SLOSS FURNACES
NAT'L HISTORIC LANDMARK

PARENT PACKET

History · Science
Art · Activities

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ABOUT THIS GUIDE

Thank you for your interest in Sloss Furnaces Education! The purpose of this guide is to provide parents activities and materials that can keep their children engaged while home from school. Sloss Furnaces National Historic Landmark encompasses amazing history, science, technology, and art topics—there truly is something for everyone!

We hope that you will find this guide helpful and use the information to further the education of Birmingham's industrial past. If you have any questions or want to request activities/information on specific topics, please email Ty Malugani, Education Coordinator, at tyler.malugani@birminghamal.gov.

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The original Sloss Furnaces before they began the modernization process in the early 1900s.

THE RISE OF BIRMINGHAM AND ITS IRON INDUSTRY—HISTORY

Birmingham was born in 1871 in an area called Jones Valley. Within 30 miles of this spot, all three ingredients needed to make iron could be found—one of the only places in the world where this happens! These ingredients are: iron ore, limestone, and coal. Without these rocks, Birmingham would never have been created. The city was built to make iron. The first land sold in Birmingham was located on the corner of First Avenue and Nineteenth Street. Within two years the city had grown so much that James Powell (Birmingham's second mayor) described it as "this magic little city of ours", forever cementing the nickname "The Magic City".

Fun Fact!

Birmingham was named after the industrial city in England—but Milnerville, Morriston, Powellton, and Muddtown were other options!

The first successful blast furnace site started making iron in 1880 and was called the Alice Furnaces. Its location in-between two railroads made it a great location for making iron. Because Birmingham was the first industrial city in the United States not built next to a river, lake, creek, or other body of water, railroads were extremely important to the iron industry. They transported the materials, products, and people in and out of the city.

Fun Fact!

The Golden Flake factory sits on the site of the old Alice Furnaces!

Fun Fact!

The Alice Furnaces were named after Henry DeBardeleben's daughter, Alice!

The Alice Furnaces were built by Henry DeBardeleben and T. T. Hillman. After they were successful at making iron in Birmingham, many more furnaces were built in the city. Just 10 years after the Alice Furnaces began operating, the Birmingham District had 28 furnaces in blast. This helped Alabama's total iron production grow from just 68,919 tons of iron in 1880 to 816,911 tons of iron in 1890. That's a 1,085% increase!

THE RISE OF BIRMINGHAM AND ITS IRON INDUSTRY—DISCUSSION QUESTIONS AND ACTIVITIES

Discussion Questions:

What kinds of things do you think were made out of iron in the early 1900s? What kinds of things are made out of iron today? How many items can you find in your house that are made out of iron?

Do you think it would be easier to build an industrial city from scratch, or change an existing city to be able to have industry? Why?

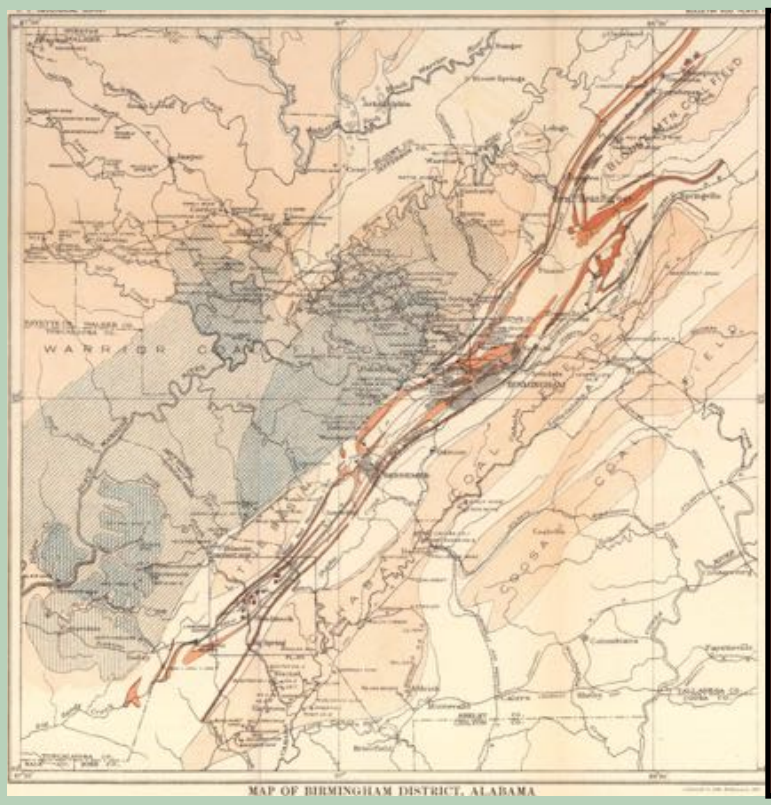
What problems do you think might happen when trying to build an industrial city from scratch? How would you fix or prevent them from happening?

