead of schedule, has widely been regarded as one of the greatest and most ambitious engineering feats in history. Spanning over 22,500 kilometers (14,000 miles) of rail line across Canada and into the United States, this monumental transcontinental project and its wandering ribbon of steel drew on the labor and expertise of thousands from around the world.

Retracing the original route aboard the Empress, the majestic steam engine CPR 2816 built in 1930 and now restored and operated by the Canadian Pacific Railway, *Rocky Mountain Express* transports audiences back to the magic and drama of the age of steam, an era of remarkable ingenuity, trials and tribulations. Award-winning Canadian filmmaker Stephen Low weaves together spectacular IMAX aerial cinematography, stunning vistas of Western Canada, archival images and maps, and the potent energy and rhythms of a live steam locomotive into a narrative of romantic railway travel.

3. The Empress

2 THE NORTH AMERICAN DREAM

REFLECTIONS ON THE RIBBON OF STEEL (CANADA AND U.S.A.)

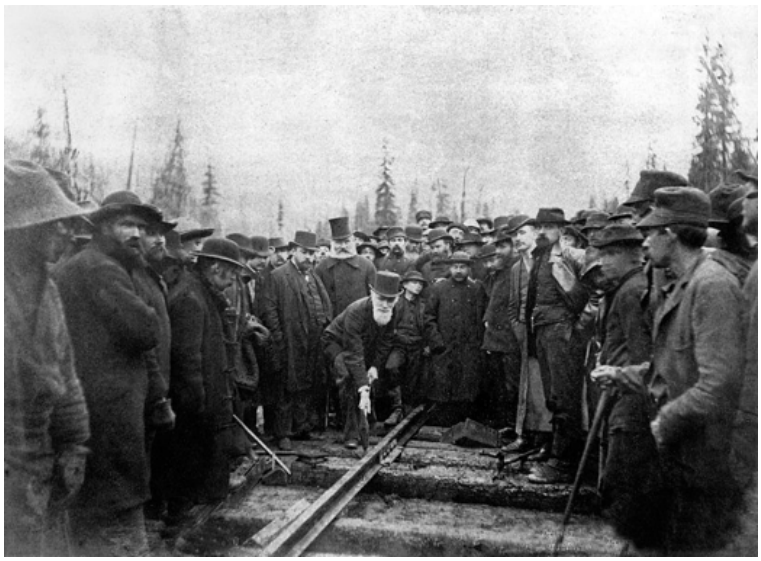
A Common Railway History

As highlighted in *Rocky Mountain Express*, the Canadian Pacific Railway (CPR) was Canada's first countrywide railway. But south of the border, the United States of America also built its own great railway. The Transcontinental Railroad—known originally as the Pacific Railroad and later as the Overland Route, was a railroad line constructed in the United States between 1863 and 1869. With 5,632.7 kilometers (3,500 miles) of track, the Transcontinental Railroad extends from California, through the Sierra Nevada Mountains and the western deserts and across the Missouri River, to Chicago, Illinois. By linking with the existing railway network of the Eastern United States, the Transcontinental Railroad connected the Atlantic and Pacific coasts of the country by rail for the very first time.

Both transcontinental railways were incredible engineering accomplishments of the nineteenth century, but they each carried a hefty price tag; the final cost for the American railroad project totaled $50 million, while that for the Canadian railway venture reached over $37 million. Behind such defining moments of glory, there were challenges, conflicts, and controversies surrounding the construction of the railroads. At the same time, there were the blood, toil, tears, and sweat as well as the cruel exploitation and severe sacrifices of numerous manual laborers, many of whom had risked and lost their lives building both railroads.

It took approximately 17,000 workers (the majority were men, and many were European immigrants and Chinese coolies), 5,000 horses, and 300 dog-sled teams to build the Canadian Pacific Railway. By the time it was finished in 1885, over 600 men perished constructing it, the majority of them Chinese laborers. In the United States, 4,000 workers, two-thirds of whom were Chinese immigrants, had completed the Transcontinental Railroad over the Sierras and into the interior plains by the summer of 1868. Almost all of the track work was done manually, using shovels, picks, axes, black powder, two-wheeled dump carts, wheelbarrows, ropes, mules, and horses. At least 150 men were killed by construction accidents and disease.

The Chinese workers played a key role in the construction of the railroads of both countries, and without their industrious efforts, the development and progress of each nation would have significantly been delayed. Their back-breaking toil for utterly meager wages in extreme harsh weather and brutal, dangerous working conditions cannot be overlooked and underappreciated.


4. The Last Spike of the Canadian Pacific Railway at Craigellachie, British Columbia

The Role of Women in Railroading

Contrary to common belief that women in the nineteenth century were confined to domestic obligations of the home, women were instrumental, alongside men, in the construction and operation of the railway. Some took on manual labor tasks at railway building sites, such as laying track and carrying rocks from blasting sites to dump carts. In a few isolated cases, women also performed more labor-intensive duties and responsibilities on the railroad, undertaking jobs like blacksmithing, boilermaking, welding, pipefitting, air brake cleaning, machinery work, and crane operation. However, the majority of women worked as telegraph operators, dispatchers, station agents, clerks, and charwomen, posts associated with administrative and domestic fields. Although the range of capacities was varied, women's roles and vocational choices in the railway industry were impeded as they faced barriers of persistent resistance, discrimination, and hostility in the male-dominated society. Male superiors and peers actively denied their female counterparts from assuming managerial and skilled craft positions and entering the union of machinists and mechanical engineers. They also discouraged companies from hiring and retaining female employees and pressured government to enact legislation that would impose physical capability requirements and restrict the number of working hours for women. In several instances, men refused to work alongside women, forcing employers to remove the latter from their posts. It was only over a long period of time that the walls began to break down, permitting women to gain acceptance in the workplace and access to more specialized occupations and leadership positions.

5. Canadian Women Working on Locomotives

6. Women Working on the Great Northern Railway at Great Falls, Montana, c1918.

3 A RAILWAY JOURNEY

EVOLUTION OF RAIL TRANSPORT

Rail as a Mode of Transportation

Rail is one form of land transportation that has developed and evolved over time. With new innovations in technology, the rail industry continues to search for better and easier ways to connect people from one region to another and to move large numbers of passengers and large loads of freight quickly and efficiently from one place to another.

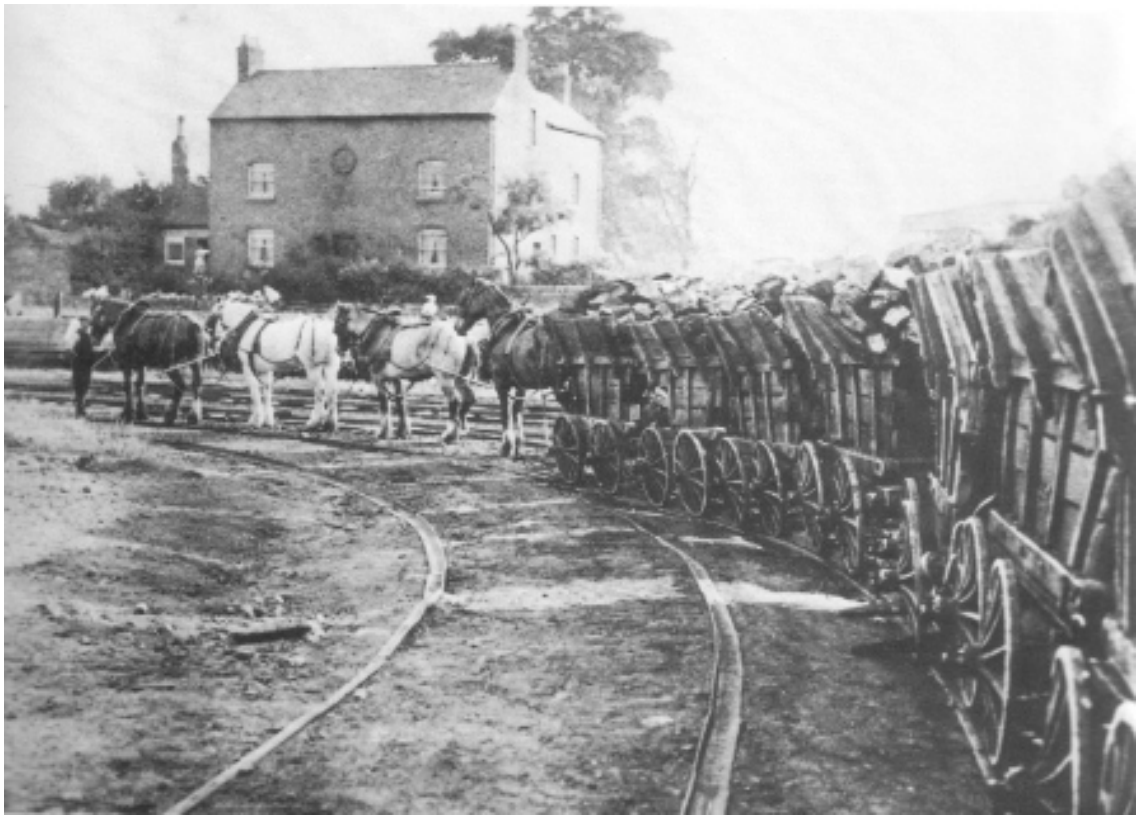
The train linked together several cars or vehicles into one long caravan. This linking was made possible by the use of tracks or roads of rail to guide the train behind the pulling engine. And eventually the track on which the vehicles traveled became the backbone of the railroad. The locomotive was perceived to be the pulling power of many horses concentrated in a single entity and was thus rated by degree of "horse power."

