amino acid compositions to be expected of active patches can now be undertaken. The complete characterization of protein intermediates and their resynthesis would mark a crucial stage in protein studies.

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Tidal Illumination Diagrams

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THE TIDAL ILLUMINATION DIAGRAM IS one of the various graphic devices designed during the recent war to represent significant hydrographic conditions on military targets. It was introduced by the Oceanographic Section of Headquarters, Army Air Forces, in 1942 to represent relationships between stage of the tide and state of illumination in target areas of Northwest Africa. Later, its use was extended to all theaters, and preparation on a mass scale was taken over by the U. S. Coast and Geodetic Survey, where facilities are available for computation and graphic presentation of these data for many parts of the world. Recent comments have shown the diagrams to be of practical use in this postwar period.

The tidal illumination diagram is so arranged that for any hour of the day combinations of solar illumination and stage of the tide are readily noted. Heights of high and low tides are referred to the sound datum of nautical charts of the specific locations. In so far as possible, tidal data from the U. S. Coast and Geodetic Survey tide tables are used. The occurrences of high and low tides are shown as a series of connected points enabling the user to visualize the changing sequence throughout the month. Days of the month are represented by vertical lines covering the period from noon through midnight to noon of the next day.

Three types of twilight are indicated to bring out gradation in light from sundown to darkness and from darkness to sunrise. Civil twilight begins with sunset and ends when the sun is 6° below the horizon. During this period, objects may be distinguished readily, and a newspaper may be read without the aid of artificial light. At its end,

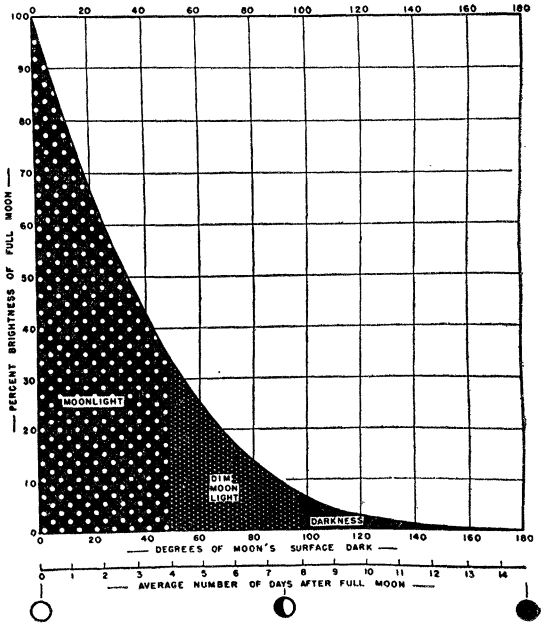

FIG. 1. Relative brightness of moon with change of phase.

sky brightness is approximately 20 times that of the full moon at zenith (Fig. 1). In the following period of nautical twilight, the brighter stars are visible, the horizon is

[1] Contribution No. 382.

generally indistinguishable, but general outlines of objects not too distant can be distinguished. Astronomical twilight begins when the sun is 12° below and ends when it is 18° below the horizon. During this period, illumination is distinctly brighter than during complete solar darkness but less than during periods of dim and brilliant moonlight (Figs. 2 and 3).

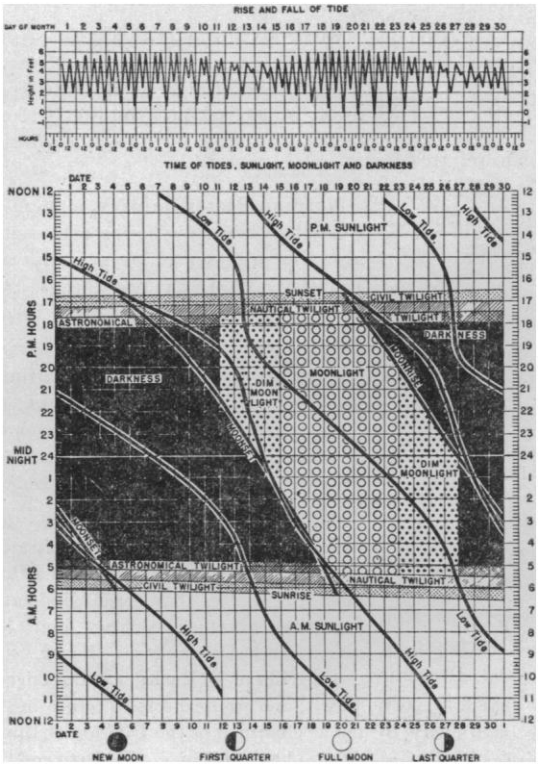

FIG. 2. Tidal illumination diagram for Yokohama, Japan, at time of occupation, November, 1945.

Variations in moonlight intensity are arbitrarily divided into periods of bright and dim moonlight. Bright moonlight is taken as the period from four days before to four days after the appearance of full moon, during which time light intensity varies between full moon brightness at its zenith and about one-third of this value (Fig. 1). The period of dim moonlight includes four days prior to the beginning of bright moonlight and four days after its end, during which time illumination intensity varies from about one-third to about one-tenth of full moon brightness at zenith. The relative brightness of the moon with phase is illustrated by Fig. 1.

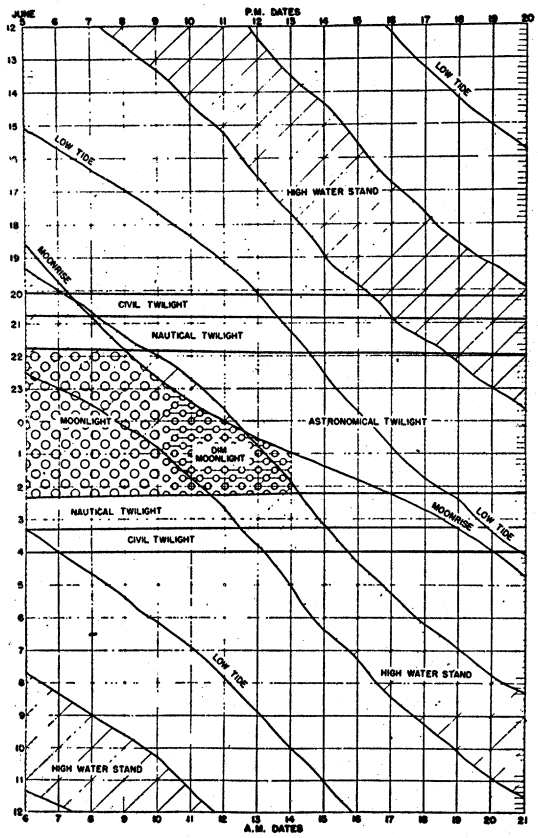

FIG. 3. Tidal illumination diagram for "Omaha" Beach, Normandy, France, during invasion, June 1944.

Tidal illumination diagrams for important target areas of World War II are illustrated by Figs. 2 and 3. These can be prepared for any coastal area where tides have been predicted; their usefulness lies in the prognosis of future conditions as well as in historical studies.