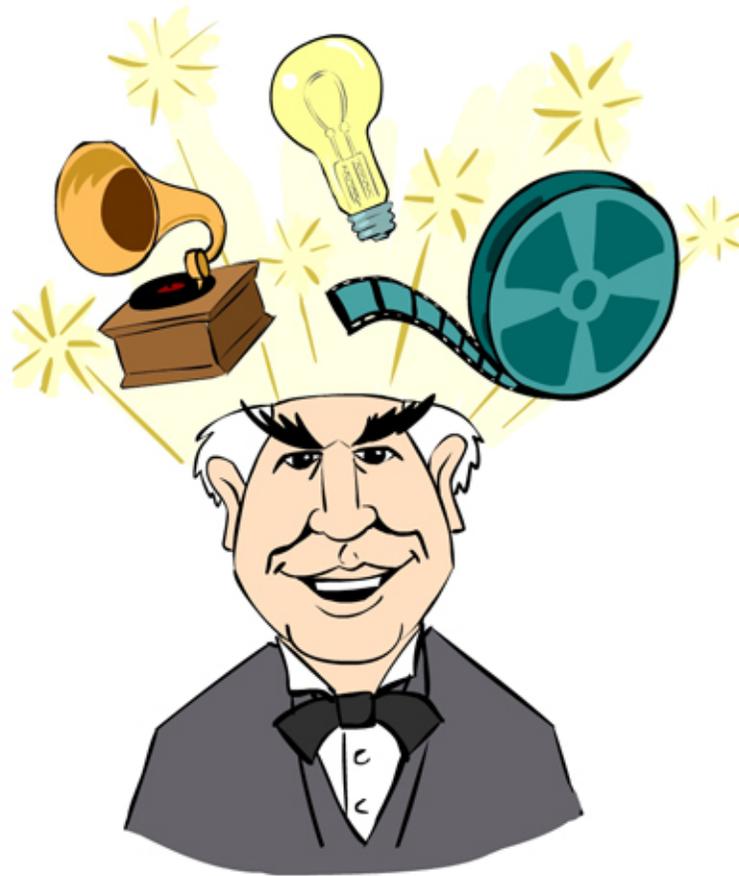


Edison:

The Wizard of Menlo Park

Study Guide



Edison: The Wizard of Menlo Park
A Musical for Young Audiences about Thomas Edison

Book & Lyrics by Mark Amenta
Music by Bill Vaananen

Presented by
Face to Face Productions

The Story of the Play

The play is set in Thomas Edison’s brain. The “Spark of Inspiration” arrives to assist Edison with developing the motion picture camera and projector. But after Spark gives the inspiration for these inventions, he thinks Edison will instantly be able to create them. Edison insists that genius is 1% inspiration and 99% perspiration. He takes Spark on a journey of former inventions—the phonograph, the light bulb, and the electric circuit—to show all the hard work and time that went into each. Finally, Edison returns to the invention of the motion picture camera and projector. Using Spark’s inspiration, lots of hard work, and a fast-motion device, Edison and Spark create the camera and projector right before the audience’s eyes, culminating in a short “film” of the Wizard of Menlo Park weaving his magic spell.

Educational Goals

- ❖ Develop and/or refine problem-solving skills
- ❖ Foster an understanding of the process of inventing
- ❖ Establish work/study/research skills
- ❖ Cultivate personal perseverance
- ❖ Encourage creative and imagination skills
- ❖ Inspire a fascination in science and its relation to the natural world

Curriculum Applications

- ❖ Electricity (circuitry, light bulb, creation of power)
- ❖ Motion Pictures (how and why they work)
- ❖ Inventions (in conjunction with school science fair or “invention convention”)
- ❖ School Newspaper project (Edison printed and sold his own newspaper)
- ❖ Sound and how it can be recorded

Educator Comments

This is a wonderfully visual production that not only imparts a great deal of information about Thomas Edison, but also celebrates his and our own creativity. Our students were especially entertained by the special effects and enthusiastically volunteered for the audience participation segment of the performance. – Beth Elkayam, Teacher/Fine Arts Coordinator, A.G. Bell School, Chicago, IL