From the Past to the Present

At the beginning, trains were employed to haul heavy freights on dirt roads.

Animal Power

- Wagon ways (wagons or carts) were drawn by animals (horse or ox) over wooden rails. They were first employed to transport coal from mines on dirt roads.
- Tramways (wagons with flanged wheels, first introduced in 1789 by Englishman William Jessup) were hauled by horses over iron rails. The flange was a groove that allowed the wheel to maintain better grip on the rail.)
- Trips were slow, treacherous, and time-consuming.



7. Wagon way

Steam Power

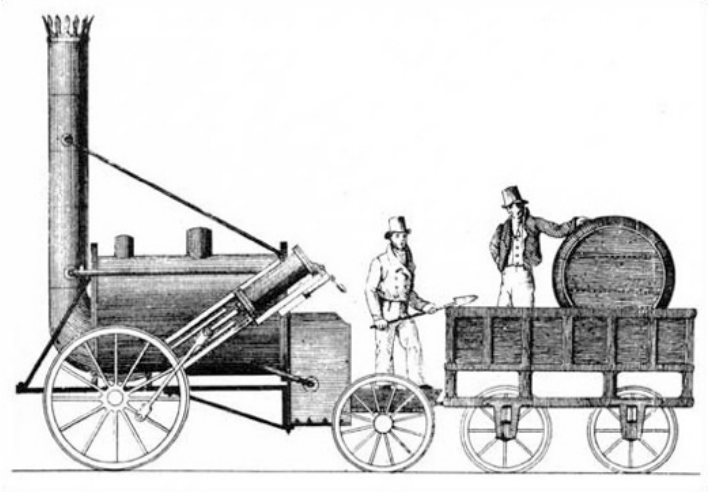
- Tramway locomotives used steam engines to pull trains. By burning coal, wood, or oil, steam was produced in a boiler which powered the locomotive.


8. German Steam Tram Engine

- British mining engineer Richard Trevithick (1771–1833) pioneered the first high pressure steam engine and in 1802 built the "Pen-y-Darren," the first functional railway steam locomotive to haul iron.

Trains not only pulled freight, bringing goods from place to place; they began to carry passengers. As trains became more accessible to people, railway travel became more popular.

- England's Stockton and Darlington Railway (S&DR), which began its operations in 1825, was the world's first regular railway service for passengers. Its original route was 42 kilometers (26 miles) long, the world's longest railway line at the time. The line was originally built to carry coal from the collieries in north-eastern England to the port of Stockton.
- In 1826–1829, English civil and mechanic engineer George Stephenson (1781–1848) designed and built, with the help of his son Robert, "The Rocket," the first public steam railway line. It won the RainHills Trials, a competition created by Liverpool & Manchester Railway, to find the best locomotive for a new passenger railway line in England. During the race, it set a speed record of 47 kilometers an hour (29 miles per hour) during the 20-lap course. It was the first locomotive to have a multi-tube boiler that consisted of 25 copper tubes instead of a single flue found in earlier locomotive boilers.

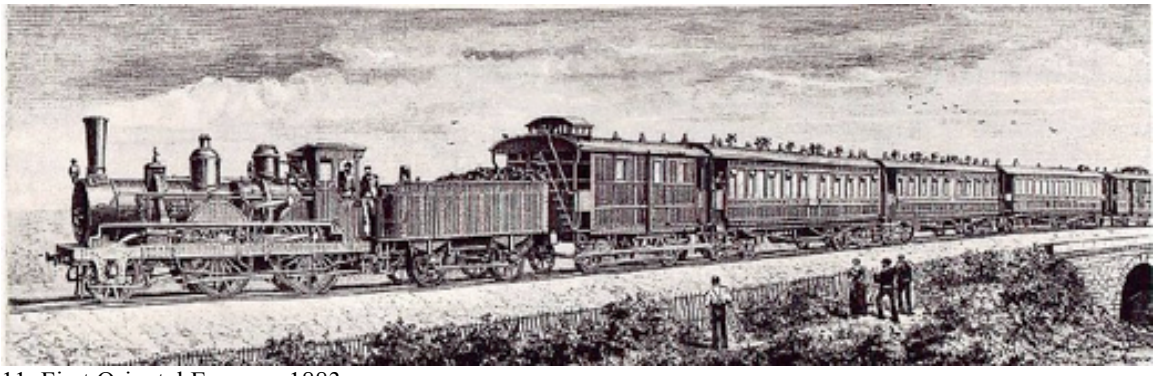


9. Stephenson's Rocket Drawing

- In 1830, American Peter Cooper (1791–1883) designed and built "Tom Thumb," the first American steam locomotive that operated on a common-carrier railroad composed of only 37 kilometers (23 miles) of completed track in the United States. It was a four-wheel locomotive with a vertical boiler and boiler tubes made from rifle barrels.
- In 1857, American engineer and industrialist George Pullman (1831–1897) invented and manufactured the railroad sleeping car, elaborately designed for overnight passenger travel. Also called "Pullman sleeper" and "palace car," each luxurious coach car was equipped with upholstered seats that converted into beds, artistically decorated furnishings, carpeted floor, 100 sheets and pillowcases, 40 blankets, towels, and, better lighting, heating, and ventilation. In a later model, the *President*, he created his "first hotel on wheels" by attaching a kitchen and dining car to a sleeper. He introduced comfort to rail transportation and hired African-American men as porters to serve the modestly affluent passengers in the coach cars and to enforce his company policies, including the rule that prohibited travelers from wearing their boots to bed.


10. Interior of Pullman Sleeping Car

- In 1883, Belgian entrepreneur and engineer George Nagelmackers (1845–1905) founded the world's most famous Oriental Express, a luxury and comfortable train with opulent sleeping cars that provided upscale long-distance travel service across Europe. A trip from Paris to Istanbul, the original endpoints of one of the timetabled routes, took 68 hours without delays.


11. First Oriental Express, 1883

- The 25 American "Big Boys," which were built in 1941 and 1944, were the largest and strongest steam engines ever produced for regular service. The Union Pacific Railroad vehicles were designed to eliminate the use of doubleheading (or the need for two locomotives) in order to travel over steep mountain slopes at high speed. Staggeringly massive, each, which weighed more than 312,979 kilograms (345 tons) and measured over 40 meters (130 feet) in length, was capable of running up to 100 kilometers an hour. With the rise of diesel-electric locomotives, the Big Boys ended its service in 1959.

