ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

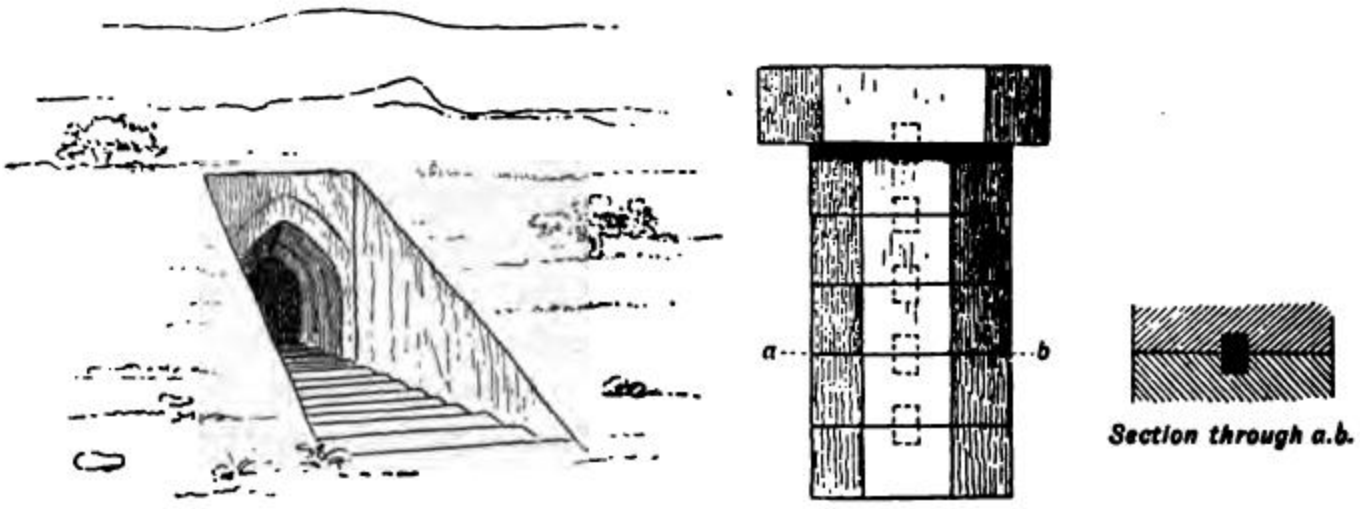
By Captain ARTHUR W. STIFFE, R.I.M.

II. KAIS, OR AL-KAIS.

This island, the successor of Siráf and predecessor of Hormuz as an emporium of trade between the West and East, lies off the Persian coast of the Persian Gulf, from which it is separated by a fine navigable strait 9 miles wide. It is of low appearance and convex profile, rising gradually from a rocky shore to a height of 120 feet above the sea in the centre. The length from east to west is 8½, and its breadth 4½ geographical miles. It contains at the present day many small villages, and a large one called Máshi, standing on the north-east corner, lat. 26° 34′ N., long. 54° 2′ E. Máshi is inhabited by about 500 Arabs of the Al 'Ali tribe, who are all pearl-fishers, and send out a large number of boats to the banks, which lie off the Arab coast. It is built of the usual Arab houses of mats made of the stalk of the date fronds, with two square masonry castles, and is nearly a mile in length along the beach. The other villages are also inhabited by Arab pearl-fishers, but have only a few boats each. There is some cultivation, especially on the north coast, with scattered small plantations of date and other fruit trees. On the island also are large flocks of sheep and goats, and some cattle. The interior of the island is rocky and barren, sparsely grown with stunted shrubs and herbage, on which the flocks feed. We visited the island several times in 1857 during the survey. This island, in common with all the others in the gulf, suffered severely from the depredations of the Joasmi pirate Arabs in the beginning of the century, when they were mostly depopulated, and have been only gradually reoccupied since the establishment of British supremacy. It now belongs to Persia, and was then subject to the chief of Chárek.

Near the centre of the north coast are the extensive ruins, now known to the people of the island as Haríra, of the old city, once the head-quarters of the trade with the East. They extend half a mile along the shore, and consist chiefly of mere mounds of stones and fragments of masonry, and the ground is strewn with fragments of pottery and Chinese porcelain, of which latter I have placed some in the British Museum. Of the large mosque some remains exist. A fine minaret of well-cut stone, which was standing only a few years before our visit, lay in heaps of ruin. The fallen pillars of the mosque lay around just as they had fallen; they were of cut stone, octagonal in section, and the several courses had a hole through the centres, evidently for the purpose of dowelling them together. There are several large water-cisterns of oblong shape, which had been roofed in, but the arched roofs had fallen in, partially filling up the cisterns with the *débris*. Two of these measured each 150 feet by 40, and

were still 24 feet deep. They were lined with masonry inside, and cemented. Near these begun a fine kanát,* or subterranean aqueduct, of better execution than those generally seen at the present day. It was cut in the solid rock, and carried at a depth of 20 feet or more from the surface; there were about forty shafts, 15 to 20 yards apart, so that its length was nearly half a mile. Four of these shafts (see sketch) had steps cut in the rock, 4 feet wide, to descend by. There were twenty-three steps in one that I descended. The bottom of this aqueduct was partly choked with rubbish, and there was no water in



it. The pointed vault over the steps, cut out of the rock, was 9 feet high.

There are ruins of smaller extent at other points on the north coast of the island. We could not find or hear of any inscriptions, or of coins being found. The stone of the island is not very durable—a coarse shelly calcareous breccia of probably late Tertiary age.

The ruins are thus much less extensive than those at Siráf (Tahiri); indeed, the prosperity of the city was, as we shall see, not of long duration. The plan shows the position of the town, and the sketch one of the staircases leading to the kanát. As there is no harbour in the island, the anchorages being open to one or other of the prevailing winds, the "ships" were probably hauled up on the beach, or inside the reef, as they seem to have been of small burden; or, in certain seasons, they may have anchored off the north-east point, which is a safe anchorage except in the winter easterly gales.

Of the history of this place, only scanty fragments have been handed down to us. Sir W. Ouseley † relates a curious legend which he considers, on the authority of a Persian manuscript, may be assigned to the tenth century, as to the first settlement on the island. It sets forth how one Kais, a son of a poor widow of Siráf, embarked for India

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* A kanát is made by sinking a line of pits to the water-level, and connecting them at the bottom by short tunnels, the bottom being slightly inclined to allow the water to flow along it.

† 'Travels in Various Countries of the East, etc., in 1810–12.' London: 1819.

with his sole property, a cat. He arrived there at a time when the king's palace was so infested by mice or rats, that they invaded the king's dinner-table, and persons were employed to drive them from the royal banquet. Kais produced his cat, the noxious animals soon disappeared, and magnificent rewards were bestowed on the adventurer of Siráf, who returned to that city, and afterwards, with his mother and brothers, settled on the island, which from him has been denominated Kais, and so on. I doubt whether much importance can be attached to this myth, which may possibly be the original of the similar English tale.

The island is not mentioned in Ebn Haukal's geography (middle of tenth century), and the earliest reference to it which I have been able to find is in the Sefer Nameh,* where the name only of the island is given in the text, but in a note the learned translator says, "Ibn Moujávir,† in his 'Tarikh Mostanssery,' has a chapter on the island. He says it is of 3 square farsangs, abounds in date trees and plantations of Garazh" (probably the hardy acacia called Ghâf at the present day), "the property of the king. It is sufficient to make a hole with the hands in the sand to obtain fresh and pure water. A subterranean canal" (see description, *ante*), "dug by the kings at a former period, runs through the garden of the prince, fed by water coming from springs and streams, and it fills the reservoirs. The houses in stone and plaster are very high, as much as seven stories,‡ and each one is a fortress." The island owes its name, "according to some, to Qais-ibn-Moulawah, others to Imr-el-Qais, but the most correct is that which attributes it to Qais-ibn-Zobair. The prince of Qais has neither cavalry nor infantry; all the people of the island are mariners. They eat only fish pounded (pilé) with dates. The king has a monopoly of building stone (grès) and bamboos."

Rabbi Benjamin, of Tudela § (A.D. 1164 to 1173), apparently visited the island, but his account is not very intelligible, as he was not a geographer. It appears he sailed from the Tigris, "which runs into the Indian sea, or Persian Gulf, and passes the island Nikrokis." This name has given rise to various conjectures. One commentator explains it Nikra = called, Kis = name of island; however this may be, it is doubtless meant for that place. He says the island is six days' journey in extent (an exaggeration); has only one canal of fresh water, and they gather water during rain in cisterns; the land is not cultivated; and he goes on to say, "This island is famous for commerce with India and the

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* 'Sefer Nameh.' By Nassir Khosran, 1035-42. Traduit per Ch. Schefer. Paris: 1881.

