Central American records on monuments and in codices have long been supposed to contain astronomical statements of eclipses, etc. Furthermore it may be remarked that by this demonstration American history is made more exact than the history of Egypt, Greece, or Rome. For instance, the dedicatory date on Stela 9 at Copan corresponds to March 31, 304 A.D., in the backward projection of our present Gregorian calendar. The earlier artistic classification of the present writer, and the general *katun* correlation of Morley, were correct within a very few years.

The data in full will appear in the *Anthropological Papers of the American Museum of Natural History.*

THE TORSIONAL MAGNETIC ENERGY ABSORPTION OF AN IRON CONDUCTOR[1]

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1. *Apparatus.*—The relations of torsion and magnetization have been studied by Wiedemann, Auerbach and many others since, chiefly in longitudinal fields. The torsion effect produced by a circular field is very small and difficult to ascertain. I, therefore, thought it of interest to make some measurements of this kind, using the displacement interferometer and achromatic fringes. The results were very definite and would easily have admitted of higher precision. The apparatus is shown in figure 1, where *AB* is a thin, low carbon steel tube, effectively 55 cm. long, having an average diameter of 0.875 cm., and walls 0.076 cm. thick.

The tube is firmly clutched below by a clamp, but free above. It carries the mirror *mm'* which is a strip of thin plate glass, silvered and slightly adjustable about a vertical and horizontal axis. The ends receive the component rays of the interferometer, so that any slight rotation of *mm'* about the vertical axis is at once registered by the displacement of fringes. Finally a strong electric current may be passed through the length of the tube, entering at *A* and leaving by the mercury cup *C*. The current must be reversible at pleasure

2. *Observations.*—The fringes are displaced (i.e., the tube receives magnetic set) immediately after closing the circuit. Closing it any number of times thereafter is ineffective to the fraction of a fringe. There is practically no temporary effect. On reversing the current, the fringes are markedly displaced in the opposite direction, again to hold the new position, however often the current is made and broken thereafter.

To obtain a temporary effect I surrounded the *AB* with a massive iron tube, about 6 inches long and 2 inches in diameter, clamped at the top *B* (bell-like) but otherwise free from it. Even now, with currents up to

20 amperes, I observed no temporary effect in excess of the quiver of the fringes.

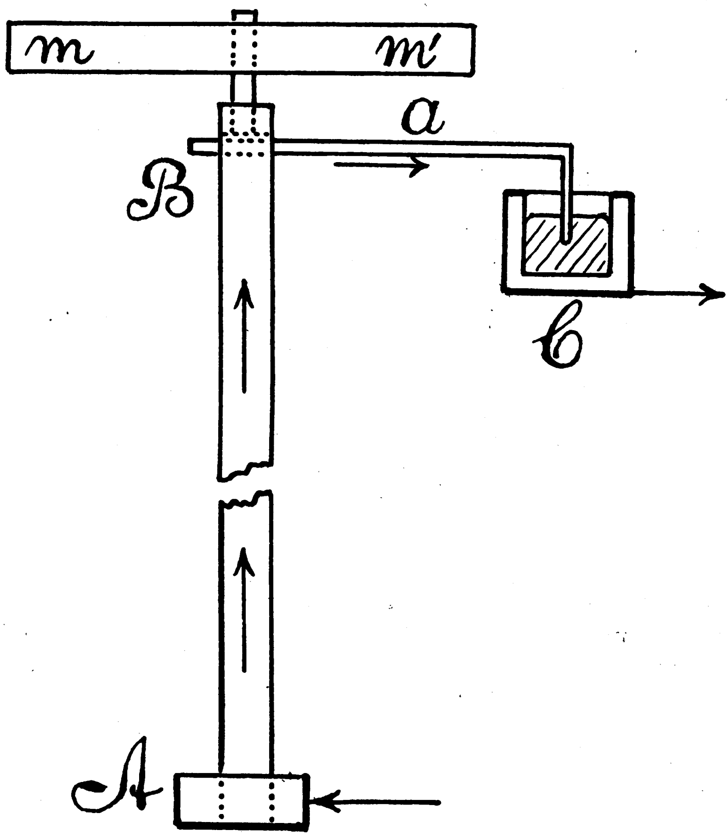

FIG. 1

The following data were obtained for the fringe displacement ΔN, showing the permanent effect of reversal of current:

Current, 3 Am.	ΔN =	?
10 Am.		0.00031 cm.
20 Am.		0.00065 cm.

Below 3 amperes I was unable to observe a displacement. For larger currents the twist increases proportionally to the current passing the tube. It is probable that here, as in similar cases in magnetization, fields below a certain small value are ineffective, as though there were static friction.

A further observation is to be made: If a certain magnetic set is produced by a stronger current (say, 20 amperes), then a weaker current (say, 10 amperes) is unable to modify it, provided both currents are in the same direction. If this weaker current is reversed, the change of twist corresponding to the current will appear. The absolute value of the set thus depends upon the past history of the iron, however varied this may have been, with the understanding that the set produced by the maximum current in either direction is characteristic of the strength of that current. Differential values, in other words, remain the same.

3. *Data*.—Finally the numerical equivalents of the observations made may be stated. The elastic torsional coefficient for a tube of the dimensions given may be computed with the usual equation, using the differential form $dT/dr = 2\pi nr^3\theta/l$ (mean radius r and length l) and taking the rigidity as $n = 8.2 \times 10^{11}$. If T is the torque corresponding to the twist of θ radians, the relation was found to be

$$T = 10^9 \times 4.7\theta.$$

On the interferometer, if the breadth of ray parallelogram is $b = 10$ cm. and $\Delta\theta$ is the rotation of the mirror mm' around a vertical axis, corresponding to the displacement of mirror ΔN (the mirror being at $i = 45°$ to the rays), the relation will be, since $\Delta\theta = \Delta N \cos i/b$,

$$\Delta\theta = 0.071\,\Delta N.$$

Hence, if we assume that the resistance to magnetic set is the same as the elastic resistance for the same twist $\Delta\theta$, the above values of ΔN will correspond to the following data:

Current	$\Delta N \times 10^6$	$T \times 10^{-5}$	E	$E/vol.$
10 Am.	31	1.03	1.13	.10
20 Am.	65	2.16	4.97	.43

The energy, E, potentialized by the magnetic set is computed as $T\Delta\theta/2$. From the volume of iron in the tube, 11.5 cm^3., the data of the last column follow.

My conception of this phenomenon is that of two concentric circular fields in opposite directions, one within the other on the outside of the tube, introducing a rather intense vortex sheet in the thin walls of the tube, in which the circular fields terminate.

4. *Longitudinal Field*.—The longitudinal strain produced by a longitudinal field is well known. The question may be asked whether in this case, in a free iron bar, there is any corresponding torsion. This was easily answered by slipping a helix over the steel tube. Feeding it with I amperes, the micrometer displacement ΔN was successively

$I =$	1.5	4.5	9.4	1.5	Am.
$10^5 \times \Delta N =$	15	10	10	5	Cm.

This means, no doubt, that the residual torsion left by the last experiments is being eliminated.

[1] Advance note from a report to the Carnegie Institution of Washington, D. C.