12. “Big Boy” 4023

Diesel Power

- German mechanical engineer Rudolph Diesel (1858–1913) invented the diesel engine in 1892. He demonstrated his invention using peanut oil at the 1900 World Exhibition in Paris. After his death, his diesel engine was further developed and was applied to the locomotive.
- These trains were faster, quieter, and more energy-efficient than steam locomotives.

Electric Power

- Electric trains were introduced in 1879. Electricity, which powered the trains, came from overhead lines, a third rail, or an on-board energy storage device.
- Electric locomotives were more efficient than diesel-powered ones.
- Monorails, which are based on a single rail, are electric-powered and only used for short distances.
- Germany’s Wuppertal Schwebebahn (or Wuppertal Floating Tram) is the world’s oldest electric elevated railway with hanging cars
- Norfolk Southern Railway No. 999 is the world’s first all-electric, battery-powered locomotive in 2008 in the United States. When one of the 1,080 lead-acid batteries which power it dies, the locomotive shuts down. To overcome this problem, Penn State researchers have developed a cost-effective method to revive the dead battery and to increase the overall capacity.

Electro-Diesel Power

- Electro-Diesel locomotives are powered by both external electricity and diesel fuel. The Centennials, designed and built exclusively for Union Pacific Railroad in 1969, were the largest diesel-electric locomotives in the world that were utilized to pull freight at high speeds. With a weight of 270 tons and a length of 30 meters (98 feet), the road locomotives possessed 6,600 horsepower. However,

most of these locomotives were withdrawn from service in 1986 due to the decline of freight movement and high cost of maintenance.

The Future

The railway industry continues to improve the speed of trains.

High-Speed Trains

- High-speed trains operate faster than traditional rail trains.
- Japan's Shinkansen high-speed trains, known outside Japan as 'bullet trains,' were designed to travel at 250 kilometers an hour (155 miles per hour). The high-speed rail line opened its operations in 1964, just in time for the Tokyo Olympics.

13. E2 Series Shinkansen 'Bullet' Train

- The V150, a specially configured TGV (***t****rain* ***g****rande* ***v****itesse*), broke the world land speed record for conventional railed trains in 2007. Built in France, the high-speed electric train reached a speed of 574.8 kilometers per hour (357.2 miles per hour) on an unopened section of the LGV Est européene between Strasbourg and Paris.
- Maglev trains employ magnetic levitation which lifts and propels the high-speed vehicles along an elevated guideway by magnets attached to the vehicles. They are cheaper, faster, extremely energy-efficient, and emit no pollution. The Shanghai Transrapid was the first commercial high-speed maglev line in the world. As the world's fastest train in regular commercial service since its opening in 2004, the passenger vehicle can travel as rapid as 431 kilometers per hour (268 miles per hour), faster than the top speed of a Formula One car.
- China's high-speed rail system (modeled after Japan's Shinkansen) opened in 2007. It is the world's longest high-speed railway network, with a combined track length of 7,531 kilometers (4,680 miles), and the network is expected to expand to 16,000 kilometers (9942 miles) in 2020.

14. High-Speed Trains in China

Trains have continued and will continue to evolve, with changes in the different methods of power and the size and operating location of trains. Some types of trains run across a country, while others remain local, ferrying people within and throughout metropolitan and regional areas.

More Fascinating Facts about Trains

An average freight train weighs 10,000 or more tons. To give you an idea of how heavy this is:

- A hippopotamus weighs between 1½ and 3½ tons.
- A white rhinoceros weighs 1½ to 4 tons.
- An elephant weighs from 3 to 7 tons.
- A bull weighs 2 tons.

A locomotive on average weighs 200 tons. This is equivalent to the weight of 8 DC-9 aircrafts, 15 school buses, or one blue whale, the largest animal on earth!

A single locomotive can deliver enough electrical energy to power your neighborhood (and probably the neighboring one as well).

The world has a total of over 22 million kilometers (14 million miles) of railroad line.

The world record on speed for a steam locomotive is 202.7 kilometers per hour (126 miles per hour), set by British locomotive 4468 Mallard, in 1938.

15. British locomotive 4468 Mallard

The longest railway route in the world is the Trans-Siberian Railway, between Moscow and Nakhodka in the Russian Federation, stretching 9,438 kilometers (5,777 miles).

The world's largest railway station is Grand Central Station in New York City in the USA.

Seikan Tunnel, situated beneath the Tsugaru Strait in Japan, is both the longest and deepest operational rail tunnel in the world. It is
53.85 kilometers (33.46 miles) in length, with a 23.3-kilometer (14.5-mile) long portion under the seabed.

The United States has the largest railway system in the world covering 48 continental states with a distance of approximately 240,000 kilometers (149,129 miles). That length is enough tracks to circle the Earth 5 times! Russia (154,000 kilometers) and Canada (72,961 kilometers) follow.

16. American Transcontinental Road Stamp

4 THE LITTLE ENGINE THAT COULD

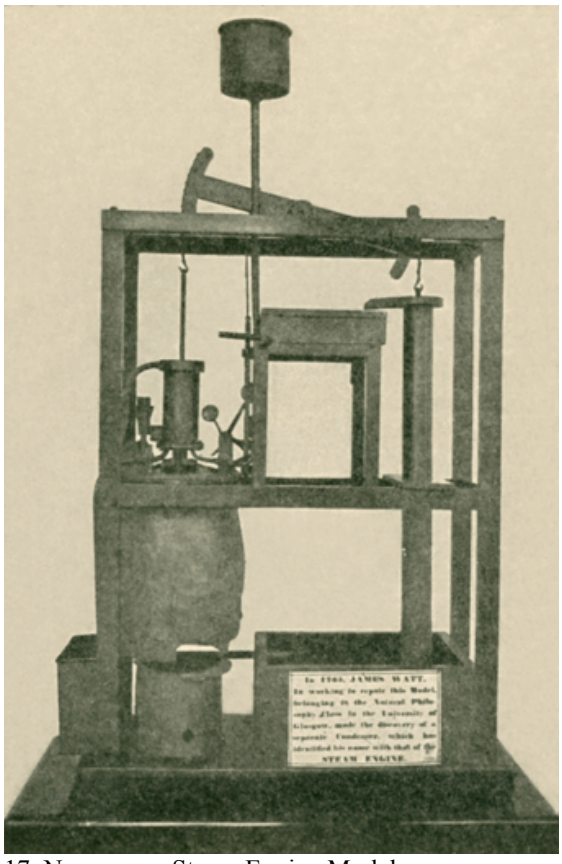
THE MECHANICS OF THE RAILWAY AND TRAIN

Railroad Tracks

Railroad tracks support and guide the train, providing a low-friction surface on which the train runs. The earliest rails were made of wood. Because they wore out quickly, wooden rails were eventually replaced by iron ones. After many decades, the iron rails were changed to steel rails as steel proved to be a stronger and more durable material.

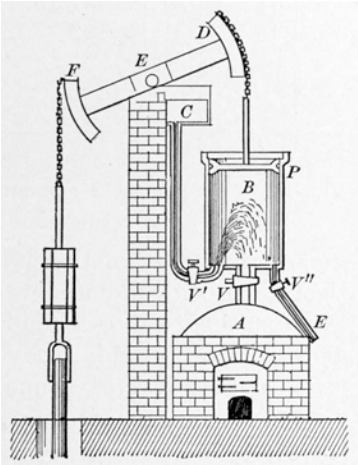
The Steam Engine

The steam engine, which was first invented by British engineer Thomas Newcomen (1664–1729) in 1705, was the first engine type to become widely used. Scottish inventor and mechanical engineer James Watt (1736–1819) further improved the steam engine in 1769.