Do you think it was easy or hard to mine the rocks out of the ground? Why?

Be a City Planner!

Design an industrial city. Where would the railroads go? Is it on a river or other body of water? What kinds of industries are in your city? Where are the schools, churches, homes, and grocery stores going to be? What is your city's name?

Draw an advertisement for your city. How are you going to convince people to live, work, and invest money in your city?



MAP OF BIRMINGHAM DISTRICT, ALABAMA

Be a Geologist!

Alabama's first state geologist was Michael Tuomey and he wrote a book about the rocks he found in Alabama in 1850. Go outside and see what kind of rocks you can find! Write a description of your rocks in a notebook—make sure to focus on your senses! How does it feel? What does it smell like? What does it look like?

Other things to look for: Does it have layers? Is it smooth or rough? Does it break easily?

Either draw a picture of the rock to go with your description, or take a picture!

Try to identify your rock using resources on the internet (with a parent or guardian!) If you can't identify it, then come up with a name for it yourself!

JAMES WITHERS SLOSS AND HIS FURNACES—HISTORY

Born in Mooresville, Alabama, James W. Sloss (1820-1890) eventually evolved into one of the wealthiest merchants in the state.

Fun Fact!

James W. Sloss helped bring railroads to Birmingham making the city possible!

In the early 1860s, Sloss became active in railroad construction after seeing the need for rail lines in the South. In the years after the Civil War, Sloss pushed for increases not only in railroads, but in all industrial development in Alabama. As one newspaper stated, "His influence will be found connected with every important industrial and commercial enterprise in the State during the latter half of the nineteenth century."

Fun Fact!

James W. Sloss's parents were from Scotland and Ireland—so James W. Sloss had an Irish accent!

Soon after DeBardeleben and Hillman built the Alice Furnaces, they convinced Sloss to build his own furnaces and create the Sloss Furnace Company in 1881. The first of two original furnaces went into blast in 1882, the second to do so in 1883. Like the Alice Furnaces, the Sloss Furnaces were built in-between two rail lines making it a great location to make iron.

Sloss Furnaces made their iron into bars, or ingots, called pig iron. This pig iron would be sold to companies to be made into products like stoves, trains, railroads, pipe, and even toys!

Fun Fact!

The Sloss Furnaces ran 24 hours a day, 7 days a week, 365 days a year!

Originally, Sloss Furnaces hired about 500 men to run each of their two furnaces on the site and they would work 12 hour shifts. The job was very hot, very dirty, and very difficult, but many men wanted to work there because it helped them provide for their families.

James W. Sloss sold the company in 1886 and died in 1890, but his hard work making sure that Birmingham and Alabama industry would be successful will never be forgotten!

JAMES WITHERS SLOSS AND HIS FURNACES—DISCUSSION QUESTIONS AND ACTIVITIES

Discussion Questions:

Would you rather work the day shift or the night shift at the furnaces? Why? What would be some of the positives and negatives of both?

Why do you think it was important that James W. Sloss was from Alabama and created industry in Alabama? Would it be just as important if someone from New York came down to build industry? Why or why not?

Why do you think railroads were so important to the South? What about the iron industry? What about industry in general?

Start a Business!

James W. Sloss started the Sloss Furnace Company in 1881—now it's your turn to start your own business! Pick a product to create (could be one that exists already, or a brand new one!) and come up with a business plan. Keep these things in mind:

What problem does your product solve, or why is it needed?

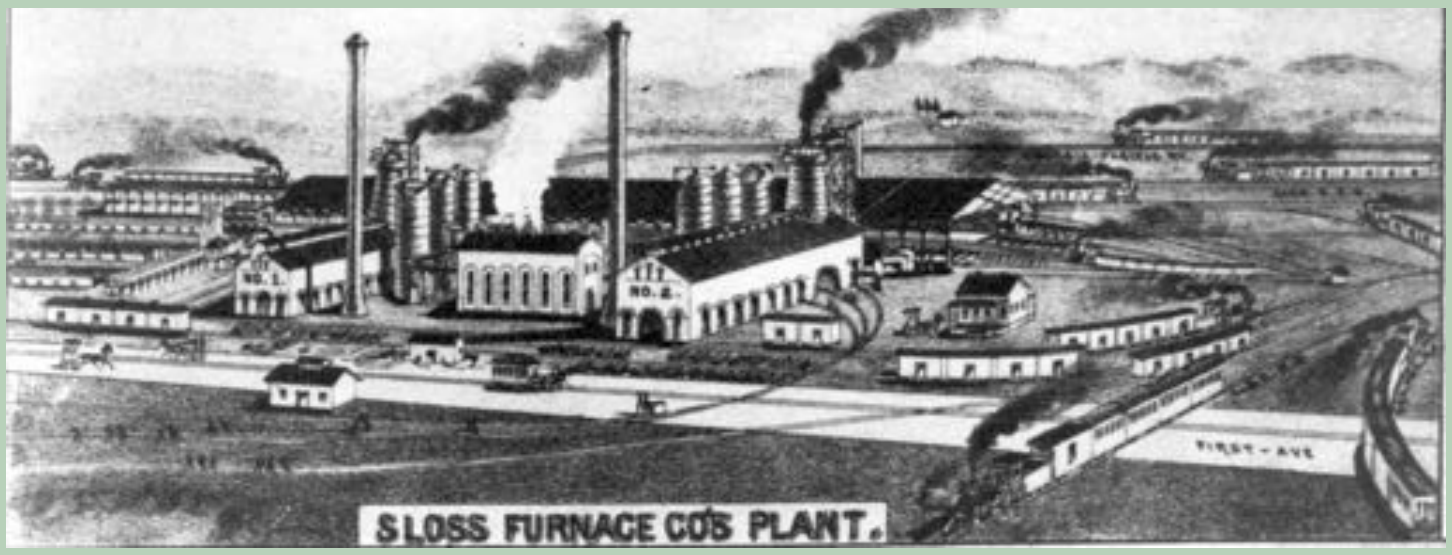
How are you going to make it? Where are the materials going to come from? Who is going to put it together? Will it be a big operation, or a small one?

