



## Suggested Activities to Complete While In New York and at the NY SKYRIDE

### Activities with a Science Focus

A Bridge to the World

\* Next Station, Bleeker Street (Includes walking tour)



## Bridge to the World

This activity introduces students firsthand to the Brooklyn Bridge, one of New York City's three suspension bridges that carry people and vehicles in and out of the Borough of Manhattan. Students study first hand the concepts of suspension bridges. Students use drawing, photography and journaling to record their discoveries on this walk across the Brooklyn Bridge.

### Activity

In this activity your students will walk across the Brooklyn Bridge. To prepare for their walk help them formulate questions they have about the bridge itself and its history. The Public Affairs Office of New York City's Mass Transit Authority (MTA) is available to answer questions that students might have. They can be reached at 646-252-7417. Have students call with their questions.

### Background Information about the Brooklyn Bridge

The Brooklyn Bridge has often been considered the most influential bridge in American history. It opened up the island of Manhattan and made travel in and out of it doable for the average citizen. This meant that people could live outside the city and still work inside the city. This meant that business could locate outside the city and still do business inside the city.

The Brooklyn Bridge was designed by the brilliant engineer John Augustus Roebling (1806-1869) and completed by his son Washington Roebling (1837-1926). At the time of its construction in 1883 it was considered an elegant structure. At that time it was the longest suspension bridge in the world. It was the first bridge to be built of steel cables.

The Brooklyn Bridge runs across the lower East River to the Borough of Brooklyn. It consists of two neo Gothic towers and a delicate lacework of steel-wire cables.

### Typical Facts about the Brooklyn Bridge:

Type of bridge: Suspension  
Construction started: January 3, 1870  
Opened to traffic: May 24, 1883  
Length of main span: 1,595 feet, 6 inches  
Length of side spans: 930 feet  
Length, anchorage to anchorage: 3,455 feet, 6 inches  
Total length of bridge and approaches: 6,016 feet  
Width of bridge: 85 feet  
Number of traffic lanes: 6 lanes

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Number of cables: 4 cables  
Height of towers above mean high water: 276 feet, 6 inches  
Clearance at center above mean high water: 135 feet  
Length of each of four cables: 3,578 feet, 6 inches  
Diameter of each cable: 15  $\frac{3}{4}$  inches  
Number of wires in each cable: 5,434 wires  
Total length of wires: 14.060 miles  
Total masonry in towers: 85,159 cubic yards  
Weight of suspended structure: 6,620 tons  
Total weight of bridge: 14,680 tons  
Cost of original structure: \$15,100,000.00

Introduce your students to the following concepts of bridge design and construction:

Compression --- Tension --- Spans --- Joints --- Columns --- Beams --- Loads --- Arches  
Ropes --- Cables --- Towers --- Geometric Shapes found in a bridge  
**(Feel free to create your own list of concepts)**

Define and discuss these concepts as a class and demonstrate them in the classroom prior to your visit to the Brooklyn Bridge.

When you arrive at the Brooklyn Bridge hand each student an assignment card. Each card presents the student with **one of the concepts** discussed in the classroom. It will be this student's responsibility or explore the Brooklyn Bridge in search of the assigned concept. Each card should have the following: the concept, its definition and a series of related questions to be answered by the student while on the bridge.

Some of the questions on the cards should be easy and straightforward. For example:

*Find 6 different geometric shapes on the Brooklyn Bridge. Or ---  
Measure the diameter of the cables on the Brooklyn Bridge.*

Other questions could be harder and more nebulous. For example:

*Can you feel the cables on the bridge just by standing on the bridge?  
Where on the bridge can you **see** tension?*

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Ask each student to photograph and/or draw sites on the bridge where he/she finds the answer to the questions presented on the card.

Ask students to take photographs of the bridge before and after they cross it. When you return to the classroom these photographs can be used to create perspective drawings of the bridge.

Have students keep a written journal of their visit to the Brooklyn Bridge.

Have students use binoculars to see what they can see in the distance. Ask each student to describe what he/she sees through the binoculars. When you return to the classroom have students locate what they saw through the binoculars on a New York City map.