Wonderful! I now have a wealth of information to take back into my classroom. The production was amazing. My students have not stopped talking about it. – Sue Stohrman, Teacher, Wescott School, Northbrook, IL

Events that Coincide with the Play’s Themes

- ❖ Your Science Fair or “Invention Convention”
- ❖ Edison’s Birthday February 11, 1847
- ❖ Invention of the light bulb: October 21, 1879
- ❖ Science curriculum on electricity

Other Information

- ❖ Audience age: K-6
- ❖ Performance length: 45 minutes
- ❖ More info: 773-631-2013 or www.FacetoFaceProductions.com

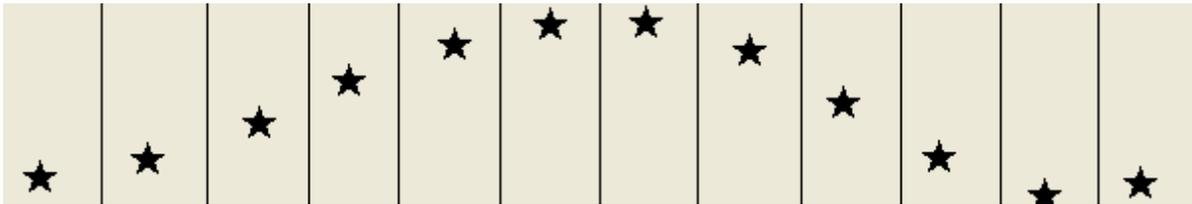
Science Connection: The Flipbook

The flipbook is the manual way you can create the illusion of animation. It is the foundation of animation in motion pictures, computer generated “gif” animations, and flash animations.

The flip book consists of a series of pages bound together that contain pictures. Each picture has a subtle difference from the previous. As the user flips through the book at a fast rate, the user’s eye catches the changes and the user’s brain interprets it as motion. If you go through the flip book slowly, the subtle changes in the image may be nearly unperceivable.

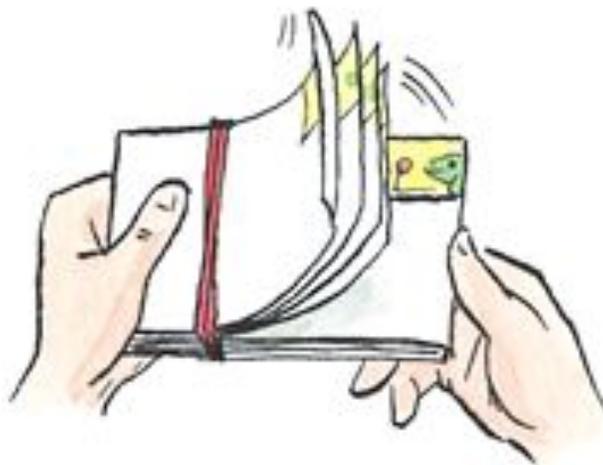
The Motion Picture Movie is a series of slides with slight differences per frame, played through a projector at a fast enough rate so the user perceives motion. The “gif” animation is similar in that it is a series of images arranged into a sequence that is played at a set rate, to simulate motion.

The Sprite: A sprite is a simple graphic that moves over a larger non-moving image. Using a simple "sprite" animation, you can set up the sequential images side by side.



After drawing the stars or whatever consistent image you want in a pattern similar to the one above, cut each panel and place the panels one on top of the other in sequence. Then, bind the panels on one side, creating the flipbook. When flipping through the flip book, the image on each page will seem to be moving.

After creating this “sprite” flipbook, have students create more complex flip books, in which the image changes slightly. You can combine this science lesson with other lessons, such as having each image be a plant in each of its developmental stages.



Science Connection: Making an Invention

Materials:

- ❖ Paper, Crayons, Markers
- ❖ “Making an Invention” handout (see next page).

