

# WHAT PARTS OF COMPUTER ARE MINED?

## NATURE SUNDAY ACADEMY

### Description

Students will explore the rocks, minerals and metals that are used to make various components of a computer. They will explore the reasons why these materials are useful to computers and they will research the complete lifecycle of some of the minerals.

Keywords: Minerals, Properties, Lifecycle, Recycling

**Materials:** Ground Rules film DVD Tape, Internet

### Definition of “Sustainability”:

In the engineering disciplines, the need to educate students “to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability” has gained sufficient value and prominence to deserve its own ABET Program Outcome, Criterion 3(c).

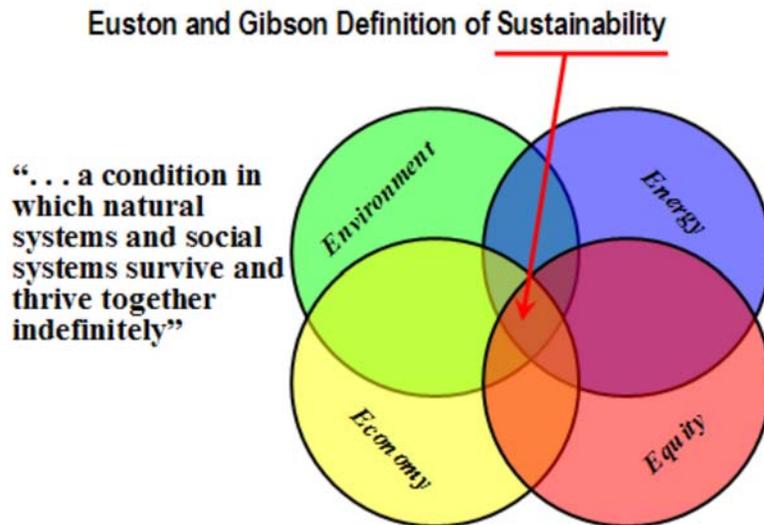


Figure 1: Sustainability Venn diagram motivated by the Euston & Gibson definition of sustainability<sup>6</sup> and James White’s four sustainability “E”s.

In this lesson, students will learn the minerals used in making a computer and associated processes.

### **Introduction (Length: 15 minutes)**

Watch Chapter 3 “Mining and the Modern World” of the *Ground Rules* film. Discuss the importance of minerals in our daily lives. Minerals have specific properties that make them useful to humans. All minerals come from the Earth’s crust and must be mined.

Ask them to recall how many minerals are used in a computer (mentioned on the film). Ask them if they can name any minerals used in a computer and why they think those minerals were useful for the purposes of building a computer. Discuss the fact that minerals have specific properties that make them useful for certain functions. If we want to build something, we must carefully choose the specific minerals that will provide the functions required.

### **Activity I (Length: 45 minutes)**

The objective of this activity is to determine the minerals and metals that are used to make a computer and to determine the properties of these elements that are useful for computers.

1. Divide the class into groups of 3 to 4 students.
2. Using resource books or the internet, have each group identify the minerals and metals used to build the following components of a computer:
  - a. Computer monitor
  - b. Computer chip
  - c. Computer circuitry
  - d. Computer case
  - e. Electrical cords

### **Activity II (Length: 60 minutes + writing and presenting time)**

The objective of this activity is to describe the lifecycle of one mineral used in a computer. Students will determine how and where the mineral is mined, how it is processed, how it is built into the component part required in a computer, and how it can be recycled after use.

1. Using the list generated in Activity I, ask each group to select one mineral for further research.
2. Using resource books or the internet, have students conduct research to identify how and where the mineral is mined, how it is processed, how it is made into the component part required in a computer, and how it can be recycled after use.
3. Each group should write a short report on their findings and present it to the class.

### **Discussion (Length: 60 minutes)**

#### **Activity III:**

Review the answers and make a comprehensive class list of the minerals and their useful properties. Based on that list, ask the class to hypothesize what minerals would be useful for another electronic item, such as a television, portable media player, cell phone, etc.

#### **Activity IV:**

Have each group present their findings to the class. Discuss the environmental implications of disposing of outdated computer equipment. Should computer equipment be landfilled? Why is computer waste one of the biggest waste issues facing the world? Discuss the effort required to disassemble and recycle all of the different components of a computer. It is labor intensive and can also be a health risk if proper health and safety equipment is not used in the process. Discuss the global implications of computer waste. A large amount of computer waste from North America is shipped to China for disassembly and recycling.

#### **Minerals and Metals in a Computer**

Computer Monitor:

- Silicon, lead, strontium, phosphorus, boron, indium, barium

Computer Chip:

- Silicon, gallium

Computer Case:

- Calcium carbonate, clays, mica, talc, sulfur

Computer Circuitry:

- Gold, aluminum, lithium, chromium, silver, nickel, gallium, lead, zinc, copper, steel, tungsten, titanium, cobalt, germanium, tin, tantalum

Electrical cords:

- Copper

#### **REFERENCES**

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[2] P. Hawken, A. Lovins, and L.H. Lovins, *Natural Capitalism*. New York: Little, Brown and Company, 1999, pp. 49-50, 57-58, 121,153-154. Available: <http://www.natcap.org/images/other/NCchapter3.pdf> [Accessed March 22, 2006].

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