

# PHYZGUIDE. THE STRUCTURE OF SCIENCE

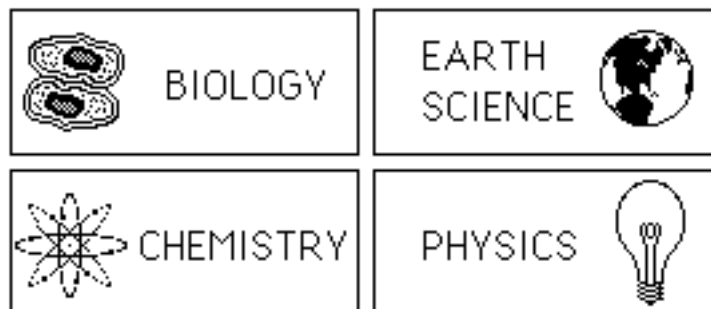
## Food Groups or Venn Diagrams?

If you're like most physics students, you've "seen it all" as far as science goes. You've been through chemistry, biology, and perhaps earth science, and now you're out to tackle physics. But before you jump into the study of physics, you need understand how physics fits into the general scheme of science.

It often seems that the sciences are unrelated: In biology, you studied plants and animals; in chemistry, you studied the periodic table and chemical reactions; and you expect that in physics, you will study motion and energy. It seems that the sciences are divided into separate groups -- somewhat like the well-known division of food groups.

### THE "FOUR FOOD GROUPS" OF SCIENCE

*Is each science independent of the others?*



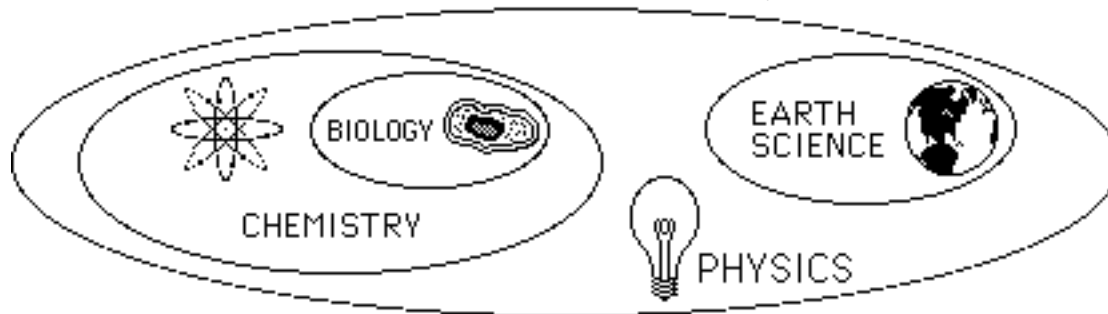
But the sciences are *not* separate groups as shown above. The sciences are related to each other very directly. **Biological** processes are actually complex **chemical** reactions. Cell division, osmosis, and other such processes can be explained by the principles of chemistry. (The exact details of many biological processes are not yet fully explained in terms of chemistry, but we know that biology can ultimately be understood through chemistry.) **Chemical** reactions are electron interactions. The behavior of those electrons is determined by the principles of energy and electrical force. The principles of energy and electrical force are the domain of **physics**. Phenomena studied in **earth science** can be explained primarily in terms of **physics**.

*Physics is the "bottom line" of science.*

Any science you've studied (and any science you will ever study) is related to physics in some way. The figure below shows how the sciences are *really* related. These relations are shown as a Venn diagram.

### THE VENN DIAGRAM OF SCIENCE

*All sciences are subsets of physics.*



This is a simplified picture of the relations between the sciences, but it is useful in providing an orientation toward science. Many other fields of science exist, and yet they don't appear on our diagram. As it turns out, those other sciences are divisions or combinations of biology, earth science, chemistry, and physics. For instance, botany and zoology are divisions of biology, and biophysics combines the study of biology with the study of physics.

Your next question might be, "Well, if all the other sciences are subsets of physics, then what is physics a subset of?" To which I would respond, "Never end a sentence in a preposition." Actually, that's a very good question. The answer is that there is *nothing* more basic than physics. The only science more fundamental than physics is *more* physics. For a clarification of this idea, see "The Why-How Tree."

*...P.S. It's O.K. to end a sentence in a preposition.*