YOUNG AGE VS. GEOLOGIC AGE FOR THE EARTH'S MAGNETIC FIELD

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The rapid decay of the earths magnetic field, predicted by the rigorous theoretical treatment of Horace Lamb and confirmed by 130 years of real time measurement, is presented as strong evidence that the earth's magnetic field is thousands and not millions or billions of years old. Attempts to substantiate a "geologic age" for the earth's magnetic field through a hypothesized self-excited dynamo to sustain the magnetic field are shown to be futile. Paleomagnetic "evidence" for reversals in the earth's magnetic field is shown, by references to the technical literature, to be fraught with inconsistencies and incapable of providing acceptable evidence for a long age for the magnetic field.

Present Decay Rate of the Magnetic Field

The rapid decay of the earth's magnetic dipole field, as deduced from real time measurements, is a formidable problem to conventional historical geology.[1] The first absolute measurements were made in the early 1830's and the decay of the field has been observed ever since then.

According to a 1967 government publication the earth's magnetic dipole field will vanish by the year A.D. 3991 if the present rate of decay is constant and continues.[2] The field is decaying at a rate of 32 gamma per year at the magnetic poles, 16 gamma per year at the magnetic equator, and at intermediate rates everywhere in between the equator and the poles.

To impress one with the magnitude of this decay rate it should be noted that one gamma variation in the earths magnetic field is easily measured by present day magnetometers. In fact, some of these instruments are capable of measuring differences in the magnetic field of one hundredth of a gamma. Hence one can understand that the decay rate of the earth's magnetic field is so large that it cannot be ignored.

Conflicting Views on the Source of the Magnetic Field

It is fairly well established that the earth's magnetic field is due to circulating current in a molten core of the earth.[3] There is, however, a wide divergence of opinion as to the source of this current. Some believe that the current was started by an event in the past and has been freely decaying ever since, as is evidenced by the present decay rate in the magnetic field.

Others believe that the present decay rate is temporary and not indicative of its long time behavior. They contend that the earth's magnetic field has reversed at irregular intervals and only temporarily loses its magnetic field, somehow maintaining the same average value of the earth's magnetic field throughout "geologic time." The reversed direction of magnetizations which has been observed in some rocks is interpreted as evidence of reversals of the earth's magnetic field.

Lamb's Solution Supports the Young Age Theory

In 1883 Horace Lamb derived a solution to Maxwell's equations which showed that the earth's magnetic field could be due to currents that were started at some time thousands of years in the past and freely decaying ever since.[4,5] His solution shows that the decay is exponential. There is no problem whatsoever with the physics of Lamb's solution. It provides a logical explanation of the earths present magnetic field if one assumes an initial magnetic field, such as a magnetic field started at the time of creation.

Opposition to this explanation of the earth's magnetic field comes from evolutionists because Lamb's solution may be used to support a young age for the earth's magnetic field. Lamb's solution has the advantage of having predicted the decay which is now confirmed by 130 years of real time measurements.

From these data one can show that the earth's magnetic field has a half life of 1400 years.[6] This observational support for Lamb's solution makes it highly implausible that the earth's magnetic field could be as old as evolutionists claim, limiting its age to thousands and not millions or billions of years.

Long Age Theory Requires a Dynamo

Because of their need to justify an age of billions of years for the earth's magnetic field, evolutionists suppose that some type of dynamo has kept the current running for billions of years. They have hypothesized "dynamos" of various kinds, but none of these dynamo theories is without its difficulties.

A comprehensive summary of problems with these dynamo hypotheses is found in Mining Geophysics Vol. II, 1967, published by the Society of Exploration Geophysicists.[7] One thing is clear, any geomagnetic dynamo theory is fraught with difficulties! Furthermore there is no satisfactory theory of a power source to drive the dynamo if there were one. The following quotation from reference 7 illustrates how unsuccessful the dynamo theories have been.

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In 1958 G. Backus and A. Herzenberg, working independently, each showed that it was possible to postulate a pattern of motions in a sphere filled with a conducting fluid in such a way that the arrangement acts as a dynamo producing a magnetic field outside of the conductor. In each case the motions were physically *very improbable* [emphasis added]; however, rigorous mathematical solutions were obtained, as was not the case with Bullard's numerical solution. The motions obtained by Backus all involved periods when the fluid is at rest. He needs these *periods* [emphasis added] of rest to insure that other fields generated by induction will not develop in such a fashion that they eventually destroy the whole process.