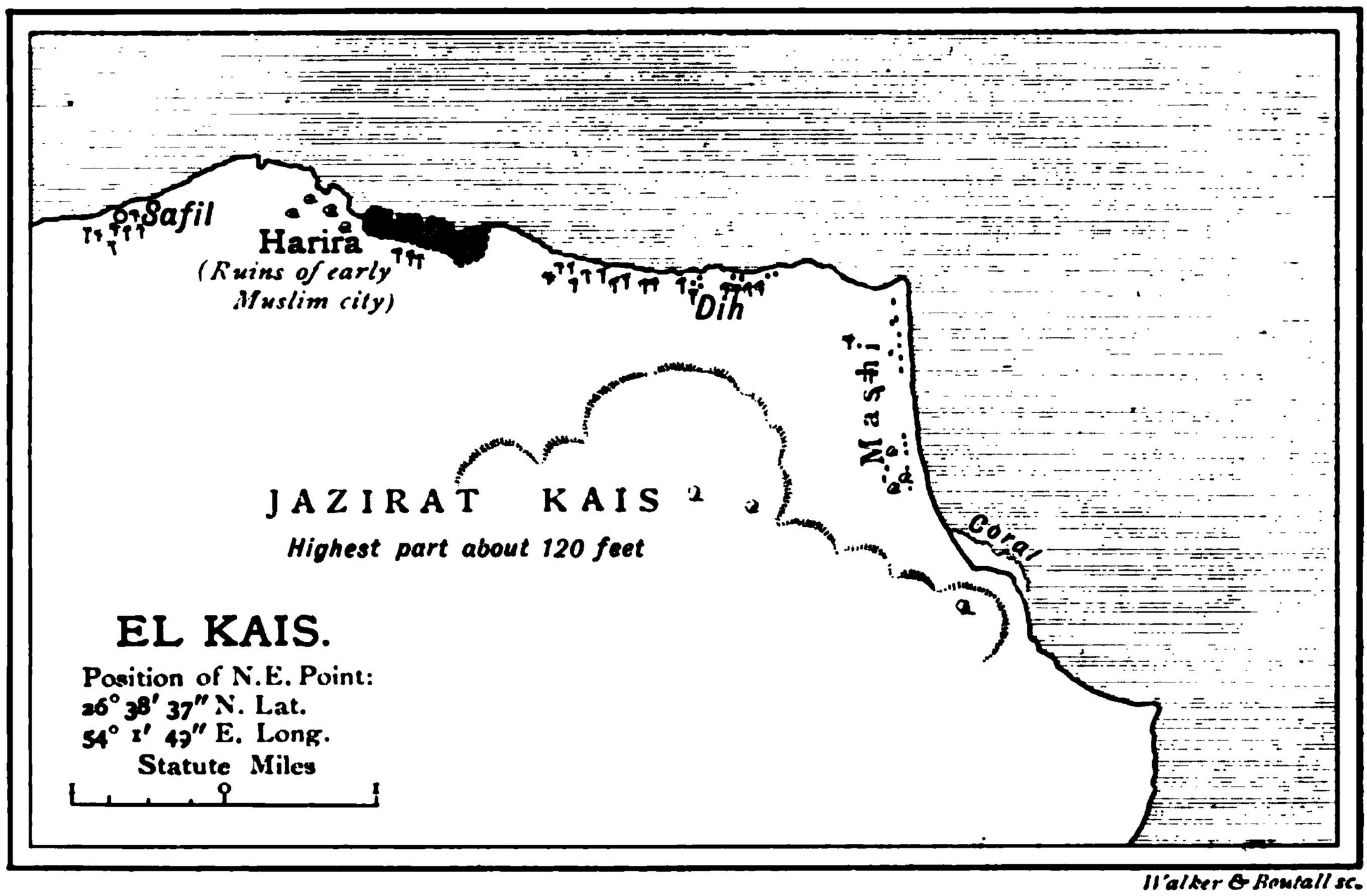
† This author, whose full name was Jemal-ed-din Abul-Fath-ibn-Yakoub-el-Dimichqy, composed a treatise of geography in 1226–42, dedicated to the Kaliphah Abu-Jafar-Mansur-Mostansser. I give the abstract of M. Schefer's quotation here, although, in point of time, the author is later than Yakút.

‡ Such high buildings of many stories may be seen at the present day, as at Linga: they are an Arab type of building.

§ Kerr's Collection.

islands of the Indian sea and Sennar (China?), Arabia, and Persia. The traveller thence went to Katíf, and so on to India and Ceylon."

I have not been able to discover the date of the original settlement of this place, but conjecture there was some settlement here from the Arab coast before 1100 A.D., and that it grew into predominance when Siráf was abandoned, as I have elsewhere suggested, after 1200 A.D. Yakút al Rumí, whose book * dates from 1218 A.D., refers to it as a fine and picturesque island surrounded with gardens and houses. He continues, "In this isle are the vessels which trade with India; there are numerous cisterns supplied by rain-water, and good, well-stocked bazaars. It is



the residence of the King of Oman, who is respected by the sovereigns of India on account of his naval strength and riches, and all the neighbouring isles belong to Kisch. His features are Persian, and costume that of Deilim" (a port in the north-east angle of the head of the gulf). He also mentions the pearl fisheries. It is stated that Yakút personally visited this place, as also Siráf, which latter he found almost deserted.

Edrisi,† whose book dates from the latter half of the thirteenth century, states that the trade of Sohar with China sea "has now ceased." Sohar is in the Arabian country of Oman, formerly of importance, and still existing as a port. He assigns the following as a reason: "A certain governor of Yemen possessed himself of an island called Kîsh, in the centre of the Persian Gulf, and opposite to Maskat"—this is not

* 'Dictionnaire geogr. de la Perse, from Yaqout.' By C. Carbier de Meynard. 1861.

† 'Geographie d'Edrisi.' Translated from Arabic into French, with notes, by P. Amédée Jaubert. Paris: 1836.

correct—"fortified and peopled it, and equipped a fleet, by means of which he became master of the littoral of Yemen. He did much damage to trade and merchants, plundering them so that the commerce was diverted to Aden. With his fleet he ravaged the coasts of Zenj (Zanzibar) and Ghamran. The inhabitants of India fear him, but resist him with vessels called el-Mechiât, which, although made of a single piece of wood, are capable of carrying up to two hundred men." Large canoes, carrying about thirty men, are at the present day in use at some places on the Arab coast, but the above number is doubtless an exaggeration. The account then continues, "The governor of Kish is reported to have fifty of these vessels, all of one piece, besides many others. He still continues his depredations, and is very rich. At Kish are cultivated fields, cattle, sheep, vines, and pearl fisheries." The account, however, gives the distance of the isle from Sohar as two days' sail, and *one* from Maskat, which is incorrect.

Abulfeda, in his geography (translated by M. Reinaud, 1848), which dates from 1273 to 1331 A.D., mentions the island, "between Ind and Basrah," also the pearl fishery, and says there are many orchards and palm trees and water in wells, and that "the people are well brought up and behaved;" but he says nothing about the town or the trade.

The account of Ibn Batuta (1325–54 A.D.) is to me unintelligible, except on the assumption that he confuses Siráf and Kais, and has compiled a description from other sources than personal knowledge.

Sir W. Ouseley (*op. cit.*), who went up the Persian Gulf in H.M.S. *Lion*, and anchored on the north side of the island, but did not land, says that Zakaria Casvini (who died in A.D. 1275) states that the town is of pleasing appearance, with a castle and many gates, gardens, and various structures, "so that it is one of the most delightful places in our time," and that the island was the resort of ships from Persia and Arabia for commercial purposes. Hamdallah Cazvini, a writer of the following century, mentions it in similar terms.

Further on, Ouseley states that Ahmad al Ghafari records that the prince of Hormuz (which town then stood on the mainland), Shehab-ad-din Ayáz, purchased the island of Gerun (Hormuz) from the kings of Kish, and began to build there about A.D. 1302.

This is confirmed by Mirkond's history,* where it is stated that the name of the king of Keys was Neyn, and that all the islands in the Gulf of Persia belonged then to Keys. This history, which was written before 1378 A.D., says that Keys, so called by the Arabs and Persians, is a small island, once the head of a kingdom, though now not inhabited, "since the trade has fallen off for fear of certain pyrates continually infesting that sea." It formerly had "all the trade that has since been removed to Harmuz." The building of the city on the island of

* The history of Persia, etc., to which is added an abridgment of the lives of the kings of Hormuz . . ., now rendered into English by Capt. Jno. Stevens, 1715.

"Harmuz" is given as 1302, under King Ayaz. The next king of Hormuz, Gordon Shah, was soon at war with Neyn, king of Kais; he was assisted by the governor of Shiráz, and after varying fortunes Kais was reduced to subjection about 1320 under his successor, Mir-sha-Kodbadin, from which date I can find no mention of it, so that it may be presumed to have lapsed into insignificance.

