ON THE

RATE OF TRAVELLING

AS PERFORMED BY

CAMELS;

AND

ITS APPLICATION, AS A SCALE, TO THE PURPOSES OF GEOGRAPHY.

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From the PHILOSOPHICAL TRANSACTIONS.

College of Fort William

ON THE RATE, &c.

Read before the ROYAL SOCIETY, March 17, 1791.

AMONGST the diſcoveries and improvements of various kinds, that may be expected from the very laudable, and, as it concerns mankind in the groſs, no leſs humane and benevolent inſtitution of AN ASSOCIATION FOR PROMOTING DISCOVERIES IN THE INTERIOR PARTS OF AFRICA, that of the geography of the Continent in queſtion may be expected to make the quickeſt progreſs: ſince, in every kind of diſtant reſearch, whether ſucceſsful or otherwiſe, the act of enquiry alone brings materials to the geographer. But, even with every

ordinary advantage, the geography of a continent muſt neceſſarily be ſlow in its progreſs towards maturity; *we*, therefore, can only expect to witneſs its early infancy; and cannot, from a view of the preſent, allow ourſelves to predict what its future features may be. Let it be our care, however, to foſter it; and contribute all within our power towards its improvement and perfection.

In a caſe where there is ſo little probability, even in a long courſe of time, of obtaining many fixed points by celeſtial obſervations (though I hope that one at leaſt will be attempted in the central part of Africa, in our time), it is fortunate that the mode of travelling happens to be ſuch, as ſerves to furniſh a remarkably equal ſcale: the rate of the camel's movement appearing to be, beyond all others, the leaſt variable; whether we examine it by portions of days, or of hours. In the preſent ſtate of things, the former mode alone can be uſed; becauſe few or none of the African travellers carry watches with them: but it may be hoped, that at no very diſtant period, the time employed on the road may be obtained with ſuch a degree of exactneſs, as to furniſh the geographer with materials of a far better kind, than any of thoſe, formed on computation, that have hitherto been exhibited.

Theſe remarks occurred on the reſult of an examination, which (though for a different purpoſe) I lately made into the rate of the camel's movement on the Arabian deſert, between Aleppo, Bagdad, and Buſſorah: for it appeared to me, that if the African caravans are compoſed of the ſame kind of camels, and are governed in their motions and œconomy by the ſame circumſtances, as thoſe which croſs the Arabian deſerts; there is no ſcale, of the computed kind, that can be more applicable to the African geography, than that formed on the camel's rate

of

of travelling. I ſhall therefore detail the examples from whence I have drawn the proportions for the hours and days journey of the camel, under the two different degrees of burthen, which conſtitute what is commonly denominated the LIGHT, and the HEAVY caravan.

The routes which furniſh the above examples are determined in their horizontal, or direct diſtance, by the reſpective poſitions of ALEPPO, BAGDAD, and BUSSORAH: all of which have their latitudes and longitudes fixed by celeſtial obſervations *. Theſe routes are five in number: and although ſome of the journals that deſcribe them, contain leſs information than others, yet all of them have the time given with a ſufficient degree of preciſion, to enable me to found a general rule on. Three of theſe routes lead acroſs the GREAT DESERT, or that between Aleppo and Buſſorah; the other two are acroſs the LITTLE DESERT, or that between Aleppo and Bagdad.

The firſt of the Great Deſert routes was traced by a Mr. CARMICHAEL in 1751. The manuſcript copy of his Journal was obligingly communicated by my friend Dr. PATRICK RUSSELL; and it manifeſts a great degree of ingenuity and perſeverance in this way. The Author declares, that he was determined to keep a regiſter of the courſes by a compaſs, and to compute, comparatively, if not abſolutely, the intermediate diſtance, on each courſe; by counting the ſteps or paces of the camel on which he rode, during a certain interval of time; and afterwards meaſuring a number of them on the ground. The particulars of this operation ſhall be given hereafter; and

* Aleppo, in Conn. des Temps, lat. 36° 11′, long. 37° 9′, reckoned from Greenwich.

Bagdad, by M. BEAUCHAMP, lat. 33° 22′, long. 44° 21′, Greenwich.

Buſſorah, by Capt. RITCHIE, lat. 30° 30′, long. 47° 33′, Greenwich.

although Mr. CARMICHAEL failed in the attempt to aſcertain his road diſtance by this method, yet his proceſs has furniſhed others with the means of aſcertaining the whole diſtance in the aggregate, and of proportioning the parts throughout. For, as the direct diſtance is given by the celeſtial obſervations, and a complete traverſe table by the journal, the *data* are perfect. And when the reader is informed that Mr. CARMICHAEL's whole line of bearing, *by compaſs*, between Aleppo and Buſſorah, nearly 720 Britiſh miles, coincided with the bearing line given by the celeſtial obſervations; by which it appears that the error could amount only to the mean quantity of the variation throughout, which might have been from ſix to ſeven degrees at that time (1751); he will give Mr. CARMICHAEL credit for much general accuracy. And it is not improbable, that even a conſiderable portion of the above error may have ariſen from the imperfection of his inſtrument *.

The ſecond journal was kept by Colonel CAPPER, in 1778, and was publiſhed ſeveral years ago; and the third, which contains little more than the time in detail, was communicated by my friend Mr. HUNTER, who croſſed the deſert in 1767.

The time given between Aleppo and Buſſorah, by theſe journals reſpectively, is as follows:

By Mr. CARMICHAEL	.	322 hours.
Colonel CAPPER	.	310
Mr. HUNTER	.	299½

* I find, by Mr. DRUMMOND's chart of the road between Aleppo and Antioch (1747), that the variation was then about 6 degrees weſterly. This is proved by comparing his magnetic bearing line between thoſe places, with that given by the difference of latitude In the head of the Gulf of Perſia, the variation was 7 degrees in 1785.

But

But to ſhew that this difference aroſe chiefly from the variations in the route acroſs the CHALDEAN DESERT (between Mesjid Ali and Buſſorah; ſee the annexed ſketch, Tab. III.), I ſhall proceed, firſt, to explain that part of the ſubject; and afterwards to exhibit the particulars in proof.

Mesjid Ali (or Ali's Moſque) is ſituated at about two thirds of the diſtance, and as nearly as poſſible in the line of direction, between Aleppo and Buſſorah; and is a ſort of land-mark to the caravans which paſs the common boundary of the Arabian and Chaldean deſerts. Its geographical poſition is deduced from bearings and latitudes taken by M. NIEBUHR and others: and therefore, as far as general geography is concerned, it may almoſt be regarded as a fixed point. Not that the truth of its poſition will in any ſhape affect the preſent head of enquiry; which is entirely directed towards a compariſon of the ſpaces of time, employed between certain points of the route, by each traveller reſpectively.

Now, that portion of the Deſert route between Mesjid Ali and Buſſorah, being ſubject to great variation in the track, as appears by the journals of different travellers; whilſt the much larger portion of it, between Mesjid Ali and Aleppo, is very nearly the ſame at all times; it is very clear, that this latter portion furniſhes the propereſt ground on which to form the compariſon: and the particulars are as follow:

Aleppo

	CARMICHAEL.	CAPPER.	HUNTER.	
	H. M.	H. M.	H. M.	
Aleppo to Hagla	11 5	11 24	10 0	Hagla.
Hagla to Ain il Koom	37 30	41 4	35 0	to Taiba.
Ain il Koom to Uklet Hauran	80 10	78 41	81 30	to Uklet Hauran.
Hagla to Uklet Hauran	117 40	119 45	116 30	
Uklet Hauran to Al Kadder	53 50	54 45	51 30	
Hagla to Al Kadder	171 30	174 30	168 0	
Al Kadder to Rackama, oppoſite Meſjid Ali	21 45	19 50	19 30	
Hagla to Rackama	193 15	194 20	187 30	
Aleppo to Rackama	204 20	205 44	197 30	

On the Little Deſert I have two examples of time, from Mr. IRWIN in 1781, and Mr. HOLFORD in 1780; both of whom kept regular journals.

	IRWIN.	HOLFORD.
	H. M.	H. M.
Aleppo to Ain il Koom.	52 0	46 27
Ain il Koom to Annah on the Euphrates	76 0	80 15
Aleppo to Annah	128 0	126 42

It appears by the journals, that Mr. IRWIN deviated from the uſual track in the firſt part of his route; and that Mr. HOLFORD did the like in the latter part of his; each to avoid an enemy: ſo that it may be preſumed, that the deviations nearly balanced each other (ſee the ſketch).