Instructions

1. Ask students questions about inventing, such as:
 - ❖ What are inventions? What do they do?
 - ❖ How do inventors help solve problems and make life easier for people?
 - ❖ In what ways did the invention of the light bulb change the way people lived?
 - ❖ Can anyone be an inventor? What kinds of qualities does an inventor need?Ask students questions about Edison and other inventors, such as:
 - ❖ Before Edison invented something, do you think he thought about how it would affect people's lives? Why or why not?
 - ❖ What things do inventors need to think about before they build something? Why?
2. Show students the light bulb, pencil, bicycle, telephone, automobile, and television. For each item, ask questions such as:
 - ❖ What do you think this invention, the _____, was created to do?
 - ❖ In what ways do you think the _____ has helped people?
 - ❖ What kinds of things did the inventor of the _____ have to think about before creating it?
3. Show students the story of Margaret Winter and Michael Marsal, from the website www.girltech.com/Invention/IN_martin.html. Margaret and Michael are award-winning, 12-year-old inventors who created a sports helmet for the hearing impaired. Follow this with questions such as:
 - ❖ What can you tell me about these 12-year-old inventors, Margaret and Michael?
 - ❖ What makes them special? How do you think they were able to do this? What did they have to think about before inventing the special helmet?
4. Ask each student to come up with an invention that would make some task they find difficult easier to do. Once they have come up with an invention, ask:
 - ❖ If you were an inventor, do you think inventing a _____ is a good idea? Why or why not?
 - ❖ Do you think it could be built?
 - ❖ What kinds of inventions or technology would you use to build it?
 - ❖ How might this help people?
 - ❖ Do you think people would want to buy or use a _____? Why or why not?
5. Divide the class into small groups and encourage them to come up with smarter and more realistic needs-based inventions that, for example, they might be able to invent at home on a small budget.
6. Distribute the “Making an Invention” handout and explain what each group will need to keep in mind as they develop their inventions. They will do this by talking about the invention and drawing an illustration of it showing the size, features, parts, etc. When finished, each group will have to address each point on the student sheet as they talk before the class about their invention ideas.

Making an Invention Handout

Invention Name _____

What does it do?

How do you use it?

How can it help people?

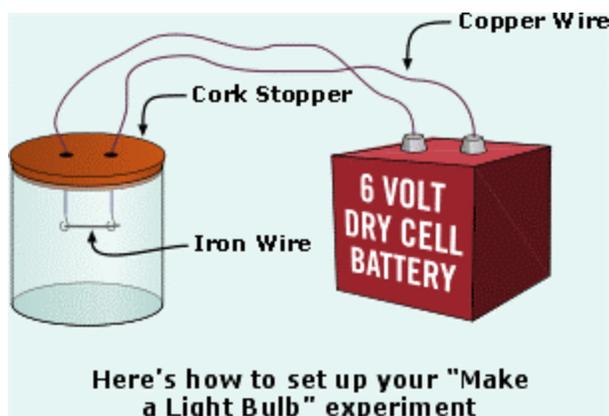
How can it hurt people?

Who will buy it?

Science Connection: Making a Light Bulb

Materials

- ❖ One small jar
- ❖ Cork stopper for a lid
- ❖ A 1-inch nail
- ❖ Three feet of shielded copper wire
- ❖ One 6-volt battery--not a car battery!
- ❖ Thin iron wire (the best source for this is unraveled picture hanging wire)



Important Safety Procedures:

- ❖ This experiment needs to be done with an adult present and supervising it!
- ❖ Always wear safety glasses and gloves when doing experiments!
- ❖ Be careful handling the filaments when they burn out—they will be HOT!
- ❖ Never play with wall sockets or household electric currents.

Instructions

1. Cut the copper wire into two lengths about 1-1/2 feet long. Cut off an inch of the shielding (plastic coating) at each end of the strands.
2. With a nail, drill two holes into the cork. Push the wire through the holes in the cork so that about two inches of the wire can be seen in the jar.
3. Make a hook at the end of the copper wires so that you can twist small strands of iron wire around them to make a filament.
4. Twist several strands of iron wire together and stretch them across the gap between the two copper hooks to form the filament.
5. Put cork stopper with filament inside the jar.
6. Carefully hook up both copper wire ends to the battery and watch your bulb light up! ***Be careful—the filament becomes very hot. Do not touch.***

During this hands-on demonstration, remind students that anyone with the inspiration and capacity to work hard can develop life-changing inventions like the light bulb. This activity may also help them to begin thinking about how inventions are constructed, which may help them in the second lesson of this series.

