Uddrag af:

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Appendix D: Columbus and the Quadrant

It has bothered me that Columbus had such apparent difficulty in measuring latitude using a quadrant. On November 2, 1492, while in the harbor of Mares (21.1° N) his quadrant reading was 42° N. he got the same reading at sea on November 21. Later, on December 13, while in the harbor of Conception (19.1° N) his quadrant reading was 34°. How could Columbus make such gross errors of som twenty degrees? He knew the readings were wrong and thought the quadrant was broken. A quadrant is so easy to use that even Morison does not suggest Columbus mishandled the instrument. Rather he suggests Columbus shot the wrong star. Morison's explanation does not seem valid to me. Columbus had been looking at Polaris and the "guards" all during the trip in order to tell time at night. Polaris's general position in the rigging and relative position on the horizon would be well known by the time he used the quadrant on November 2. To misselect Polaris at the latitude of Cuba would be like selecting a twety-five-story building to survey instead of a twelve-story building while standing three hundred feet away.

I remember reading the suggestion that Columbus may have used a quadrant which, for som reason, had twice the number of degree graduations it should have had. The idea that the scales on Columbus's quadrant may have been out of the ordinary could have merit. The standard quadrant often had other scales besides the equal interval degree scale along the circumference. The large variety of scales in surviving instruments, even long before Columbus's time, must be seen to be believed. Included were standard scales for the elementary trigonometric ratios: tangent (*umbra recta*), cotangent (*umbra versa*), sine (*corda recta*), cosine (*corda versa*). There were many ways to represent these functions, which found their way into everyday use by builders, military men, surveyors, pilots, and the like. It is not unlikely that Columbus's quadrant had a tangent/ cotangent scale running parallel, and just inside, the degree scale, and along the circumference. Such a scale is shown in Apian's quadrant. This scale gives one hundred times the trigonometric tangent of angles under forty-five degrees, and one hundred times the cotangent of angles over forty-five degrees. Suppose then when Columbus took his quadrant readings – in the dark, of course – his thumb, which held in place the weighted thread which measures the angle, covered the numbers on the degree scales. In the light of a lantern or at the binnacle he might mistakenly read the nearby numbers on the tangent scale. If this was the case the inverse tangent (arc tangent) of his reading should approximate his true position. Let's do the arithmetic.

Date	*Columbus's Latitude Reading*	*Arc Tangent of 1/100 Reading*	*Columbus's True Position*
Nov. 2	42	22.8° N	21.1° N
Dec. 13	34	18.8° N	19.9° N

These are pretty good results and conform to the reasonable assumption that one could easily measure angles to within a couple of degrees with a quadrant.

On February 3, 1493, Columbus records observing Polaris to be very high, as at Cape Saint Vincent (37° N). This observation sans quadrant or astrolabe is pretty close to the latitude calculated by McElroy to be the fleet's position that day, namely 35° N.
I suppose that Columbus never resolved his difficulty with the quadrant during the course of the voyage. For in his letter of February 15, 1493, he notes that the new lands are twenty-six degrees from the equinoctial line. This position corresponds closely with the plotted location on a portolan chart of his landfall relative to the Canaries. Hierro is in 27.7° N.