Between Annah and Bagdad, theſe gentlemen made part of their journey in the caravan of loaded camels, and partly with *light* camels (that is, without any other load than the rider). Mr. IRWIN employed 62½ hours: but the laſt 15 hours, on light

light camels, were at an accelerated rate of half a mile *per* hour, or one fifth part, above the ordinary rate; according to his idea, which I have no doubt was a very juſt one: and this accelerated rate ſhould add 3 hours to the 15, to reduce it to caravan time; making 65½ hours inſtead of 62½. Mr. HOLFORD's journey, by the ſame *ratio*, muſt be reckoned at 68: but as this part of the two journies is obviouſly too inaccurate to draw any concluſions from, in the way of compariſon, I ſhall only make uſe of Mr. IRWIN's time (to which no ſolid objection can be urged) when I calculate the rate of the camel's travelling.

We have now ſeen, that on a journey of about 200 hours, between Aleppo and Mesjid Ali, two accounts differ only 1 hour 24 minutes; and a third differs from the mean of the other two ſeven hours and an half. And we may obſerve, that if the ſtage from Aleppo to Hagla be taken out of the queſtion, the number of Mr. HUNTER's hours would be nearer on an equality with the others by about an hour and a quarter (ſee p. 6.). The reaſon of the different reports of the diſtance between Aleppo and Hagla, appears to be, that travellers commonly join the caravans either at Hagla or on the road to it; and they, travelling by a quicker conveyance than camels afford, and then adjuſting the time to the caravan rate, make different eſtimates of the diſtance. Or there may be ſome other cauſe which has not been explained. Four different perſons give the time as follows:

	H.	M.		H.	M.
CARMICHAEL	11	5	CAPPER	11	24
HUNTER	10	0	HOLFORD	9	12

So that the proper point of outſet in making the compariſon, is

is Hagla. And, reckoning from thence, we have in the firſt table (p. 6.) the numbers 193¾, 194½, and 187½, for the time between Hagla and Mesjid Ali, in the three journies reſpectively: and the ſame table affords alſo the following compariſons between different places on the route:

In one inſtance,	80$\frac{1}{24}$ and 78⅔;
In a ſecond,	117⅔, 119¾, and 116½;
In a third,	53¾, 54½, and 51½;
And in a fourth,	171½, 174½, and 168.

Again, between Aleppo and Annah on the Euphrates, the numbers in the ſecond table ſtand thus:

128, and 126⅔.

I think I need not produce any more examples to prove the equal rate of motion of a camel that is in any degree loaded; or rather of a number of camels together, where the rate will be determined by the *ſlow-going ones*: and whatſoever rate, in actual diſtance, may be deduced from theſe examples, muſt be applied to loaded camels travelling in a body together, and not to light camels, or thoſe choſen for ſpeed, whoſe rate appears to be at leaſt $\frac{1}{7}$th greater. By a light camel is meant one that has only a man, or a very ſmall quantity of baggage, on it; whereas a camel's load is 500 to 600 pounds; and camels ſo loaded, form what is termed the HEAVY caravan. LIGHT caravan, on the contrary, is applied to camels under a *moderate* load, or perhaps little more than half loaded. And with reſpect to camels, either *moderately* or *fully loaded*, I can perceive no difference in their hourly rate of motion: the difference alone appears in the length of their day's journey; as we ſhall perceive hereafter. A camel, it is ſaid, will not permit himſelf to be over-laden; and this may be the reaſon why the load does not affect his rate of motion.

It

It appears, that the direct diſtance between Aleppo and Buſſorah, is 621 geographic miles, or 720 Britiſh, nearly. And Mr. CARMICHAEL's route, traced by a compaſs through all its principal bendings, and calculated trigonometrically, gives 688 geographic miles, or of Britiſh 797. It follows then, of courſe, that as the ſame gentleman was 322 hours on the road, the mean hourly rate of the camel's motion, was 2,475 Britiſh miles. Colonel CAPPER's route, though eaſily traced on the map, is not correct enough in its particulars, to ſerve as an authority equal to Mr. CARMICHAEL's; and the like may be ſaid of Mr. HUNTER's: but they muſt both be allowed to corroborate Mr. CARMICHAEL's in a general way; for as nearly as Colonel CAPPER's route can be traced, over the CHALDEAN Deſert (and, as we have before obſerved, the track is nearly the ſame at all times, in all other parts of the Deſert) the hourly rate of his camels was 2,51 *per* hour; and that of Mr. HUNTER's 2,585.

We come now to the LITTLE DESERT route. It has been noticed, that Mr. IRWIN employed 128 hours on his journey from Aleppo to Annah; and 65½ more (allowing for his accelerated rate 3 hours, ſee p. 7.) between Annah and Bagdad; altogether 193½ hours between Aleppo and Bagdad. The direct diſtance between thoſe places is 393 geographic miles; and by the route traced by Mr. IRWIN, the *road diſtance* comes out about 414½, or Britiſh miles 480 *. And this number, divided by 193½, gives 2,48 *per* hour for the camel's rate; or

* Not that the diſtance between thoſe places is ſo much as 480 miles by the direct road: it is probably leſs than 470. But Mr. IRWIN's party took a circuitous courſe to the ſouthward, between Aleppo and Ain il Koom, to avoid an enemy that lay in the way. He eſtimated his diſtance at 493 miles.

within a very ſmall fraction of Mr. CARMICHAEL's rate; his being, as we have juſt ſeen, 2,475.

I think I may venture to reſt the calculation of the loaded camel's mean hourly rate of travelling, on the experiments of Mr. CARMICHAEL and of Mr. IRWIN; both of whom appear to have taken much pains with the detail of their journies *; and then it will ſtand as under:

Mr. CARMICHAEL on 322 hours 2,475 } Mean 2,478 Bri-
Mr. IRWIN on 193½ . . 2,48 } tiſh miles.

We have mentioned above, the reſult of Colonel CAPPER's and of Mr. HUNTER's time, which gave a rate ſo very near to CARMICHAEL's and IRWIN's: and it may not be amiſs to add to theſe, the reſult of Mr. HOLFORD's; as well as the eſtimates of the camel's rate, formed by ſeven different perſons. All theſe I have placed in one point of view, in the following table.

	CARMI-CHAEL.	IRWIN.	CAPPER.	HUNTER.	HOL-FORD.	PLAISTED.	Anony-mous.
	Brit. mi.						
Eſtimated rates	2,29	2,55	2,25	2,33	2,24	2,3	2,5
Experiments	2,475	2,48	2,51	2,585	2,5	—	—

Mean of the ſeven eſtimates, 2,35.
Mean of the five experiments, 2,51.
Mean of CARMICHAEL's and IRWIN's, 2,478.

* Mr. IRWIN alſo took the bearings of his courſe by a compaſs, though not ſo much in detail as Mr. CARMICHAEL; but Mr. IRWIN not only remarked the time, but the particular rate of travelling, on each day; which appeared to vary from 2 to 3 *per* hour, but was commonly 2½; and the mean of all 2,55 Britiſh miles.

Before

Before I quit the ſubject of the hourly rate, I ſhall obſerve, that the road diſtances in Mr. CARMICHAEL's traverſe table are often thrown together in lines of very conſiderable length, ſuch as 20 miles and upwards; and very commonly in lines of 5, 6, and 7, and yet are all conſidered as ſtraight lines. By this mode, it is probable, that many ſmall inflexions paſſed unnoticed: and therefore the rate taken from the reſults of CARMICHAEL's and IRWIN's obſervations, will be rather under the mark than otherwiſe; but it is obvious, that no kind of rule can be found to correct it by. It is certain, that fewer inflexions are likely to occur in the Deſert routes, than in almoſt any other; not to mention that the long lines of diſtance happen chiefly in the open, level part of the route. The road diſtance exceeds the direct diſtance, by *one-fourteenth part* of the latter only, between Aleppo and Mesjid Ali; amounting to a fraction of ,168 Britiſh mile on each hour; or in the proportion of 7¼ miles on each hundred of direct diſtance. This, I confeſs, is much leſs than I could poſſibly have ſuppoſed; and which nothing ſhort of actual experiment could have induced me to believe. On the whole road between Aleppo and Buſſorah, the proportion is nearly 11 on each hundred, on CARMICHAEL's route: but his route over the Chaldean Deſert was unuſually circuitous; and cannot be admitted to have any weight, in the determination of this queſtion.

