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A Description of an Experiment Involving The Use of a Modified Drum-Type Spherometer for Measuring the Rate of Weathering

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For the teacher who is interested in teaching a unit on weathering, the cemetery may provide unlimited amounts of data. As an exercise in weathering, a measuring instrument was devised and tested by the author on tombstones in the Buffalo area. The instrument used and the results of the test are described as follows:

Procedure

In order to determine the rate of weathering, a drum-type spherometer, with an accuracy of 0.01 mm, was modified to fit the demands of the problem (see Fig. 1). The modified

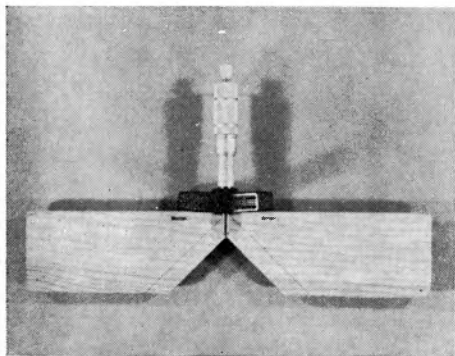


Figure 1

A Modified Drum-Type Spherometer
for Measuring the Rate of Weathering

instrument was carefully checked to make certain that its degree of accuracy has been maintained. Measurements were made on the corners of the stone and in order to achieve a representative sample result, three measurements were made, one on each side and one from the top, with the results averaged. It will be noted that on both granite and marble stones a slight amount of rounding off of the corners had occurred during the stone's preparation.¹

A small number of measurements were then made on both granite and marble tombstones. The stones selected for measurement were at approximately 50-year intervals, beginning with recent stones, as indicated by the dates carved on the stone faces. In each case it was assumed that no weathering had occurred until

¹ While information on the degree of rounding is at best scanty, it would appear that each stonecutter would have had his own standards for rounding and that these standards would in turn be passed on to apprentice stonecutters who were learning the trade. Further, since the number of stonecutters in any community tends to be small, it may be assumed little variation will actually exist.

after a date had been carved on the stone.

Results

The rate of weathering as indicated by Figure 2 would indicate that a linear relationship existed. In the case of marble stones, no measurements were made at the 150-year interval because the rate of weathering had so obscured the date as to be unreadable. Granite stone dates, however, could easily be read at the 150-year interval.

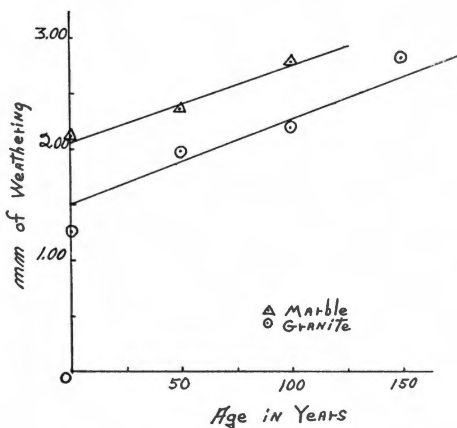


Figure 2
Rates of Weathering Measured at
50-Year Intervals on Granite and
Marble Tombstones

Aged marble stones presented a flaky appearance and weather particles could easily be scraped away by a fingernail. This fact may have resulted in inaccurate readings, although extreme care was exercised.

Conclusions

Since the city of Buffalo is not only a large community but also an industrial one, it would seem logical that

the following factors would influence the rate of weathering:

- 1) Rainfall
- 2) Air and ground moisture
- 3) Frost action
- 4) Chemical activity of gases artificially introduced into the air
- 5) Effect of solid particles, such as soot, found in the air
- 6) Variations in temperature
- 7) Effect of wind

These factors plus others such as the different chemical composition of the various stones, the impossibility of measuring the same stones over an extended period of time, and the probable variation in the original rounding of the corners of the stones can only lead to the conclusion that it is difficult to determine precisely what the true rate of weathering actually is. In spite of this rather discouraging fact, it is still possible to determine the approximate rate of weathering as well as the relationships which may exist between several different kinds of stone.

Summary

While it will be noted that the objections listed in the conclusions are indeed formidable ones, one may still conclude that an apparent linear relationship does exist with regard to the rate of weathering. In addition, it will be obvious that the granite is the more resistant of the two rocks, and therefore is the more satisfactory for use as a permanent marker.

Still further differences may appear if the student notes such things as: 1) the direction that the stones face, and 2) effects of climate change (which may be determined by examining local climatic data).