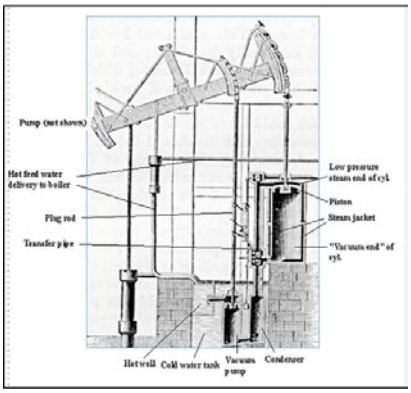


17. Newcomen Steam Engine Model

How Does a Steam Engine Work?
A steam engine is a heat engine that performs mechanical work using steam as its working fluid. Water is heated into steam in a boiler (which was originally made of wrought iron) until it reaches a high pressure. The extremely hot steam expands fully, and its pressure pushes the pistons which move the gears and wheels of the locomotive. The remaining steam is then condensed and pumped back into the boiler or released into the atmosphere. In the latter, the steam escapes in a rapid burst of pressure, creating the characteristic "choo" sound.



18. Diagram of the Newcomen Steam Engine



19. Diagram of the Watt Steam Engine

How is a Diesel Engine Different from a Steam Engine?
A diesel engine is an internal combustion engine in which the fuel is burned *inside* the cylinders, the main part of the engine where power is produced. The steam engine is an external combustion engine where the fire that heats the water to produce steam is located *outside* the cylinder.

The Braking System of Trains
Brakes are employed on the railway train cars to allow deceleration, control acceleration (particularly when the train is descending downhill), or keep them stationery when parked.

In the early days, stopping a train was difficult.

Steam trains with one or two cars used a "countersteam brake" which employs the engine (specifically the cylinders) to help brake the vehicle. By reversing the steam flow to the cylinders, the engine driver was able to cause the locomotive to act as a brake.

When trains got longer, heavier, and faster and started to travel in mountainous terrain, each rail car was equipped with brakes since the locomotive was no longer capable of halting the entire train in a reasonable distance. Brakemen were hired to move from rail car to car and manually apply or release the brakes when they were signaled to do so by

the locomotive engineer with the train whistle. Occasionally, the whistle signals were misinterpreted, incorrectly given, or not heard, and runaways, derailments, and collisions would occur.

The vast majority of trains in the world today are usually equipped with FOUR braking systems available along with one propulsion system since it is much harder to stop a train than to get it moving. The "air brake" or "pneumatic brake," a type of friction brake that is actuated by compressed air, has been the standard, fail-safe braking system used by railways around the world. Full air pressure signals each rail car to release its brakes, while a reduction or loss of air pressure signals each rail car to apply its brakes.

5 TALES, TRAGEDIES, AND TRIUMPHS

THE RAILWAY AND ITS ENVIRONMENTAL CHALLENGES

Compared to other types of transportation, the railroad is the most efficient form of land transportation. It requires the least amount of fuel and human labor and much less room than a four-lane highway. It is also more ecological-friendly as it leaves fewer scars in the environment.

However, the natural geographic landscape has posed daunting obstacles for the railway surveyors. The engineers and builders had to come up with creative, practical ways to penetrate and conquer Nature's stunning and at times, unforgiving barriers: vast stretches of rugged wilderness punctuated by rocky terrains, impenetrable forests, numerous lakes and rivers, unfathomable muskegs (machinery-swallowing bogs), desert grasslands, and snow-capped mountains chaotically broken by deep chasms and river gorges.

Unknown Territory

During the time of the conception, planning, and construction of the Canadian Pacific Railway, there were no available, adequate maps of the vast wild land and the mountainous regions for the railway surveyors, for many have never even step foot in the rugged wilderness in question. The railway engineers and builders needed to find and establish routes through the unfamiliar terrain in order to realize the seemingly impossible railroad dream.

20. Map of the Major Lines of the Canadian Railway Network

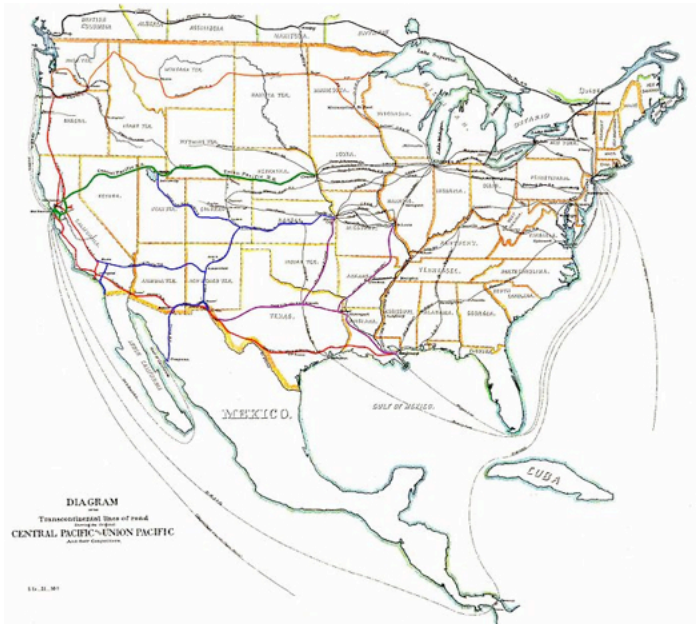
Maps

What are maps?

- A map is a flat drawing of a place or part of the world.
- A map looks as if it were drawn from the view of someone sitting in an airplane.

How do maps help us?

- Maps help us find our way from one place to another.
- A map shows where things or places are located.
- Maps can be used to show how far one place is from another.



21. 1887 Map *Diagram of the Transcontinental Lines of Road Showing the Original Central Pacific and Union Pacific and Their Competitors*

Mountains

Mountain Tunnels

In the early days, railroad laborers used pick, shovel, and dynamite explosives to open and build tunnels through rock. However, this method sometimes caused holes and uneven surfaces inside. Today, engineers have created new technologies suitable for carving and constructing tunnels in mountain with hard rock layers. Unique and challenging from other kinds of tunnel construction, mountain tunneling is created by drilling a hole through layers of very rough and hard rock. Engineers have to determine the type of rock inside the mountain and then decide how to strengthen the tunnel from uneven and shifting rocks.

Tunnel Boring Machines

Tunnel boring machines, an alternative to drilling and blasting methods in rock, are now the most effective way to create smooth tunnel walls and fewer disturbances to the natural environment nearby. These huge circular machines, which move like giant earthworms, employ a rotating cutting wheel to break and dig up rock and soil which is then carried away by a conveyor belt system.

Natural Hazards

In areas of steep mountains with extreme snow fall and buildup, avalanches are very common. The high-velocity snow slides have the destructive force capable of damaging the environment and burying and destroying life and man-made structures. They can ravage a forest or wipe out an entire town.

Rogers Pass

Rogers Pass, with an elevation of 1,330 meters (4,360 feet), is a high mountain pass through the Selkirk Mountains of British Columbia, used by the Canadian Pacific Railway. After the railway was completed in 1885, it was originally abandoned during the winter months due to serious avalanches at the location. In order to maintain rail operation during the winter months, 31 snow sheds which covered a total length of 6.5 kilometers (4 miles) were built in order to shelter the Rogers Pass stretch from unexpected disastrous natural forces. However, most of the route through the pass was not protected, so workers still had to clear the railroad line buried under the heavy show.

In response to a substantial number of winter disaster accidents, including the tragic Rogers Pass Avalanche incident in 1910, the Canadian Pacific Railway constructed the Connaught Tunnel through Mount MacDonald in order to bypass the dangers of Roger Pass.