One would expect that the inflexions of which no account is taken by Mr. CARMICHAEL, would amount to at leaſt half as much as thoſe which are taken notice of; and ſuch addition would make the whole hourly rate 2,56 inſtead of 2,475. But this is merely a ſuppoſition; and it is poſſible, that the rate may not be higher than 2,52, the mean of the four other experi-

ments. At all events, the error can be but ſmall: and poſſibly, all circumſtances taken into the caſe (and particularly this remarkable one, that of three perſons who attempted to aſcertain the rate, by counting and meaſuring the camel's footſteps, none reckoned it higher than 2¼, and one went ſo low as 2¼), I think the rate of two miles and an half *per* hour may be uſed, as differing but a ſhade from the general reſult; and as having the moſt manageable fraction.

Thus it appears to me, that the hourly rate of the camel may be applied as a very uſeful ſcale to the African geography; whenſoever the uſe of watches ſhall be adopted by the native travellers employed by the AFRICAN ASSOCIATION *; and with ſtill greater advantage, of courſe, if Europeans are employed. And if Mr. CARMICHAEL could deſcribe the general bearing, on a line of more than 700 Britiſh miles, ſo nearly as within 6 or 7 degrees of the truth; and that with a pocket compaſs; nothing more need be ſaid concerning the advantages that may be derived from the uſe of that valuable inſtrument, aided by ſuch a ſcale as I have been deſcribing.

The mean length of the day's journey of the camel, varies according to the degree in which it is loaded: and in this particular it is that the ſtate of the camel, as to its burthen, operates on its progreſs. It is neceſſary to obſerve, that whatſoever remarks I may offer, on the ſubject of the camel's day's journey, are meant to be applied only to the *mean* rate on journies of conſiderable length; ſince any other kind of experiment would be of no uſe in geography: I ſhall therefore conſider only the progreſs of the LIGHT and HEAVY CARAVANS, in which

* In the Memoirs of ABDUL KURRIM, a Caſhmerian of diſtinction, he informs us, that he kept an account of the time, on the road between *Bagdad* and *Mecca*, by means of an European watch, in the year 1740.

the

the camels are left to purſue their journey quietly and at leiſure; and with the regularity of a machine: and not that of the LIGHT CAMELS, which are not only freed from incumbrance, but are alſo urged on.

I have two examples of the heavy kind, and three of the light kind, where the time has been regularly kept: beſides a third example of the heavy kind, where the neceſſary regularity is wanting, but yet containing within itſelf, evidence ſufficiently ſtrong to corroborate the other two.

The HEAVY caravans were thoſe of Mr. CARMICHAEL and M. HOLFORD; the firſt of 1000 camels, of which 600 were loaded, went, on a journey of 45 days, at a mean, each day, ... H. M. 7 10

The ſecond, with 50 loaded camels, on a journey of 15 days 7 40

Mean of the two, 7 25

The third, TEIXEIRA, with 130 loaded camels, on a journey of 21 days, *about* . . . 7 30

Mean of all, *per* day, 7 27

The LIGHT caravans were,

			H. M.
Meſſ. IRWIN, CAPPER, HUNTER,	from 80 to 100 camels,	21 days,	9 12
		33 —	8 38
		34 —	8 45
		Mean of the three	8 52

Here then the mean of the heavy caravan day is under ſeven hours and an half; and that of the light caravan between eight and three quarters, and nine hours.

Some

Some of the ordinary watering places on the Deſert, being from 3 to 5 days journey aſunder, it may be ſuppoſed, that the length of the intermediate journies, would be determined by the known and approved ſtandard of a proper day's walk for a camel: for as they often arrive at the watering-place early in the day, it appears, that the caravan chiefs, do not, by any means, divide the ground between ſuch watering places, into equal portions for marches. This being the caſe, one may expect to arrive at the knowledge of what is at leaſt *intended* for a proper day's journey for a camel, under the circumſtances of the caſe: and indeed the reſult is ſuch as to prove what I have before advanced, reſpecting the length of the mean journies of both kinds. For having ſelected from the five above-mentioned journals, the length of the *apparently optional* journies in each; it appears, that the heavy caravans went 7 h. 51 m. on a mean of 24 ſuch days: and the light caravans 9 h. 8 m. on a mean of 38 days. In both of which caſes, as might have been expected, the length of the mean *optional* day, is ſomewhat longer than that of the whole journey; in which there is a wider field for delays and accidents. The compariſon is as follows:

	Heavy caravan.			Light caravan.		
		Diſtance in Britiſh miles.			Diſtance in Britiſh miles.	
	H. M.	at 2½ *per* hour.	at 2,56	H. M.	at 2½ *per* hour.	at 2,56.
Mean daily rate of the whole journey . .	7 27	18,64	19,06	8 52	22,17	22,7
Of optional days . .	7 51	19,62	20,1	9 8	22,8	23,38

Thus

Thus the mean daily rate of the heavy caravan, appears to be 18,64 Britiſh miles, reckoning two miles and an half for each hour; and 19,06 if taken at 2,56: and the mean rate of the light caravan 22,17 miles, at 2½; 22,7 at 2,56.

In order to apply this ſcale with effect, to the African geography, it is neceſſary to ſtate the number of days that the caravans uſually halt on the road; for as yet I have only conſidered their rate of motion: but it is evident, that if the length of the journey in the groſs, is given, the requiſite information will not be obtained, without a previous knowledge of the time loſt by neceſſary, or unavoidable halts on the road. My enquiries have furniſhed me with an account of 13 halts, to 149 days of travelling; or, which is the ſame thing, 13 halts out of 162 days, reckoned from the time of departure, to the time of the arrival of the caravans at the place of deſtination: that is, 1 halt to 12½ travelling days. This, of courſe, muſt be deducted from the aggregate of the diſtance: or, ſhould it be averaged on each day, the heavy caravan day muſt be reckoned at 17,14 miles inſtead of 18,64; and that of the light caravan 20,4, inſtead of 22,17; when the hourly rate is taken at two miles and an half.

It alſo remains to be ſtated, from the proportion that the road diſtance bore to the direct diſtance, by the trace of Mr. CARMICHAEL's route; what length in direct diſtance, and in geographic miles, may be allowed for each day, for the heavy caravan, on ſimilar lengths of journey, and over ſimilar tracts of country. It appears then, that on the 28 days between Aleppo and Rackama (oppoſite Mesjid Ali) the mean length of the day's journey, in direct diſtance, is about 15¼ geographic miles: and on the whole 45 days between Aleppo and Buſſorah, 13,8 ſuch miles. But this is without any allowance

ance for halts; which, as has been obſerved before, require a deduction of 8 parts in 100, to be made from the groſs amount of the whole journey, when applied to the purpoſes of geography.

I have already taken notice, that Mr. CARMICHAEL counted the camel's ſteps, in order to aſcertain a ſcale of diſtance; and I ſhall now give the reſult of his obſervations, as well as of Mr. HOLFORD's, who alſo counted the ſteps, and meaſured the length of a number of them on the ground. Mr. HUNTER's experiment was on too ſmall a ſcale to ground a calculation on. It is certain, that theſe reports of the number of ſteps during certain portions of time, and the meaſurement of a certain number of thoſe ſteps on the ground, furniſh a reſult that does not agree with the experiments on the great ſcale; ſuch as we have juſt related, and which appear to be ſuſceptible of greater accuracy than thoſe made in detail. But it will, nevertheleſs, be proper to give the reſults, and to make ſome remarks on them; if be only to prevent any perſon in future from founding a calculation on them.

