# It Hertz When It Bytes

Do you get frustrated when looking for a new computer? Have ever just nodded blankly at the mention of "gigahertz?" If so, this week's Practical Science topic is for you.

**PRACTICAL SCIENCE WITH PHIL FREDA**

Buying a new computer can be a daunting task indeed.

On Father's Day, I was discussing this week's article with my father, and when I mentioned something concerning gigabytes and gigahertz, he exclaimed, "It hurts when it bites!" Hence, this week's title.

During our Father's Day brunch, my father was explaining that he had recently purchased a new iMac and wanted to know what I thought about it. When I asked how much memory it had, and what was the processor's speed, he shrugged his shoulders.

So for my father, and anyone out there that doesn't feel comfortable around or understand computer lingo, this article is for you.

Let's start with the basics.

## Input/Output

Computer components can be broken down into two large categories: ***input*** and ***output***.
Input components are parts of the computer that you, the user, give instructions or information through to the computer. This could be composing and sending an email, opening a program, surfing the Web—anything.

The most commonly used input components on a standard personal computer (PC) are the mouse, keyboard and USB/optical drives. Through clicks and keystrokes, we control what tasks our computer performs.

After you give the computer desired commands, the information flows via electrical current to the *"magic box."* (We'll cover later.)
After the computer does its thing, which is computing, it gives us nice, friendly output—music, a YouTube video, cool 3-D graphics, you name it!

The primary output components on a standard PC are the monitor and speakers.

So, we've covered everything right?

Well, not exactly—we missed the part that the output and input devices are plugged into. If you have a desktop PC, this is called the system unit. If you have a laptop, all of the parts are integrated.

# Inside the 'Magic Box'

So, what's inside the computer? There are many parts of a computer, but here is a list of the main ones and what they do with help from howstuffworks.com:

- **Central Processing Unit (CPU):** This is where the processor is. Consider this the brain of the computer. It is where all of the mathematical work is done. Everything you input into a computer is basically a math problem that the computer needs to solve to provide you with the desired output. The faster the processor, the more calculations it can perform in a shorter window of time.
- **Motherboard:** The motherboard is the main circuit board in the computer that integrates all of the internal components, including the CPU.
- **Hard Disk or Hard Drive:** This is a large-capacity storage unit made of rigid platters with magnetic surfaces that holds all of your important information, pictures, documents, music files and favorite programs.
- **Power Supply:** This does exactly what its sounds like it should do— regulates, delegates and provides electricity to the computer.
- **Operating System:** This is usually a graphical user interface that allows you to connect with the computer. Trust me; you don't want to talk to a computer in its language. Examples are Windows 7,Mac OS X, and Ubuntu.
- **Sound Card and Graphics Card:** Your computer uses a sound card to produce and record audio. A graphics card translates image data into something that you can visually see on your monitor. Powerful graphics cards actually have their own CPUs called GPUs.
- **Wireless Adaptor or Ethernet Card:** This is what allows you to access the Internet, whether through a wireless connection or hard line.
- **Memory:** Memory allows your computer to hold data that it can access very quickly and is connected directly to the processor. Memory is further broken down into various components:
- **Random-Access Memory (RAM):** I know you have probably heard of RAM before. RAM is temporary storage for information that you are currently working with. The more RAM you have, the more "stuff" can be going on at once, basically. You know you don't have enough RAM when you notice your computer getting sluggish or choppy when too much is open.
- **Read-Only Memory (ROM):** This is a permanent type of storage that cannot be altered. I'm sure you have heard of a CD-ROM before, and all that the ROM part means is that you cannot alter the data it has on it—it's Read-Only.
- **Basic Input/Output System (BIOS):** This is a type of ROM that is used by the computer when it is turned on to set up basic communication with the components.
- **Caching:** This is the storing of frequently used data to RAM that is directly connected to the CPU. Websites you access and programs you use frequently are stored in a cache.
- **Virtual Memory:** This is space on your hard disk that moves data in and out of RAM when you need it.

- **Flash Memory:** This is a solid-state device like a flash drive that retains data even when the computer is off.

## Terminology

We've went over the parts of the computer. Now, it's time to discuss what all that mumbo-jumbo means.

- **Hertz (Hz):** This is how the speed of the processor is measured. The unit Hertz (Hz) signifies a complete cycle that a computer produces with electromagnetic waves and its internal clock. As the cycle repeats, we get a certain frequency. Frequency describes how often something happens. Since we now have computers with processors that are measured in gigahertz, we will use it as an example. The prefix "Giga" stands for one billion. This means that a computer with a 1 gigahertz processor can perform a billion cycles per second! This might seem totally arbitrary, but think of this as the computer's problem solving speed.
- **Bytes:** Underneath all of your family photos, music files, awesome programs and fun games, there is something called the ***binary code***. Your computer actually stores and reads information as a series of 0s (zeros) and 1s. The most basic unit of measure when it comes to memory is the bit. A bit is one of these 0s or 1s. One byte is the equivalent of 8 bits. An example of a byte would be 10011011. Most computers have hard disks with upward of 250 gigabytes, which means they have 250 billion or so bytes. This is how much information can be stored on the hard disk. RAM is also measured in bytes, and most computers today have at least 3 gigabytes of RAM. Remember RAM, or Random Access Memory, is memory that denotes how much the computer can handle open and operating at the same time.
- **DVD±RW/CD-RW:** This means that instead of just being able to read CDs and DVDs only (ROM), it has the capability to write and rewrite on CDs and DVDs. Note that not all CDs and DVDs can be written on; you have to get ones that are rewritable.
- **DDR3 and SATA:** SATA just means that the connection that the hard disk has uses a SATA connector, which is the most widely used one currently. It's kind of like when a car manufacturer says, "This car has airbags." At this point in the game, we already know that cars come standard with airbags, but they still advertise it. When buying a computer, just purchase one that you think has enough free space (gigabytes). DDR3 refers to the RAM the computer has. It's the same story with DDR3 RAM as it was with the SATA hard drives. At this point, every computer manufacturer uses DDR3 RAM because it is much faster.
- **32-bit vs. 64-bit Operating Systems:** The major difference between these two systems, according to Microsoft, is that a 64-bit processor can handle larger amounts of RAM more effectively that a 32-bit system. Most computers are now using 64-bit operating systems.

  Congratulations! Now that you have read this guide, I am confident that you are more computer savvy than you were just a few minutes ago.