The book contains 476 pages of text, 14 Tables, 167 figures illustrating the various articles and instruments and an extensive Index, and, although specially prepared for use on board H.M. Ships in view of the ever increasing importance of Meteorology as affecting Navigation in general, should be of the utmost value to all Mariners, being written in clear precise language easily understandable by those without previous technical knowledge.

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THE DIVISIONS OF THE CIRCLE

(Extract from Askania Review, N° 7, Berlin.)

The adoption in topographic services of the division of the circle into 400g instead of the 360° division made us reflect upon why the 360° division is maintained at all in certain branches and upon the origin of the two systems.

The division of the circle into 360° dates back to antiquity. Already the Babylonians who observed the movements of heavenly bodies knew that the sun completes the zodiac once in approximately 360 days. Consequently 1° almost corresponds to the sun's daily travel. In addition, the division of the circle into 360° offers the advantage that this figure is easily divided by 2, 3, 4, 5, 6, 8, 10, 12 etc. The resulting arcs of a circle or the angles of 180°, 120°, 90°, 72°, 60°, 45°, 36°, 30° etc. are of great importance in connection with regular diagrams and with technique. The division of the circle, therefore, into 360°, has been maintained throughout the centuries.

On the other hand, the division of the entire circle into 400g (centesimal degrees) was only suggested about 150 years ago when establishing the metre as a unit of length. The metre is supposed to correspond to one forty-millionth of the earth's meridian, and the kilometre to one forty-thousandth of the entire circle, i.e. 0,01g = 1 c (centesimal minute). However, as the earth is not exactly spherical, an angle of 1c does not always cover quite the same distance of the earth's surface. It was therefore decided to adopt as unit of length a measure deposited in Paris and called standard metre ; consequently, the radio between the unit of length and the 400g division is only approximate. The 400g division is thus closely related to the dimensions of the earth's surface, and for this reason has been utilised by various countries for quite a long time. In order to facilitate the exchange of results obtained by the countries in question, and in view of the advantages offered, the topographic services of numerous countries have systematically adopted the 400g division.

The fact that in changing over to the 400g division, the customary subdivision of 360° into 60' (minutes) of 60" (seconds) each, was also abandoned and replaced by decimals, is quite independent of the division of the circle into either 400g, 360° or any other number of units. Nevertheless, the habit of subdividing 1g into 100c of 100cc each, has been maintained, but this way of writing is equivalent to a decimal; for example 2g34c56cc = 2,3456 g. The designations of these sub-divisions are taken from the Latin : 1 degree (1g) is derived from "gradus" = pace, 1 minute from "pars minuta prima" — first diminished part, and 1 second from "pars minuta secunda" = second diminished part.

Besides the division of the circle into 360° or 400g, other divisions are in use. Certainly the nautical division is one of the very oldest. The compass card is divided into 4 by the four headings; between north and east, north-east (45°) is interpolated; between north and north-east, north-north-east (22 1/2°) is interpolated and between north and north-north-east, north to east (11 1/4°) etc... In other words, the quadrant is subdivided into 8 parts, called "points". This division, with decimal subdivisions, is still to-day the basis for various sciences, as for instance artillery.

In astronomy, the division of a celestial circle into 24 hours is known in addition to the 360° division. This time measuring unit can very well be applied to arc measurement, as the time measurement has been deduced from the daily revolutions of the stars. As the latter require 24 hours sidereal time for one full revolution, they cover in one hour 15° or 16.6666g.

The conversion of the units of the 24-hour division into units of the 360° division is an easy task as far as full hours are concerned, the same thing applying to the conversion of minutes of time into minutes of arc and of time seconds into seconds of arc. On the other hand, the conversion of full hours into centesimal degrees, leads in most instances to periodic decimal fractions, which is certainly not very practical. Astronomy is, therefore, insterested in adhering to the 360° division as long as the division of time into 24 hours of 60 minutes of 60 seconds each, is maintained. Should a decimal unit like the metre, the litre, the are, the centesimal degree be one day adopted for time measurement, the introduction of the 400g division into the science of astronomy would probably result. These remarks are, however, not meant to be interpreted as new suggestions, but only to show the relations existing between the different measuring units and every day life.

Finally, there is the radian, also called absolute angular unit. This unit is much used in mathematics as it simplifies many calculations. The division is not based on the full circle, but on an arc the length of which corresponds to the radius. This unit equals 57°17'45'' = 63g66c20cc = 3 h. 49 m. 11 s. An angle of 180 expressed in absolute units amounts to 3.14159 = π . As the absolute unit defines the angle by the proportion: arc length radius, there are no dimensions. Hence, a special denomination is not always explicitly used, 180° = π or 180° = π radians being equally employed.

This essay on the different angle measurement units shows that each unit is justified by the saving of work entailed. A unification of the existing measuring units would certainly reduce the number of designations which have to be retained, but would, on the other hand, complicate many calculations and the reading thereof : and this would not constitute an economy !