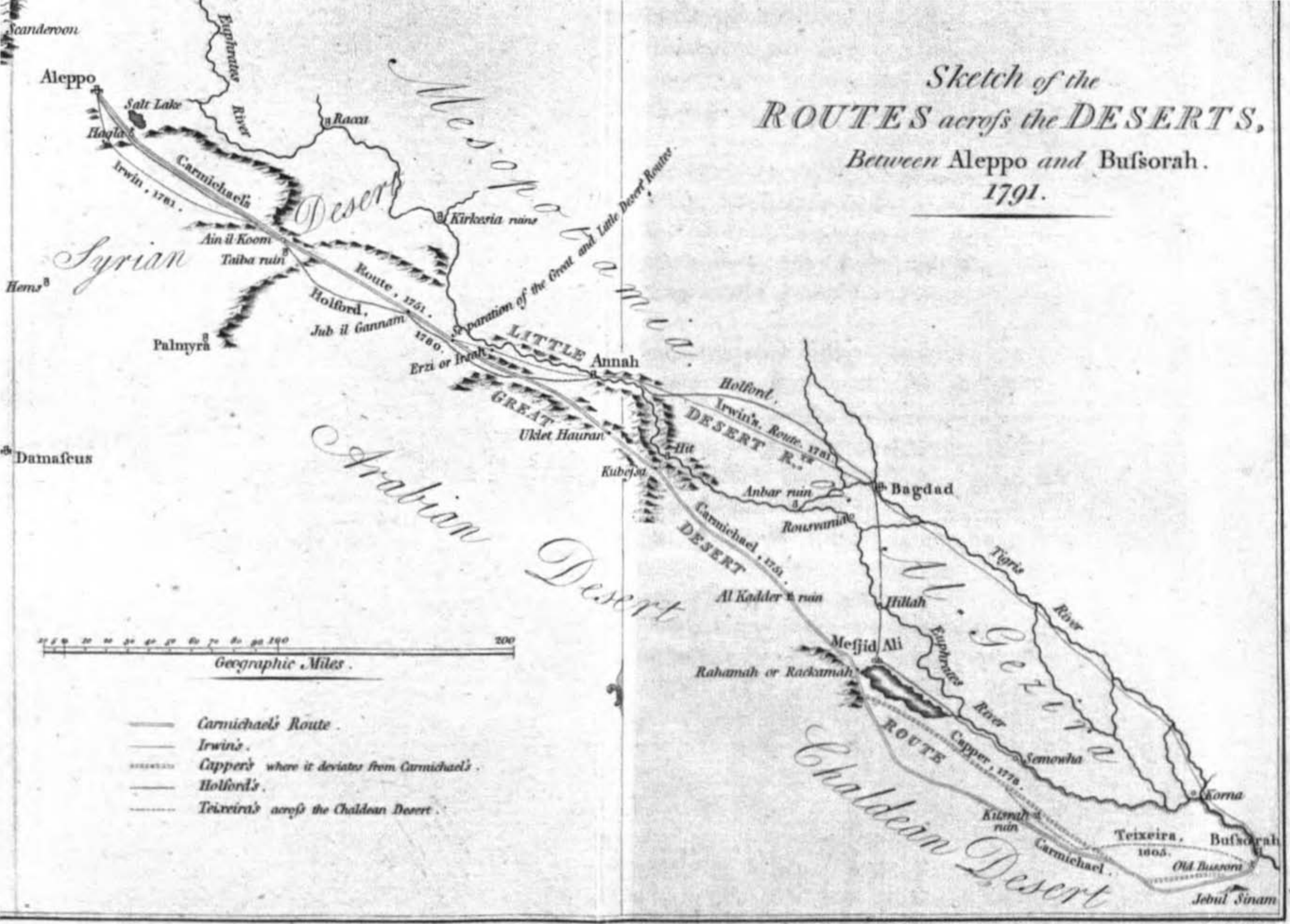
Mr. CARMICHAEL counted the double ſteps, or rather the return of the ſame foot, of a camel on which he rode, for an hour together, on 20 different days; at times when, from the nature of the ground, he thought the greateſt variation took place, in the rate of motion. He found the greateſt number of ſteps to be 2420, the leaſt 2086; and the mean of the whole 20 hours, was 2200. Mr. HOLFORD reckoned the greateſt 2240, leaſt 2060; mean 2150. They both report the double ſtep to be 5 feet and an half. The reſult of the former account is 2,29 Britiſh miles *per* hour; of the latter 2,24; and each allowed his diſtance accordingly, in his journal: though nothing is more certain than that their computed diſtances fall very

ſhort

ſhort of the truth. Mr. CARMICHAEL, for inſtance, reckons the diſtance from Aleppo to Buſſorah, by the road, at 720 Britiſh miles, although the direct diſtance itſelf ſcarcely falls ſhort of it. And Mr. HOLFORD's road diſtance alſo falls very ſhort. Even Mr. CARMICHAEL's higheſt number of paces, would exceed the mean rate given by the experiment at large, by a *ſixtieth* part only.

As theſe gentlemen's experiments differ only 50 ſteps, in the mean number, during the hour (one being 2200, the other 2150), that is, a 44th part, the error muſt be looked for elſewhere; and it probably originated in their meaſuring too ſmall a number of ſteps on the ground to found their calculation on.

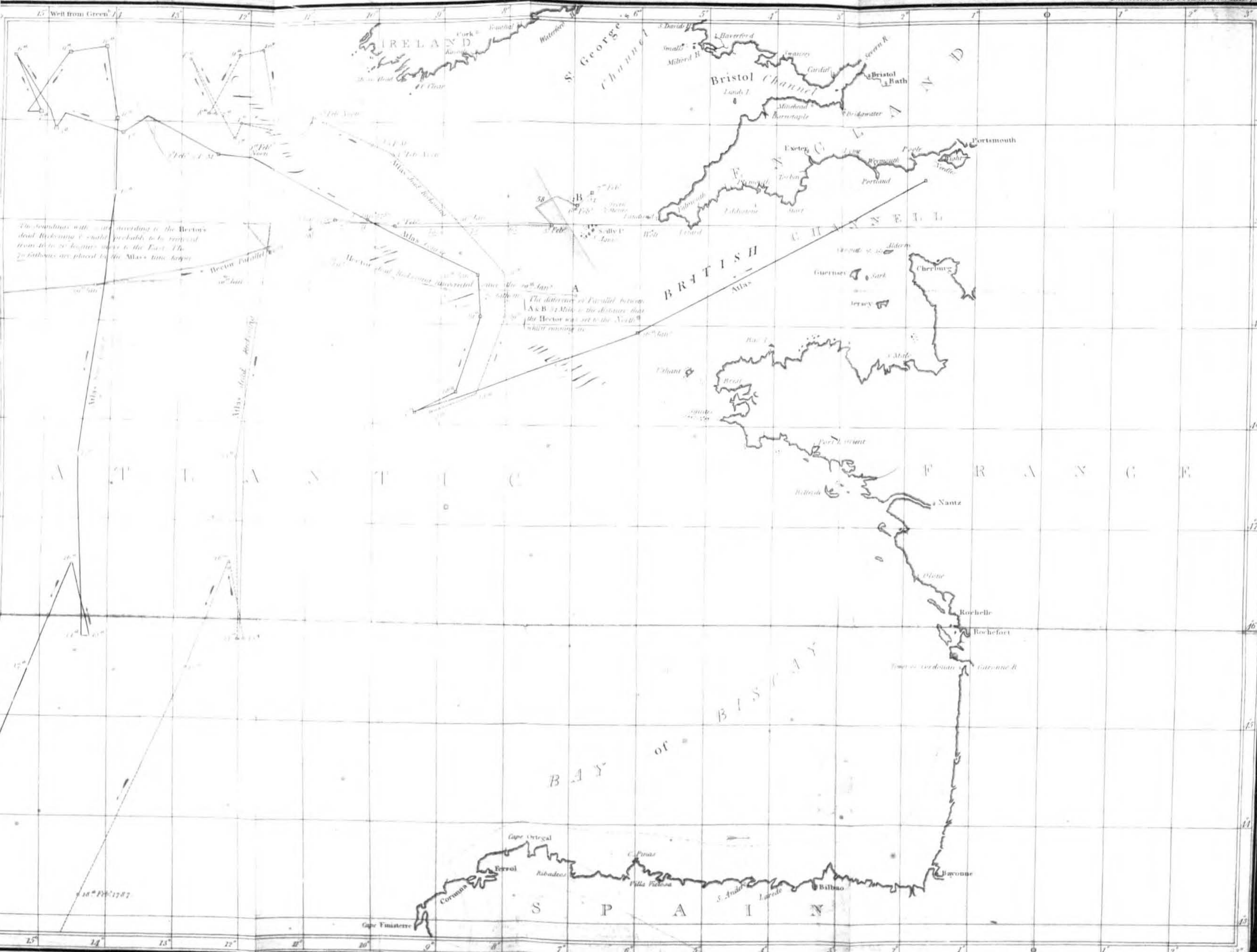
The reaſon of this great variation in the number of paces, in a given time, is the plenty or ſcarcity of the Deſert ſhrubs, on which the camels feed, as they go on; and thus ſuch expements become almoſt uſeleſs, unleſs the quality of the Deſert was deſcribed in every part. As the hourly rate of Mr. CARMICHAEL, coincides with that of Mr. IRWIN, within a very ſmall fraction, although the one travelled in November and December, the other in March and April; it appears, that the ſeaſons have little or no effect in this particular: and it is therefore highly probable, that the ſhrubs may flouriſh in ſome parts of the Deſert, and be dried up in others, at one and the ſame ſeaſon.