When you return to the classroom have each student report his/her findings to the class.

Repeat this activity on a bridge in your community.

### **Materials Needed**

Assignment cards  
Map of New York  
Binoculars  
Cameras  
Measuring equipment as dictated by student questions  
Drawing materials  
Journals and writing implements

### **Good Websites About New York City Bridges**

1. <http://www.pbs.org/greatprojects/> --- This is a wonderful PBS site that tells all about some of the greatest building projects in the United States. There is a separate section on building the George Washington Bridge in NYC.
2. <http://www.davefrieder.com/> --- This is Dave Freider's website. He is a photographer and bridge expert. He has some wonderful photographs of many of New York City's bridges.
3. <http://www.newyorkled.com/bridges.htm> --- This site gives photographs and videos of New York bridges. It's a very complete site with lots of good information.
4. <http://www.nycroads.com/crossings/brooklyn/> --- Go to this site for up-to-the-minute information about conditions on the Brooklyn Bridge. The site also has a very nice summary of the history and construction of the bridge along with some interesting photographs.

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5. <http://www.transalt.org/files/resources/bridges/> --- This site provides information about walking, biking or skating across New York's bridges.
6. <http://www.mta.nyc.ny.us/bandt/index.html> --- This is the official website for the Metropolitan Transit Authority. It has information about all of New York City's bridges.
7. <http://www.ci.nyc.ny.us/html/dot/html/home/home.shtml> --- This is the official website for the New York City Department of Transportation.

### **Good Books About Bridges**

Burr, William **Report on Design and Construction of Queensboro Bridge** (New York, 1908)

Hopkins, H.J. **A Span of Bridges; An Illustrated History** (New York, Praeger Publishers, 1970)

Huxtable, Ada Louise **The Architecture of New York** (Garden City, Doubleday, 1964)

McCullough, David G. **The Great Bridge** (New York, Simon and Schuster, 1972)

New York City's MTA Brochure **Bridges and Tunnels Brochure**.

Reier, Sharon **The Bridges of New York** (New York, Quadrant Books, 1977)

Shannon, Rebecca Read **The City That Never Was** ( New York, Penguin Group, Viking Press, 1988)

Steinman, David **The Builders of the Bridge: The Story of John Roebling and His Son** (New York, Harcourt Brace, 1945)

White, Norval and Willensky, Elliot, eds. **AIA Guide to New York City, Third Edition** (San Diego, Harcourt Brace Jovanovich, 1988)

Winpenny, Thomas R., **Manhattan Bridge. The troubled story of a New York monument.** (Easton PA, Canal History and Technology Press in association with the Smithsonian Institution, 2004)



## Next Station, Bleeker Street

See Student Worksheet G

The purpose of this activity is to have students focus on New York City's Subway system to get a beginning understand of how transportation systems affect a city's development and the lifestyle of its residents. Students will be asked to do some first-hand research while in the city based on some assumptions about the problems associated with creating an underground transportation system. They may also explore the present day system taking a look at the art work placed there and how it relates to the activity and energy of the city.

### Background

By the middle of the 19<sup>th</sup> century overpopulation in New York was a severe problem. The influx of blacks from the South and immigrants from Europe had created a density of living in lower Manhattan that was unimaginable. Living conditions were deplorable.

But as the century drew to a close, things began to change. New York experienced a grand movement beyond its northern city limits. On what is now the Upper West Side, William Earle Dodge Stokes built the Ansonia Hotel, a great Beaux Arts style building adorned with ornate scrolls, brackets, balconies, and cornices. It was magnificent. And it was just the beginning. Other builders followed suite.

Edward Clark, head of the Singer Sewing Machine Company, built a row of 27 private homes and invested \$1 million in his family hotel at Central Park West and 72nd Street (This hotel later became known as the Dakota). Every apartment in this hotel was rented by the day it opened.