Who are you going to sell it to? How are you going to advertise for it? How much are you going to sell it for?

Draw a picture of the factory or plant that will be making your product and design a logo for your company.

Word Play!

How many words can you come up with only using the letters from JAMES WITHERS SLOSS? What about SLOSS FURNACES?



THE PEOPLE WHO CAME TO WORK—HISTORY

As Birmingham's industry grew, people flooded into the new city to find work at the mines, furnaces, and plants. Birmingham's population grew from 3,086 people in 1880 to 132,685 people in 1910—a 4,200% increase! Most of these people came from the Black Belt area of Alabama—many of which were African-Americans. Systems like share-cropping (renting land and equipment to farm in exchange for part of the crop) could be oppressive, and many times these farmers would not know how much money they would make until the crop came in and their debts settled. To escape this system and find steady work, people packed up and moved to Birmingham.

Fun Fact!

In 1900, 1 out of 4 white person in Birmingham was a first or second generation European immigrant!

Another group of people moving to Birmingham were from Europe. People from Germany, Italy, Greece, Lebanon, Britain, and Russia were immigrating to Birmingham in high numbers. These people, along with African-Americans and whites moving in from the rural areas of the South, brought their families and culture. Their music, churches, and food became an important part of their lives—as one of the last connections to the lives they knew before Birmingham. If you drive throughout Birmingham today, you can still see examples of these cultures still around in our city in the churches, restaurants, and architecture.

Fun Fact!

Sloss-Sheffield used to pay men in company scrip (or money made by the company) that could only be used at the company store!

Industrial companies, like Sloss, saw an opportunity with all these people moving to the city. The furnaces needed men to work, and the men needed a place to live. So the industrial companies built housing communities right next to their sites to house the men and their families. At Sloss, they were called the Sloss Quarters. These communities had a doctor's office, company store or commissary, school, church, space for gardens. These communities made it easier for the companies to control their workforce and keep men coming to work. While these were not the best living conditions, the women who lived in the communities worked hard to make them feel like a home and less like broken-down houses on an unpaved road.

Fun Fact!

Each industrial company had their own baseball team that would play teams from the other companies!

THE PEOPLE WHO CAME TO WORK—DISCUSSION QUESTIONS AND ACTIVITIES

Discussion Questions:

What do you think would be the hardest part of moving to a new city you've never been to before? Would it have been harder in 1900 than today? Why or why not?

What ways have you seen other cultures in Birmingham?

How do you think you would feel if you had to use company scrip which could only be used at the company store? Why do you think the company used that kind of money?

What's Your Culture?

Write down what you would describe as your family's culture. Some things to think about:

What type of music does your family listen to? If it's many types, are there any similarities with the types that you can find?

What types of TV shows or movies does your family like to watch? It it's many types, are there any similarities with the types that you can find?

What hobbies or activities does your family do together? Do you like being outdoors or indoors more? Do you like doing activities together or alone? What kinds of foods are your family's favorite to eat?

Now put all that information together into one paragraph that describes your family's culture!

Move to a New City!

Many of the men and their families moving to Birmingham to work in industry had to pack everything up and take it with them. Sometimes, though, they couldn't take everything. Go around your house and see if you can find 20 items that would be the most important items for you to take with you to a new city. Then see if you can narrow it down to 10 items. What about 5? And finally find that 1 item that would be the most important item to take with you if you had to move to a new city.