Sketch of the
ROUTES acrofs the DESERTS,
Between Aleppo and Bufsorah.
1791.
Scanderoon
Aleppo
Salt Lake
Hagla
Euphrates River
Racca
Mesopotamia
Desert
Syrian
Irwin, 1781.
Carmichael's Route, 1751.
Ain il Koom
Taiba ruin
Kirkesia ruins
Hems
Holford, 1760.
Jub il Gannam
Palmyra
Separation of the Great and Little Desert Routes
LITTLE DESERT
Annah
Erzi or Irzah
GREAT DESERT
Uklet Hauran
Damascus
Arabian Desert
Holford.
Irwin's Route, 1781
Hit
Kubesa
Anbar ruin
Bagdad
Rouswanide
Carmichael, 1751.
Tigris River
Al Gezira
Al Kadder ruin
Hillah
Mesjid Ali
Rahamah or Rackamah
Euphrates River
Semowha
Capper, 1778.
ROUTE
Chaldean Desert
Korna
Kitsmah ruin
Teixeira, 1605.
Carmichael.
Bufsorah
Old Bussora
Jebul Sinam
Geographic Miles.
200
Carmichael's Route.
Irwin's.
Capper's where it deviates from Carmichael's.
Holford's.
Teixeira's across the Chaldean Desert.
Basire Sc.

CHART of the TRACKS of the HECTOR and ATLAS EAST INDIA SHIPS, in 1778 & 1787, Exhibited with a Design to prove the Existence of a CURRENT, between USHANT and IRELAND.

Philos. Trans. MDCCXCIII. Tab. XXI. p. 200.



IRELAND
ENGLAND
FRANCE
SPAIN
ATLANTIC
BAY of BISCAY
BRITISH CHANNEL
St. George's Channel
Bristol Channel
Cork
Waterford
St. Davids H.
Haverford
Milford H.
Swansey
Cardiff
Severn R.
Bristol
Bath
Lundy I.
Minehead
Barnstaple
Bridgewater
Exeter
Lyme
Weymouth
Poole
Portsmouth
Portland
Torbay
Plymouth
Falmouth
Eddistone
Start
Lizard
Scilly I.
Guernsey
Sark
Jersey
Cherburg
Alderney
Ushant
Brest
Port L'Orient
Belleisle
Nantz
Rochelle
Rochefort
Garonne R.
Bayonne
Bilbao
Laredo
Villa Viciosa
Ribadeo
Ferrol
Corunna
Cape Ortegal
Cape Finisterre
Atlas
Hector Parallel
Atlas dead Reckoning
Hector dead Reckoning
The difference of Parallel between A & B 51 Miles is the distance that the Hector was set to the North while running in
The Soundings with ... according to the Hectors dead Reckoning & ... probably to be removed from 16 to 20 Leagues more to the East. The 70 fathoms are placed by the Atlas's time keeper
A
B
West from Green.
18th Feb. 1787

OBSERVATIONS

ON

A CURRENT

THAT OFTEN PREVAILS TO THE WESTWARD OF SCILLY;
ENDANGERING THE SAFETY OF SHIPS THAT
APPROACH THE BRITISH CHANNEL.

BY

JAMES RENNELL, Esq. F.R.S.

FROM THE

PHILOSOPHICAL TRANSACTIONS.

OBSERVATIONS, &c.

Read before the ROYAL SOCIETY, *June 6*, 1793.

It is a circumstance well known to seamen, that ships, in coming from the Atlantic, and steering a course for the British channel, in a parallel somewhat to the *south* of the Scilly Islands; do, notwithstanding, often find themselves to the *north* of those islands: or, in other words, in the mouth of the St. George's, or of the Bristol channel. This extraordinary error has passed for the effects, either of bad steerage, bad observations of latitude, or the indraught of the Bristol channel: but none of these account for it satisfactorily; because, admitting that at times there may be an indraught, it cannot be supposed to extend to Scilly; and the case has happened in weather the most favourable for navigating, and for taking observations. The consequences of this deviation from the intended track, have very often been fatal: particularly in the loss of the Nancy packet, in our own times; and that of Sir Cloudesley Shovel, and others of his fleet, at the beginning of the present century. Numbers of cases, equally melancholy, but of less celebrity, have occurred; and many others, in which the danger has been imminent, but not fatal, have scarcely reached the public ear. All of these have been

referred to accident; and therefore no attempt seems to have been made, to investigate the cause of them.

I am however of opinion, that they may be imputed to a specific cause; namely, a current: and I shall therefore endeavour to investigate both that, and its effects; that seamen may be apprized of the times, when they are particularly to expect it, in any considerable degree of strength; for then only, it is likely to occasion mischief; the current that prevails at ordinary times, being, probably, too weak to produce an error in the reckoning, equal to the difference of parallel, between the south part of Scilly, and the track that a commander, prudent in his measures, but unsuspicious of a current, would chuse to sail in.*

It seems to be generally allowed, that there is always a current, setting round the Capes of Finisterre, and Ortegal, into the Bay of Biscay. This I have the authority of Captain MENDOZA RIOS, a Fellow of the Royal Society, and an officer in the royal navy of Spain, for asserting. Besides, such an intimation was amongst the earliest notices that I received, concerning matters of navigation, when on board of a ship that sailed close along the north coast of Spain, in 1757. The current then, is admitted to set to the eastward, along the coast of Spain; and continues its course, as I am assured, along the coast of France, to the north, and north-west: and indeed, any body of water, once set in motion, along a coast, cannot suddenly stop; nor does it, probably, lose that motion, until

* It may be remarked, by the way, that the true latitude of the present lighthouse on St. Agnes's Island, is 49°. 54′; and that of the most southerly part of the whole group of islands and rocks, is 49°. 52′. This is according to an advertisement given out by the Trinity House, in 1792.

by degrees it mixes with the ocean; after being projected into it, either from the side of some promontory, that extends very far beyond the general direction of the coast; or after being conducted into it, through a strait.

The original cause of this current, I apprehend to be, the prevalence of westerly winds in the Atlantic; which, impelling the waters along the north coast of Spain, occasions a current, in the first instance. The stronger the wind, the more water will be driven into the Bay of Biscay, in a given time; and the longer the continuance of the wind, the farther will the vein of current extend.

It seems to be clearly proved, that currents of water, after running along a coast that suddenly changes its direction, (as happens on the French coast, at the promontory south of Brest) do not change their course with that of the shore, but preserve, for a considerable time, the direction which they received from the coast they last ran by. In some instances, after being projected into the sea, they *never* again approach the shore; but preserve, to a very great distance, nearly the direction in which they were projected; as well as a considerable degree of their original velocity, and temperature. The gulf stream (of Florida) is a wonderful instance of this kind; which, originating in a body of *pent-up* waters, in the Gulf of Mexico, is discharged with such velocity, through the Straits of Bahama, that its motion is traceable through the Atlantic, to the Bank of Newfoundland; and may possibly extend much farther. This being therefore the case, we can have no difficulty in conceiving, that the current of the Bay of Biscay continues its course, which may be about NW by W, from the coast of France, to the westward of Scilly and Ireland.

At ordinary times, its strength may not be great enough to preserve its line of direction, across the mouth of the British Channel; or, if it does preserve its direction, it may not have velocity enough to throw a ship so far out of her course, as to put her in danger. But, that a current prevails *generally*, there can be little doubt; and its degree of strength will be regulated by the state of the winds. After a long interval of moderate westerly gales, it may be hardly perceptible; for a very few miles of northing, in the 24 hours, will be referred to bad steerage, or some other kind of error: but after hard and continued gales from the western quarter, the current will be felt in a considerable degree of strength; and not only in the parallel of Scilly, but in that of the south-west coast of Ireland likewise.

Our observation of what passes in the most common waters, is sufficient to shew how easily a current may be induced, by the action of the wind, on the water contiguous to a bank, when the wind blows *along* it. In a canal of about four miles in length, the water was kept up *four inches* higher at one end, than at the other, by the mere action of the wind, along the canal. This was an experiment made, and reported to me, by my much lamented acquaintance, the late Mr. SMEATON. We know also, the effects of a strong south-west, or north-west, wind, on our own coasts: namely, that of raising very high tides in the British Channel, or in the Thames, and on the eastern coasts; as those winds respectively blow: because the water that is accumulated, cannot escape quick enough, by the Strait of Dover, to allow of the level being preserved. Also, that the Baltic is kept up *two feet* at least, by a strong NW wind of any continuance: and

that the Caspian Sea is higher by *several* feet, at either end, as a strong northerly, or southerly, wind prevails. Therefore, as water pent up, in a situation from which it *cannot escape*, acquires a higher level, so, in a place where it *can escape*, the same operation produces a current: and this current will extend to a greater or less distance, according to the force with which it is set in motion; or, in other words, according to the height at which it is kept up, by the wind.