Not far behind, at the beginning of the 20<sup>th</sup> century the "subway", a new, underground transportation system was in the making and it would change where and how people lived. Now people had the ability to access parts of the island that had been accessible only to the wealthy. Private homes were replaced by enormous apartment buildings, especially near the new subway stops. Broadway became a commercial thoroughfare. Offices and banks sprang up everywhere. New Yorkers moved northward.

Shortly after this the subway would carry New Yorkers into the outer boroughs, off the island of Manhattan. The city would never be the same.



### Activity #1 Creating A Subway

After or before a day of exploring in New York City have students think about the city's subway system. It's simple, right? You dig a hole, lay some track, buy some trains, hire staff and suddenly you have a subway! Wrong! Begin a discussion with your students about the variables they think would be involved in creating a subway system.

Here are a few of the variable that might be involved:

- Where should the system be?
- Who needs it and why? And When?
- Who will pay for the system?
- What will be done to keep disruption to city life at a minimum while the system is being created?
- What will the fare be? How do you go about deciding this?
- Are there problems with the ground underneath the city that will affect the creation of the system? If so, what are they?
- What size trains do we need/can we use?
- What will riders want to have in the stations?
- How do we construct the system to allow for expansion in the future?
- What are the safety issues that should be considered?
- What do we want the stations to look like?

After a general discussion divide students into Observation Teams based on the variables that were discussed. These teams should be of your choosing but might be such as the following:

- Observation Team #1 --- Subway Location
- Observation Team #2 --- Subway Station Function
- Observation Team #3 --- Subway Aesthetics
- Observation Team #4 --- Trains

Have each team summarize the variables discussed that relate to the topic they have been assigned.

Plan an excursion for the very next day that involves riding the New York subway. Plan to spend some time in at least 5 different subway stations. At each station have the teams evaluate that station based on their topic/variables.

Compare observations at the end of the day.



Discuss what the section of the city around each station visited would be like if there were no subway stop there or nearby.

### **Materials Needed**

- Paper and pencils for recording observations
- Cameras for recording observations
- New York Subway maps
- New York City maps

### **Activity #2 The Stories Told By Art in the Subway, A Challenge**

Prepare students for a few hours exploring the art found inside the New York City Subway. Present each student with a map of the city's subway system and discuss how to read it. Begin by learning all there is to know about the legend. When you're ready to read the stops begin by finding the closest stop to your present location and branch out from there.

After students have a basic understanding of the subway system, introduce them to their task for the day --- **to complete a matching challenge all about the art in the New York City subways.**

Present students with the Student Worksheet: *Art In Transit Challenge* and explain their challenge:

Their challenge is to complete a three-way-match. They must match each of the artists presented on the worksheet with the artwork that he or she created for a New York City Subway Station. To do this they must visit each of the stations listed and find the artist's creation. Then they must select one of the descriptions provided for this work of art.

Last, but not least, they must give the work of art their own name for it.

The Student Worksheet: *Art in Transit Challenge* has a workspace for making these three-way-matches.

At the end of the day, have students compare their answers to the *Art in Transit Challenge*.

Have students give their opinion about the works they saw. Did they like them or not? Why or why not? What would they change about them --- the topic used, the materials used, the colors chosen? Would music have added anything?

You may have students who would like to create their own work for one of the stations visited. Ask for ideas.



### **Materials Needed**

Copies of the New York Subway Map for each student  
Student Worksheet: *Art in Transit Challenge*  
Pencils  
Cameras

### **Good Websites for Information About the New York City Subway**

1. [www.nycsubway.org/](http://www.nycsubway.org/) --- This is the official site of the New York City Subway. It has a great collection of historical documents and photographs. It also has a list of all the artwork scattered throughout the subway system.
2. <http://www.mta.info/index.html> --- This is the Metropolitan Transit Authority's home page. It's a great site for viewing the art in the New York City subways.
3. <http://www.nycsubway.org/maps/historical.html> --- This is another link to the New York City subway. This one leads directly to their collection of historic NYC subway maps.
4. <http://www.nationalgeographic.com/features/97/nyunderground/> --- This is a National Geographic site that gives information about lots of things under New York City.