MODERNIZATION AND UPDATING THE FURNACES—HISTORY

Even after James W. Sloss sold the company in 1886, Sloss Furnaces continued to grow. In 1899, the Sloss Furnace Company combined with several other companies to form the Sloss-Sheffield Steel and Iron Company. This more than doubled the company's size. Now, Sloss-Sheffield produced the second largest amount of pig iron in Birmingham. While the company was growing, the site was not. The furnaces were in need of updating the old technology. However, it was not until the late 1920s did the furnaces see improvement.

Fun Fact!

Even though Sloss-Sheffield had steel in its name—it never made steel!

World War I was a turning point in Sloss history. Sloss-Sheffield earn about $2 million per year during the war selling iron for the war effort. With this money, the company was finally able to upgrade the furnaces. They completely rebuilt the furnaces bigger and better than before. Now they could produce 400 tons of iron a day each, twice as much as before. They continued to modernize into the 1930s and even some in the 1940s, but just like the city and the state around them Sloss' production began to slow by 1950.

Fun Fact!

700 Sloss-Sheffield employees went to fight during World War I!

Fun Fact!

60% of the hand grenades used by American forces during World War II came from Birmingham!

The new technology brought to Sloss made the job a lot easier and safer, but it also took away jobs from the men. Machines were now used to do most of the dangerous and difficult tasks that used to be done by men. Most of this new technology was created by engineers at Sloss like James Pickering Dovel and Edward Uehling.

James Pickering Dovel

The new technology made the iron-making process easier and cheaper, and helped Sloss Furnaces make iron to help during World War II as well. The iron that came out of Birmingham went into everything from farm equipment to hand grenades and was a key part of the Allies winning the war.

MODERNIZATION AND UPDATING THE FURNACES—DISCUSSION QUESTIONS AND ACTIVITIES

Discussion Questions:

What are some other types of technology that are now outdated? Is there anything that is not used anymore, but you used at some point in your life? How do you still remember those things?

Discuss the trade-offs between modernization and jobs. Do you think it is worth it to modernize if it means people are going to lose their jobs? Why or why not? How would you help people who have lost jobs because of modernization?

What could be some problems that might happen if two companies merge? What would you do to solve those problems? How much do you think you would have to compromise?

Be an Innovator!

Sloss Furnaces had many innovators over the many years it was in operation. These people would come up with ways to make jobs easier and cheaper—as well as safer. Now it's your turn!

Pick a task or chore that you have to do on a regular basis. Think about that task or chore. What all goes into doing that task or chore? What's the hardest part of doing it? How do you do it now?

Now think about ways that you can make that task or chore easier. Think outside the box. Also think about how simple machines (wheels, ramps, pulleys, wedges, screws, levers) might be able to help. Draw out your design for a new tool or machine or way to help you do that task or chore faster or easier, or both!

Lastly, see if you can actually make it (with adult supervision) with things you find around your house.

Merge Your Companies!

Sloss Furnaces merged with several companies to form Sloss-Sheffield Steel and Iron Company in 1899. This helped make Sloss one of the top iron companies in the country. Now do the same!

Research online some companies that make products in your area. What all do they make and sell? How big are they? Can you find how many employees they have or how much their company is worth?

Now come up with your own company and what they would make. Make your choice based on what you think would merge well with the company you researched. How would your product help their company, and how would their product help with yours? Describe how your companies would work together. Who would be in charge? Why would the other company want to merge with yours? Come up with a new name for the merged company and a logo for it as well.

THE DECLINE OF IRON—HISTORY

The iron industry in Birmingham went through several rough periods of time. The recession of 1873 nearly killed the still young city. The recession of 1887 nearly put an end to the growth of iron. The Great Depression in 1929 hit Birmingham so hard the city was called "The Hardest Hit City in the Country". Through it all, however, Birmingham and its iron industry persevered. Even as production began to decline in the 1950s, Birmingham still created large amounts of iron. It wasn't until the 1960s when things really started looking bad for Birmingham's iron industry. Several factors played a part in the decline of Birmingham's iron industry: new environmental pollution regulations, the use of scrap iron instead of pig iron, the importation of cheaper foreign iron, out-of-date furnaces that needed costly improvements, but most importantly plastic became a more viable resource to use in place of iron. The most common use for Sloss' and other iron furnaces pig iron in Birmingham was in cast iron pipes. Once plastic pipes replaced cast iron in popularity, Sloss lost their best customer.

Fun Fact!

Sloss-Sheffield was one of only 3 iron furnaces in Birmingham to stay running during the Great Depression!

Fun Fact!

The Clean Air Act was signed into law in 1970 by President Richard Nixon!

With this decline a similar decline in industrial jobs came as well. In 1930 68% of Birmingham's jobs were in blast furnaces, steel mills, foundries, and fabricating plants. By 1979 that number had dropped to 5% or just 33,000 of the 645,900 jobs in the Birmingham area in that kind of industry. Today, very little remains of Birmingham's once powerful iron and steel industry.