It may possibly be asked, why a similar current does not prevail in the British Channel, from the same westerly winds? To this I answer, that the increased height and velocity of the tides, during the prevalence of such winds, prove that a part, at least, of the same effect which happens in the Bay of Biscay, is produced in the Channel; and I have little doubt, that there is, in fact, a current also; but that, as it is blended with the common tide, the effect on the senses is lost: for it may appear only in the form of a *stronger* flood tide, or a *weaker* ebb, than at other times. Whereas the Bay, a wider space, and of a different form, allows a freer scope to the tides, than the British Channel does: it being high water nearly at the same time, all over the Bay; but varying in the Channel, at least five hours. And it may be concluded, from analogy, that the form of the Channel does not allow of the same effect being produced by the wind, on its included waters, as may be produced on those of the Bay: these meeting with an opposition, in the coast of France, the others having a partial exit, at the Strait of Dover: we may also conclude, that if no such phænomenon as a tide existed, a current, though less strong than in the Bay, would be perceived in the British Channel.

Of the Bay of Biscay it may be observed that, by reason of its form, and exposure to the reigning winds, which are often violent, and which pass over a vast expanse of water, there is no part of the ocean, familiarly known to us, whose circumstances are, in any degree, similar to it. It ought not therefore to surprize us, if we find that it differs, in any particular, from other seas. Seamen have remarked its uncommon degree of agitation, in stormy weather; but this has not, as far as I know, been properly accounted for. May it not be owing generally, to the same cause as that which produces the current? and at times, to the very current itself? With respect to the first—the waves of a deep bay or gulf, when the wind forces the water into it, will meet with a resistance in the land at the head of it, which must occasion a reverberation, that will render the surface of a great part of the gulf more unquiet, than when there is an opening at the end, to allow the undulatory motion a freer scope. What is said here, is exemplified on a small scale, by Mr. SMEATON'S very ingenious manner of quieting Ramsgate harbour. (See his Tract on that harbour, page 45.) And with respect to the second cause—the effect of a current running to windward, in producing a short, hollow, and therefore dangerous, wave, is pretty well known. Accordingly, at seasons when the current runs strong, and the wind blows fresh from the north-west quarter, this cause must also contribute to the agitation of the waters, in the north part of the bay.*

* How far the reverberatory motion may extend, I know not: but it is certain that an undulatory motion impressed on the sea by the wind, will extend to a prodigious distance; and even into a region where a different wind prevails: as for instance, a swell raised by a strong gale, at south, or south-west, in the tract of variable winds,

It is quite uncertain at what interval of time, from the commencement of strong westerly gales, in the Atlantic and Bay of Biscay, the current may operate on the tracks of ships, near Scilly; for we are not possessed of the *data*, requisite for determining it. If we were to conceive a current, originating on the coast of Spain, and afterwards disturbing the courses of ships, on the west of Scilly and Ireland; this would require too much time, to agree with one of the instances which I mean to adduce: although it is probable, that this may be nearly the effect at ordinary times, and when the westerly winds blow moderately. But as, in one striking instance, it appears that the current operated in a very remarkable manner, on the ship's course, on the fourth day after the commencement of the gale, in the quarter where the ship was; the cause should rather be looked for, in the *sudden* and *great accumulation* of water, in the Bay of Biscay: otherwise, there is no accounting for the sudden appearance of the current. And the very act of accumulation, causing an indraught, there will consequently be a current round the Capes of Finisterre, and Ortegal, towards the Bay. Be the exact cause, however, what it may, it no doubt originates in the Bay, by the action of strong westerly winds: the prevalence of such winds, will therefore be the *signal* for the appearance of a current, between Ushant, and the south-west coast of Ireland: for though the cause can only be guessed at, the effect is too well ascertained, to remain in doubt.

I shall now adduce the facts, on which the idea of the existence of a current is founded.

has been felt, very far within the limits of the south-east trade wind, in the Indian Ocean.

In crossing the eastern part of the Atlantic, in the HECTOR East India ship, in 1778, we encountered, between the parallels of 42 and 49, very strong westerly gales; but particularly between the 16th and 24th of January, when, at intervals, it blew with uncommon violence. It varied two, or more, points, both to the north and south of west, but blew longest from the northern points; and it extended, as I afterwards learnt, from the coast of Nova Scotia, to that of Spain.

We arrived within 60 or 70 leagues of the meridian of Scilly, on the 30th of January, keeping between the parallels of 49 and 50; and about this time we began to feel a current, which set the ship to the north of her intended parallel, by near half a degree, in the interval between two observations of latitude; that is, in two days. And the wind, ever afterwards, inclining to the south, would not permit us to regain the parallel; for, although the northern *set* was trifling, from the 31st until we arrived very near Scilly; yet the wind, being both *scant* and *light*, we could never overcome the tendency of the current. Add to this, that the direction of the current, being much more *westerly* than *northerly*, we crossed it on so very oblique a course, that we continued in it a long time; and were driven, as it appears, near 30 leagues to the west, by it: for we had soundings in 73 fathoms, in the latitude of Scilly, and afterwards ran 150 miles, by the log, directly east, before we came the length of the islands. In effect, in running 120 miles, we shallowed the water, only nine fathoms.

We not only were sensible of the current, by the observations of latitude, but by *riplings* on the surface of the water, and by the direction of the lead line. The consequence of all

this was, that we were driven to the north of Scilly; and were barely able to lay a course through the passage between those islands and the Land's End.

Having no time keeper on board, we were unable to ascertain the several points, in this part of our track, and therefore can only approximate our longitude; and that but very coarsely. But according to what we learnt from our soundings, and from a vessel which had only just entered the current, it may be concluded, that the current, at times, extends to 60 leagues, west of Scilly; and also runs close on the west of those islands. However, the breadth of the stream, may probably be little more than 30 leagues; for we crossed it, as has been said, very obliquely; and perhaps, in the widest part.

The journal of the ATLAS East India ship, Captain COOPER, in 1787, furnishes much clearer proofs, both of the existence of the current, and of the rate of its motion: for having time keepers on board, Captain COOPER was frequently enabled to note the difference between the true, and the supposed, longitude; and it may be said, that this journal, by the means it affords of ascertaining the current, is highly valuable; as containing some very important facts, and which might have been entirely lost to the public, had not Captain COOPER marked them, in the most pointed manner.

I shall proceed to state, in abstract, the most important of the facts recorded in the journal.

The ATLAS sailed with a fair wind, and took her departure from the Isle of Wight, on the 25th of January, 1787; and on the 27th had advanced 55 leagues to the westward of Ushant; when a violent gale of wind began at south, and,

about 11 hours afterwards, changed suddenly to the westward. The gale continued through the four following days: on the 28th, it was generally W by S, and WSW; on the 29th, SW by W, or more southerly; and on the 30th and 31st, SSW, to SW by S.*

During this long interval, the ship was generally *lying to;* and with her head to the NW. On the 1st of February, the wind abated, but still blew from the south-westward; and the ship was kept to the north-west. The stormy weather returned again the following day, and continued, with little intermission, until the 11th; blowing from all the intermediate points, between south and WNW; but chiefly, and most violently, from the WSW, and SW. At intervals, on the 8th and 9th in particular, the journal remarks, that "*it blew a mere hurricane.*" On the 11th, the weather growing more moderate, and the wind favourable, the ship proceeded on her course, southward; being then two degrees and a quarter of longitude, to the west of Cape Finisterre, by the reckoning; but by the time keepers, more than *four degrees and a half.*

After the above abstract of the proceedings of the ship, I shall subjoin the following particulars; which are the most in point, to the purpose of the present discussion.

On the 27th, at noon, soon after the gale commenced, the longitude, by reckoning, agreed within 14 minutes of that shewn by the time keepers; the latter being the most westerly. This difference alone might well have arisen from

* In this, as well as in the former statement of the winds, I have allowed for the variation of the compass; that the application of it, to the quarter of the heavens, and to the chart annexed, (see Tab. XXI.) may be more easy and clear.

an error in the log, or even in the position of the needle point on the Isle of Wight, from whence the departure was taken; but it may also be owing to the westerly current, whilst the ship remained in it, on the 27th; if we admit that such a current prevails at all times, though in different degrees of strength. Here it is proper to remark, that in delineating Captain COOPER's track, on the chart, I have scrupulously adhered to the result of each day's work, of the reckoning, as I find it in his journal; contenting myself with inserting my own observations on the track, in this paper only; where they cannot mislead.

