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Captain Vancouver's strange reporting of Peter Puget's longitude determinations

by Nick Doe

Most of the field-notes made by Captain George Vancouver during his great survey of the North Pacific coast of America in the 1790s have been lost, leaving only his three-volume book and an incomplete collection of mostly-routine ship's logs to describe the voyage. Although his book contains many records of his determinations of longitude by astronomical observation of the position of the Moon (lunar-distances) and by chronometer,[1] he provides few details of his position-fixing techniques, or indeed of his surveying techniques in general.[2]

Studies of the data contained in his book show it to be highly processed. Some of the chronometer calibration data, for example, is at variance with his longitude reckonings as the result of revisions that were not documented,[3] and some of the lunar-distance "observations" have been recalculated to improve their consistency.[4] Plain old arithmetic errors are also quite common. However, in most cases it is easy to come up with a plausible explanation for the inconsistencies. This is not so in the case of Vancouver's reporting of Peter Puget's observations off the coast of Washington in April 1792. The record of these observations made during the expedition's first crossing of the Pacific from Hawaii has been altered in quite an elaborate fashion to make it appear as though the observations were made several weeks earlier than they actually were; but for what reason is not clear.

The observations in question are the nine sets of lunar-distance measurements of longitude made by the second lieutenant of the *Discovery*, Peter Puget, reportedly made at sea between March 28 and April 9, 1792. The results appear both in Vancouver's Californian landfall longitude calculation of April 18 and,[5] without additions, in the Washington State Port Discovery longitude calculation of May 4.[6] That these results are derived from the same observations can be verified by repeating Vancouver's reduction calculations. Thus:

> Port Discovery longitude – landfall longitude by chronometer calibrated at 4.03 sec/day gaining: 124°01' – 125°00' = –59'

> Puget's landfall longitude by chronometer calibrated at 4.03 sec/day gaining: 124°24'W

> Hence, Puget's Port Discovery longitude by chronometer calibrated at 4.03 sec/day gaining: –59' + 124°24' = 123°25'W

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[1] Lamb, W.Kaye, ed. *A Voyage of Discovery to the North Pacific Ocean and Round the World 1791–1795 by George Vancouver*, Hakluyt Society, 1984.

[2] David, Andrew, *Vancouver's Survey Methods and Surveys*. In Fisher R. & Johnston H. eds., *From Maps to Metaphors*, UBC Press, pp.51–69, pp.291–293, pp.303–305, 1993.

[3] Doe, Nicholas A., *Vancouver's Assessment of Kendall's Chronometer K3 in 1791/1792*, Lighthouse 50, pp.15–26, 1994.

[4] Doe, Nicholas A., *Captain Vancouver's Longitudes—1792*, Journal of Navigation, Vol. 48, pp.374–388, September 1995.

[5] Lamb, *A Voyage...*, p.485.

[6] Lamb, *A Voyage...*, p.531.
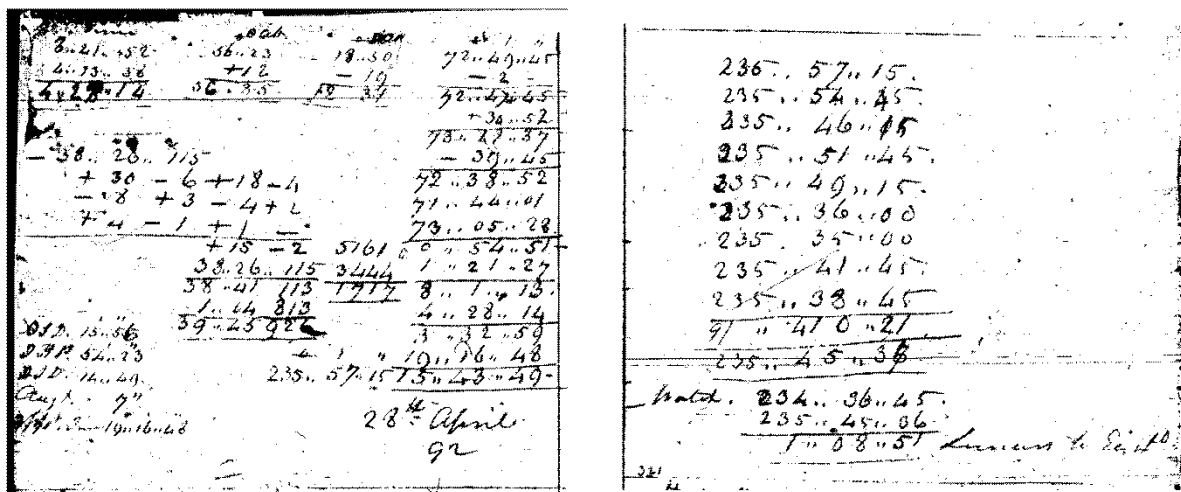
An extract from Puget's rough log showing on the left the calculation of longitude, 235°57'15"E (124°02'45"W), from a set of lunar distance observations dated April 28, 1792. This date is confirmed by the presence of two numbers (lunar distances) in the calculation that were taken from tables for that date in the Nautical Almanac for 1792. The longitude appears later in the log as the first of nine in an undated averaging calculation shown on the right.

