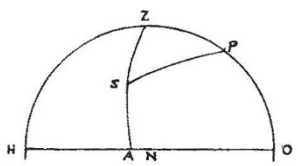
Dr. Kunz cites, among the precious stones mentioned by Shakespeare, a number of substances which, though they can scarcely be reckoned precious, have long been employed in jewelry, such as agate, amber, coral, jet, and rock-crystal. His little volume, though without literary distinction, contains much information on the subject of which it treats, and will be welcomed by lovers of the great dramatist.

## IDENTIFICATION OF STARS.

*Star Identifier and Diagrams for the Graphical Solution of Problems in Nautical Astronomy.* By J. E. McGegan. (London: The London Name Plate Manufacturing Co., and J. D. Potter, 1916.) Price 10*s.* 6*d.* net.

BY the pamphlet and diagrams prepared by Mr. McGegan he suggests a method by which, when an observer has taken an altitude of a star the identity of which is doubtful, he can, if he also observes the compass bearing of the object at the same time, ascertain its declination and right ascension, and thus identify it in the Nautical Almanac.

The problem is very simple, provided the data can be accurately observed, as the annexed diagram will show: where P is the pole, Z the zenith, N the place of the observer, H O the horizon, while S is the star observed which requires to be identified. The arc S A will be its altitude, the arc P O the latitude of the observer. Consequently, the arc Z S will be its zenith distance, and the arc P Z the colatitude, whilst the angle P Z S will be its azimuth, which can be obtained by correcting the compass bearing observed to the true bearing, and then deducting the result from 180° to find the azimuth. There is consequently a spherical triangle P Z S, with two sides and the included angle known, to find the third side P S (the polar distance) and the angle Z P S (the hour angle). By applying the hour angle to the right ascension of the meridian of the place, readily ascertained from the Nautical Almanac, the right ascension of the star is obtained and its declination from its polar distance.




To solve the problem without much calculation Mr. McGegan has ingeniously constructed two diagrams on equal scales, one the diagram of a hemisphere divided into circles of declination from the equator to both poles; and into meridians representing sidereal hour angles, or circles of right ascension; a second diagram on celluloid, which is transparent, represents a semicircle marked in circles of altitude from the horizon to the zenith, and of arcs of azimuth 0° to 90° east and west from the meridian.

There is, in addition, on the diagram of right ascension and declination a quadrant at the side marked from 0° to 90° to represent latitude.

Now if the position of the star by altitude and azimuth be marked on the celluloid semicircle, and the semicircle be placed over the diagram of the hemisphere in such a manner that its centre coincides with the centre of the hemisphere, and its horizon cuts the quadrant marked outside the hemisphere at the latitude of the observer, then the position on the celluloid will show on the diagram of the hemisphere under it the declination and hour angle of the star to be identified.

In actual practice this is seldom, if ever, necessary. Star observations at sea are only of use when the horizon is clear and well defined—for instance, at twilight morning or evening, or when Venus or Jupiter passes the meridian at an interval of more than 2½ hours from noon. When the horizon is well defined the stars are nearly always too faint to enable compass bearings of them to be observed.

Stars on or near the meridian can at twilight nearly always be seen through the sextant, when invisible to the naked eye, if their approximate altitude be placed on the sextant. For longitude only very bright stars are available at twilight, and navigators know well where they are situated and where to look for them.

As the celluloid semicircle easily slips out of its place over the diagram of the hemisphere, it would be an advantage if a screw-pin were placed through the centres of both with a clamp and screwed tightly, when the horizon line had been placed on the appropriate latitude on the side of the diagram of the hemisphere.

## AN ARABIC ALGEBRA.

*Compendio de Algebra de Abenbéder.* Texto árabe, traducción y estudio por José A. Sánchez Pérez. Pp. xlvii+117. (Madrid: E. Mastre, 1916.)

THIS work is "a compendium of algebra composed by the sheikh Abu Abdullah Muhammad b. 'Umar b. Muhammad, generally known as Ibn Badr." Practically nothing is known about the author, and not much about the date of the treatise. The MS. on which this edition is based was written in A.H. 744 (=A.D. 1343), and the text contains a reference to Abu Kāmil (trans. p. 57, text p. 39) and "his book about algebra." The editor takes this Abu Kāmil to be Abu Kāmil Shuja' b. Aslam al-Ḥāsib (the reckoner). The treatise comprises a theoretical part and a collection of problems, or rather a set of numerical examples of particular types, followed by problems relating to practical affairs of commerce, etc. The theoretical range includes (in this order) quadratic equations, quadratic surds, law of integral indices, rule of signs for multiplication (given without any comment), multiplication of ordinary polynomials, division of one monomial by another, rule of transposition. Among the problems we have cases of simultaneous equations of various kinds; and it is clear (p. 70) that the author was acquainted with the arithmetical theory of proportion.