The longitudes pointed out by the time keepers on the 28th, 29th, and 30th, shew, that the increasing, though trifling differences, between the true longitude, and that by the dead reckoning, had amounted to 24 minutes only, on the 30th. At this time the ship was about 24 leagues to the WSW of Scilly; and, at 5 or 6 leagues to the SSE of this position, (that is, at 25 leagues SW by W from Scilly) they had soundings at 70 fathoms. This last particular is mentioned, to prove that the longitude shewn by the time keepers (8° 28′ west from London) was nearly the longitude in which the ship really was, on the 30th of January. That of St. Agnes (Scilly) is taken at 6° 46′.

The Atlas was now entered into the stream of the same current which occasioned so much delay to the Hector; but the course of the Atlas, being opposite to that of the Hector, it facilitated her progress; and also carried her clear of the south-west coast of Ireland.

On the 31st, the time keepers shewed that the ship had been

set very considerably to the westward of the reckoning; and by the 2d of February, at 3 in the afternoon, it appeared that she had been *set* two whole degrees of longitude to the west of the reckoning, since the 30th at noon: that is, in the course of 51 hours. (Here it may be proper to remark, that I have, throughout, reckoned according to *sea time;* that is, the day commences at noon.)

On the 3d of February, at noon, the time keepers shewed a further *set*, of 23 minutes of longitude, more than the reckoning gave, in the interval since the last observation, which was 45 hours; so that, since the 30th of January, 4 days only, the ship had been carried by the current, no less than *two degrees and* twenty-three *minutes*; and since the 27th, when the gale began, 2° 32′ of longitude; amounting, in these parallels, to ninety-nine marine miles. But here, the current appears to have totally left them: and it is very probable, that it even ceased before the time of observation, on the 3d: for the succeeding observations of the 5th, 6th, 7th, 9th, 10th, and 11th, although the strong westerly gales continued, come so near the longitude by the reckoning (deduced from the observation of the 3d) that the differences, which are sometimes to the east, and at other times to the west, may be with more propriety ascribed to errors of the log, than to a current; as may be seen by the two tracks on the chart. We may therefore conclude, that the current did not cease at the very point of time, when the observation of the 3d was taken, but probably some time before.

It appears then, that the Atlas experienced a westerly current, from a point about 24 leagues to the WSW of Scilly, (if

not earlier) to four degrees of longitude west of the meridian of Cape Clear,* in the parallel of 51°; where its effects were no longer perceptible. And, as no current was felt in the track southward, on the 11th; nor in any part of the track to the north-west, between the 3d and 10th; although it was felt nearly in the same line of direction, between the 1st and 3d; it may be inferred that the stream goes off to the north-west, between the aforesaid track, and the south-west coast of Ireland. It is much to be regretted that no observations appear on the 12th and 13th; which would have been decisive of its course.

I come now to two particulars of the case, which, I confess, perplex me exceedingly. The first is, that the current was felt, apparently in its full strength, on the fourth day after the commencement of the gale; which began at south, then changed suddenly to the west and WSW, and afterwards fixed in the SW quarter. This gale was felt between the 48th and 50th degrees of latitude, and, no doubt, extended its effects very far to the south and west; but what the state of the winds had been in those quarters, previous to the 27th of January, we are ignorant. The winds in the British Channel had been easterly, for three days preceding the gale: the fourth day, preceding, there had been strong gales at SW; and the five days preceding *that*, there had been chiefly light winds at west. According to this state of facts, we can only suppose that the current originated from a vast body of water, pent up in the Bay of Biscay, by violent gales of wind; first from the southward, eleven hours; then from a point or two to the south of west; and lastly, at south-west.

* Cape Clear is reckoned to be in long. 9° 25′ from London.

We are not to consider the water of this current, as having made the circuit of the Bay of Biscay; but as the *collective body* of *pent up* waters, in the Bay, running off along the SW coast of Britanny, and thence to the north-westward; preserving nearly the direction it had acquired, by running along that coast. And it may be conceived, that the frequent recurrence of westerly winds, keeps up a constant current in the Bay, and to some distance beyond it; although during the longest intermissions of these winds, the current may become so slow, as to be scarce perceptible.

The second particular which perplexes me, is, that no northern *set* is indicated by Captain COOPER'S journal: that *is to say, by the mode in which each day's log is wrought*; and which, in the formation of the chart, as is said before, I have strictly adhered to. It indeed appears to me very wonderful, that no northing should appear, when it seems to be the very same kind of current which carried the Hector so far to the northward. It is certain, that the state of the weather was such, as to preclude those nice attentions to the reckoning, which might enable us to detect any small differences, between the latitude by account, and that by observation; although the western *set* was too considerable to escape notice, and may even have been more than the statement sets forth. I cannot therefore, by any means admit, that there was no northing in the current through which the Atlas passed; first, because they had not observations of latitude, regularly; and lastly, because on the 31st of January, when *lying to*, 36 miles are allowed for 20 hours *drift*, to the north-west; which appears to me excessive. On that day they had no observation of latitude, and on the following

day, the observation shewed two miles northing; which however proves nothing. Again, on the succeeding day, (the 2d) in a most important point of the track, there was no observation of latitude.

In the Hector, precisely in the same track, and at the same season of the year, the current had, as has been observed, a considerable degree of northing in its course. On two days it was about 12 miles, each; on another day 13, and on two others, 9, and 8; and this, in weather very favourable for keeping a reckoning, and with observations of latitude, on every day save one; not to mention the strong circumstances of a visible *set* to the northward, indicated, as well by the lead line, as by the ripling on the surface of the water. It is in the nature of currents, to expand their streams or columns of water, after being projected into the ocean; and therefore, according to this law, the middle part of the stream should preserve its original course, in a greater degree than the borders of it; so that the middle part may run to the NW by W, whilst the eastern border may run more *northerly*, and the western border more *westerly*. It is certain, that in the Hector, we felt the northerly current much stronger, close on the west of Scilly, than further out; and it appeared by the distance we ran, after sounding in 73 fathoms, that the current must have set much more *westerly*, than *northerly*, the whole time.

The following remarks obviously occur, on the effect of this current.

1st. Whatever may be the breadth of the stream, (which is at present unknown) if a ship crosses it *very obliquely*, that is, in an E by S, or more southerly direction (as may easily

happen, on finding herself too far to the northward, at the first place of observation, after she gets into the current), she will, of course, continue much longer in it, and will be more affected by it, than if she steered more directly across it. She will be in a similar situation, if she crosses it with light winds; and both of these circumstances should be attended to. And if it be true, as I suspect it is, that the eastern border of the current has a more northerly direction than the middle of it, this also should be guarded against. I conceive also, that the stream is broader in the parallel of Scilly, than farther south. And here we may remark, that those who, from a parallel south of Scilly, have been carried clear of it to the north, when approaching it, in the night, may esteem themselves fortunate that the current was *so strong*; for had it been weaker, they might have been carried on the rocks.

2d. A good observation of latitude, at noon, would be thought a sufficient warrant for running eastward, during *a long night*: yet as it may be possible to remain in the current, long enough to be carried from a parallel that may be deemed a very safe one, to that of the rocks of Scilly, in the course of such a night; it would appear prudent, after experiencing a continuance of strong westerly gales in the Atlantic, and approaching the Channel with light southerly winds, either to make Ushant, or at all events to keep in the parallel of 48°, 45′, at the highest. If they keep in 49°, 30′, they will experience the whole effect of the current, in a position where they can least remedy the evil: but if in 48°, 45′, they are assailed by the north-west current, they are still in a position from whence a southerly wind will carry them into the

Channel. But all ships that cross the Atlantic, and are bound to the eastward of the Lizard, had better make Ushant, under the above circumstances, in times of peace. Or, at all events, why should they run in a parallel, in which they are likely to lose ground?

3d. Ships, bound to the westward, from the mouth of the Channel, with the wind in the south-west quarter, so that it may appear indifferent which tack they go on, should prefer the *larboard* tack; as they will then have the benefit of the current.

4th. I understand that the light house of Scilly is either removed, or to be removed, to the south-west part of the islands; or of the high rocks. This is certainly a wise measure; as the light should be calculated more particularly for ships that have a *long*, than a *short* departure; like those from any part of the European coasts, to the northward, or eastward. The light house ought also to be built very lofty. I am sorry to remark, that, as far as my observation has gone, this light has never appeared clear and bright, as a light to direct ships ought to do.