Sloss finally shut down in 1971 after almost 90 straight years of operation. Experiencing the same issues that had plagued the rest of the city's industrial businesses, it was time to call it quits. By this point in its history, the site was owned and run by the Jim Walters Corporation who recognized the history of the site and donated the furnaces to the Alabama State Fair Authority. Even though the site was set to be destroyed, the people of Birmingham got together and saved the furnaces. After convincing the City of Birmingham to take ownership of the site, they voted in $3 million to preserve it as a museum. It opened in 1983, representing the character and spirit of the South's industrial heritage.

Fun Fact!

Sloss Furnaces is the only museum of its kind in the country!

THE DECLINE OF IRON—DISCUSSION QUESTIONS AND ACTIVITIES

Discussion Questions:

What are some places that are important in your life, like school, church, your home, etc.? What makes them so important? How can these buildings help tell your story?

The Clean Air Act helped get rid of a lot of pollution, but it meant a lot of factories shut down which meant people lost their jobs. Do you think it was worth it? Why or why not? How do you think we should balance keeping our environment clean, while keeping industrial jobs? What would you do to make sure our environment stays clean?

How important is it that we save our physical history (buildings, landmarks, etc.)? What if a company could use the land to make more jobs for people? How do you think we should balance that?

Make a Time Capsule!

The people of Birmingham worked together to save Sloss Furnaces, a part of their city's history. Now it's your turn to save part of your history! There are two ways to make a time capsule:

Find a metal (or other strong material) box that could survive underground for many years. Then put objects that mean a lot to you, or that remind you of important parts of your life today. You could even write yourself a note that explains why those objects are important! Then put it all in the box and with an adult's help, bury the box somewhere in your yard. You could keep it there for anywhere between 1 and 10 years. When you dig it back up it will serve as a history of what your life is like today!

Or you could search online for a time capsule sheet. Fill it out and put it in a folder. Then laminate the folder shut so you can't get to it. Wait sometime between 1 and 10 years and reopen it. Now you have a piece of preserved history all about you!

Create Your Own Exhibit!

Sloss Furnaces is an industrial museum that has exhibits on the iron industry in Birmingham. All museums have exhibits on the topics they want people to learn about. Make your own exhibit with one or both of these options!

Take a hobby or something you like to do and make an exhibit about that thing. Keep in mind that you are trying to teach someone about this topic. Try to find objects that can serve as your artifacts. Write up descriptions of the artifacts and how they can teach people about your topic.

Make an exhibit about YOU! Find objects that could help someone understand who you are and what you like. Write up a few sentences for each one to describe what they are and how they are important to your life.

Some things to think about: do you want to group similar objects together, or make it a timeline style exhibit? How would you display the artifacts? What things would you like to add, but don't have right now?

THE SCIENCE BEHIND SLOSS FURNACES

The blast furnace is the core of the iron-making operation. Within the furnace iron ore, flux (limestone, dolomite, or a combination of the two), coke (processed coal), and hot air combine to produce pure molten iron and two waste products: molten slag and exhaust gas. The slag mainly consists of the limestone mixed with the impurities of the iron (namely phosphorous, sulphur, and silica). The gas is a mixture of various gases including carbon monoxide, carbon dioxide, and nitrogen.

The blast furnace worked 24 hours a day, 7 days a week, so it was continually being charged with raw materials and drained of its molten products. New materials were added at the same rate at which iron and slag were produced. Iron ore, flux, and coke were charged into the top, through a stock channel just six feet above the blast. Hot air was blown into the bottom through openings called tuyéres (pronounced “tweers”). The hot air fueled the burning coke which released both carbon monoxide $C + O_2$ à CO, and an extreme amount of heat (over 2000 degrees Fahrenheit) which swept upward, heating the slowly descending stock. The carbon monoxide, hungry for oxygen atoms, drew them away from the molten ore, forming carbon dioxide and freeing pure iron:

Fe_2O_3	+	CO	→	FeO	+	CO_2
Iron Oxide	+	Carbon Monoxide	→	Iron	+	Carbon Dioxide

The furnace also decomposes the limestone into calcium oxide:

$CaCO_3$	→	CaO	+	CO_2
Calcium Carbonate	→	Calcium Oxide	+	Carbon Dioxide

The calcium oxide then absorbs impurities such as silica to make slag:

CaO	+	SiO_2	→	$CaSiO_3$
Calcium Oxide	+	Silica	→	Calcium Silicate

THE SCIENCE BEHIND SLOSS FURNACES—ACTIVITIES

Density Experiment

Slag is the by-product that floats on top of the molten iron in the furnace. Even though it is a liquid, it still floats because it is less *dense.* You can do a simple experiment at home to see how density works!

Take a clear cup or glass and put about 1/2 cup of vegetable oil or other type of cooking oil into the glass. Then about 1/2 cup of water and ask what they think will happen when the water is put in with the oil. Then put the water into the glass. As they will see, the oil separates from the water and floats on top—just like the slag in the furnace! This is because the oil is less dense than the water.