Science Connection: Invention Research

In *Edison: The Wizard of Menlo Park*, only a few of Edison's inventions are presented:

- ❖ Phonograph
- ❖ Incandescent lamp
- ❖ Electric generator
- ❖ Kinetograph (motion picture camera)
- ❖ Kinetoscope (motion picture projector)

Have your students research other inventions—either Edison's or others'—in one of these ways:

- ❖ Research a few of the other nearly 1,100 inventions Edison came up with
- ❖ Distribute cards with names of inventions on them—one per card—and have students find out who invented what
- ❖ Take one of Edison's inventions—or one of another inventor who came up with many inventions—and have students find the links to other inventions (for example, the motion picture camera depends on the incandescent lamp)
- ❖ Have students research the competition that existed between inventors, and some of the races that existed between inventors to get their patent first

Language Arts Connection: Newspaper Project

As a young man, Edison sold newspapers on a train from Port Huron to Detroit. He was very successful at this venture, and decided to print his own newspaper with stories of local interest. His newspapers were well-received, despite the “exorbitant” price of 8¢ a copy.

Have your students put together a newspaper for the school. Divide the class into reporters, writers, editors, proofreaders, artists, and photographers. Sell the newspaper for 8¢ a copy, with paperboys and papergirls dressed as old-fashioned “newsies.” Put the proceeds toward a good cause.



Math Connection: Exploring the Light Bulb

In *Edison: The Wizard of Menlo Park*, Edison and his colleagues had to do a lot of measuring and calculating throughout all their experiments. Using the previous activity, “Making a Light Bulb,” as well as other light-related activities, you can add mathematics appropriate to your students’ grade level:

- ❖ When making the light bulb, use different types of wire, and, using a watch with a second hand, determine how long each type of wire allows the bulb to burn.
- ❖ Light the room with a variety of bulbs of different wattages. Then have the students add up the total amount of watts. Take one bulb away. Have them determine the remaining wattage.
- ❖ Determine the percentage difference of standard light bulb wattage. Start with an easy example: *If a 100-watt bulb is equal to 100%, what percentage is a 60-watt bulb.* Now make it harder: *If a 75-watt bulb is equal to 100%, what percentage is a 60-watt bulb?*
- ❖ Measure the different amounts of heat bulbs of different wattage produce, using these bulbs and a mounted thermometer. Devise a calculation that shows the relationship between wattage and temperature.

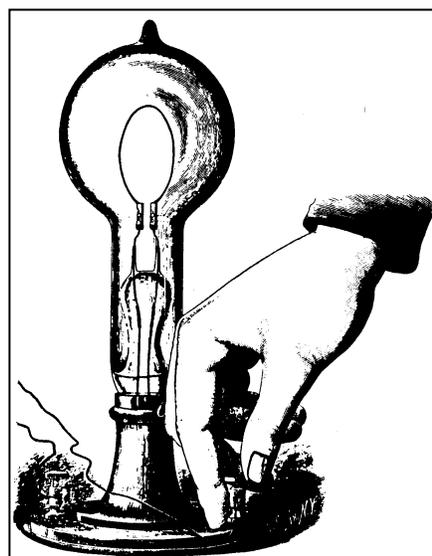
Art Connection – Making Posters for Edison

Materials

- ❖ Poster board or paper
- ❖ Markers, crayons, colored pencils, etc.

Instructions

1. Divide the class into groups of two or three.
2. Have each group imagine that it is the late 1800’s and they have been hired by Edison to make special posters that advertise the uses and benefits of the light bulb.
3. Let the groups know that it is important to make the posters interesting and easy to understand. Each poster will need to have these parts:
 - ❖ A title (example: "Light Up Your Homes At Night!")
 - ❖ A big picture of the invention being used (example: a light bulb lighting up a room)
 - ❖ Show how it helps people (example: a smiling family sitting at a dinner table)
4. Students may also adorn the poster with descriptive and enticing words like "bright!" and "wow!" to get people's attention. They may also use Edison's famous name to explain who created the new product.



Social Studies Connection: Time Line

Have students construct a time line that includes some of Edison's key events (below) as well as other historical events during this time period. Have the students point out how Edison's achievements coincided with what was happening in the world at the time.

