

observations on both sides. In the case of properly selected stars at twilight, morning and evening, this error can always be corrected; and in obtaining the latitude at noon, by the sun's meridian altitude, it can also be eliminated if the sun is high enough to allow its altitude to be obtained by the north as well as the south horizon.

If observations of one heavenly body are alone obtained, the precise position of a vessel is always open to doubt, as an allowance has to be made for the change in the ship's position, for the time elapsed between the observations for latitude and longitude. This necessitates an allowance for tide and current, which is always uncertain.

(2) Lieut. Radler de Aquino's work is simply an amplification of a problem which has been taught in some navigational schools for more than sixty years and was propounded originally by Captain Thomas H. Sumner, a United States shipmaster, in 1837, as properly stated in a footnote on page ix. of the introduction to this work. It is based simply on the fact that if a line be drawn from the centre of the earth to any heavenly body, at the point where that line cuts the earth's circumference the altitude of that heavenly body will be 90° . If a radius of the earth be taken 10° from the first line and a circle be described on the earth's surface, at every part of that circle the altitude of that heavenly body will be 80° , &c. When, therefore, an altitude of a heavenly body is taken, the observer is on a circle on the earth's surface at every point of which the altitude will be exactly equal to the altitude he has observed, and his position on that circle will be where the true bearing of the heavenly object cuts the circle.

The circles on the earth's surface have such a large radius that they can be treated for short distances as straight lines, by assuming the tangent to the circle to be a line of position on which a ship is situated.

In the days of sailing ships, or of auxiliary powered steamers, these lines of position were used chiefly to obtain the latitude and longitude, as, by observing the altitudes of two or more heavenly bodies suitably situated, as near right angles to each other as practicable, two or more lines of position were obtained at the same time, and the observer's position was in the spot where these lines cut each other.

In these days of full-powered steamers the position line can be made use of to make any particular point on a coast, for if the line of position runs towards the coast a vessel has only to steam along it to arrive at the point on the coast which it cuts. This is not new, but is only practicable in ships of the present day.

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In Lieut. Radler de Aquino's book some tables are given by which the problem can be solved without working out the spherical triangle upon which the problem is based but as the spherical triangle can be worked in about five minutes, there is no particular advantage to an officer in throwing over the system which he *must* understand and be familiar with to be a good navigator, to take up another system in its place, and to crowd the limited space available in ships with works that are not absolutely necessary, more especially as little or no time is saved by doing so.

OUR BOOKSHELF.

Notes on Chemical Research. An Account of Certain Conditions which Apply to Original Investigations. By W. P. Dreaper. Pp. x+68. Price 2s. 6d. net.

MR. DREAPER is the editor of *The Chemical World*, and his "notes" first appeared in that vigorous young journal. They were well worth reprinting; for, although they have the unsystematic character which the title seems to admit, they are informed both by wisdom and enthusiasm and cannot fail to stimulate the young workers to whom they are addressed.

Mr. Dreaper's main thesis is that the researcher "must give special attention to the theoretical side of his science, and train his mind to discover in the recorded work of others the conditions which have led to success." In delivering this opinion he has in view researchers both in "pure" and "applied" science. Indeed, one of the most interesting points in the book is the author's oft-expressed conviction that under modern conditions the dividing line between these two kinds of inquiry has become and will continue to become less marked. It has become necessary for the practical man to keep closely in touch with theory and for the worker in pure science to have some knowledge of industrial experience which is apt—owing to the large scale of the phenomena—to throw important light upon theoretical questions.

This view is excellently illustrated by numerous examples drawn from the present state of pure and applied chemistry. For the rest, it must suffice to add that Mr. Dreaper presents in an attractive and non-technical way a sound philosophy of scientific inquiry. T. P. N.

Elektrobiologie. Die Lehre von den elektrischen Vorgängen im Organismus auf moderner Grundlage dargestellt. By Prof. J. Bernstein. Pp. ix+215. (Braunschweig: F. Vieweg und Sohn, 1912.) Price 6 marks.

PROF. BERNSTEIN'S "Electrobiology" is a particularly fascinating presentation of the electrical phenomena of animal and plant tissues, coloured from beginning to end by the observations and ideas of its author.

The earlier chapters, dealing with historical matter and with the electrical properties of muscle, nerve, &c., lead up to his "membrane theory"