I take the following information from Hammer-Purgstall,* referring to an earlier war with Hormuz. He begins by stating that the most brilliant of the conquests of Abubekr (the Attabeg king of Persia) is that of the island Kais, or Kish, and Bahrein. The first of these islands is called after Kais, one of three sons of Kaissar, a shipowner of Siráf, the haven and emporium of the Southern Persian coast. [Then follows the story of the cat, nearly as already given.] The sons of the widow became mighty shipowners, and extended their operations to the coasts of India, etc. They built on Kais a great palace, which they called Aferide, and which rivalled the palace of Adhad-ed-Doulat at Naband,† and the Hall of Columns, attributed to the same person, at Siráf. The Khalífah, Nassir-ed-dín-illah, gave them the lordship of Kais with the title Sultan-ibn-al-Malik-Jamshíd. Thus the Beni-Kaissar, whose very existence, as well as that of the Beni-Amara in Fars, has escaped European historians, reigned on the island of Kais, until Seyf-ad-din-Abu-Nadhr-Ali-bin-Kaikobad, the lord of the island Hormuz,‡ offered the Attabeg king of Fars his assistance in the conquest of Kais in A.D. 1229. The commanders of the Garmsír (the hot coast of Persia on the gulf) were ordered to subdue Kais, and the Malik Jamshíd was killed. This war is represented in Mirkhond's history (*vide ante*) as a merely domestic war between Kais and the Hormuzians, which latter did not retain possession of the island, although it was overrun by them under Seyf-ad-din, as already stated, at a later period.

DIAGRAM FOR DETERMINING THE PARALLAXES IN DECLINATION AND RIGHT ASCENSION OF A HEAVENLY BODY, AND ITS APPLICATION TO THE PREDICTION OF OCCULTATIONS. §

By Major S. C. N. GRANT, R.E.

THE diagram was designed for the purpose of obtaining rapidly, and with some degree of accuracy, the parallaxes in declination and right ascension of the

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* 'Geschichte der Ilchane.' Von Hammer-Purgstall. Darmstadt: 1842. I have somewhat modified the German orthography, as *j* for the cumbrous *dsch* (the only way of expressing the sound in German).

† A village where there are many ruins, situated to eastward of Siráf.

‡ This is a mistake; Hormuz was *not* at that time on the island. I do not find the authorities given throughout in von Hammer's history; it is doubtless in part from Wasáf.

§ Diagrams, p. 688. Separate copies of this paper with the diagrams mounted may be obtained by application at the Society's rooms.

moon, and the practical use to which the parallaxes, so obtained, were put was that of predicting the elements of occultations of stars by the moon preliminary to making observations for the determination of longitude.

The generally accepted systems, both theoretical and graphic, of calculating the local elements of occultations are somewhat long and tedious; whereas the system to be described in these notes is rapid, simple, and sufficiently accurate for practical purposes.

The diagram itself represents an orthographic projection of the Earth, showing parallels of latitude and hour circles; the line OO represents the projection of the equator, and the projections of the parallels of latitude are drawn at intervals of 5°. The divisions on the circumference of the circle, however, give the positions of parallels to each degree, and as the intervals between these divisions can be divided into four parts, latitude can be plotted to 15′.

The hour circles are drawn only on the eastern half of the circle, and a portion of the north-west quadrant. They are numbered in two ways—one from O at the centre to VI. at the east circumference; and the other from O at that circumference to VI. at the centre, and continued to VII. and VIII. beyond the centre. The use of these two systems of numbering will be explained hereafter. Where the space permits, the intervals between the hour circles have been subdivided into spaces representing five minutes; the hour nearest the circumference is divided only into spaces of fifteen minutes. Near the centre of the circle these divisions can be subdivided by eye into five parts, each part representing one minute, which may be taken as the limit of accuracy to which the hour angle can be plotted, and consequently need be calculated. The accuracy, however, decreases as the divisions become smaller near the circumference and in high latitudes.

In the south-west quadrant, the radius of the circle and the radii of all the declination circles up to 32°, the limit of the moon's declination, are divided into scales of one hundred parts.

To determine Parallax in Declination.

Rule—Plot on the diagram the position of the place of observation from its known latitude and the hour angle, counting the hour angles from *right to left*—that is, from the circumference towards the centre. Call this point A. Draw a straight line through the centre of the circle and that division of the circumference representing the moon's declination, above or below the line OO according as the declination is north or south, and in the same side of the circle as that from which the hour angles commence to count. Denote this line by CB.

The length of the perpendicular drawn from the point A to the straight line CB, produced if necessary, is a measure of the parallax in declination. With a pair of compasses, find what proportion the length of this line bears to the radius of the circle, which is divided into a hundred parts on the diagram; multiply this proportion by the horizontal parallax of the moon, and the product is the parallax in declination.

Let us take an example—

Latitude, 10° 30′ N.; moon's declination, 20° 50′ 30″ N.; moon's horizontal parallax, 59′ 16″; hour angle, 1h. 40m.

On the diagram the point A is plotted at lat. 10° 30′ N., and hour angle 1h. 40m., counting the hour angles from the circumference towards the centre as numbered in the lower line of figures. CB is drawn through the centre C and the division on the circumference representing the declination 21° N. approximately.

If the diagram represents an orthographic projection of the Earth on a vertical plane passing through the centres of the Earth and moon, the point A and the

line CB are the projections of the place of the observer and of a line joining the centres of those two bodies.

AD, being the perpendicular dropped from A on to BC, is a measure of the parallax. The length of AD is found on actual measurement to equal $\frac{15}{100}$ of the radius FC of the circle; so that—

$$\begin{aligned}\text{Parallax} &= \tfrac{15}{100} \times \text{horizontal parallax} \\ &= \tfrac{3}{20} \times 59' 16'' \\ &= 8' 48''\end{aligned}$$

Were the declination south instead of north, the parallax would be represented by AD'; this equa's $\frac{49}{100}$ of the radius, and the parallax would equal—

$$\tfrac{49}{100} \times 59' 16'' = 29' 0''$$

In some cases the hour angle may exceed six hours, and the line of the moon's declination may require to be produced through C; for instance, the line EF represents the parallax in declination under the conditions—latitude, 45° N.; hour angle, 6h. 45m.; declination, 30° S.

The Sign of the Parallax in Declination.—If the place of observation as plotted in the diagram is below the line drawn through the centre and the declination, the effect of the parallax will obviously be to move apparently the position of the moon towards the north; it will thus increase north and decrease south declination. The converse is also true. Thus, in the first example the parallax represented by AD would be added to the moon's north declination; that by AD' would be added to the moon's south declination; and that by EF would be added to the moon's south declination.

Parallax in Right Ascension.

The diagram now represents a similar projection on a vertical plane at right angles to the former, and the hour angles should be plotted from the vertical line passing through the centre of the circle, and counted as numbered in the upper series of figures. If from the point plotted by latitude and hour angle a perpendicular line be drawn to the centre vertical line, the length of this perpendicular is a measure of the parallax; but instead of being, in all cases, measured on the radius of F C of the circle, as in finding the parallax in declination, it should be measured on the scale of the radius of that declination circle representing the moon's declination. These radii for declinations from 0° to 32°, which covers the range of the moon's declination, are divided each into one hundred parts in the south-west quadrant of the figure. The proportion of the perpendicular to the radius of the particular declination circle, multiplied by the moon's horizontal parallax, is the parallax in right ascension.

Both parallaxes will be in terms of arc or time, according as the horizontal parallax is stated in arc or time.

Let us take, as an example, the same values as those in the first example of parallax in declination. The point G represents the place of the observer plotted at latitude 10° 30'; whether north or south is immaterial, and 1h. 40m., the hour angles being counted, as before explained, from the centre outwards. GH, the perpendicular let fall from G on to the centre meridian, is a measure of the parallax. The moon's declination is practically 21°, and so GH is measured on the scale JK, and equals forty-five parts, so that—

$$\begin{aligned}\text{Parallax} &= \tfrac{45}{100} \times \text{horizontal parallax} \\ &= \tfrac{9}{20} \times 59' 16'' \\ &= 26' 36'' \text{ (arc)} \\ &= 1\text{m. } 46\text{s. (time)}\end{aligned}$$

Sign of the Parallax in Right Ascension.—If the sidereal time at place exceeds the moon's right ascension, that is, if the moon is to the west of the meridian, the effect of parallax is to decrease the moon's right ascension. The converse is also true.

The most convenient way of using the diagram is to cover it with a piece of tracing-paper, and to draw a line on the tracing-paper across the diagram at the latitude of observer's station. Place a ruler to represent the line joining the centres of the Earth and moon. Then with one leg of a pair of compasses on the point at which the hour circle cuts the latitude line, adjust the other leg so that, when swept round, it touches the edge of the ruler in one case, or the central meridian in the other; the compasses are then open to the length of the perpendicular, and the proportion to the particular radius can be scaled off at once. These proportions can be conveniently multiplied by the horizontal parallax by means of a slide rule.

The Nautical Almanac gives the elements of occultations as they would be seen from the centre of the Earth, and although the limits of latitudes between which the star may be occulted are stated, this does not mean that the star will be occulted as seen from every place within the limits stated, but rather that outside these limits the star cannot be occulted. Again, although an occultation may be visible, the star's apparent path may so approach a tangent to the moon's disc as to render the results obtained from the observation of such an occultation unreliable. The time of occultation may, owing to the effects of parallax, be any time from about two hours before to the same interval after the time of conjunction as given in the Nautical Almanac. These circumstances render it desirable to determine, before attempting to observe an occultation, whether the star as seen from the observer's station will be occulted at all, and if so, at what time approximately it may be looked for, and at what portion of the moon's disc the star will disappear and reappear. The simplest way of doing this is to draw to scale the position of the star, and relatively to it the path of the moon as affected by parallax.