22. 1910 Rogers Pass Avalanche

23. Connaught Tunnel at Glacier, British Columbia

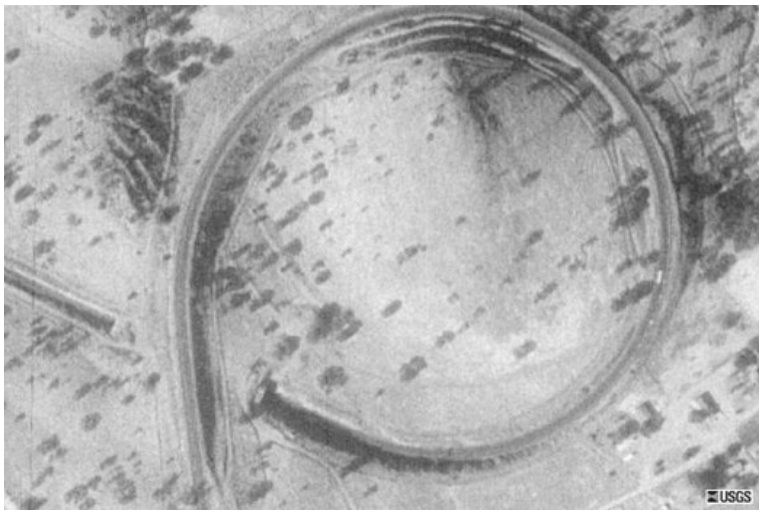
Connaught Tunnel

Connaught Tunnel, in the Selkirk Mountains under Rogers Pass, is part of the Canadian Pacific Railway principal line between Calgary, Alberta, and Revelstoke, British Columbia. Located under Mount Macdonald (2,893 meters or 9,492 feet), it was originally excavated to relieve rising train traffic experienced between 1910 and 1913 and to circumvent the hazardous Rogers Pass, which was prone to avalanches.

At the time of its construction, it was the longest railway tunnel in all of North America, measuring 8.082 kilometers (5.022 miles) in length. Work started in 1914 as 300 laborers drilled 270 meters (900 feet) of tunnel per month. Many problems were encountered with ventilation, loose rocks, and wet rails, which caused trains to stall; the tunnel was ultimately lined with reinforced concrete and furnished with a superior aeration system. The cost of the entire project ended up being 8.5 million dollars. Named in honor of the Governor General of Canada at the time, Prince Arthur, Duke of Connaught, the tunnel finally opened in 1916, and the railway abandoned Rogers Pass.

Spirals

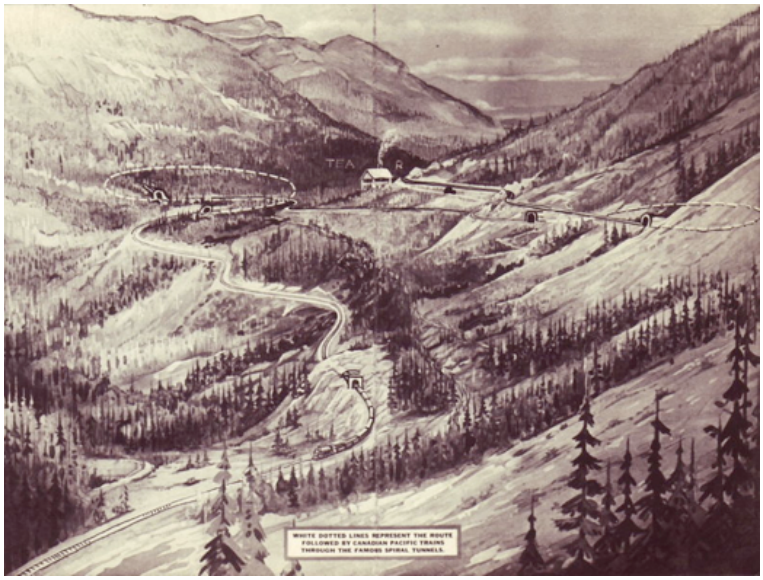
A spiral, also referred to as a spiral loop or simply a loop, is a method employed by railways to climb steep hills. Railway spirals go up on a continual curve until a loop has been completed, going over itself as its height increases. Spirals are substitutes for sharp turns in alternating directions or “zigzags,” which can be dangerous and cause sudden changes in a train’s movement. This technique permits a railway to increase elevation in a short, straight distance, help trains steer clear of having to stop and reverse direction as they ascend mountains, and ensures the train and the riding passengers remain safe and comfortable!



24. Spiral Loop

Big Hill (From Inclined Track to Spiral Tunnels)

Along the Canadian Pacific Railway line lies the most difficult and treacherous stretch of trail known as the "Big Hill," the steepest incline and sharpest curves of any main rail line in Canada. Situated near Field, British Columbia, a cozy vacation town in the Canadian Rockies, the Big Hill with its narrow valleys and high mountains was notorious for blizzards with temperatures dropping to -40°C, frequent stalled engines, runaway train incidents, and persistent threats of avalanches and rock slides on the valley side which caused sever disruption and delay of rail service. Due to the increased traffic over the line in the early 1900s, the Big Hill "temporary line" needed to be improved and was eventually replaced by two spiral tunnels in 1909 to gain the track length in order to reduce the overall grade on the hill by half. These famous spiral tunnels were regarded as one of the engineering triumphs of the day.


25. Panorama of the Spiral Tunnels, 1908

Bodies of Water

Suspension Bridges

Suspension bridges are one of the oldest of human engineering forms. They have a roadway (or railway) that hangs from massive cables which are anchored at each end of the bridge and supported by two tall towers.

Stoney Creek Bridge

Stoney Creek Bridge is one of the scenic landmarks for the Canadian Pacific Railway. Positioned on the Eastern slope of Rogers Pass, British Columbia, the 200-meter (660-foot) long truss arch bridge carries rail cars 91 meters (300 feet) above Stoney Creek, situated between Revelstoke and Golden. The original wooden trestle, built in 1885, was replaced by the current steel bridge, which was constructed in 1893. In order to support heavier traffic, the structure was strengthened with a second set of steel arches in 1929. The original bridge was yet another fabulous engineering feat when it became the tallest bridge in the world at that time.

26. Stoney Creek Bridge, British Columbia

Trestle Bridges
A trestle is a rigid frame employed as a support. In the context of a trestle bridge, the structure is composed of a number of short spans supported by frames which involve trestlework.

Timber trestles were utilized to connect the railroad to its destination. Once the railway was operating, it was employed to transport construction material to replace trestles with more permanent bridges.

Lethbridge Viaduct
Known as the "High Level Bridge," the Lethbridge Viaduct over the Oldman River was designed and constructed by the Canadian Pacific Railway as part of a major diversion of the Crowsnest Pass route between Lethbridge and Fort Macleod in Alberta. It is the highest and longest steel rail trestle in the world. Spanning 1624 meters (5328 feet) in length and close to 96 meters (315 feet) above the river bed, this impressive bridge on the relocated route replaced several wooden trestles, including one that measured 894 meters (2,933 feet) long and 20 meters (66 feet) high, and helped shortened the distance, eliminate many curves, and reduce the grade of the original stretch of trail.

The building of the steel tower bridge, which commenced in 1907, was challenging due to its immense size and the unfavorable conditions of strong winds, dry soils, and extremes of temperature in the Oldman River Valley. At the site, the area was cleared and graded, piers were constructed, and footings were placed while the steelwork was being prefabricated. In 1908, a team of 100 men worked on the erection of the steel structure with the help of a huge travelling crane, and the bridge was completed in 1909. The outstanding engineering work, which is still in use, continues to stand the test of time.


27. Lethbridge Viaduct, Alberta


28. Lethbridge Viaduct, Alberta

6 DO THE CHOO-CHOO

A TRAIL OF INFLUENCE AND INSPIRATION

As one of the great historic legacies that have left an indelible impact on the world, the railway has fueled enduring fascination, admiration, and adulation for countless people. Sounds and images of railways and trains have been immortalized in a myriad of cultural works. From literature to music to film, the railway has occupied a special place in the hearts and minds of artists as they pay tribute to one of the marvels of the modern industrial world.