To make matters worse for the dynamo concept, Cowling[8] (1934) *proved that it is not possible for fluid motions to generate a magnetic field with axial symmetry* (such as the dipole field of the Earth). *Cowling's theorem* is indeed a blow to the evolutionary efforts to develop a dynamo theory. It eliminates the possibility of a straight forward theory for a self-exciting dynamo to sustain the earth's magnetic field. Nevertheless futile efforts continue and one still finds claims, but no proof, of a dynamo in the core of the earth.

For example, Parker[9] (1971) states:

> The theory for the origin got under way with Elsasser's[10,11] assertion that the only possible explanation of the dipole field of Earth was motion in the liquid metal core of Earth. . . . All other ideas such as thermoelectric effects, magnetostrictive effects, etc. are woefully inadequate. In view of Cowling's theorem Elsasser pointed out that the fields in the core need not have axial symmetry, nor are the fluid motions entirely symmetric. Elsasser worked out a mathematical formalism for treatment[11-14] and later Bullard[15-17] explored the possibilities.

Then, in reference to Elsasser-Bullard dynamo theory, Parker[18] states:

> So the generation of field is complicated, but based largely on the streaming and twisting of loops. . . . Calculations[19] show how variation in the strength and distribution of cyclonic turbulence in the core of Earth can lead to active destruction, and reversal, of the geomagnetic field.

Note that the only possibility of having a dynamo in the earth's core requires motion of fluid in the core of the earth; that such motion cannot be a simple rotation, or any other *symmetric* motion; and that all proposed motions have been unreasonably complex motions. As of now there is no physical evidence, seismic or otherwise, that there is any motion within the core.

In order to emphasize the weak foundation upon which the Elsasser-Bullard based Parker theory rests we refer again to the Society of Exploration Geophysicist's Vol. II article on the Earth's Magnetic Field by J. A. Jacobs:

> It must be pointed out that Bullard's solution merely shows that one particular set of motions could set up a self-exciting dynamo. It does not follow that his particular solution is the actual one. *There has also been some doubt cast on the convergence of his solution.*[20] [Emphasis added].

If the basic solution does not converge it is meaningless. This is indeed a severe inference about that work.

Association of Reversal Magnetization with Age of the Rocks

As previously mentioned, paleomagnetic observations are frequently cited as evidence that the earth's magnetic field has reversed its polarity many times in the past.[21] Rock samples at some locations have been found to be magnetized in a direction opposite to the direction of the present magnetic field. Magnetic surveys in the oceans also show reversed magnetization in some formations near the floor of the ocean. Reversed remanent magnetization of the rocks is often cited as positive evidence that the earth's magnetic dipole has had reversed polarity in the past.

The assumption is made that molten rock will, when cooled down below the Curie temperature, have a remanent magnetization in the same direction as the earth's magnetic field at the time of cooling. It is known, however, that there are many exceptions and that this is an oversimplification of the problem.

Because of inconsistencies which will be mentioned later, the samples to be associated with reversal of the magnetic field always have to be selectively chosen. Attempts have been made to correlate these selected samples of magnetization with "geologic ages." This has led to various "histories" of reversals in the earth's magnetic field. The supposed reversals are said to have occurred at irregular intervals. These "histories" vary with different authors but the last reversal is said by some to have occurred about 700,000 years ago.

Difficulties with the Reversal Hypothesis

There is a high degree of uncertainty in interpreting reversed magnetization in rock. Many samples show inconsistencies with the reversal hypothesis. Jacobs (1963) after attempting to make a case for reversals of the earth's magnetic field, cautions:

> However, before such an explanation is accepted, it must be asked whether there exist any physical or chemical processes whereby a material could acquire a magnetization opposite in direction to the ambient field. J. W. Graham (1949) found some sedimentary rocks of Silurian age which were reversely magnetized. He was able to identify the precise geological horizon over a distance of several hundred miles by the presence of a rare fossil which only existed during a short geological period. He found that some parts of the horizon were normally magnetized and some reversely and argued that this could not be accounted for by a reversal of the Earth's field which would affect all contemporaneous strata alike. . . . Graham thus wrote to Professor L. Néel of Grenoble and asked him if he could think of any process by which a rock could become magnetized in a direction opposite to that of the ambient field. Néel came up with not one but four possible mechanisms —and within two years two of these four mechanisms had been verified, one by T. Nagata for a dacite pumice from Haruna in Japan, and one by E. W. Gorter for a synthetic substance in the laboratory.[22]

Although Jacobs subscribes to the field reversal hypothesis, the following quote shows that he recognizes that it is fraught with difficulties.

