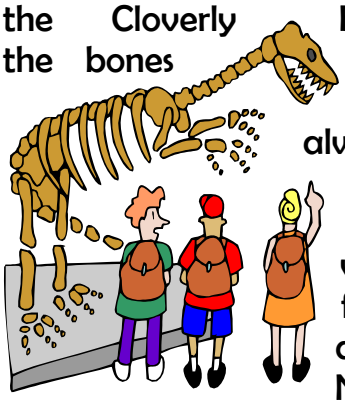
How can we tell how old dinosaur bones are?

We can get an idea of how old dinosaur bones are relative to each other by using the principles of stratigraphy. Here's an example: The bones of Deinonychus are found in the Cloverly Formation. In another formation, the Thermopolis Shale, we find the bones of a different dinosaur, Nodosaurus. Whenever the two formations are found in the same area, the Thermopolis Shale is always on top of the Cloverly. The principle of superposition states that whenever one formation is found on top of the other, the one on top is the younger (you can see the same principle at work in your own bedroom – the shirt that you dropped on the floor just last night is going to be on top of the socks that you dropped on the floor last Tuesday morning.) So we know that Nodosaurus lived after Deinonychus.



Stratigraphy can show us the order in which the different kinds of dinosaurs lived, but it doesn't tell us exactly how long ago that was in terms of numbers of years. To get an absolute date paleontologists use another technique called potassium/argon dating. Volcanic rocks often contain a particular isotope of potassium, potassium-40. Potassium-40 is unstable: every 1.3 billion years there's a 50/50 chance that a potassium-40 atom will lose a proton and change into another element, argon-40. (This interval of 1.3 billion years is called the isotope's half-life.) So after 1.3 billion years, half of the potassium-40 in a given rock sample will have turned into argon-40. Since the rate at which this happens is known, scientists can measure the amount of potassium-40 in a volcanic rock, compare it to the amount of argon-40, and thus calculate the age of the rock.

Of course, not every dinosaur was considerate enough to die next to a lava flow or on top of a layer of volcanic ash, so in practice scientists use the two methods together to build up a composite timeline.

Potassium/argon dating is not to be confused with carbon dating, which measures an isotope of the element carbon, carbon-14. Carbon-14 has a half-life of less than 6,000 years, so after about 100,000 years there just isn't enough of it left to measure. For this reason, carbon dating can't be used on dinosaur bones, which are millions of years old. Carbon dating has, however, been very useful in dating Native American dwellings, Egyptian artifacts, and has helped to confirm many of the dates given in the Bible.