Music

Classical Music

- *Eisenbahn-Lust Walzer, Op. 89* (1836) by Johann Strauss I (1804–1849). These "Railway Pleasure Waltzes" for orchestra were created to mark the opening of the first Austrian steam railway in 1837, operating between the Viennese suburbs of Floridsdorf and Deutsch Wagram.
- *Københavns Jernbanedamp Galop* (1847) by Hans Christian Lumbye (1810–1874). To celebrate the opening of the first stretch of railway in Denmark, this "Copenhagen Steam Railway Galop" orchestral piece depicts the journey of the steam engine, chugging out of the station situated in the royal city of Copenhagen and grinding to a halt at the terminal located in the cathedral city of Roskilde.
- *Vergnügungszug*, *Polka Schnell, Op. 281* (1864) by Johann Strauss Jr. (1825–1899). This "Pleasure Train" polka written for string quartet or string orchestra was inspired by the Austrian Southern Railway wand the popular excursion trains which offered surprise journeys with mystery destinations.
- *John Henry* (1940) by Aaron Copland (1900–1990). This railroad ballad for chamber orchestra is based on the well-known folk song about the legendary African-American steel-driver hero famous for his amazing strength and valor.
- *Bachianas brasileiras No. 2* (1930) by Heitor Villa-Lobos (1887–1959). The Toccata finale of this orchestral suite "O trenzinho do Caipira" ("The Little Train in Caipira") was inspired by a ride taken by the Brazilian composer on an ancient steam train which was carrying berry pickers and farm laborers between villages in São Paolo.
- *Música para Charlar* (1938) by Silvestre Revueltas (1899–1940). This two-movement orchestral suite, drawn from the Mexican composer's film score of *Ferrocariles de Baja California* ("Railroads of Baja California"), conveys the coming of the railroad to Mexico's northwestern peninsula.
- *Pacific 231* (1923) by Arthur Honegger (1892–1955). This work suggests the sounds of the famed steam locomotive which consists of the 4-6-2 arrangement of four pilot wheels, six driving wheels, and two trailing wheels. The French classification system for steam locomotives which count axles rather than wheels denotes this arrangement as 2-3-1.

29. Pacific 231G 558

Jazz

- *Take the "A" Train* by Billy Strayhorn (1941). Universally associated with Duke Ellington, this work celebrates the "A" train which served the Harlem district in New York City.
- *Chattanooga Choo Choo* by The Glenn Miller Orchestra (1941). From the inspiration of a small, wood-burning steam locomotive, the song describes a trip from New York City to Chattanooga.

30. Steam Locomotive "Chattanooga Choo Choo" (known from Glenn Miller's Big-Band Swing Song)

- *Choo Choo Ch' Boogie* by Louis Jordan & His Tympany Five (1946). As part of the swing-era repertoire, this work quickly became a smash hit among both African American and Caucasian American audiences.
- *Last Train Home* by the Pat Metheny Group (1987). This piece evokes the American Midwest with its simple melody and relentless rhythm which convincingly conveys the sounds of a train travelling on the tracks.

Pop Music

- *Train of Love* by Johnny Cash (1962). This song of yearning features the train as the backdrop of the story. As a tribute to this American legendary musician, Bob Dylan recorded his rendition of the original song in 1999.
- *Canadian Railway Trilogy* by Gordon Lightfoot (1967). Commissioned by the Canadian Broadcasting Corporation (CBC), this song marked the start of the centennial celebration of the construction of Canada's railway.
- *Casey Jones* by the American rock band Grateful Dead (1970). Inspired by the real story of Casey Jones, the song is about a railroad engineer who is on the brink of a train wreck due to the excessive speed of his passenger train.
- *Locomotive Breath* by the British rock group Jethro Tull (1971). From their album *Aqualung*, the song uses the imagery of an imminent and unavoidable train wreck as a metaphoric portrayal of a man's life that is spinning out of control.
- *Long Train Runnin'* by American rock band The Doobie Brothers (1973), Included in their album *The Captain and Me*, the hit song evolved from an *ad-libitum* instrumental jam that the band created on stage for their frenzied fans.
- *Midnight Train To Georgia* by American R&B-soul family music group Gladys Knight & The Pips (1973). As one of their signature songs, the hit single describes a failed musician who, in despair, decides to leave the hustle and bustle of Los Angeles and return to the simpler life of Georgia.

- *Love Train* by the American R&B group The O'Jays (1973). The hit single uses the train as a symbol for peace and harmony regardless of race, religion, creed, or country of origin.
- *A Passage to Bangkok* by the Canadian rock band Rush (1976). From the album *2112*, the song narrates a drug-addled excursion by train to places around the world.
- *Morning Train (Nine To Five)* by Sheena Easton (1981). As one of the Scottish recording artist's biggest hits, the music video for this song was filmed on the Bluebell Railway, a heritage line operating along the border between East and West Sussex, England.

31. Kingscote Station on Bluebell Railway in England
(Sheena Easton's *Morning Train (Nine to Five)* video was filmed on the Bluebell Railway.)

- *Train of Love* by Neil Young (1994). Greatly affected by the death of Kurt Cobain, the Canadian singer-songwriter created a collection of songs for his album *Sleeps with Angels*, including this song which alludes to the affairs of the heart.

Film

In various films, the theme of the railway or train is incorporated into the compositional fabric of the motion picture.

Historical Setting

- *Union Pacific* (1939). This American dramatic western film revolves around the building of the Union Pacific Railroad across the wilderness of the American West.

Mystery and Suspense

- *The Great Train Robbery* (1903). As the first narrative film of American cinema, the 12-minute silent Western work focuses on a group of four cowboy outlaws who stage a train hold-up, rob the passengers, and then attempt their grand escape.
- *Murder on the Orient Express* (1974). Based on the novel with the same title by Agatha Christie, the film unravels the murder mystery of an American businessman that occurred aboard a train car.
- *Silver Streak* (1976). This comedy-thriller film tells the tale of a murder on a Los Angeles-to-Chicago train journey.

Disaster Scenarios

- *Shinkansen daibakuha* ("*Bullet Train*") (1975). In this Japanese action film, a Shinkansen bullet train is threatened with a speed-triggered bomb unless the criminals' ransom demand is met.
- *The Cassandra Crossing* (1976). In this British thriller film, passengers on a European transcontinental train find themselves contending against a bacterial plague unleashed by a group of terrorists.

32. Poster of the Film *The Cassandra Crossing* (1976)

- *Runaway Train* (1985). In this American thriller film, two escaped convicts and a female railway worker are trapped on an unmanned, brakeless train through Alaska.
- *Unstoppable* (2010). Based loosely on the real-life "Crazy Eights" incident, this American action thriller film narrates a story of a runaway long freight train and the veteran engineer and a young conductor who race against the clock to stop it.

Journey of Experience and Self-Discovery

- *The Polar Express* (2004). Based on the classic children's book with the same title by Chris Van Allsburg, this computer-animated fantasy film centers around a young boy's journey on a magical train that takes children to the North Pole and Santa Claus's home.
- *The Little Engine That Could* (2011). This animated film is based on the timeless story by Watty Piper of a train that learns to overcome obstacles with a bit of determination and courage.

Famous Train Enthusiasts

A number of celebrities have shown a keen interest in, a strong passion for, and in some cases, a rabid obsession with, railways and trains.

- American singer and actor Frank Sinatra was a member of the Train Collectors Association, one of the world's largest and most respected organization of train enthusiasts devoted to collecting, preserving, and running toy trains. His extensive train collection of miniature tracks, train cars, buildings, and other accessories is housed in a specially designed building resembling the train station in Ramsey, New Jersey, at his Rancho Mirage estate in California.
- Actor and former President of the United States Ronald Regan was also a member of the Train Collectors Association. Some of his trains, including a large model engine that was gifted to him during his presidency, are on display at the National Toy Train Museum in Strasburg, Pennsylvania.
- Canadian musician Neil Young is part owner of Lionel, the great American toy train and model Railroad Company, and designer of most of the enterprise's control and sound systems for model trains. His "Broken Arrow Ranch" in La Honda, California, just south of San Francisco, includes an 853-meter (2,800-foot) barn that houses a sprawling model train railroad layout of 229 meters (750 feet) of track set in a lush landscape of outbuildings, towering redwood mountains, and flowing streams.
- British singer-songwriter Rod Stewart, who also has a hobby of model railroading, frequently travels with a large part of his collections and reserves an additional hotel suite to set up and operate his layouts.