- 1847 Thomas Alva Edison born, February 11 in Milan, Ohio
- 1853 Attempts to hatch goose eggs by sitting on them (needless to say, he's unsuccessful)
- 1854 Family moves to Port Huron, Michigan
- 1857 Builds a laboratory at home
- 1859 Becomes a "news/candy butcher" on the train into Detroit
- 1862 Starts his own newspaper "The Weekly Herald"; saves Jimmy McKenzie from a train. Jimmy's father teaches him telegraphy
- 1863-69 Works as a telegrapher
- 1868 Applies for first patent – the vote-recording machine
- 1869 Leaves Western Union, sells patent to stock-ticker machine (\$40,000), opens up workshop, becomes fulltime inventor
- 1871 Marries Mary Stillwell December 25
- 1872 Applies for patent on automatic telegraph
- 1876 Builds research laboratory in Menlo Park, New Jersey
- 1877 Invents the phonograph and carbon transmitter (microphone) for the telephone
- 1879 Perfects electric lamp (light bulb) on October 21st
- 1880-81 Sets up manufacturing companies
- 1881 Moves headquarters to New York City
- 1882 Section of New York City is lit by the first electric light station
- 1884 Mary Edison dies
- 1886 Marries his second wife, Mina Miller
- 1887 Builds new laboratory in West Orange, New Jersey
- 1888 Perfects improvements on phonograph
- 1889 Invents Kinetoscope (motion picture camera)
- 1891 Patents the "kinetoscopic camera"
- 1909 Perfects nickel-iron-alkaline storage battery
- 1911 Merges all of his companies to become Thomas A. Edison Inc.
- 1914 Fire destroys several of his factories in West Orange, N.J.
- 1915 Heads Navy Consulting Board (for inventions)
- 1916 Begins work on anti-submarine devices
- 1920 Awarded the Distinguished Service medal
- 1927-29 Develops a natural substitute for rubber
- 1928 Awarded Congressional Medal of Honor
- 1929 Develops severe diabetes and kidney disease
- 1931 Dies from complications of above on October 18th.

Language Arts Connections: Word Search

Find the words listed below in the box at the bottom of this page. The words will be either left to right, right to left, upward, downward, or diagonal.

BRAIN	INVENTION	POWER
BULB	LAMP	PROJECTOR
CAMERA	LIGHT	REELS
DARK	MOVIE	SOCKET
EDISON	NEWSPAPER	TOM
ELECTRIC	PATENT	TRAIN
EXPERIMENT	PHONOGRAPH	WHEELS
FILM	PLUG	WIRES

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

Language Arts Connection: Vocabulary

Below is a list of words used in *Edison: The Wizard of Menlo Park*. Have your students look up the words appropriate for their grade level and present their definitions to the class.

battery	deaf	genius	mystery	solution
beam	detect	idea	nature	solve
bottom	discover	imagination	past	sound
brain	dream	imagine	patent	spark
bulb	dynamo	inspiration	phonograph	spin
camera	electric	invent	plan	steam
candle	electricity	invention	power	telegraph
carbon	engine	job	present	test
chemical	experiment	kinescope	progress	think
circle	factory	lab	projector	track
circuit	fail	lamp	railroad	train
clever	filament	learn	record	vacuum
connect	film	light	reel	vision
cotton	flame	listen	research	wheel
creative	future	memory	right	wire
cylinder	gas	motion	sleep	work
dark	generator	motor	socket	wrong

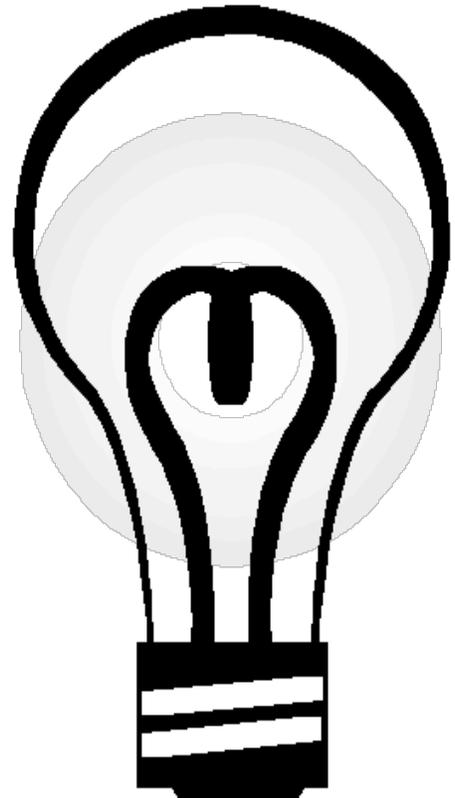
Language Arts Connection: Spelling Light Bulbs