A form showing the small amount of calculation necessary is given on p. 653.

In the instance worked out, the G.M.T. of geocentric conjunction is 17h. 48m. 18s., and the calculation is commenced with the view of finding the parallaxes at 17h. and 18h. so as to plot the position of the moon at those two times, and from those positions as plotted, to draw the path of the moon's centre. Before we can plot the parallaxes off the diagram, the hour angles must be determined, and the first portion of the calculation is for this purpose. The hour angle at 17h. is found to be 1h. 48m. 40s., and since the sign is + the moon is on the west of the meridian. This, according to the rule before stated for the sign of the parallax in right ascension, throws back the moon in right ascension, and, as far as the effect of that only is concerned, delay the time of conjunction; so that we may infer that this time, instead of being between 17h. and 18h., will probably be between 18h. and 19h., and it will consequently be better to plot the position of the moon at those hours, and the hour angles for those two times are noted down. It is not necessary to recalculate the hour angles, but for each difference of one hour of G.M.T. add *algebraically* about 58m. to the hour angle. That is to say, when the moon is on the west of the meridian the hour angle may be considered positive and is increasing, and when the moon is on the east of the meridian the hour angle may be considered negative and is decreasing.

The moon's horizontal parallax and semi-diameter are next taken from the N.A.; they should be corrected approximately to time of occultation.

The remainder of the calculation consists simply in applying the parallaxes, scaled from the diagram, to the right ascensions and declinations of the moon taken from the N.A., and in taking the differences of the right ascensions and declinations

as well as those of one of the positions of the moon and of the star. These differences are taken out only to facilitate plotting the relative positions on a figure or drawing. See that the right ascensions and their parallaxes are stated both either in time or in arc. The figure (p. 688) is constructed as follows:—A is taken as the position of the moon's centre at 18h. G.M.T., and relatively to this B represents the same at 19h., and S that of the star. B and S are plotted from their differences of right ascension and declination from A. A circle described with S as centre and radius equal to the moon's semi-diameter, cuts the moon's path at D and E; these two points are positions of the moon's centre at the times of disappearance and reappearance respectively. Should this circle fail to cut the line of the moon's path, it shows that no occultation will take place. The moon passes over the distance A B in one hour, and if we assume its motion uniform, we have the time the moon takes to travel over $AD = \frac{AD}{AB} \times 60m.$ Measure the lengths of AD and AB on any scale convenient, and—

$$\text{Time AD} = \begin{matrix} 27 \\ 122 \end{matrix} \times 60m.$$
$$13m.\ 17s.$$

So that the G.M.T. of disappearance is 18h. 13m. 17s., or, corrected for longitude, 10h. 43m. 17s. local time.

Similarly, $\frac{BE}{AB} = \frac{41}{122}$, and $\frac{41}{122} \times 60m. = 20m.\ 10s.$, so that G.M.T. of reappearance is 19h. 20m. 10s., or 11h. 50m. 17s. local time.

As regards the angles: if DF and EG be drawn vertically, or rather in the same direction as the differences in declination have been plotted, then the angles FDS and GES are the angles, from the north point of the moon's disc, of disappearance and reappearance respectively; if these be reckoned from the north towards the east, we have the former 4° and the latter 305°.

The most convenient way of drawing the figures is on what is known as logarithm paper, ruled with blue or red lines into squares. If these lines are drawn about a quarter of an inch apart, and each division is taken to represent one minute of arc, a figure can conveniently be drawn on half a sheet foolscap size.

After a very little practice, the calculations of hour angles, scaling off the parallaxes, and drawing the diagram can all be done in from a quarter of an hour to twenty minutes, and if done with only a moderate amount of care, the error of the time either of disappearance or reappearance arrived at should not exceed ten minutes. The mean error of a large number worked out by myself, or under my supervision, was 4·5m. The angles, however, should differ only a degree or two from the correct angles of ingress or egress respectively.

DATE—JANUARY 16, 1894. STAR, 9 TAURI.*

Lat. 20° 30′ S.; *approx. Long.* 112° 30′ W.

	h.	m.	s.
G.M.T. of conjunction	17	48	18
Sidereal time, G.M.N.	19	43	38
Correct for 17 hours	17	2	48
Sidereal time at Greenwich	12	46	26
Correct for longitude	7	30	0

* In the Nautical Almanac for 1896, a change has been made in the arrangement of the elements of occultations.

	h.	m.	s.
Sidereal time at place	5	16	26
Right ascension of moon	3	28	46
Hour angle at 17 hours G.M.T.	1	47	40
„ 18 „	2	45	0
„ 19 „	3	42	30

Moon's horiz. parallax ... 59′ 39″ Semi-diam. ... ... 16′ 16″

	Moon's right ascension.				Declination.		
	h.	m.	s.		°	′	″
18 hours	3	31	13	N.	22	33	29
Parallax		−1	45			+35	45
	3	29	28		23	9	14
19 hours	3	33	42	N.	22	44	18
Parallax		−3	22			+31	18
	3	30	20		23	15	36
Difference in time			52s.				
„ arc			13′ 0″				6′ 22″

	h.	m.	s.		°	′	″
Star's right ascension	3	30	44	Declination	22	51	47
Moon at 18 hours	3	29	28		23	9	14
Difference in time		1	16				
„ arc		19′	0″			17	27

THE MONTHLY RECORD.

THE SOCIETY.

Honour to the President.—The Fellows of the Society will be pleased to learn that the honour of Knight Commander of the Bath has been conferred by Her Majesty upon our President, Clements R. Markham, C.B., for his long and distinguished services to geography.

Royal Medals and other Awards for 1896.—The Royal Medals for this year for the encouragement of geographical science and discovery have been awarded as follows: The Founder's Medal to Sir William Macgregor, K.C.M.G., for his long-continued services to geography in British New Guinea, in exploring and mapping both the interior and coast-line, and giving information on the natives. The Patron's Medal to Mr. St. George R. Littledale, for his three important journeys in the Pamirs and Central Asia. The Murchison Grant has been awarded to Yusuf Sharif Khan Bahadur, Native Indian Surveyor, for his important work in Persian Baluchistan and elsewhere; the Gill Memorial to Mr. A. P. Low (of the Canadian Survey), for his five explorations in Labrador; the Back Grant to Mr. J. Burr Tyrrell (of the Canadian Survey), for his two expeditions in the Barren Grounds of North-East Canada; the

Cuthbert Peek Grant to Mr. Alfred Sharpe, for his journeys during several years in Central Africa. The following have been elected honorary corresponding members—M. P. de Semenoff, Vice-President of the Russian Geographical Society; Professor Dr. Karl von den Steinen, President of the Berlin Geographical Society; Professor Dr. G. Neumayer, Director of the Naval Observatory, Hamburg; Professor A. de Lapparent, late President of Council of the Paris Geographical Society; Dr. Albrecht Penck, Professor of Geography in Vienna University; Professor Dr. Otto Pettersen, of Stockholm, the distinguished oceanographer; Professor Dr. Kan, President of the Dutch Geographical Society; Sr. D. Ernesto do Canto, of São Miguel, Azores, who has edited a series of the Archives of the Azores; Professor H. Pittier, Director of the National Physico-Geographical Institute of Costa Rica.

Legacy to the Society.—The late Mr. William Chandless, a gold medallist of the Society, whose death we regret to record, has left the Society a legacy of £500, free of duty.

EUROPE.

Glaciation and Lake-Basins of Subalpine Switzerland.—At a recent meeting of the Geological Society of London, a paper was read by Dr. C. S. du Riche Preller on 'The Pliocene Glaciation, Pre-Glacial Valleys, and Lake-Basins of Subalpine Switzerland.' The main object of this paper was to solve the problem whether the Pliocene glacio-fluviatile conglomerates of the Swiss lowlands were deposited on a plateau or in already existing valleys. For the purpose of this inquiry the author examined last summer a large number of additional glacial high- and low-level deposits throughout the Zürich valley over an area more than 40 miles in length; and his investigations led him to important conclusions with respect to the combination of causes which determined the formation of the lake-basins lying in the same zone at the foot of the Alps. The author contended that at the advent of the first glaciation the Zürich valley was already eroded. In his view the isolated high-level deposits were formed during the intermittent shrinkage of the upper Pliocene ice-sheet, while the low-level deposits were formed during the subsequent recession of individual glaciers left in the several valleys. He further adduced evidence that the Subalpine valleys of the Reuss, Aar, and Rhine were likewise excavated before the first glaciation. The author showed that the Lake of Zürich owes its origin, in the first instance, to a zonal subsidence (probably between the first and second glaciation) of about 1000 feet. During the second and third Ice-periods the original lake-basin was gradually filled with glacial and fluviatile deposits at both ends, and was finally restricted to its present dimensions by a post-Glacial bar deposited at its lower end by a tributary river. In the author's view the other subalpine lakes, extending from the Lake of Constance to Lac Bourget in Savoy, owe their origin and present limits, in the main, to the operation of similar causes.

