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The Truth About Radiometric Dating

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INTRODUCTION

The use of radioactive decay of certain elements to estimate the age of a rock containing these elements is an extremely attractive idea. It bears a close analogy to a sand glass used as an egg timer. Just as sand, initially in the top (see Fig. 1) eventually ends up in the bottom, so uranium will eventually become lead. In both cases, the time for the process to take place can be presumed to be known with sufficient precision for the purpose.

There are many radioactive decay systems proposed as radiometric clocks. Uranium to lead is one. Others are potassium to argon and rubidium to strontium. The initial element in each case is called the parent and the end product is called the daughter. The time required for one-half of the original parent to have decayed into the daughter is termed the half-life.

However, in the sand glass it is easily known how much sand is initially in the top (100%) and in the bottom (zero). In rock radiochronology, neither is known with certainty. The initial amounts of uranium and of lead must be estimated, and the precision of this estimate determines the precision of the entire dating process.

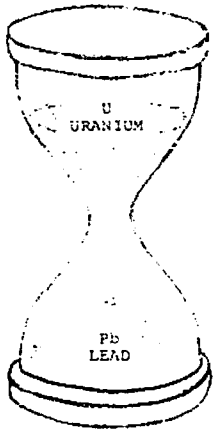

Figure 1

An analogy of the radiodating process. Uranium turns into lead at a predictable rate.

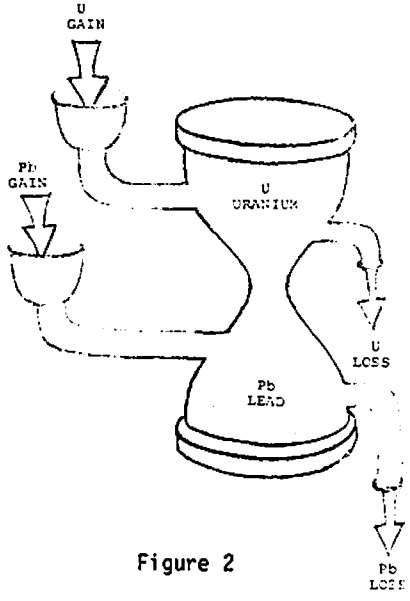

Figure 2

If parents or daughters may enter or leave the system at will, the value of the time-piece is destroyed.

Fig. 2 illustrates an important additional complicating factor. Just as sand inadvertently introduced into, or leaked from, either upper or lower chamber would destroy the ability of the sand glass to indicate precise time, so the rock being dated can have no history of uranium or lead entering or leaving since its formation. The ability to ascertain this history is necessary if any credence can be given to the radiometric age determined from this process.

THE ISOCHRON DIAGRAM, A SOLUTION

A mathematical approach called an isochron has been developed to solve the above problem. We will discuss the rubidium-strontium isochron. Rubidium-87 decays to strontium-87 with a half-life of 48.8 billion years.

Suppose we were able to assume that all the rocks in a particular formation were formed at the same time. (Isochron is a Greek word meaning "the same time".) We could then pick up several rocks from different places in the formation and analyze them for content of ^{87}Sr and ^{87}Rb. Through the powerful mathematical process of simultaneous equations we should now be able to get around the unknown quantities. What are they? One is the age. The other is the initial ^{87}Sr content of each rock. We must have one equation for each unknown, and since each rock gives us an equation and an additional unknown, no matter how many rocks we analyze we are always short by one.

We are saved, though, by making another assumption. Suppose the initial ^{87}Sr content is the same for all the rocks. We now have only two unknowns, the time and the initial daughter concentration. Only two rocks now give us all the data we need for a solution!

An additional constraint is required. The equations must be independent. Each rock must have an independent value of parent concentration; they cannot be the same. Obviously this invalidates the last assumption above. If each rock has the same value for the content of the daughter, it cannot have a differing value for the content of the parent, and vice versa. By modifying the assumption to state that the ratio of the daughter strontium (^{87}Sr) to the "common" strontium (^{86}Sr) is initially the same throughout the formation at the time the rocks crystallized, a modicum of credibility is obtained for the method. However, this is ultimately its Achilles' heel.

Another necessary concern is the ability to believe that the rocks being analyzed were "closed systems" since their formation; that is to say that neither parent or daughter has either entered or left the rock during the period. This is accomplished by analyzing more than two rocks, the more the better. If the results from each pair give the same age and initial value, within acceptable limits, the system can be assumed to have been closed.

Mathematically, all the above reduces to plotting the points representing each rock as shown in Fig. 3, using the parameters of $^{87}Sr/^{86}Sr$ and $^{87}Rb/^{86}Sr$. If a straight line results, the last constraint is satisfied (a closed system), and the modified assumption (same initial Sr ratio) is also verified. On the surface, the method appears sound, if straight lines can be regularly obtained, and indeed they are. These plots are called isochron diagrams or isochrons.

WHERE'S THE RUB?

It is important to ask the question concerning any scientific process, "Is this the only known method of obtaining the results?" If not, is this the most reasonable? The answer is NO on both counts.