7 ALONG THE RAILROAD TRACKS

ACTIVITIES FOR THE TRAIN-MINDED

Teacher's Corner

7.1A Appreciation of the Historical Past

Have students analyze any archival material such as photos, documents, and posters from the film so they can truly appreciate the phenomenon of both the Canadian Pacific Railway and Transcontinental Railroad.

7.3 Creating a Train Craft

Students can use their imagination to create choo-choo trains using easy arts and crafts and decoration materials.

Materials (per student)
Construction paper
Tissue paper, origami paper, fabric, and/or doilies (optional)
Long pipe cleaners
String, yarn, or ribbon
Scissors
Bone folder (optional)
Ruler
Glue

What to do
Step 1: To create a paper box, be sure to make the creases sharp and to match corners and edges carefully. Start with a square of construction paper and fold the paper diagonally into a triangle. Crease well with a bone folder or ruler and unfold. Fold diagonally in the opposite direction. Crease well and unfold. Take each of the 4 corners of the sheet and fold it towards the center of the "X" that has been formed from the earlier creases. Crease well. Take one of the straight edges of the created square and fold it horizontally towards the center to form a rectangle; crease well and unfold. Repeat to the other 3 sides. Unfold the 4 folds that have just been made. Take the top flap and unfold. With scissors, cut diagonally along the upper edge of the folded flap located on the left side until the inner ending point of the top horizontal crease of the folded flap has been reached. Repeat the slit formation to the other side of the unfolded flap. Take the left corner of the unfolded flap and fold in to create a triangle. Repeat to the right corner of the unfolded flap. Then fold horizontally along the middle of the two triangles where their corners meet and towards the inside. Unfold except for the two triangles to create a "house" formation. Repeat the "pentagon" formation to the bottom triangular flap. Take the uncut triangular flaps and raise the trapezoid "walls" to an upright position, keeping their inner bottom triangle formations flat. Fold each of the raised pointed flaps inwards at a 90-degree angle. Take the top "house" flap and fold over the raised pointed flaps of the trapezoid walls. Make sure that they occur inside the house flap. Repeat the covering procedure to the other sides of the trapezoid walls to form the open-faced box. To create the base of the box, make sure that the square of the base is at least 3/5 centimeter (¼

inch) smaller than that of the cover to ensure that it fits properly into the cover. **[Step-by-step video: http://www.youtube.com/watch?v=Op15rZhsK8g]**

Step 2: Have students create their design as well as windows, doors, and/or hatches by pasting different shapes of construction paper, tissue paper, origami paper, fabric, and/or doilies on to the sides and roof of the train car.

Step 3: To create the wheels of the train car, take a pipe cleaner and center the pipe cleaner on to one of the smaller walls of the paper box. Bend the pipe cleaner along the perimeter of the paper box to form a square "U" shape. Take one end of the pipe cleaner and bend it to create an "e" shape (along the longer wall of the paper box) and then continue to bend the pipe cleaner to form a circle, the end overlapping. Twist the end around the pipe cleaner "wheel" to secure in place. Repeat the wheel formation to the other end of the pipe cleaner. With a second pipe cleaner, repeat the entire wheel set procedure. Make sure that both axles and the bottoms of each wheel are equally leveled when both wheel sets are placed parallel to each other. Set the wheel sets aside.

Step 4: Cut a piece of string, yarn, or ribbon, the length of what the student wants his or her train to be, including enough excess string to pull the train. Glue the string (starting in the back of the last train car) to all of the train cars.

Step 5: Glue the wheel sets on to the bottom of the car train. Repeat the entire procedure for each car train.

7.4 A Trip to the Treasured Past

If possible, plan a field trip to a railway museum for the students to enhance their knowledge, understanding, and appreciation of the railway industry as they discover and explore the buildings, historic sites, and collections of cars, locomotives, equipment, objects, artifacts, and documents which have been assembled and preserved by the institution. Have them experience the historic past in a fun, interactive manner through activities such as tours and rides organized by the museum.

Have a debriefing session for the students after the field trip so that they can share their learning and experience with the class.

7.7A Map Reading

By examining maps, students can better appreciate the changes introduced by the railroad.

33. Map of the Route of the First Transcontinental Railroad

What to do
After students have viewed the film, have them discuss the animated sections of the film that show the construction of the Canada Pacific Railway by using a series of simulated maps.

What additional information do the maps provide about the railroad system at that time? How do they enhance the students' understanding of the film?

7.9 Travelogue Writing

Divide students into small groups. On a map, have each group pick a section of the Canadian Pacific Railway or Transcontinental Railway and study its geography. Then have them answer the following questions:

1 What do you notice about its landscape?
2 Did the train cross a bridge over water or enter a tunnel?
3 Survey the landscape and write down your impressions.

7.10 Build It and They Will Cross

Students can learn how to build a suspension bridge out of Popsicle sticks.

Materials

Blank paper	Pencil
Popsicle sticks	Laundry clamps
Wood glue	Übercutter

Notes
Sticks should overlap by 1.3 to 2 centimeters (one-half to three-quarters of an inch) when gluing them together. If you want a narrower bridge, then you can employ shortened Popsicle sticks.

What to do

Step 1: Draw a rough profile sketch of the suspension bridge on paper, including the horizontal roadway, two vertical towers, and the curved suspension cables. The cables should start at one end of the roadway, curve up to the top of one tower, curve to the next tower, and end at the other end of the roadway. Trace the drawing onto a second paper sheet.

Step 2: Lay the Popsicle sticks over the horizontal roadway of both drawings, and glue the sticks to each other. Lay the Popsicle sticks for the towers, and glue the sticks to each other and to the roadway.

Step 3: Lay the Popsicle sticks along the curved lines for the cables. If the sticks are too long to follow the cable curves, then cut them in half with a übercutter. Glue these sticks to each other, to the roadway, and to the towers on both of the drawings.

Step 4: Allow the glue to dry completely. Remove both units from the sheets. Stand both halves of the bridge up parallel to each other and prop them in position with books, less than one Popsicle stick apart from each other.

Step 5: Apply a dab of glue to the top of the roadway on each half of the bridge. Start at one end of the roadway and lay the Popsicle sticks perpendicular to each half of the bridge, with the end of each stick resting in the dab of glue. Continue laying sticks across the roadway.

Step 6: Glue a popsicle stick from the tower top on one half of the bridge to the corresponding tower top on the other half, temporarily securing it in place with laundry clamps. Repeat with the other tower. For more support, add more Popsicle sticks between towers. Remove books and laundry clamps when dry.

7.11 Famous Tunnels

Different types of tunnels which serve different purposes have been constructed around the world. Examine and discuss some of the world's famous tunnels.

7.12A Tunnel All the Way Through!

Notes

The following exercises employ knowledge about geology, transportation, and engineering.

Engineering is the discipline that applies scientific theories to design, develop, and analyze technological solutions.

There are many types of engineers: civil, environmental, architectural, mechanical, electrical and many others.

These professionals are needed to work in teams in order to create the safest, most-effective tunnels around the world.

Approximately one-quarter of the Earth's landmass is covered with mountains, so planning, designing, and constructing routes that cross around or through mountains make up a substantial part of transportation engineering.

What to do

1 Ask students what kind of engineer each of them would like to be.

2 Discuss various transportation routes in other parts of the country and examine the roles of engineers in the design and implementation of such transportation routes.

3 Have students list the several types of engineers that are involved in the final design of a mountain tunnel.

4 Ask students questions that inspire curiosity and get them thinking about mountains and tunnel construction.

5 Divide class into small groups and assign groups to play the roles of environmental, architectural, mechanical, and electrical engineers. Designate the remaining group of students as journalists who are attending a press conference to learn about the construction of a new mountain tunnel that will create efficient travel through a mountain. Ask each engineering group to describe and explain their tunnel model and their specific role in the tunnel project. Have the journalists take notes with their pencil or pen and paper and then evaluate each tunnel model in a question-and-answer period following each engineering group’s presentation.

6 Have students write about the newly unveiled tunnel project for tomorrow’s newspaper based on their notes from the press conference.

