

PHYSICAL  
WORLD



# Inventions & Technology



GOD'S  
DESIGN®

4th Edition  
Debbie & Richard Lawrence

*God's Design® for the Physical World* is a complete physical science curriculum for grades 3–8. The books in this series are designed for use in the Christian school and homeschool, and provide easy-to-use lessons that will encourage children to see God's hand in everything around them.

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# Welcome to GOD'S DESIGN®

## PHYSICAL WORLD



**You are about to start an exciting series of** lessons on physical science. *God's Design® for the Physical World* consists of three books: *Heat and Energy*, *Machines and Motion*, and *Inventions and Technology*. Each of these books will give you insight into how God designed and created our world and the universe in which we live.

No matter what grade you are in, third through eighth grade, you can use this book.

### 3rd–5th grade

Read the lesson.



Do the activity in the light blue box (worksheets will be provided by your teacher).



Test your knowledge by answering the **What did we learn?** questions.



Assess your understanding by answering the **Taking it further** questions.

Be sure to read the special features and do the final project.

There are also unit quizzes and a final test to take.

### 6th–8th grade

Read the lesson.



Do the activity in the light blue box (worksheets will be provided by your teacher).



Test your knowledge by answering the **What did we learn?** questions.



Assess your understanding by answering the **Taking it further** questions.



Do the Challenge section in the light green box. This part of the lesson will challenge you to do more advanced activities and learn additional interesting information.

Be sure to read the special features and do the final project.

There are also unit quizzes and a final test to take.

When you truly understand how God has designed everything in our universe to work together, then you will enjoy the world around you even more. So let's get started!

# UNIT 1

## Communications

- 1 Printing Press • 8
- 2 Telegraph • 13
- 3 Telephone • 17
- 4 Radio • 21
- 5 Television • 25
- 6 Communication Satellites • 29
- 7 Computer • 33

- ◇ Explain the historical importance of the printing press.
- ◇ Explain how electricity changed the way people communicate.
- ◇ Describe how information can be sent without wires.
- ◇ Relate the basic operation of each of the devices discussed in the unit.



## 1

## Printing Press

Communications  
breakthrough



### Why is the printing press one of the most important inventions of all time?

#### Words to know:

proof

platen

#### Challenge words:

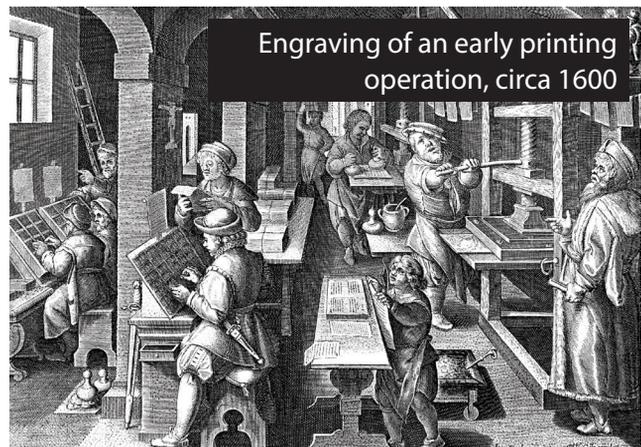
font

**Communication is very important.** From the very beginning of time, God communicated with man, and His words and actions were written down so that later generations would know God's thoughts. Communication has taken many forms in different societies. All societies have oral communication. Talking is a major way of conveying information. Complete histories have been passed on from one generation to another through oral stories.

However, talking is not the only form of communication. Some societies have used drums or smoke signals to pass on information, but written communication is the primary way of passing information on from one place to another, and from one generation to the next. Information has been recorded on clay tablets from before the time of Abraham.

Other civilizations have used stone, animal skin scrolls (called parchment), and papyrus scrolls to record information. All of the books of the Bible were recorded and faithfully copied on parchment scrolls for hundreds of years. Written information is vitally important to the passing on of knowledge. This is why one invention is considered the most important invention of the modern world, and perhaps the most important invention of all time. That invention is the printing press. The printing press allowed for the quick distribution of all kinds of information, and most importantly, the distribution of God's Word.

The invention of the printing press is credited to Johann Gutenberg who printed the first Bible on a letterpress from 1454–1457. Although block



printing had existed in China for centuries, Gutenberg's press was the first to use metal moveable type.

