practice (and these seem to be few in number) prefer the geometrical solution to that obtained from tables and it is not surprising that the tables are now obsolete. A complete description of the three-bearing problem with anlayses similar to those made by Goodwin is to be found in the first edition of the useful book[9] on chartwork by Stewart and Stephen published a half century ago. It also appeared in the second edition of *Nicholls's Concise Guide*,[10] volume 2.

The geometrical construction given by Goodwin and suggested by Stewart and Stephen is relatively clumsy; requiring as it does a '*ratio line*' to be drawn through the charted position of the observed mark at right angles to the middle bearing. That it should be drawn at right angles is of no significance: in fact any angle will do. The neatest method is to use the first (or last) position line and its extension through the charted position of the mark as the '*ratio line*'. This provides for a speedier solution with fewer lines on the chart than the generally recommended method.

As a footnote it is of interest that William Wales, in his revised edition of Robertson's textbook on navigation designed for the pupils of the Royal Mathematical School, Christ's Hospital,[11] described a method for finding 'the course steered by a ship seen at a distance'. The method required the observer to be stationary (*in a ship lying to*). By taking three bearings at two known intervals of time, and using a geometrical construction identical to that given by Goodwin, the apparent course of the ship '*seen at a distance*' may be found. This interesting problem was given at least as early as 1786.

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'A Prospect of Navigation'

MR. SHIGEAKI MABUCHI writes:

It is interesting to consider navigation and the problem of traffic control with the common underlying concept of randomness, though Anderson's presentation seems more oriented to thermodynamics than to information theory.[1] But the underlying philosophy is the same: entropy never increases.

In order to decrease entropy without the help of Maxwell's demon we have to introduce work or energy, that is we measure the state of a specific object and control that state with the aid of the information gained. The trouble is

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that the measurement is always subject to disturbances or noise; the lower limit of reduced entropy depends on the intensity of the noise. In order to reduce the effect of noise we usually rely on some statistical processing and for this purpose it is important to know the statistics of noise; this knowledge of noise depends largely on what Anderson calls 'prior work'.

In particular, the first thing we want to know is the average noise and its variance. When the averages of noises disturbing the parameter values concerned are known, in a stationary gaussian process, the standard deviation of the error of the estimated position (without measurement of the position) is not proportional to t, but $\sqrt{t}$. We may suppose that this deviation corresponds to the radius of randomness, giving less weight to the extreme values of the error in estimating the position. In other words we should distinguish the predictables and the unpredictables and weigh the values of the error according to the probability of their occurrence, not counting every value of the error, large or small, on an equal basis. Then we can choose an appropriate strategy. For example the repetition rate of measurements depends on the intensities or the variances of the unpredictable disturbances. Incidentally, for a general description of the problem the rate may better be nondimensionalized by dividing it by the speed of the craft or system concerned.

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