Text Entry

The Use of Proxy Sources in Carbon Dating

In order to determine how the present rate of climate change compares to variations in the past, scientists attempt to model climate conditions that existed long ago. As direct measurements from that time period are limited, this process relies upon the use of proxy sources. Proxy sources are quantifiable indicators from which inferences may be made about environmental conditions. Some examples of proxy sources are tree rings, sedimentary deposits, and cave deposits. An analysis of these sources allows scientists to determine such things as temperature change over time and variations in the size of glaciers. For example, after variations in the density of fossilized tree rings is calibrated to known conditions, inferences may be made about past temperature and moisture levels. In addition, the amount of pollen in sediment cores provides estimates about past levels of precipitation. Other proxy sources are plankton and insects, whose populations respond to changes in the environment; the fossilized remains of these species provide valuable information about changes in the Earth's ecosystem. Scientists do not rely upon only one proxy source but rather correlate several proxy records, which helps to minimize the errors inherent in a system that makes assumptions about the past behavior of the natural world.

Another important method of obtaining information about climate change is carbon dating. This technique is based on the assumptions that carbon-14 is produced in the atmosphere at a fairly constant rate, cycles rapidly through the environment and its organisms, and then is no longer utilized by organisms after their death. By comparing the amount of carbon-14 left in an organism after its death with the amount of this element in living organisms, the length of time since the organism's death can be determined. Carbon dating is very useful because it allows scientists to place known events in Earth's history into a given time period and then correlate climate change to other environmental factors. However, this tool has been shown to have some weaknesses. Most importantly, the amount of carbon-14 in the atmosphere has not been constant over time, as was supposed. In fact, it has varied by as much as 5%. In addition, after 45,000 years, the amount of carbon-14 in a sample becomes too small to accurately ascertain the sample's age. Given these flaws, it is necessary to use other dating methods such as potassium-argon dating. Also, the ratio of carbon isotopes can be analyzed, as carbon-14 decays while carbon-13 and carbon-12 remain stable, so their relative abundance may be used to date environmental events.

The scientific tools described above have allowed scientists to create a model of palaeoclimatic change. While many aspects of this model are under debate, there is consensus among a large percentage of scientists that the earth is presently undergoing considerable climatic change that is linked to human activities and which will have serious effects on the quality of human life.

References:

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