Correction to 8 sec/day gaining for 12.4 days: $(4.03 – 8) 12.4/4 = –12'18"$

Correction to 11.5 sec/day gaining for 17 days: $(4.03 – 11.5) 17/4 = –31'45"$

Puget's Port Discovery longitude: $123°25' – 12'18" – 31'45" = 122°40'57"W$

Vancouver's calculation: $122°40'55"W$

The results are practically identical confirming that this is how Vancouver processed Puget's observations. The only assumption that has been made in this calculation is that the lunar-distance observations were made, on average, 12.4 days before April 17, the day that Vancouver changed his estimate of the Kendall K3 chronometer's rate-of-going from 8 sec/day gaining to 11.5 sec/day gaining.[7]

There would be little to add to this analysis were it not for the fact that among the surviving fragments of Puget's rough log I have found a page of arithmetic without annotation that is without doubt the processing for these nine sets of observations.[8] The arithmetic is dated April 28, 1792 and although Puget was not the best of record keepers, the lunar-distance figures contained in the calculation confirm that this was indeed the date the observations were made.

On April 28, Vancouver was anchored south of Destruction Island off the coast of Washington State; he was not, as Vancouver's calculations required, in mid-Pacific.
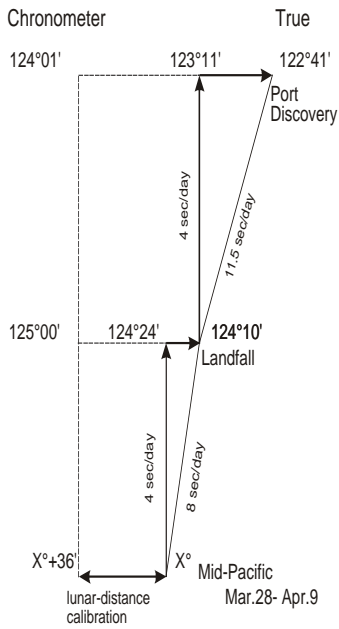
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[7] Captain Vancouver set his chronometers to read Greenwich mean solar time, hence if the chronometer was running fast, he would have concluded that the difference between local time on the Pacific west coast and Greenwich time was greater than it actually

was and that he was therefore further west than he actually was. The correction for a chronometer that is running fast is therefore to move the deduced longitude east.

[8] Puget, Peter, *Rough Log 1791–1793*, British Museum Add.17545.

Chronometer ... **True**

124°01'   123°11'   122°41' Port Discovery

4 sec/day   11.5 sec/day

125°00'   124°24'   **124°10'** Landfall

4 sec/day   8 sec/day

X°+36'   X° Mid-Pacific

lunar-distance calibration   Mar.28- Apr.9

RJD:+125 May 4

RJD:+119 April 28

RJD:+109 April 18

RJD:+95 April 4

How Vancouver says he processed Puget's observations

Chronometer ... **True**

124°01'   122°52'   122°41' Port Discovery

125°23'   124°14' Destruction Island

lunar-distance calibration

11.5 sec/day   4 sec/day

125°00'   124°24'   123°51' Landfall

124°10'

4 sec/day   8 sec/day

Y°+14'   Y° Mid-Pacific
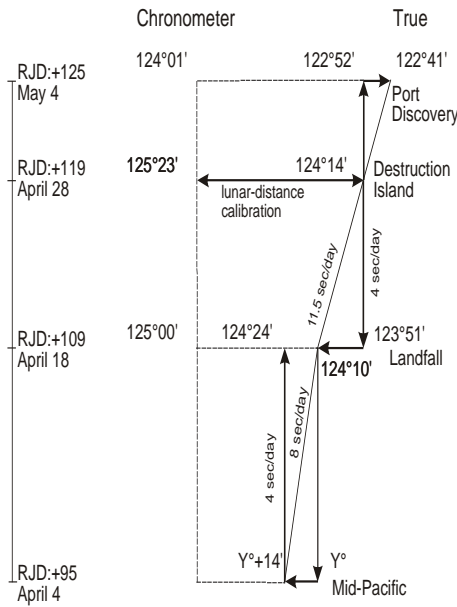
How Vancouver actually processed Puget's observations

Vancouver measured longitude by, in effect, comparing the time displayed by two clocks, one showing the time at Greenwich and the other showing local time. If local time appeared to be one hour behind Greenwich time, for example, he would know that he was 15° west of Greenwich.