Lake Peipus.—M. Venukoff gives in the *Comptes Rendus* of the Paris Academy of Sciences (vol. 122, p. 1078) a short account of the observations made by M. Spindler in Lake Peipus, a lake which overflows by the Narova river into the Gulf of Finland. Although the lake is nearly as large as that of Geneva, it is only 44 feet in depth, and its variation of level with the season is about 4½ feet. The water is very muddy, and the bottom is invisible at a depth of 7 feet. The lake

abounds with fish, the number of which seems to be increasing, although fishing is actively carried on.

ASIA.

Caucasian Travels of Dr. Abich.—Mr. Douglas W. Freshfield writes:—Dr. Abich was one of the German men of science who found employment and a field for scientific inquiry under the auspices of the intelligent administrators who fifty years ago directed the Caucasian government. A man of science more than a man of letters—in the technical sense of the phrase—he produced a mass of valuable technical treatises on Transcaucasian geology, but no popular or complete work. The voluminous correspondence now published consists almost entirely of family letters, ranging from the year 1842 down to 1874. But though addressed to his nearest relations, Dr. Abich's collected correspondence is in reality a diary of his wanderings and a notebook of his scientific observations and conclusions. Before 1850 Dr. Abich, in his capacity as an official, had been able to penetrate many of the mountain fastnesses at the foot of the great peaks which have lately become objects of attention to our countrymen. He realized the true character of the chain, and he describes in these letters, in simple but graphic terms, its characteristics. It is strange that he should have allowed these descriptions to remain buried for fifty years in an unpublished correspondence, while the best European works of reference were supplied with the most erroneous details as to the region in question. He evidently was equally without the phrasemaker's and the bookmaker's ambition. He seldom—and this will be the chief fault found by lovers of Nature with his letters—stops to depict a scene. He sums up the characteristics of Suanetia in a few appreciative sentences; but he brings back no particular landscape to our memory, and he certainly will suggest none to those who have not ventured into this region. Not to waste more space in analysis, Dr. Abich was in no sense an artist, but he was an observer, and what is much more, an original and independent thinker. His pages are interspersed with shrewd axioms and criticisms, as well as with clear statements of physical facts, and these are no sooner made than they are put to use as ethnological material for the explanation of the distribution and the characteristics of the various races that inhabit the mountains. Owing to its form, the valuable material scattered up and down this work is hard to piece together and use; the letters are a maze without a plan or an index; but they will repay perusal, and they must form an indispensable addition to the Caucasian shelf in every public library. They recall many stirring past episodes of warfare as well as the more commonplace mishaps of mountain traveller. There is no doubt that Dr. Abich, had he taken the trouble, might have produced a work on the Caucasus which, if it did not result, as he was led to believe on his visit to London in 1868 such a book might, in a profit of "several thousands of pounds," would have taken a high place among popular books of travel. It is satisfactory to find how completely in accordance Dr. Abich is in his observations and remarks with the English mountaineers who have succeeded him as explorers of the Caucasus.

The Brothers Grum Grjimailo's Journeys in East Tian Shan.*—We have before us one more volume of the admirable quarto series published by the Russian Geographical Society, and devoted to the reports of its expeditions to Central Asia. This last volume, edited with the same luxury as the preceding ones, is the first of a work in two volumes, which will contain the records of the journeys of the two brother explorers in West China, and it embodies their explorations in the Eastern Tian Shan. The expedition started in May, 1889. Its

* "Description of a Journey to West China," by G. E. Grum Grjimailo, with the aid of M. E. Grum Grjimailo. Vol. i. Along the Eastern Tian-Shan. St. Petersburg, 1896, 4to, 547 pages.

primary aim of exploring the southern slopes of the Pamirs had to be abandoned, and the Eastern Tian Shan, as well as the Nan Shan highlands, were taken instead. The party, consisting of the two brothers, accompanied by eleven cossacks, went first to Kulja, whence it proceeded north-east, across the Min Moral mountains to the Ebi Nor. These mountains suddenly fall on their northern slope from the height of the Tsyterty pass (8490 feet) to the low sandy depression, now occupied by the lake (700 feet). The party's aim was now to recross the Tian Shan, *i.e.* the Boro Khoro mountains, from north to south, and they went from one Taugut encampment to another, vainly asking for a guide. Finding none, they tried to find a passage themselves almost due south of Ebi Nor, but they had soon to abandon their intention. The valley they followed became a mere rent in the mountains, and the stream-bed, which they had to take to, was not only covered with immense blocks of rock, but was also soon inundated by volumes of water rushing from the snow-clad peaks. There are no proper river valleys in that part of the mountains, which form in the east of the Dos-Meghen a short chain of high snow-clad peaks. In their middle course the streams flow in cañons, which are cut through the diluvial deposits, and in their upper course they become mere rents in the rocks. As to the orography of the region, we are inclined to think, from the author's description, that the Khalyk-tau runs north-east, and that it meets with the Iryan-kharbut chain which runs north-west. The Boro Khoro, which evidently has the characters of a border ridge (p. 105), is thickly clothed, in a zone of from 6000 to 9000 feet, by fir-trees. Crossing now several northern spurs of the mountains and exploring every opening, the party made another series of attempts at crossing the main range in the south-south-west of Manas, but were finally compelled to take to the usual caravan route from Manas to Urumchi. Some reward was found, however, in an excursion from Urumchi to the Bogdo-ola lake and peak. The beauty of the scenery around the lake and at the foot of the mountain, which raises its three snow-clad summits to a height of over 12,000 feet, fully explains why the Mongols consider the Bogdo-ola as the seat of deity, and maintain that the lake covers the remains of 100,000 saints. The photographs of the chief mountain and the beautiful morainic lake, taken by M. Grum Grjimailo, and reproduced in the work, well illustrate the impression. From Urumchi the expedition went to Guchen, and therefrom made an incursion into the Jungaria desert, to the well Hashun, in order to secure specimens of the wild horse (*Equus Prjevalski*, Poljakoff) which Prjevalsky so passionately desired, but failed, to obtain. A small herd of seven horses was soon discovered as they came to drink at a small salt lake, but the difficulties of killing two of these most watchful animals, guided by one experienced sire, were very great. They were secured at last, and the fact that we have in Jungaria the real ancestor of our domestic horse is now fully established. Crossing the relatively low and narrow continuation of the eastern Tian Shan, the expedition went next to Hami, and to Turfan, and the pages given to the description of these two oases and their inhabitants will be found full of interest. They ought to be translated into English, as well as, in fact, nearly the whole of the work, which is written very pleasantly for the general reader. The importance of the Turfan oasis as a centre of commerce and administration is especially insisted upon. An important geographical discovery was made in the south of Turfan, when the expedition, exploring the relations between the Tian Shan and the highlands which lie further south, came across the sandy depression of the Assa, near Lukchun, and found that the bottom of this depression, situated between the Jarghoz (Eastern Tian Shan) and the Chol-tau mountains, lies 170 feet below the level of the ocean. The very low altitude of that bottom of an old lake has now been fully confirmed by two years' observations, made during Roborovsky's expedition. Turning from this depression

southwards, the expedition entered into the exploration of the mountains which may be considered as a link between the above and the highlands of the Nan Shan; but a full discussion of this connection being promised for the next volume, it may be as well to postpone until that time an analysis of the same. A comparison of the map which accompanies this volume with the old maps fully shows to what a considerable extent our knowledge of this part of Central Asia has been increased by the expedition. The map, which covers 4° of latitude (41° to 45°) and 10° of longitude (81° to 93°), is drawn on a scale of 27 miles to the inch, and contains many new and important details. Twenty-five photographs, some of which are most interesting, embellish the volume. Lists of birds (by M. Pleske) and of lepidoptera (by the author), which were brought in by the expedition, are added to this volume, while other collections, all very rich, are still in the hands of specialists.

A Journey from Damascus to Bagdad (*conclusion*).—The second and concluding part of Freiherr von Oppenheim's journey (see above, p. 548 of *Journal*) is contained in the fourth part of *Petermann's Mitteilungen*, 1896. The first part of this second section of the journey lay between the Euphrates and the Upper Tigris, a route which led him past many interesting remains of antiquity. He crossed the Euphrates at Der (Ed Deir) by a bridge connecting the town with an island in mid-stream, and then by a ferry connecting that island with the left bank. He then proceeded eastwards to Sauar on the Khabur, and ascended that river and its tributary, the Jaghjagh, to Nisíbin. The Khabur, a stream which, on account of the rapid fall in its bed and the large number of rapids, it would be difficult to render navigable, is bordered on both banks as high as Heseke (about 34 miles in a direct line from Sauar) by a succession of mounds, on the tops of which are numberless glazed and unglazed potsherds, showing the mounds to contain the buried remains of decayed villages. On the Jaghjagh, about 7 or 8 miles above its confluence with the Khabur at Heseke, v. Oppenheim found the ruins of an old bridge in the course of a road which he regards as identical with that marked on the Tabula Peutingeriana (Segmentum XI.) as leading from Ras el Ain to the Sinjar. Nisíbin, or Nesíbin, he describes as lying in a marshy situation, and subject to visitations of malignant fevers. At this place he was met by a body of retainers of Faris Pasha, Sheikh of the Shammar tribe, and conducted by them to the camp of their chief, to whom his expected arrival had been announced. The tribe over which this chief rules is the most powerful Beduin tribe in Mesopotamia, roaming over the whole of the upper part of that region from the Belich to the neighbourhood of Bagdad, and still holding the smaller nomadic tribes and numerous villages on the borders of the steppe in a kind of tributary relationship, though the Turkish Government has at last succeeded in enforcing on themselves the payment of taxes. Von Oppenheim's route eastward from Nisíbin passed a little to the north of two large mounds, Lelan and Tell Rarase, both said to conceal extensive ruins, and led him to two others not marked in any map, the Tell er Rumélan in 36° 36′ N., 42° 6′ E., and another a short distance to the east. Touching the Tigris at the frequented ford of Havi Zummar in 36° 46′ N., he remained on the right bank of the river and continued his journey, now in a south-easterly direction, towards Mosul, and about 50 miles north-west of that city, near the village of Abu Vajne, came upon the ruins of a hitherto unknown town of considerable size, which must date from the Arabs of the Middle Ages, and must have had a population of 20,000 to 30,000. The remains of this town are in part well preserved, beautiful gypsum columns of a ruined mosque speaking to its former prosperity. The ruins of Eski Mosul, which have the same character as those of Abu Vajne, were also visited. From Mosul, von Oppenheim descended the Tigris to the neighbourhood of Bagdad on one of the usual rafts supported by inflated goatskins. The whole journey on

