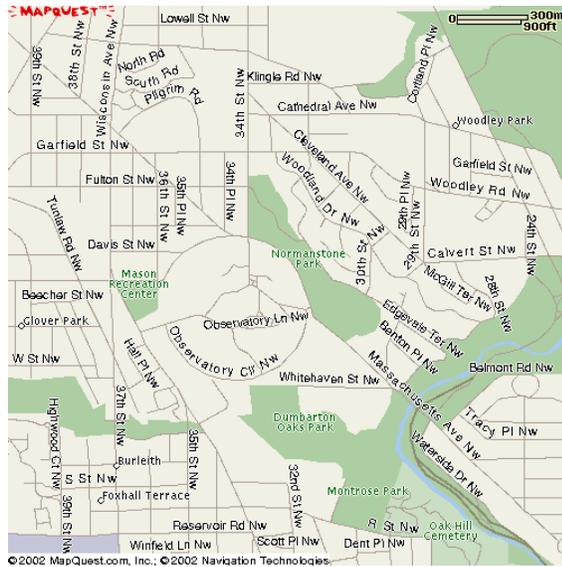


## THE CIRCLE

If you have ever looked at a map of Washington D.C. you may have noticed that Massachusetts Avenue is straight as an arrow for much of its length but near the U.S. Naval Observatory it curves along a near-perfect arc. This shows up clearly on a map of the area, see map to left.

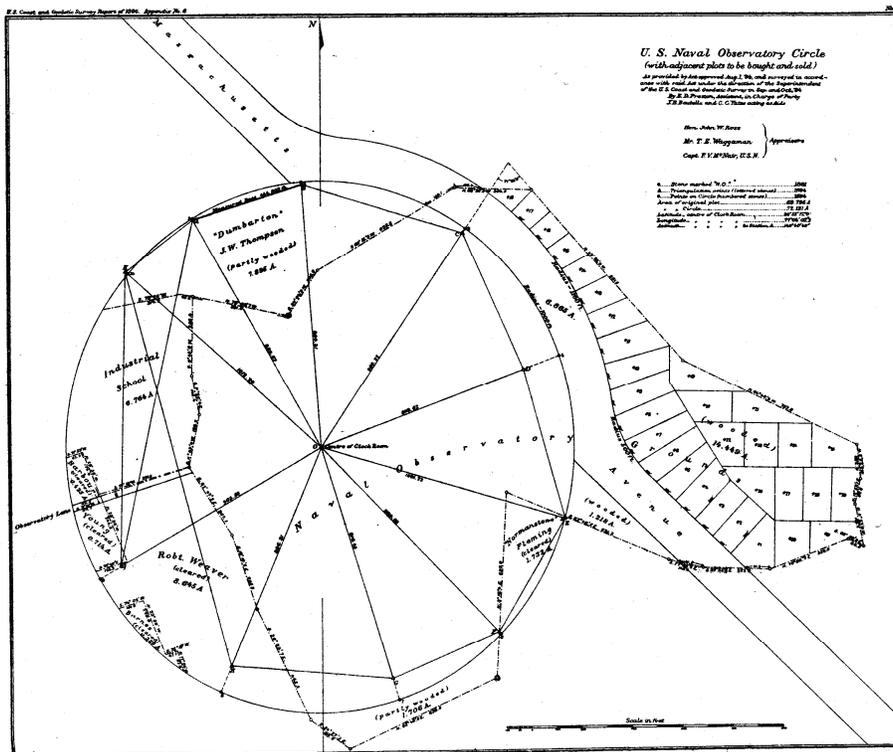


The curve suggests that the road is avoiding a deep gorge or rocky bluff, but neither is the case. To find out the reason, we must go back to the 1896 Report of the Superintendent of the U.S. Coast and Geodetic Survey (USC&GS)

[http://docs.lib.noaa.gov/rescue/cgs/data\\_rescue\\_cgs\\_annual\\_reports.html](http://docs.lib.noaa.gov/rescue/cgs/data_rescue_cgs_annual_reports.html)

By Act of Congress, the USC&GS was tasked to survey a circle around the Observatory for the purpose of “guarding the delicate astronomical instruments at the U.S. Naval Observatory against smoke or currents of heated air in their neighborhood, and undue vibrations from traffic upon the extension of public thoroughfares in the vicinity...” And this was before long before today’s heavy automobile and truck traffic!

Several methods were considered for defining the 1000 foot radius circle. The method selected used triangles, with one point (the center) at the center of the clock room, and the other two points of each triangle out near the circumference of the circle, see triangulation diagram to left.



The circumference points were chosen for inter-visibility as the varying terrain allowed.

To control the scale, one of the exterior sides of the figure was measured as a base line. The final base line length was 444.803 +/- 0.001 feet. All three angles were measured in each triangle. The angles were also very precise with the average correction to an angle at the center to close the horizon of 0.16 seconds, and the average correction to an angle to close the triangles was

2.1 seconds. Note, the angles at the center were measured with a theodolite reading to 2 seconds, and the exterior points with a theodolite reading to 5 seconds. After observations and computations, the short distance from the circumference points to the actual circumference was measured with a tape. According to the report, "By this procedure, the greatest uncertainty in the lengths of the radii did not exceed three-hundredths of a foot." The position of the center point was also determined at this time by observing on three existing USC&GS points, the Washington Monument, the U.S. Capitol, and the Fairfax Theological Seminary. A theodolite with an 8 inch circle reading to 2 seconds was used. "Each pointing at the center was made in three positions of the circle 120 degrees apart with two series in each position: one series consists of a point with telescope direct, and one with telescope reversed, so that each angle was given twelve independent measures."

So, 100 years ago as today, the Geodesy Division of the USC&GS (now called the National Geodetic Survey, NOAA) was performing very accurate surveys of lasting benefit to our nation!