Determining local time is relatively straightforward. You can do it approximately by watching for when the sun is highest in the sky to the south at noon, and setting your clock to 12:00. To be more accurate, you need tables—they are quite simple—that tell you on the date that you are making the observation the precise time of noon—it varies by a few minutes throughout the year because the earth's orbit is not exactly circular.

The time at Greenwich was determined by measuring the position of the moon relative to either the sun or to a star—most often he used the sun. He carried with him pre-calculated tables of the moon's position at various times and dates.

Vancouver claims in his book that one of his many determinations of the longitude of Port Discovery was based on Peter Puget's lunar-distance observations in mid-Pacific and the measured difference in longitude of Port Discovery and that of the location where the lunar-distance observations were made, as determined by chronometer. This calculation process is shown on the left.

The evidence however is that Vancouver has invented this scenario. The lunar-distance observations, which he had lost, were actually made at Destruction Island as shown on the right. To arrive at lunar-distance observations in mid-Pacific that were consistent with the Port Discovery longitude, which he knew, he worked backwards from Port Discovery to arrive at calculated lunar-distance observations to substitute for the ones that he had lost. Unfortunately for him, the timing of the calculated substitutes confirms that no such observations were actually made.

Puget's observed longitude, according to his rough log fragment is 124º14'24"W, and we can again verify that this is the result that Vancouver used by repeating his calculation. Thus:

Port Discovery longitude – Puget's longitude by chronometer calibrated at 4.03 sec/day gaining: 124º01' – 125º23'15" = –1º22'15"

Correction to 11.5 sec/day gaining for 6 days: (4.03 – 11.5) 6/4 = –11'12"

Puget's observed longitude: 124º14'24"W

Hence, Puget's Port Discovery longitude: 124º14'24" – 1º22'15" – 11'12" = 122º40'57"W

Vancouver's calculation: 122º40'55"W

The only explanation for this misrepresentation of Puget's result I can think of is that when it came to writing his book, Vancouver, or someone helping him, was unable to locate the data for the original observations. Rather than admit to a loss of the records, the landfall data was calculated by working backwards from the Port Discovery longitude.[9] This entailed "inventing" a date for the observations and then removing the corresponding corrections that would have had to have been made to compensate for changes in the chronometer's rate-of-going from the rate of 4.03 sec/day established on the island of Tahiti in January 1792. For publication purposes, the author of this deception then ascribed a rather vague date to the observations, namely, sometime between March 28 and April 9, 1792.

If this explanation for Vancouver's strange reporting of Puget's observations is correct, then the perpetrator did make mistakes.

As shown above, the supposed date of the observations must have been 12.4 days before April 17, that is, about midnight on April 4. This is an unlikely time of day to have been making lunar-distance measurements from the Sun!

Even more serious is the fact that it would not have been possible to have made the lunar-solar distance observations on that date because the Moon was almost full; consequently, the lunar distance from the Sun was greater than the 120° that can be measured with a sextant, and hence there were no entries in the Nautical Almanac to enable the necessary calculations to be made.[10]

Notwithstanding these mistakes, if was not a bad effort to disguise the loss of the original notes—a dilemma probably familiar to those of us who have been on extended data-collecting field trips.

John Naish, a retired consultant physician, in his book on the expedition,[11] makes several interesting observations on the characters of Vancouver and Puget which must be

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[9] Some of the relationships between Captain George Vancouver and the men who sailed with him were not especially good after completion of the voyage, but this was not so in the case of his with Peter Puget. It is even likely that Puget helped Vancouver's brother John put the finishing touches to the manuscript of Vancouver's book and atlas after Vancouver became too ill to do the work himself. This would seemingly put paid to any notion that the data was being maliciously withheld, although their remains the possibility that it was rendered unavailable by the Admiralty bureaucracy.

[10] Also excluded is the possibility that not all of the observations were made on the same date. Since the average date was April 4, some observations would have to have been made after April 4 if they were not made together. This is not possible for observations using the Sun, which Vancouver and his crew almost always did, because there was a full moon on April 9.

[11] Naish, John M., *The Interwoven Lives of George Vancouver, Archibald Menzies, Joseph Whidbey, and Peter Puget*, Edwin Mellen Press, 1996.

carefully considered by anyone contemplating charging either one of them with a "cover up".

Captain Vancouver was a stickler for detail and had a propensity to keep everything ship-shape and tidy; however, his perfectionist drive did sometimes lead him to attempt "...to conceal episodes which might have thrown a bad light on his command" (p.368).

Peter Puget, like Vancouver was a master of detail, an exceptionally upright and punctilious character who in his later years was to become a Commissioner of the Navy in which post he struggled relentlessly against corruption and bribery (pp.425–427).

I think that in this instance, Vancouver's fear of being criticised for mislaying the observational data overcame his desire to be perfectly honest, but he was also very fearful of being found out. ◊