Encourage more experimentation—always remembering to ask what they think will happen first and then why they think it is happened after. Try dropping food coloring in. Will some things float on top of the oil, in between the oil and water, or just sink altogether? And any other ideas they might have!

Rising Gas Experiment

Another by-product of making iron is waste gas. Carbon-dioxide rises up the furnace and helps breakdown the iron ore at the top and is also pulled out to be used throughout the furnace site. This experiment will show how carbon-dioxide rises after being made!

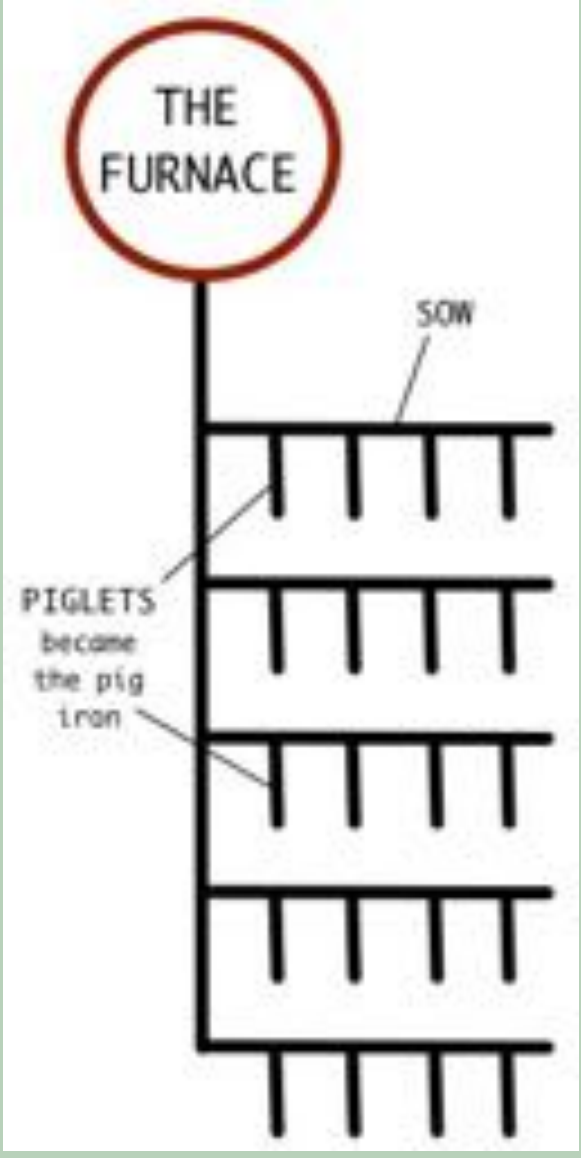
Put 2 tablespoons of baking soda into a non-inflated balloon (a funnel makes this easier). Then put 4 tablespoons of vinegar into a plastic bottle. Without putting the baking soda into the bottle, wrap the mouth of the balloon around the mouth of the bottle. Then turn the balloon over to let the baking soda fall into the bottle and see what happens!

If done properly, the balloon should expand as if it were being filled with air—but it's being filled with carbon-dioxide!

Again make sure you ask what they think will happen before the experiment and why it happened after the experiment. And encourage more experiments they would like to try!

WHY'S IT CALLED PIG IRON?

Pig iron was made by melting iron ore in furnaces heated up with coke (basically purified coal) and lots of heated air. While slag (the waste material that floated on top of the iron) was tapped every two hours, the liquid iron was tapped every four hours and ran into the cast shed. Prior to the use of the pig casting machine, molten iron flowed down hand-formed sand channels into small sand molds. The resulting shape resembled piglets feeding from the mother pig, hence the name "pig iron." This process was dangerous and difficult as men worked alongside and even on top of molten iron (which could reach 3,300 degrees!) and would have to carry the bars by hand (which could weigh 100 pounds!) to the other end of the casting shed. Tough as it was, though, they needed the work and with their regular pay schedule were able to provide a stable financial environment for their families. Without these workers and their sacrifices, Birmingham would never have survived.



Compare Your Days!

Draw or describe your normal day. Then draw or describe what you think a normal day would be for a worker working at a furnace. What differences and similarities might there be? What do you think was the most difficult part of working at the furnace?

Example of molds dug into the ground to make pig iron.

PIG IRON CRAYON ACTIVITY

Make Your Own Pig Iron Crayons!

For this activity, you will need to have crayons and at least one silicon mold. If you do not have any silicon molds, you can find a wide variety on Amazon or other online stores and they can ship them to you. They come in many different designs, but if you'd like to be true to the pig iron history, make sure you find one that looks like a bar.