A printing press involves three parts: the metal type, the ink, and the press. Perhaps the most difficult part of the invention was making the metal type. Each letter was made by first carving a mold, and then pouring molten metal into the mold. Gutenberg had worked as a metal punch maker earlier in his life, so he had the skills for designing and making the metal type needed for a printing press. Still, he worked for years to perfect the type-making process. Ink was already available, so once the type was perfected, the press had to be designed and built.

The process for printing a page was fairly long. First the letters for the words on one line were placed side by side on a composing stick. Next, the letters were transferred to a pan and held in place. When a whole page of words was ready, the letters were inked and a proof was made. A **proof** was a quick copy that was used to find any mistakes in the words. Once the letters were all placed correctly they were put into a frame and locked in place so they could not shift or fall out.

This frame was then placed in the press. The letters were inked using a leather ball that was filled

with ink. Next, a piece of paper was placed over the inked letters. The **platen**, which was a thick piece of flat wood, was placed on top of the paper. The platen was then screwed down, pressing the paper tightly against the letters. The platen was then lifted and the paper removed and hung to dry. The letters were then re-inked and the process was repeated until the desired number of copies was made. When one page was completed, the letters were cleaned with an alkali solution and returned to the tray where they could be used in forming the next page.

Gutenberg's invention was so popular that it was quickly copied and improved upon. The



## Make your own printing press

**Purpose:** To copy the process of the first printing press by using rubber stamps

**Materials:** rubber stamps, ink pad, paper, potato, knife, paint

### Procedure:

1. Look at the bottom of the stamp. How does the word or picture appear? It looks backwards from what you expect. This is necessary in order to make the printed image correct.
2. Ink the stamp with an ink pad and press the stamp on a sheet of paper. You have just repeated the steps required for the printing press.
3. Use your stamps to make greeting cards to share with someone else.

Those students who are old enough to use a small knife can try making their own stamps. Stamps carved out of wood

will last longer, but it is much harder and more time consuming to make them, so we will start by making stamps from pieces of a potato.

1. Decide what letter or design you wish to make.
2. Draw your design on a piece of paper and cut it out.
3. Place your design top side down on the potato.
4. Now, carefully carve away the potato from around your pattern, leaving the pattern sticking out.
5. Once you have your pattern, remove the paper, coat the stamp with tempera paint, and press it onto a piece of paper.

**Conclusion:** You have now made your first printing type. Making all the letters needed for a printing press was a long difficult process.

## Fun Fact

The letters for the early presses were kept in special trays called cases. The capital letters were stored in the top section of the case, called the upper case, and the small letters were stored in the bottom section, called the lower case. Thus, capital letters became known as uppercase letters and small letters became known as lowercase letters.

invention of the printing press is largely responsible for the explosion of scientific discoveries, the Protestant Reformation, and the Renaissance, all of which occurred shortly after its invention.

Today, modern printing presses are wonders that can print thousands of pages in a very short period of time. Books, magazines, and newspapers are now abundant, and information is readily available in

most parts of the world. The computer printer in your home or office is a direct descendant of Gutenberg's first printing press. ⚙️

## What did we learn?

- What different forms of communication are commonly used?
- What was the very first human communication we know of?
- What are the three necessary parts of a printing press?

## Taking it further

- Why is the printing press such an important invention?
- How are modern presses different from the original printing presses?

## Fonts

As you know, all letters do not look alike. Not only does an "A" look different from an "E," but depending on the type of print you are using, an "A" can also look like **A**, *A*, **A** or *A*. Different styles of letters are called **fonts**. Some fonts are very plain and straight, while others are fancy and curly. Different fonts can give your writing a different look and feel. If you use a blocky font like this, **your writing will look very bold and straight**. If you want to have a more

personal feeling to your writing, you might *use a font like this one*.

Research different fonts and make a poster showing what you have learned about the fonts that are commonly used in printing today. There are hundreds of different fonts, but most can be grouped into certain categories. Be sure to find out about serif, sans serif, calligraphy, and script categories of fonts.

