

July 23, 1963

Observations during the eclipse of July 20, 1963.

On the above date there was an eclipse which at the location of Boston was 94.4% total.

I started warming up my torque pendulum at 1:35 on Saturday afternoon, July 20th. This gave me ample time to reach equilibrium conditions.

Post time
Whereas the timing cycles can be used before, actual timing can be considered acceptable after 2:55. (All times are given in Eastern Daylight Saving Time.) The charts and graphs are self-explanatory. From an experimental viewpoint, I want to go on record as follows:

This was one of the cleanest and most precise runs that I have ever taken.

It was cloudy and the sun was hidden frequently interfering with visual observation. My recordings, however, visibility or not, are quite significant.

All external conditions between 3:00 and 8:00 P.M. when the serious observations took place (thus substantially bracketing the eclipse time of 4:40 to 6:48), ~~at~~ 82 degrees F. *one* observed on the red alcohol thermometer inside the vertical tube of the torque pendulum. During this entire time the ~~barometric~~ pressure was substantially constant (29.53 inches at the beginning and 29.51 inches at the end). Also the relative humidity remained significantly constant with changes as little as 80% relative humidity at the beginning and 78% relative humidity towards the end of the experiment. *Hence no change of weight of the air column.*

The following elements of instrumentation require improvement (though they did not seriously interfere with the measurements referred to).

1.) I had to make several adjustments at the high voltage. I do not understand why same should have built up during the experiment. I started at 2,500 volts precisely. I had to reduce this voltage several times, never for any large amount, but for adjustments ranging from a maximum adjustment at 5:36 that was half a division to reducing the voltage several times the thickness of one line.

As a working hypothesis, it may be possible that somewhere in the high voltage circuitry there is leakage current. As the heat in the instruments builds up, insulation improves. Under these conditions then there is less leakage as the apparatus gets warmer, hence voltage builds up. ¶ If this is correct, the remedy for the situation is quartz insulators instead of the present dry wood and masonite that we are using on the pendulum. Of course also high vacuum is indicated.

As another alternative, a variation of the input voltage may be considered. This, however, is contradictory to the fact that I had to increase (not decrease) the voltage on the de-gaussing coils several times slightly. A better voltage stabilization there seems indicated.

Although I had to make some manual monitoring on the above positions, this was not serious. It was rather keeping ultra-precise adjustments constant. These slight adjustments should not significantly affect the recordings. If I had permitted them to accumulate, they then might have influenced the experiments but not while they were caught practically immediately.

2.) Another thing where personal monitoring was of the essence was in the timing of the electro-pneumatic time delay and the delay switch on the Berkeley counter. I am under

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the impression that as the instruments run themselves in and the coils get warm, the electro-pneumatic delay becomes slower. This results then in playing havoc with the delay and resetting cycle of the Berkeley counter. (There exists of course the possibility that the delay circuit being essentially of a resistor type may change in the Berkeley also.)

(A true change of the field may have occurred. There is a very short firing and a skip prior to the deviation).
From a practical viewpoint, however, I believe that even the electro-pneumatic cycling is inadequate and that an error of a couple of seconds builds up over a four-hour period. This error as far as the Berkeley counter is concerned is doubled because we are operating with the double cycle of first resetting the DC electro-magnets and thereafter having the counter operate once more upon the return motion. In any event, I had to make the electro-pneumatic relay slightly faster and carefully reset during the run the delay of the Berkeley so as to make sure that the counter would be ready to start counting within a reasonable margin of safety. I tried to set the delay on the Berkeley but it would reset the figures about midways between the last pulse of the resetting mechanism and the start of the counter.

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Addendum:

On Sunday evening, July 21st, my brother-in-law, Edwin Hildreth, dropped in. I found out conversationally and indirectly that Barkeley & Dexter in Fitchburg have a special building that was built by mortgage of the Shawmut Bank. This is called the Milligal Building (conversationally called the Metrecal Building). I understand there is hell loose at Barkley & Dexter because they couldn't get their gravity equipment running in time for the eclipse.

Since I had particularly pointed out to Dr. Thompson and associates including the representative of Barkley & Dexter, the

special effects that I observed during the eclipse, I cannot help but feel that they must have tried to imitate at least in part my equipment if not all.

The more I think of the situation, the stronger I feel that I ought to write a paper after I have the records of this eclipse and get it published in the Journal of Geophysical Research or in Science. It may be perfectly feasible to do both. Also I should send a copy to the Nuovo Cimento.