> An extremely interesting finding is that all rocks of Permian age have normal polarity. - - - If the field reversal hypothesis is incorrect, it follows that mineral assemblages necessary for self-reversal are abundant in Carboniferous and Triassic rocks (both these periods have many reversals), but are missing in all Permian rocks. Such a conclusion is very difficult to believe - - - it is far more plausible to assume that the field did not alternate during the Permian.[23]

Note that this is merely a choice between two possibilities: 1) a reversal of the earth's magnetic field at selected times, or 2) self-reversal in the rocks and no reversal of the earth's magnetic field.

Jacobs also points out the following evidence against the paleomagnetic reversal hypothesis:

> E. Asami (1954) has examined some early Pleistocene lavas at Cape Kawajiri, Japan. Several hundred specimens were taken from closely spaced sites along the coastline. Along some stretches of the coast all the magnetization was normal; in other stretches it was reversed, and on some stretches normal and reversed were found close together. Such results show that one must be cautious about interpreting all reversals as due to a field reversal and the problem of deciding which reversed rocks indicate a reversal of the field may in some cases be extremely difficult. To prove that a reversed rock sample has been magnetized by a reversal of the Earth's field, it is necessary to show that it cannot have been reversed by any physio-chemical process. This is a virtually impossible task since physical changes may have occurred since the initial magnetization or may occur during certain laboratory tests.[24]

Permanent Magnetization of Rocks Is Found to Be Ill-defined

Chapman and Bartels, in their treatise *Geomagnetism*, give very little credence to the use of magnetization in rocks as an indication of the past state of the earth's magnetic field. They point out the difficulties in the following reference to the work of E. Thellier.

> Thellier has developed convenient and accurate apparatus for such studies, and has made extensive measurements on rocks, bricks, and other objects of baked clay. After reviewing the evidence afforded by his own and other measurements, he concludes that the permanent magnetization of rocks is ill-defined, and gives no safe basis on which conclusions as to the past state of the earth's magnetism can be arrived at.[25]

However credence is given to the use of magnetic measurements associated with less old objects made of *baked clays*, as can be seen:

> Objects of baked clay, on the contrary, appear well suited to this purpose, when adequate particulars concerning them are available. By measurements on the magnetism of French bricks of known age, dating from A.D. 1400 onwards, he has obtained what he regards as a reasonably probable curve showing the variation of magnetic dip from this time until actual dip observations were made, at about A.D. 1780, for Paris. The later part of his inferred curve fits on well with the actual observations made at Paris, and also runs reasonably parallel with the earlier part of the dip-curve for London.[26]

The London data extend back to 1540.

One obvious complicating factor in using rock magnetization to interpret the history of the magnetic field is local disturbances. For example, *lightning can magnetize rocks.* Strangeway, in attributing "erratic" effects in the remanent magnetism to lightning, states: "It is probable that much of the scatter observed is the result of lightning strikes."[27]

Stresses and Folding May Alter the Orientation of Rock Magnetization

In addition to the four mechanisms for self-reversal which Néel discussed, Doell and Cox

(1967) point out that *magnetostriction* (magnetization causing change in dimensions of the body and the converse effect of stress on the body causing changes in the magnetization) can cause "remanent magnetizations of rocks to be in directions that are not those of the fields acting when remanent magnetization was originally acquired."[28]

Alteration of the direction of remanent magnetization by pressure and other stresses is important. The effects of magnetostriction should not be overlooked in attempting to explain the magnetic variations where strata have been subjected to great stresses. To date that seems to have been ignored in selecting orientations for the reversal chronologies.

For example, the magnetic reversal anomalies near the floor of the ocean have been proclaimed as evidence of the reversals of the earth's dipole field; whereas great upheavals and folds in the earth beneath the oceans must certainly have yielded profound magnetostrictive effects, altering the orientation of the magnetization in the rocks.

Folding in rock formations may physically change the orientation of the rock. Hence the direction of the magnetization may be reversed where the formation has been folded backward. Magnetization in folds has been interpreted in two different ways: 1) that its direction of magnetization has been reversed by that movement, or 2) that the magnetization took place after the folding and was not affected by the fold. These interpretations have been an either-or option selected to fit the "assumed" history.

Conclusion

It is clear that paleomagnetic arguments for reversal of the earth's magnetic field are not conclusive and depend in the main on arbitrary interpretations of selectively chosen samples. Cowling's general theorem puts any geomagnetic dynamo theory into the category of the implausible. No acceptable dynamo theory to sustain or oscillate the earths magnetic field has ever been conceived nor is one very likely.

Hence one may conclude that the strongest theoretical and observational evidence supports Horace Lamb's theory of freely decaying currents as the source of the earths magnetic field. That theory implies an initial (created) field in the not too remote past. Extrapolation backward for as much as twenty thousand years yields an implausibly large magnetic field.[29] The earth's magnetic field must be very young compared to the so-called "geologic age."

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