such rafts seldom takes more than from six to eight days, while the land journey lasts about ten days. No other method of navigation is used on the Tigris above Bagdad. The highest point at which such rafts might be used on the Tigris is uncertain, but the actual limit at which their journeys begin is Diarbekr. The route is now regarded as tolerably safe, while formerly the rafts were frequently fired at, stopped, and plundered, especially by the Shammars. Von Oppenheim was, however, accompanied by an escort of zapties. There are bridges of boats across the Tigris at Jezire (Jeziret-ibn-Omar) and Mosul; the only others lower down are one at Samarra, one just above Bagdad, one at Bagdad itself, and one just below the city. The Turkish Government is now considering projects for the erection of an iron bridge across the river at Bagdad. Freiherr von Oppenheim's account of his journey is followed by an appendix, in which he gives an account of his mode of transcription of Arabic names (not followed in these notes), and an alphabetically arranged list of the places on his route in Roman and Arabic characters.

Phœnician Characters in Sumatra. Their Possible Connection with the Voyages of Nearchus.—In *Archæologia Oxoniensis* (1892–95, part 6) it is pointed out that the existence of characters of pure Phœnician type in Rejang, South Sumatra, described by Marsden in his history of that island, may possibly be due to a voyage of ships of Alexander the Great to those parts, of which written traditions also exist. After the successful voyage of Nearchus and Onesicritus—in ships built by Phœnician shipwrights—from the Indus to the mouth of the Tigris, and the narration by the former of his adventures to Alexander at Susa, a long interval elapsed, during which both captains disappear entirely from the scene. They are heard of again shortly before the death of Alexander, who, according to Plutarch (confirmed by Quintus Curtius), was met by Nearchus on his approach to Babylon, and during his fatal illness heard from him the history of his voyage on the ocean, from which, it is said, he had returned. Although Dean Vincent supposed this to refer to the coasting voyage, it is possible that a second voyage is alluded to, the inducement to which may have been supplied by an account of an Arab pilot, met with (as we know) by Nearchus on the coast of Gadrosia. The Rejang writing—specimens of which, from tablets preserved in the India Office Library, accompany the paper—was accepted as clearly Phœnician both by Professor Sayce and M. Renan, and more recently Dr. Neubauer has attributed it, from the shape of the letters, to the fourth or fifth century B.C. It presents marks of adaptation, which point to Greek influence such as might have been exerted during Nearchus' voyages, and reads, like the Greek of the period, from left to right, although in Sumatra generally, where the writing is Arabic, the reverse is the case. Traditions exist both in Java and Sumatra of the arrival of ships from the Persian Gulf in the time of Alexander, who is said "to have built a bridge across the sea," an expression which may refer to an intercourse established by his ships. Finally, it is worthy of remark that, while two of the characters are Cypriote forms found in inscriptions at Citium, the fleet on the Indus, according to Plutarch, numbered Cypriotes among its crews.

Friar Odoric's Island of Dondin.—A short note by M. Romanet du Caillaud, extracted with modifications from his forthcoming work on the origin of Christianity in the Annamite countries, is published in the *Comptes Rendus* of the Paris Geographical Society (1896, p. 117), on the subject of the identification of the Dondin island of Friar Odoric, which has always been a puzzle to commentators. The suggestion was thrown out by Sir H. Yule that the name might possibly be a misread contraction of "Isola D'Andiman" (the Andamans, with which M. Cordier also is inclined to connect the account), though he also notices that Marco Polo relates a story similar to Odoric's with reference to Dragoian (? in

Sumatra), and that the cannibalism mentioned by Odoric is ascribed by Gasparo Balbi to the kingdom of the "Rey del Dagin," by which Achin is signified. M. du Caillaud thinks the name may be derived from the Annamite form of the Chinese term for the "Province of Luzon" (Lû'-Tông-Tinh), by which the Archipelago might well have been known to those arriving from China and Tongking. He refers to the traces of Christianity found by the Spaniards in the Philippines in the sixteenth century, and thinks that these may be ascribed to the teaching of the Franciscans of the missions founded by John of Montecorvino, especially Odoric. It may be remarked, however, that in Sir H. Yule's opinion ('Cathay,' p. 7) the missionary labours ascribed to the latter appear to be quite unsupported by evidence, no hint of such labours appearing in his travels. M. du Caillaud's explanation of the easterly direction taken in sailing from Dondin to China, seems also not quite satisfactory; but there is every indication of confusion in the sequence of this part of Odoric's narrative, as his description of Ceylon (immediately preceding that of Dondin) comes later than the accounts of Sumatra and Java.

AFRICA.

Mr. Scott-Elliot's Book on Mid-Africa.—In his recently-published account of his journey to Ruwenzori,* Mr. Scott-Elliot, besides giving fuller details respecting the country traversed than was possible in the paper read before the Society last year, devotes several chapters to a discussion of general questions connected with East and Central Africa, such as the climate in its relation to European settlement, the various floras of the country and their origin, the best method of opening up the British spheres, and so forth. In describing the various regions passed through, the author, as a botanist, naturally gives special attention to the vegetation and its conditions of growth. The peculiar character of the Mau forest, with its groups of slender stems resembling in growth the bamboo, with which it is associated, is ascribed to the action of the wind. Other features dwelt on are the papyrus swamps in the valleys of the Victoria Nyanza region; the bare, grassy hills of Karagwe and Ankole; the dry and monotonous plains of the neighbourhood of Lake Albert Edward; and the valleys and slopes of Ruwenzori, with their zones of vegetation. Like the other high mountains of East Africa, the highest peaks of Ruwenzori† are almost perpetually hidden from view by mist, which in the morning covers the lower slopes and appears to rise at the rate of about 1000 feet an hour. The upper limit of forest is given at 9000 feet, of bamboos at 11,000, while the heather-zone reaches to 15,500, at which the snow begins. The highest point is given as 16,700, which, considering the extent of the snow-fields revealed by photographs, certainly seems a surprisingly low estimate. The author lays stress on the importance of the central range of mountains‡ which he crossed before descending to the Tanganyika depression, and which he considers to stretch in a nearly continuous line along the eastern side of Tanganyika, rising to a height of 8000 to 10,000 feet. Not having seen von Götzen's map at the time of writing, he considered that the Mfumbiro peaks formed the northern termination of this range, which, where crossed, did not sink below 7700 feet. The plain at the head of Tanganyika appeared to contract suddenly at 30 or 40 miles from the lake, and it is possible that this is an indication of the position of a waterfall on the Rusizi, first mentioned by Livingstone, and marked on von Götzen's map. As regards climate, four zones of altitude are distinguished: (1) the coconut or oil-palm zone,

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* A Naturalist in Mid-Africa. By G. F. Scott-Elliot. London: Innes, 1896.

† The correct spelling is said by Mr. Scott-Elliot to be Runsororo.

‡ Named by Baumann the Central African schistose range.

below 3000 feet; (2) the coffee zone, between this and 5000; the colony zone, from 5000 to 7000; and the cloud-belt, above 7000. In British East Africa, however, the first is subdivided into the wet coast jungle, and the dry region of scrub further inland. The shores of Tanganyika are considered very unhealthy, and the water of the lake dangerous to drink. Botanically, three main divisions only are laid down for all tropical Africa up to the Sahara, viz.: an eastern and western wet region (up to 3500 feet), and a fairly dry central ridge, the higher West African lands north of the Congo being not alluded to. The sudden change from the central to the western flora, on descending to Lake Tanganyika, is very striking. The Ruwenzori region is stated to be a more promising coffee (and tea) district than even the Shire highlands, apart from its present inaccessibility. Mr. Scott-Elliot, as is well known, strongly favours the adoption of the lakes route into the interior, even for parts of British East Africa. For colonies, the Masai uplands and the Stevenson Road plateau are the most recommended. A useful general map is given, showing the zones of altitude. As regards the special map, it is only fair to mention that, apart from corrections of one or two special features, it is really a copy of that published in the *Journal* last year.