# Johann Gutenberg

1394?–1468

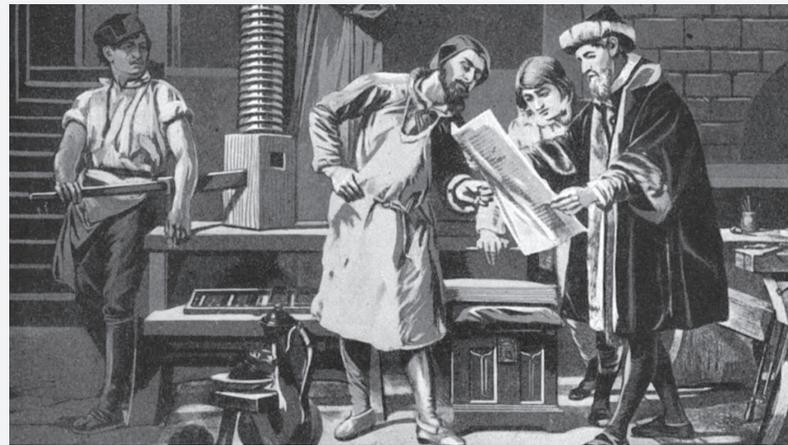
**For being one of the most important** inventors of all time, we really know relatively little about Johann Gutenberg. We know that he was born sometime between 1394 and 1399, but his exact birth date is not known. He was born in Mainz in southwest Germany. Johann's parents were aristocrats (the noble ruling class), but their last name was Gensfleisch not Gutenberg. Gutenberg was the name of the house that they lived in and Johann was most likely called Johann von Gutenberg, meaning from Gutenberg, and the name stuck.

In 1428 there were riots against aristocrats in Mainz, so Johann and his parents fled to Strasbourg. There Johann worked making metal punches for gold working and polishing semiprecious stones. While doing this work, he had the idea of making letters that could be used in a press. He worked on molds that could be used to make lead letters. This was a painstaking process.

Eventually, Gutenberg set up his own shop with a couple of partners and began making mirrors and cheap jewelry. He used all of his extra earnings to finance his experiments with molds and metals. But by 1442, the business had dwindled and Johann was nearly bankrupt.

Gutenberg left Strasbourg and his whereabouts for the next four years are unknown. Then, in 1448, he returned to Mainz and set up a press on which he printed several copies of a grammar book called *Ars Grammatica*. This book was important to every scholar, but most people preferred the handwritten copies of the book. So Gutenberg continued working to perfect the printing process. Unfortunately, his expenses were greater than the profit he made on the few books that he printed, and he continued to have financial problems.

It seemed that his fortune was about to change in 1450, when a wealthy lawyer named Johann Fust



decided to loan Gutenberg enough money to set up a real printing shop. To secure the loan, Gutenberg put all of his equipment up as collateral. Two years later the money had been used up and Gutenberg was still not making a profit, so he could not pay back the loan. Fust decided then to become a partner in Gutenberg's business. He contributed more money and encouraged Gutenberg to perfect the process so that they could begin making a profit.

By 1454 the process was good enough that Gutenberg set up 6 presses and began printing 200 copies of his now famous 42-line Bible. It took two years to complete and bind the first copy. During this time Fust decided to take Gutenberg to court and accused him of not paying back the original loan. The court sided with Fust and Johann lost all of his equipment and all of the copies of the Bible that were in progress. Fust and his son-in-law, who was also a partner in the business, made all of the profit from these first Bibles.

Gutenberg did not give up, however. He found a new partner, a wealthy man named Konrad Humery, who was willing to finance a new printing shop. It took three years for Gutenberg to build new molds, type, and presses. He then printed a new Bible in a different format from the

earlier one. This new edition was very successful and allowed him to print many other works including a dictionary, an encyclopedia, and an astronomical calendar.

Gutenberg continued working on improving his presses and teaching apprentices until his death on February 3, 1468. Although we know little else about him, Gutenberg's contribution to the development of the movable type printing press changed the world.

"It is a press, certainly, but a press from which shall flow in inexhaustible streams. . . . Through it, God will spread His Word. A spring of truth shall flow from it: like a new star it shall scatter the darkness of ignorance, and cause a light heretofore unknown to shine amongst men." – Johann Gutenberg



This Gutenberg Bible is in the Thomas Jefferson Building at the Library of Congress. It is one of the finest copies still existing of the original 42-line Bibles. It is believed that between 180 and 200 of these Bibles were originally printed, and between 47 and 49 of them are still in existence today.