Take crayons and cut them into small pieces after removing the paper outer. This works better if you group them by color. There are two different ways you can do this activity: you can melt them directly into the silicon molds, or melt them then pour them into the molds.

If you wanted to melt them directly into the silicon molds, put the pieces into the mold how you would like them to look. You can make them all one color, or all one similar color, or try out mixing colors together. Heat your oven to 200 degrees, then put the filled molds into the oven for about 10 to 15 minutes. Then take them out and either let them cool completely on their own, or stick them in the freezer to make it faster. You can also use a microwave and heat up the crayons about 2:00 minutes stirring every 30 seconds or until they are melted.

If you wanted to melt them first then pour them into the molds, make sure you are melting like colors and pouring them in separately. If you just throw a bunch of colors into a bowl and melt it down, it will turn brown. Put the bits of crayon into a microwave safe container and heat it for about 2:00 minutes, stirring every 30 seconds. Then pour the liquid into the molds and let them cool.

This is a cool way to talk about physical changes in science—like what happens inside the furnace. We take a solid crayon, with enough heat it turns into liquid crayon, and then after cooling in the molds it is solid once again. Even though it changed its state of matter twice and changed shape, it is still a crayon.

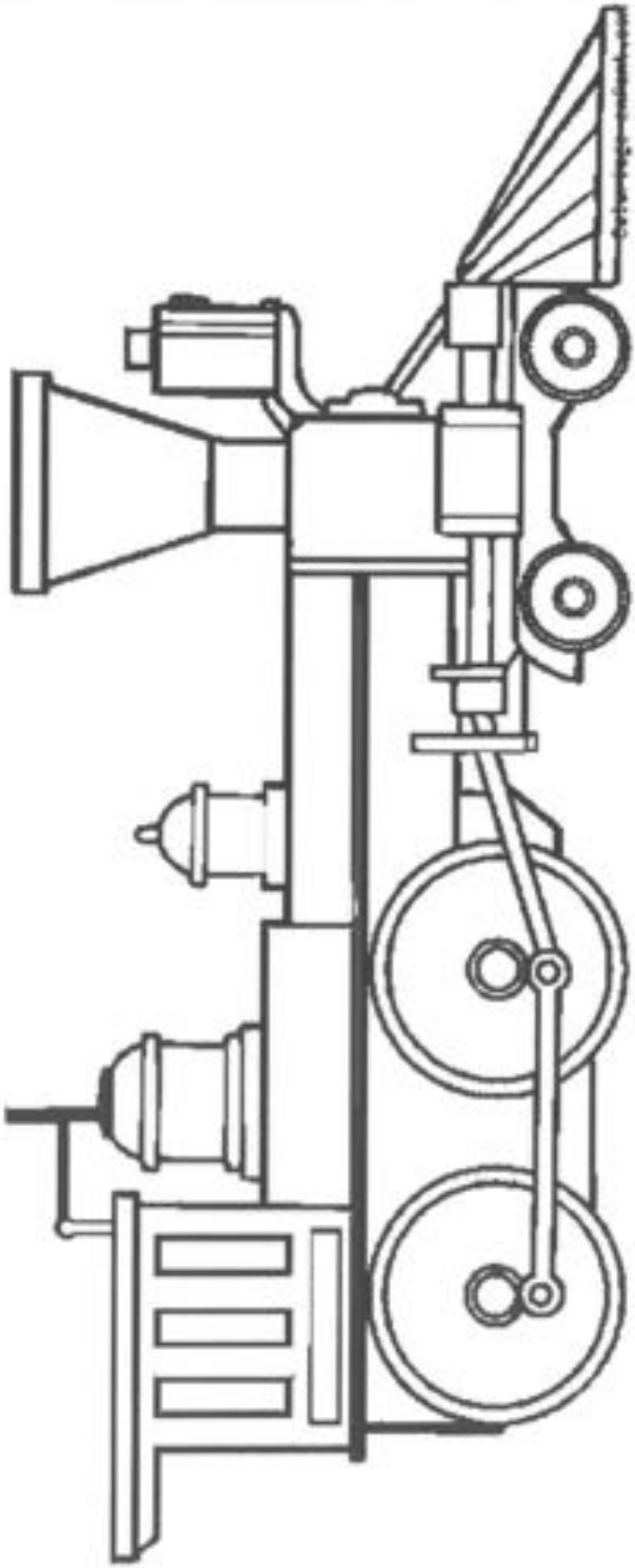
In the furnace, solid iron ore goes in and is melted into molten iron. The molten iron is poured out and into a mold. Once cooled it is back to being a solid iron bar. Same as the crayon—changing its state of matter twice and is a different shape, but was iron the entire time.