Journey from the Niger Delta to the Benin River.—Through the courtesy of the Foreign Office we have been favoured with a copy of a report by Major Copland-Crawford, Vice-Consul at Warri on the western arm of the Niger Delta, on a journey made by him, in January last, from that station to Sapele on the Benin River. The latter place is at the junction of the two main arms of the Benin River (see *Journal*, vol. i. p. 123), and has lately been made the site of a Vice-Consulate. The object of the journey was to ascertain the nature of the country and people with a view to establishing a communication overland between Warri and Sapele. It proved, however, that owing to the amount of water in the rainy season, this route would be unsuitable for a road, but the journey was of use in establishing friendly relations with the people of the district. In order to avoid the head of Kaunusi's Creek a detour was first made to the east to Eferun and Tori, whence the direction was nearly due north. Before reaching Tori a marsh with 1 foot of water in the dry season, and probably 6 to 8 in the rains, had to be crossed. Beyond the town the country assumed the usual aspect of that inhabited by the Sobos, the path leading through bush or narrow belts of trees with cultivated plantations of cassava, yams, ground-nuts, etc., interspersed with oil-palms, on each side. Many dips with water and mud were met with, showing signs of a considerable amount of water in the rainy season. At a fairly large village named Abuga numbers of chiefs from the surrounding country were received, and friendship established. The inhabitants of most of the villages turned out to clear the road for the consul, but at Upay the people not only neglected to do so, but tried to hinder the efforts of the neighbouring villagers. The path about here was bad and beyond Upay ran through low swampy ground. At Adegi the chief, a blind but intelligent and friendly old man, expressed himself desirous of peace, trade, and the friendship of the white men. Other swamps and patches of damp rank bush were passed, some with considerable difficulty, and the path in places was narrow and overgrown, and obstructed by fallen trees, but cultivation was also seen, with oil-palms scattered about. On the second half of the route the country seemed generally lower than that previously passed through. The largest villages, Oquetolla and Odobrassa, had populations of 400 to 500 and 300 to 400 respectively. At the former the chief, Igbama by name, was of good presence and seemed to be a man of importance. He was well dressed in silk. Sapele was finally reached after a march of a little over two days, but if time had pressed it could have been reached sooner.

The New Road from Mombasa to the Victoria Nyanza.—At the end of January last Captain B. L. Sclater, R.E., F.R.G.S., who is in British East Africa as superintendent of communications under the orders of the Foreign Office, had advanced from the coast as far as Fort Smith, Kikuyu, where he had about sixty trained oxen in his two-wheeled carts. He had been lucky enough to get five of his ponies through the fly-district of the coast into the highlands, where they were doing well. From Kikuyu to the top of the Kedong escarpment—about 15 miles—was a tough bit, very broken and hilly and covered with dense forest or thick bush, which would take some time to get through. While this was in progress Captain Sclater was going on to Lake Naivasha to establish a station there. As regards this route generally, Captain Sclater reports the first 180 miles from the coast to be the most horribly dry and scrubby country he had ever seen, the little vegetation being all thorns and euphorbias, and the scanty population being in constant famine from want of water. On reaching the Kibwesi district there are permanent streams rising from under the lava-rocks, and the country improves a little, but is still covered with a dense thorny scrub. Between Kibwesi and Ukambani there are plains partly covered with thorny scrub and partly open grass, but the streams are all more or less salt. Here there are large herds of zebras and wildbeestes, and numerous rhinoceroses still to be met with. The hartebeest, probably *Bubalis cokei*, is plentiful, as are Thomson's and Grant's gazelles. Waterbucks are to be seen on the Kiboko, and a few herds of giraffes are met with. These plains extend far out towards Kilimanjaro, and are broken only by some volcanic-looking cones which stand out in that direction. No doubt the streams of lava came from that quarter also. Ukambani is a block of hills, perhaps 50 miles in length and 20 or 30 miles wide, surrounded by plains, and bordered on the east by the Athi river. It is an almost treeless country, and what trees there are are scrubby and thorny. Yet it is undoubtedly fertile, and well watered by numerous streams, all flowing into the Athi. The natives live for the most part on the tops of the hills, but grow large crops in their gardens in the valleys. They possess large herds of cattle, goats, and sheep, and plenty of fowls. The new road keeps along the western edge of the Ukambani hills. Between Ukambani and Kikuyu lie the Kapté or Athi plains. It had been hoped to carry the road straight across them, but it was found impracticable, the plains being broken up by swamps and covered in places by small blocks of lava. It was therefore found necessary to divert the road round to the east, skirting the Machako hills and crossing the two Athi rivers at the same places as the old caravan route. These plains were formerly the grazing grounds of the Kapté Masai, but the Masai having died of starvation and small-pox after the cattle-plague had carried off all their cattle, the plains have been re-occupied by vast herds of zebras and antelopes, varied by numerous rhinoceroses and ostriches. The soil of these plains, which are from 5000 to 5500 feet above the sea-level, does not appear to be very fertile, but grows excellent short grass. There are, however, many parts covered with loose blocks of lava, especially in the valleys and near the rivers. Kikuyu is on a broad ridge running south from Mount Kenia, and bounded on the west by the Kedong escarpment and on the east by the plains of the Athi and upper Tana. Kikuyu was apparently once covered with dense forest, which still remains all round the edge of the district, but of which the greater part of the centre has been cleared off by the natives for cultivation. Immense crops of potatoes and grain are grown, and there are numerous herds of goats kept and a few cattle. The climate, according to the testimony of the few Europeans who live there, is extremely healthy.

Explorations in the Barotse Country.—Captain Gibbons, who accompanied Mr. Reid and Captain Bertrand in the expedition to the Barotse country, of which a

short account was given in our April number, writes to us from the Nkala mission-station (S. lat. 15° 53′ 26″; E. long. 26° 4′ 00″), giving an account of his journeys after parting with his companions at Kazungula (*supra*, p. 427). During his voyage up the Zambesi to Lialui, he took numerous observations for latitude, and, with the help of a compass survey in addition, hopes to considerably improve the map of this part of the river. From Lialui he struck eastwards, and, after exploring the tributaries of the Lui, came upon a system—that of the Luena—apparently till then undiscovered.* The river is said to disappear in a lake near the Zambesi some 30 or 40 miles north of Lialui, draining subterraneously into the main river. From the source of a tributary of the Luena in 15° 43′ 9″ S. (altitude 3790 feet), Captain Gibbons went south and reached the Njoko at the junction of its two headstreams, the highest point at which there is permanent water at the end of the dry season. After returning to Penda-ma-tenka *viâ* the Njoko and Sesheke, the traveller again went north, exploring the Sejlefula and Majili systems. The station of Nkala, from which he wrote, was only some 8 miles from the Kafukwe, known there as the Loenje, but his intention of crossing this river and going north on its eastern side *en route* for the Luena was frustrated by floods. He therefore intended to go straight to the Luena, follow it up some 200 miles, and return along the watershed of its northern tributaries. All the rivers between the Lui and Sejlefula rise, according to Captain Gibbons, much further east than has been supposed. All these explorations appear to have been made independently of the other members of Mr. Reid's party, but the routes of Captain Gibbons must have crossed theirs at several points. We hope before long to receive a full report of the work accomplished, which will be read with much interest.

Organisms of Marine type in Lake Tanganyika.—In a paper describing the anatomy of a jelly-fish from Lake Tanganyika, reprinted from the *Quarterly Journal of Microscopical Science* (vol. 36, part 2), Mr. R. T. Günther makes some general remarks on the occurrence of such marine forms in fresh water, and its possible explanation by a change in the physical geography of the regions in which they occur. The number of Medusae inhabiting fresh water is very limited, and the occurrence of one in Lake Tanganyika is made more striking by its association with several genera of molluscs of decidedly marine type. Where such forms are found not far from the sea, as is the case in a lagoon in Trinidad, their presence can be explained by supposing a former connection between the existing fresh water and the sea, and an excess of rainfall over evaporation subsequent to their separation. An analogous explanation in the case of Lake Tanganyika would involve the supposition that the marine forms wandered in at a time when the region of the lakes was more than 2700 feet lower than at present, and the Atlantic extended over the present Congo basin with a fiord-like arm occupying the site of Tanganyika. The freshness of the lake-water at the present day would imply that the condition of overflow which now obtains must, on the whole, have been the rule since the separation of the basin. It will be remembered that Mr. Joseph Thomson gave a somewhat similar explanation of the development of the Tanganyika basin, attributing its formation, however, to a date subsequent to the separation of the Congo sea from the ocean (cf. *Proc. R.G.S.*, 1882, p. 627).

M. Foureau's Journey in the Erg south of Algeria.—Owing to the disturbed state of the Tuareg countries, M. Foureau has this season confined himself, at the request of the Governor-General of Algeria, to an excursion in the

* The name appears, however, in Livingstone's first map (drawn by Arrowsmith) both as a tributary of the Zambesi (Loena) entering in about 15° S. lat., and also (Ruena) as a small lake further north-east.