Materials

- ❖ Colored paper
- ❖ Scissors
- ❖ Markers

Instructions

1. Cut out a stack of paper light bulbs.
2. Put one letter from the alphabet on each bulb, using the same distribution of letters found in the Scrabble® game.
3. Divide the class into small groups.
4. Read a word from the vocabulary list above. The first group to assemble the bulbs into the correct spellings gets the points—one point for each letter of the words.



Language Arts Connection: Edison's Quotes

Below are some of Edison's adages that tell us a lot about the person he was as well as his philosophies of science and work. You can use these quotes in an activity in which you:

- ❖ Have students write a short essay or story that relates to one of the quotes
- ❖ Have students write their own adage about inventing, intelligence, family, friends, etc.

There is no such thing as genius. What people choose to call genius is simply hard work - genius is 1% inspiration and 99% perspiration.

There is far more opportunity than there is ability.

We shall have no better conditions in the future if we are satisfied with all those we have at present. Restlessness is discontent and discontent is the first necessity of progress. Show me a thoroughly satisfied man and I will show you a failure.

Thinking is a habit, if you do not learn to think when you are young, you may never learn.

Imagination supplies the ideas; technical knowledge carries them out.

I always keep within a few feet of the earth's surface all the time. I never let my thoughts run up higher than the Himalayas!

Loss of sleep never hurt anybody.

I have tried so many things I thought were true and found out that I was wrong that I have quit being too sure about anything.

There are few things people won't do to avoid the labor of thinking. Thinking is the hardest work in the world for those who have not formed the habit. But thinking can give excitement and pleasure.

Nature is full of mysteries.

Everything comes to him who hustles while he waits.

(On being deaf) Think of all the nonsense I haven't had to listen to by not being able to hear it.

Education isn't play - and it can't be made to look like play. It is hard, hard work. But it can be made interesting work!

(On the future) I think the world is on the eve of grand and immense discoveries before whose glory the record of the past shall fade.

Results! Why man, I have gotten a lot of results! I know several thousand things that won't work!

Books on the Thomas Edison

Title	Author	Publisher	ISBN#	Ages
<i>A Picture Book of Thomas Alva Edison</i>	David A. Adler	Holiday House	0823414140	4-8
<i>Thomas Edison: Great American Inventor</i>	Shelley Bedik	Scholastic	0590483579	4-8
<i>Thomas Edison to the Rescue</i>	Howard Goldsmith	Aladdin	0689853319	4-8
<i>Inventing the Future</i>	Marfe Ferguson Delano	National Geographic	0792267214	9-12
<i>Thomas Edison, Young Inventor</i>	Sue Guthridge	Aladdin Library	0020418507	9-12
<i>The Story of Thomas Alva Edison</i>	Margaret Cousins	Random House	0394848837	9-12
<i>Thomas Alva Edison, The King of Inventors</i>	David C. King	Discovery Enterprises Ltd	1878668552	9-12
<i>Thomas A. Edison: The World's Greatest Inventor</i>	Anna Sproule	Blackbirch Marketing	1567113311	9-12

Edison Websites

Website	Address
Thomas Edison's Home Page	www.thomasedison.com/
Edison National Historic Site	http://www.nps.gov/edis/forteachers
Motion Picture & Sound Recordings of the Edison Company	memory.loc.gov/ammem/edhtml/edhome.html
Thomas Edison: American Inventor	www.lucidcafe.com/library/96feb/edison.html
PBS: Edison's Miracle of Light	www.pbs.org/wgbh/amex/edison/
Thomas Edison's Patents	edison.rutgers.edu/patents.htm
The Inventions of Thomas Edison	inventors.about.com/library/inventors/bledison.htm
Thomas Edison in Menlo Park	www.jhalpin.com/metuchen/tae/taeindex.htm