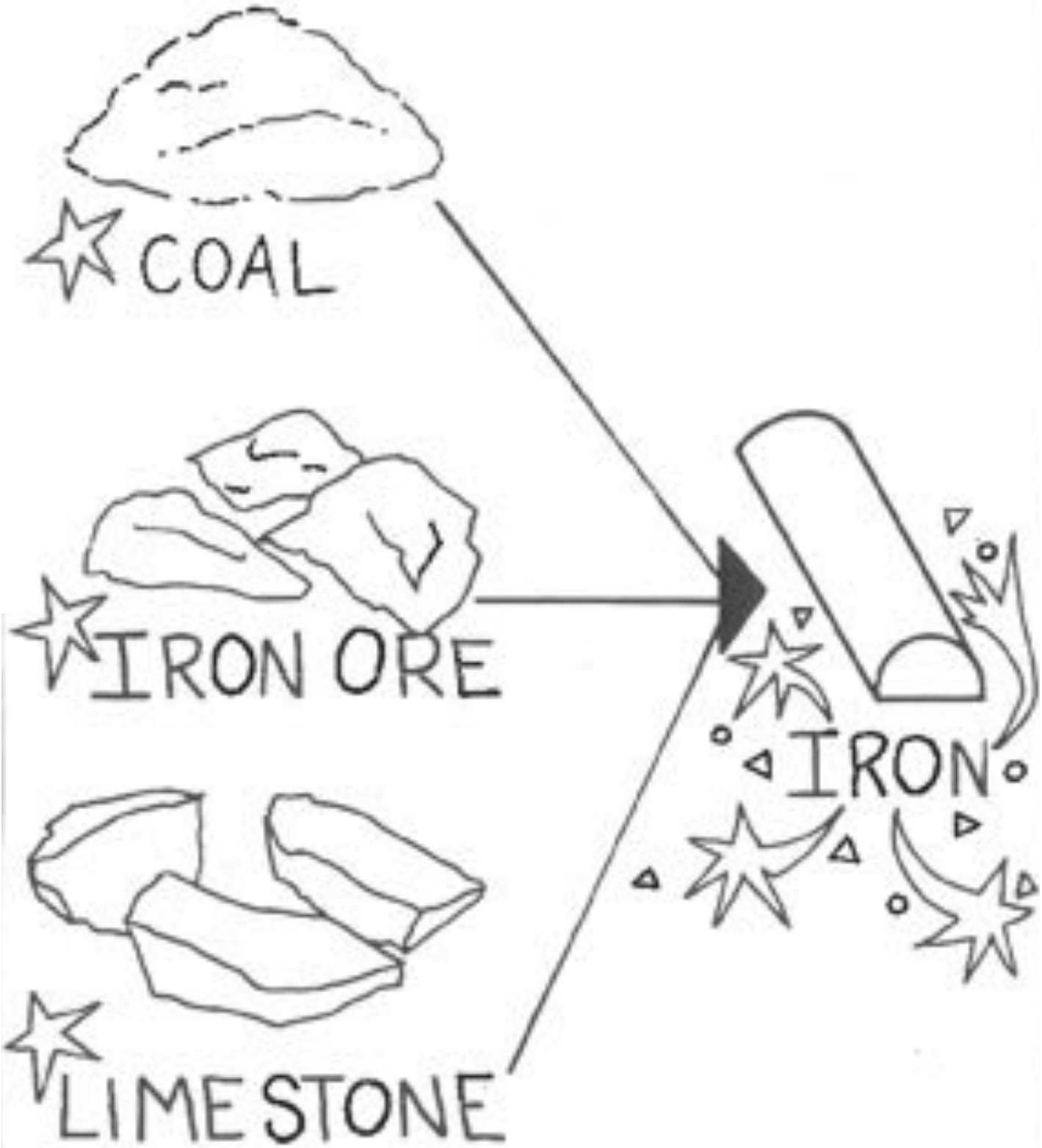
METAL ARTS AT SLOSS FURNACES

Today, iron is still being poured at Sloss Furnaces. We have several artists-in-residence at Sloss constantly pouring all sorts of metals, creating art, and teaching classes. Sloss Metal Arts offers Workshop Weekend classes on everything from cast iron sculpture to creative welding. They also have a monthly Bowl-O-Rama where the public is invited to come to Sloss and design a bowl made of cast iron. The metal arts program also runs a Summer Youth Internship program that allows young people to learn the craft of making iron and other metals into art.

The National Conference on Contemporary Cast Iron Art & Practices is another important aspect of Sloss Metal Arts. Every two years Sloss Furnaces hosts this prestigious event. Over 400 artists from all over the world come to Sloss to showcase their knowledge and skills, as well as learn from the top experts in the field.

Lastly, the metal arts program opens its doors to school groups interested in learning about iron-making and iron art. During the iron pour experience field trip, students learn about the history of making iron and then watch iron being poured right in front of them. They make a piece of iron art that they take home so they can always remember their trip to Sloss Furnaces.




COAL
IRON ORE
LIMESTONE
IRON


SLOSS

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NAT'L HISTORIC LANDMARK

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