If point A on Fig. 3 represented the composition of a lava flow, and point C represented the rock through which it flowed, the lava would partially mix some of C into it. If on the day after formation an isochron were plotted, points may fall on A or C and anywhere on a straight line connecting them, including B. The resultant "age" could be billions of years for this formation, even though it formed yesterday. Such a line is called a "mixing line", and there is no way to distinguish it from an isochron.(1,2,3)

Many of these plots have a negative slope,(4,5) indicating negative time. They are obviously mixing. Mixing, or contamination as it is often called, is a valid reason to discard any suspicious data. The creationist may validly throw out all the old dates on this basis. He is in good company. Evolutionary geochronologists have carefully tried many isotope systems on many types of rocks, and only finally accept as valid those that give dates which in their judgment are in the proper range. Their judgment is based ultimately on the old index-fossil system of 100 years ago, before the discovery of radiochronology. We are safe in saying that the radiometric dating system has been

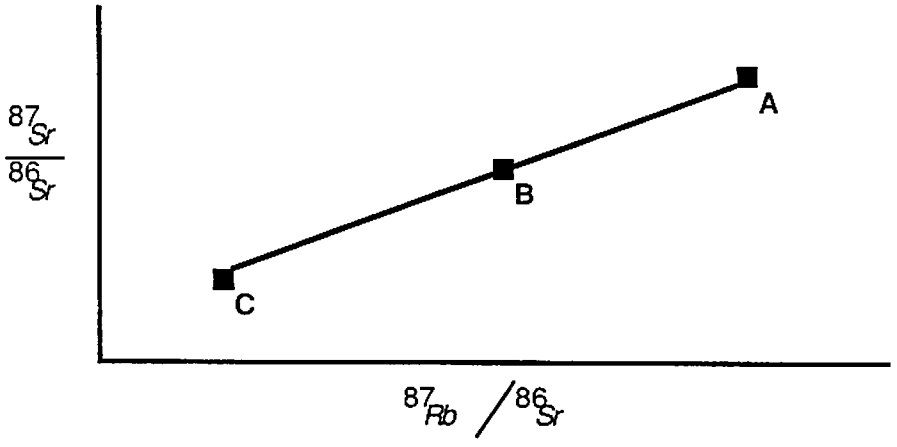

Figure 3

Typical Configuration of a Rb-Sr Isochron

calibrated against the fossil dates, which were extrapolated on the basis of uniformitarian geology and a faith not only in evolution but in the particular evolutionary scenarios of 100 years ago.

We return to the problem of obtaining independent samples. If they are not independent, they would all fall on a single point from which we could not make a curve. The isochron method is most ably defended on the basis of the mineral isochron. Here individual minerals in the form of crystals are analyzed. If the original melt were completely homogenized, having everywhere one composition, the individual crystals, which grow from special chemical processes, will choose their own composition. Thus each mineral will have its own composition of rubidium, and consequently its own point on the isochron. This process could indeed form an isochron without mixing, although the presence of mixing would certainly enhance the process. What has actually occurred, however, is that most often the mineral isochron fails to give a straight line. Mineral crystals appear to be too small to be "closed systems", and the constituents migrate in and out. So geochronologists fall back on the "whole-rock" isochron where the sample is so large that it is thought to contain the contents of the original crystals. It would, however, also contain the entire original melt. When they find the independent samples (independent in rubidium) from which they plot the published isochrons, the assumption that the strontium daughter ratio is initially uniform, therefore, is no longer valid. The only mechanism to honestly explain the whole-rock isochron is mixing. The whole-rock isochron also is involved in the vast majority of all isochrons published.

Most rocks are dated by only one isotope system, the one considered most valid for the particular rock type. When more than one is used, the most general case is "discordance";(6) that is, they don't agree. These disagreements are large, far beyond experimental error. Radio-dating proponents feel secure in opposing a 6000-year earth, however. Why, they ask, is the discrepancy between one billion and two billion years any comfort to the creationist? Is not 6000 years fully discredited? By what? we ask. The large discordances are sufficient to thoroughly discredit the process in the light of the attractive alternative, mixing.

Mixing lines misinterpreted as dates in the rubidium-strontium system must give dates in the range of billions of years because of its 4.9-billion-year half-life. Uranium-lead, with a 4.5-billion-year half-life can yield dates below the 100-million-year area, as can potassium-argon, at 1.3-billion-year half-life.

To get isochrons yielding dates under 10,000 years would require analysis for isotopes with much shorter half-lives. Needless to say, the dating laboratories are not equipped for such analysis.

CAN RADIOMETRIC PROCESSES GIVE ANY POSITIVE YOUNG-EARTH DATA?

We can cite two examples. Robert Gentry,(7,8) some of whose work appears in the second volume, has reported on the basis of uranium and polonium radiohalos in coal, that these coal formations are a few thousand years old at most. The radiohalos are caused by radioactive decay. The shape of the halos indicates that the deposit of uranium was there when the coal formed, and the micro analysis of the radio center indicates decay for a few thousand years.

Robert Whitelaw (9) has analyzed over 30,000 radiocarbon dates from several dating laboratories. By plotting them on a population basis, by age, he has discovered a startling pattern from a creationist standpoint. Radiocarbon dates formerly-living material only. The plot specifically presents what percentage of remains found died 7000 years ago, 6000, 5000, etc. The result shows a single extinction event approximately 4500 years ago, the Biblical date for the Flood.

The truth, then, about radiometric dating is that it yields ancient-age dates for rocks which are believable only to those who have already accepted ancient age on some other basis. On the other hand, cogent young-earth data are available from the same or similar mechanisms for any who are willing to examine it with an open mind.

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