Here are some questions to consider:
Who will do the careful tunneling and excavating?
Who will test for air quality and ventilation?
Who will install the lighting systems and back-up generators in the event of a power failure?
Who will oversee the safety concerns?
What will you do with the rock and soil removed from the mountain as you make the tunnel?

How much weight could the tunnel hold? Would the tunnel collapse if the mountain was covered in heavy snow, if there was increased growth of plant life, or if there were added structures?
Will the development of the tunnel change the structure of the mountain? Describe how.
Will the tunnel be insulated from the weather? Will there be water leakages problems? Why or why not?

7.14 Feel the Music

Have students select a train or railway song of their choice and have them describe how the imagery of the train or railway is conveyed in the music.

Student Activity Corner

7.1B Understanding the Historical Past

1 Why was the Canadian Pacific Railway built? _____

_____

_____

2 Who built the Canadian Pacific Railway? _____

3 Who used the railroads, and why? _____

_____

_____

4 What effects did the Canadian Pacific Railway have on Canada? _____

_____

_____

_____

_____

5 What do the Canadian Pacific Railway and the Transcontinental Railway share in common? _____

_____

_____

_____

_____

6 Why was the Transcontinental Railroad built? _____

_____

_____

7 How did the Transcontinental Railroad affect Native Americans? _____

_____

_____

_____

8 How did the Canadian Pacific Railway and the Transcontinental Railway affect other minorities? _____

_____

_____

_____

9 What were the advantages of railroad travel? _____

7.2 Women in the Rail Industry

1 Identify and discuss the women in the nineteenth century who have significantly contributed to the North American rail industry.
2 World War 1 and World War II affected the rail transport field. How did these historical events change men's prejudiced perception of, and attitudes towards, women in the railroad industry, in the workplace, and in society?

7.5 Types of Transportation

1 The train is one form of land transportation. What are the other two principal types of transportation? _____
[Answer: air, water] _____
2 What are other forms of transportation by road? _____
3 What are some forms of transportation by water? _____
4 What are some forms of transportation by air? _____
5 Which transport modes can handle both freight and passenger traffic? _____
6 In what ways is the subway system similar to rail transport? In what ways is it different? _____

7.6 Transportation with World-Breaking Records

1 What is the fastest jet in the world? _____
2 What is the fastest boat in the world? _____
3 What is the fastest car in the world? _____

4 What is the fastest motor cycle in the world? _____

5 Which country has the fastest train? _____

6 Which city has the longest subway system in the world? _____

7.7B Making Sense of Maps

1 Search for maps of the region where *Rocky Mountain Express* takes place. Then find on the map the names of landmarks mentioned by the narrator (Rocky Mountains, Fraser Canyon, Rogers Pass, Lethbridge, Revelstoke, Selkirk Mountains, Connaught Tunnel, Mount McDonald Tunnel, Golden, Columbia River, Frank, Turtle Mountain, Kicking Horse River, Field, Big Hill, Craigellachie, Banff, Lake Louise, Jasper, Glacier, and Yoho)

2 Examine the given map and answer the following questions.

34. Route Map of *The Canadian*
Red dotted line—the original route along the Canadian Pacific Railway
Blue dotted line—the current route along the Canadian National Railway

How many rail lines are depicted on the map? _____
Where do rail lines start and end? _____
_____
Through what cities do the trains travel? _____
_____
Are there other forms of transportation that are depicted on the map? _____
_____

Do the rail lines depicted on the map still exist today? _____
If so, how were/are railroads used? _____
_____
_____
_____
_____

3 Search for your hometown and province or state and major American or Canadian cities on maps of places with which you are familiar.

7.8 Map-Making

Using a blank drawing paper, and pencil, crayon, ink, and/or paint, retrace your own map of the region where *Rocky Mountain Express* takes place, using the routes the steam engine CPR 2816 had traveled.

Study the introduction of railroads to the United States and its impact, from its most basic importance to its more complex contribution, including the building and development of the country.

7.12B Mountain Travel

1 What are the different ways that people can travel or transport items to a city on the other side of a mountain? _____

_____

_____

[Answer: they can usually travel over the mountain or through the mountain.]

2 What are the advantages to having a mountain tunnel for transportation? Consider the impact of weather. Is the driving weather more likely to be better on top of a mountain or inside of it? _____

_____

_____

_____

_____

_____

[Answer: Fog and snow at high mountain elevations are more likely to cause closures on roads that cross over mountains; roads that pass through mountains are safe and dry inside! The engineering of mountain tunnels allows us to transport goods and people by going through mountains in much less time than driving over or around a mountain.]

3 Have you driven through a mountain before? _____

4 How do you think engineers built the tunnel? _____

_____

_____

_____

_____

5 Why do you think mountain tunnels are important? _____

_____

_____

_____

_____

6 Would you rather drive over a mountain or through one? Why? _____

_____

_____

_____

_____

7.13 The Railway and Its Impact

How does the railway affect the landscape and the environment?

Suggested Additional Reading

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Wikipedia

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3. Photo of the Empress: http://en.wikipedia.org/wiki/File:Canadian_Pacific_2816.jpg
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   "This Canadian work is in the public domain in Canada."
7. Benjamin Outram's Little Eaton Gangway in July 1908:
   http://en.wikipedia.org/wiki/File:Wagonway.jpg
8. German Steam Tram Engine:
   http://en.wikipedia.org/wiki/File:Steam_tram_engine_at_Stock_-_geo.hlipp.de_-_3982.jpg
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9. Photo of Stephenson's Rocket Drawing (PD-US):
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10. Interior of Pullman car (PD-US): http://en.wikipedia.org/wiki/File:Pullman_car_interior.jpg
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12. Big Boy 4023: http://en.wikipedia.org/wiki/File:Big_Boy_4023.jpg
13. E2 Series Shinkansen:
    http://en.wikipedia.org/wiki/File:Nagano-Shinkansen-Nagano-Station-C5211.jpg
14. China Railways CRH2C and China Railways CRH3C: Author: 颐园新居
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15. British locomotive 4468 Mallard:
    http://en.wikipedia.org/wiki/File:Number_4468_Mallard_in_York.jpg
    Author: PTG Dudva
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    http://en.wikipedia.org/wiki/File:Transcontinental_RR_1944-3c.jpg
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18. Diagram of the Newcomen Steam Engine (PD-US):
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19. Diagram of the Watt Pumping Engine (PD-US):
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    http://en.wikipedia.org/wiki/File:US_Transcontinental_Railroads_1887.jpg
22. 1910 Rogers Pass Avalanche:
    http://en.wikipedia.org/wiki/File:Rogers_Pass_avalanche_disaster_5_March_1910.jpg
24. Tehachapi Loop on the Union Pacific Railroad, California:
    http://en.wikipedia.org/wiki/File:Tehachapi_Loop_USGS_closeup.jpg
25. Panorama of the Spiral Tunnels, 1908:
    http://en.wikipedia.org/wiki/File:Spiral_Tunnels_1908_Kodak.jpg
26. Stoney Creek Bridge: http://en.wikipedia.org/wiki/File:Eastbound_over_SCB.jpg
    Photograph by David R. Spencer

27. Lethbridge Viaduct: http://en.wikipedia.org/wiki/File:Lethbridge_Viaduct.gif
28. Lethbridge Viaduct: http://en.wikipedia.org/wiki/File:Lethbridge_High_Level.jpg
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http://flickr.com/photos/33507204@N00/48639718
30. Old Steam Locomotive "Chattanooga Choo Choo" (known from Glenn Miller's Big-Band Swing Song) at Old Station in Chattanooga:
http://en.wikipedia.org/wiki/File:Chattanooga_ChooChoo_Locomotive.jpg
31. Kingscote Station at England: http://en.wikipedia.org/wiki/File:Kingscote_Station_Rawding.jpg
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32. Film Poster of *Cassandra Crossing*: http://en.wikipedia.org/wiki/File:Cassandra_Crossing.jpg
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