Erg region south of the Shotts, between Tuggurt and Ghadames, about half of the distance traversed being over new ground. As usual, he has executed a survey and taken photographs of the country. He was unable to discover the site of an ancient watering-place in the south of the Erg, of which he had heard, but acquired a knowledge of some interesting facts relating to the features of the country. From north to south six different zones, distinct in general aspect and in vegetation, can be distinguished, to which special names are applied. The two last consist of very difficult country, and contain regular mountains, now almost ingulfed in sand. Indications of an eastern arm of the Igharghar, the existence of which M. Foureau had before hinted at, were discovered towards the south of the Erg, along a line marked by high barometric pressure (*Comptes Rendus*, Paris Geographical Society, 1896, nos. 5, 6, 7).

GENERAL.

Awards of the Paris Geographical Society.—The various medals and other awards of the Paris Geographical Society have this year been given as follows: Gold medals have been assigned to Prince Henry of Orleans (journey in Indo-China), Captain Toutée (Niger), Commandant Decœur (Niger), MM. Chantre (work in the Caucasus), F. J. Clozel (explorations north of the Sanga), Auguste Pavie (who also obtains a money premium, for his explorations in Indo-China), Dr. L. Lapicque (journeys in the Persian Gulf, etc., and studies on the Negritos), and Commandant Decazes (surveys, etc., in French Congo). A special medal and premium is given for the Dictionary of Geography begun by M. de St. Martin and completed by M. Rousselet. Silver medals fall to MM. Renaud and de l'Isle, for surveys in the archipelago of Pai-tsi-long (Tongking); to M. de Saint-Arroman, for his work on the Geographical Missions of the Ministry of Public Instruction; to M. Gochet, for works connected with the teaching of geography; to M. F. A. Forel, the limnologist: and to M. Foureau, the Saharan explorer. The Jomard prize is awarded to M. Froidevaux, for his works on the history of geography.

The Geographical Association.—The committee was engaged last year in collecting the opinions of masters of Secondary Schools, including all the great public schools, as to the desirability of certain reforms in examinations in geography. A report on the results of this inquiry has been printed and circulated, and a short summary of it was given in the *Journal* for February (p. 208). The next step was to draw up a paper of suggested reforms, which was submitted to the Royal Geographical Society, the Royal Colonial Institute, the Education Committee of the Teachers' Guild of Great Britain and Ireland, the Royal Scottish Geographical Society, the Manchester Geographical Society, the Reader in Geography at Oxford, and the Lecturer on Geography at Owen's College, Manchester. Having received their sanction and approval, the suggestions were recast in the form of a memorial, and this has now been sent, with a covering letter, to the following boards of public examiners, conducting examinations that specially concern the secondary schools; viz. the Civil Service Commissioners, the Delegates for Local Examinations of the Universities of Oxford, Cambridge, and Edinburgh, the Oxford and Cambridge Schools Examination Board, the London University (Matriculation), the Victoria University (Preliminary), the College of Preceptors, the Scottish Education Department, and the Scottish Universities Preliminary Examination Joint Board. Omitting the introductory letter, the reforms advocated by the committee of the Geographical Association are as follows: 1. That the main principles of physical geography should form the basis of geographical teaching at all stages, and should be fully recognised in all examinations in geography. 2. That a general knowledge of geography, based on physical principles, should be required, together with a special study of some selected

region, *e.g.* India, a group of British Colonies, South America, Central Europe. 3. That it is desirable that all public examining bodies, such as the Civil Service Commissioners, the Universities (in their Local and Certificate Examinations, and London Matriculation), and the College of Preceptors, should recommend a course of instruction in accordance with the ideas suggested above. This would stimulate geographical teaching in schools, ensure that geography should be systematically taught throughout the school, and do away with the need for separate classes to prepare candidates specially for the various public examinations in geography. 4. That in the examinations above referred to geography and history should be dealt with in separate papers, and that the maximum of marks should be approximately the same for each.

Geographical Methods.—In the January number of the *Geographische Zeitschrift*, Professor Ludwig Neumann of Freiburg-i-B. has a valuable survey of the German literature dealing with the question of Geographical Methods. He divides his paper into two parts—(1) the method of orienting the subject itself, (2) the method to be adopted in teaching it at different stages of education. The question, "What is Geography?" seems to be asked in Germany as well as in this country, and Dr. Neumann quotes the ideas of several authorities who agree in the main with each other and with our own geographers in their definition of the scope of the science. Geography has two aspects, general and special. General geography (*Allgemeine Erdkunde*) deals with the "general laws of the distribution of every single category of phenomena on the Earth's surface." Special geography (*Länderkunde*) "describes and explains the various countries in their characteristic and distinguishing peculiarities of land and water forms, climate, vegetable covering, animal life, human settlements and their conditions of organisation and culture." The main divisions of general geography are classified as (1) Mathematical Geography, (2) Geophysics, (3) Geographical Morphology, (4) Oceanography, (5) Climatology, (6) Biological Geography, (7) Historical, or better, Anthropogeography. 3, 4, 5, are grouped as Physical geography, but it would be better to include 1 and 2 also under this heading. In the second part of his paper Professor Neumann reviews recent German works on Geographical Pedagogics. Germany is fortunate in this matter, for many of the leading geographers have had experience in school teaching, and therefore write with authority. Dr. Neumann insists on the importance of the teaching of geography by experts, and ridicules the absurdity of entrusting it to a teacher who "has not had a book of geography in his hand for eight or ten years, and who has no suspicion of its scope, methods, or teaching material," as is still sometimes done in Germany, and almost invariably in our own country. Every teacher of geography will find this an indispensable guide to the German literature on the teaching of the subject, which is too voluminous for each to read for himself.

Local Maps in American Schools.—Professor W. M. Davis has written an interesting little paper entitled "The State Map of Connecticut as an aid to the study of Geography in Grammar and High Schools," which is published as "Connecticut School Document, No. 6." The author gives very clear instructions for using the new 1-inch to the mile contoured map of the state, and while touching on the importance of scholars being trained to draw rough route-maps, he lays much greater stress on the results to be expected from being able to handle and understand the good maps provided by government. "The systematic use of the State Topographical Map in schools," he says, "would greatly promote the chief end of all geographical study; namely, a clear perception of the fundamental facts of earth-form in their relation to the occupation of the earth by man. . . . The teacher and student of geography should turn a larger share of their attention from

mere matters of location to the more important and interesting questions of the reasons for location, as determined by various classes of geographical controls, such as the forms of land and water, the relative positions of different forms, the products of the earth, which in turn are determined by soils, climate, etc., and the available sources of power, such as coal, waterfalls, and wind, which in turn influence manufactures, trade, and commerce." What Professor Davis says applies with equal force to the utilization of the 1-inch map of the United Kingdom in the schools of this country, as a manual of home geography, and an incentive to wider study.

OBITUARY.

Admiral Sir Robert O'Brien FitzRoy, K.C.B.

By Admiral Sir Anthony H. Hoskins, G.C.B.

By the death of Vice-Admiral Sir Robert O'Brien FitzRoy, K.C.B., this Society has lost a valued member, and the navy one of its most prominent officers. The son of a father distinguished alike by his professional and scientific attainments, he evinced the same remarkable qualities which induced the latter, when Flag-Lieut. to the Admiral on the south-east coast of America, to take up the command of the *Beagle*, vacant by the death of Captain Stokes, and to carry out under circumstances of the most arduous nature those surveying duties which eventually led him to such high honour and distinction in the service of the country. The subject of this notice worthily followed in his father's footsteps, and from the first moment of his entry into the navy gave promise of the career in which he achieved such high distinction, and which is now prematurely cut short. Having served with much credit in the war with China, '57 and '58, and obtained his promotion, on his return to England he qualified for Gunnery-Lieut., and being appointed to the *Edgar*, attracted the notice of Sir Geoffrey Hornby, then captain of the ship, and who from thenceforward became his firm and constant friend. Following that distinguished officer into the *Bristol*, on the west coast of Africa, he became the commander of that ship at an unusually early age, and subsequently served in the *Prince Consort* in the Mediterranean.

Promoted to Captain in February, 1872, he was in August of that year selected, notwithstanding his youth, by Sir Geoffrey Hornby as his Flag-Captain in the *Minotaur*, the Flag-Ship of the Channel Squadron, and on the termination of that command he was after a short interval again selected by Sir Geoffrey to be his Flag-Captain in the *Alexandra* in the Mediterranean, where he shared all the difficulties and responsibilities which devolved upon his chief during the Russo-Turkish war. On the paying off of the *Alexandra*, it may be said that his reputation was established as one of the most reliable and able captains in the navy, and consequently when the Egyptian war broke out in the summer of 1882 he was at once appointed to the command of the *Orion*, a vessel which from her construction and light draught of water was sure to occupy an important position in any operations in which the navy could take part after the bombardment of Alexandria.

On his arrival out, being pushed up at once to Ismailia, the key of the situation in the canal, he seized that place when the time for action came, and subsequently commanded the Naval Brigade which was landed to assist in carrying the works of Tel-el-Kebir. For these services he was made a C.B., and by them added greatly to the already high estimation in which he was held. With such qualities and such experience, it was almost as a matter of course that on the reconstitution of the