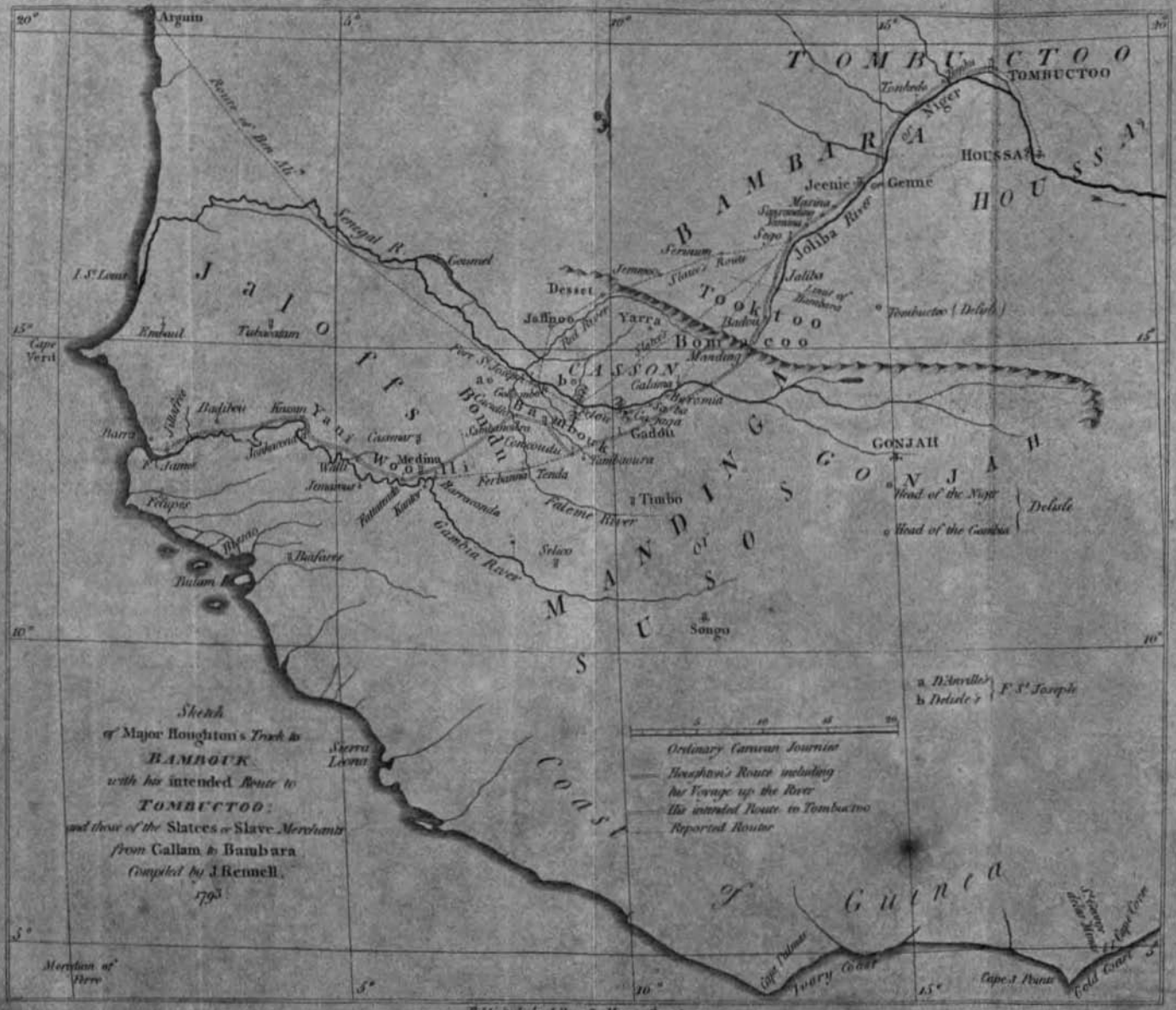
5th. It would be worth the attention of government (in my humble opinion) to send a vessel with time keepers on board, in order to examine and note the soundings between the parallels of Scilly and Ushant, at least; from the meridian of the Lizard point, as far west as the moderate depths extend; I mean such as can be ascertained with exactness, in the ordinary method of sounding. I have reason to suppose that our chart of soundings is very bad; and indeed, how can it be otherwise, considering the imperfect state of the art of marine surveying, at the time when it was made? A set of time

keepers will effect more, in the course of a summer, in the hands of a skilful practitioner, than all the science of Dr. HALLEY, during a long life; for who could place a single cast of soundings, in the open sea, without the aid of a time keeper? The current in question, must have disturbed every operation of this kind. It should be the task of the person, so employed, to note all the varieties of bottom, as well as the depths; the time of high and low water; setting of the tides, and currents, &c. Such a survey, skilfully conducted, might enable mariners to supply the want of observations of latitude, and of longitude; and, of course, to defy the current, as far as relates to its power of misleading them.

6th. It is certain, that the current in question may be somewhat disturbed by, or rather will appear to be blended with, the tides, at the entrances of the British and St. George's Channels; but it is obvious that the current will have the same effect, in setting a ship out of her course, as if no tide existed; because, whatever effect one tide may have, the next will nearly do away. But there are two particulars, well worth ascertaining; and these are, first, the point at which the two tides of St. George's, and of the British Channel separate, on the west of Scilly. And secondly, what degree of northing one of the streams has, more than the other. Because a ship, in approaching Scilly, from the west, on a flood tide, and keeping in a parallel which may be to the *north* of the point of separation of the two tides, (and consequently in the tide stream of St. George's Channel) may be thrown too far to the north; although, had she been far enough to the west, to receive the effect of the next ebb, this temporary, and alternate derangement of the course, would

have had no ill effect; or even have been noticed. But admitting that a tide, with any degree of northing in it, does take place, a little to the west of Scilly; this will furnish an additional reason for keeping in a southern parallel.

SKETCH
of the Northern Part of
AFRICA:
Exhibiting the
GEOGRAPHICAL INFORMATION
Collected by
The AFRICAN ASSOCIATION.
Compiled by J. Rennell.
1790.
Corrected 1793.


Sketch
of Major Houghton's Track to
BAMBOUK
with his intended Route to
TOMBUCTOO:
and those of the Slatees or Slave Merchants
from Callam to Bambara
Compiled by J. Rennell.
1793
Ordinary Caravan Journies
Houghton's Route including
his Voyage up the River
His intended Route to Tombuctoo
Reported Route
Published by J. Rennell May 20th 1793

ELUCIDATIONS

OF THE

AFRICAN GEOGRAPHY;

FROM THE

COMMUNICATIONS

OF

MAJOR HOUGHTON, AND MR. MAGRA; 1791.

COMPILED IN 1793.

LONDON:

PRINTED BY W. BULMER AND CO.
Shakspeare Printing-Office.
1793.

ELUCIDATIONS, *&c.*

THE communications of Major Houghton, and of Mr. Magra, (his Majesty's Consul at Tunis), contain some curious particulars relative to the course of the NIGER river (as we have been accustomed to call it). These accounts, the one collected at Tunis, the other in the neighbourhood of the river of Senegal, agree in determining the course of the Niger to be from *west* to *east*; as well as in fixing the place of its source at a very distant point westward from TOMBUCTOO. The expectations of Major Houghton, were, that the source, and even the navigable part of that river, would be found at no great distance on the east of the country of BAMBOUK; from whence his last dispatch* was forwarded. And I confess that the information, collected, and transmitted by him, has left the same kind of impression on my mind. I shall therefore bring together the scattered notices that appear in the above communications, of various dates; for the information of the ASSOCIATION, on this particular head:

* Dated the 15th July, 1791.

and first I shall detail such parts, as relate to the routes between MEDINA, the capital of WOOLLI, the station of Major Houghton on the river Gambia; and Tombuctoo: which information, although unconnected in point of form, and by no means complete in itself; yet appears to me to contain much of that kind of evidence, which arises from a comparison and combination of circumstances.

The Major, after ascending the river Gambia to Fattatenda, in the neighbourhood of *Medina*, struck to the ENE to *Cacullo*, on the river Falemé, situated in the route to Tombuctoo. His computed distance on this land route, was about 150 road miles: for which, perhaps, 108 geographic miles, in direct distance, may be allowed. The interval between the two points of Medina and Cacullo, is quite new ground, in a geographical light: and it differs in point of extent, about 27 miles, from M. D'Anville's map of the Senegal and Gambia rivers; taking for granted that Medina, which does not appear in any former map of this tract,* is 26 miles from Fattatenda, according to Major Houghton's report; and that it is also within a few miles of the Gambia river; as by circumstances, it ought to be.†

* *Medina*, amongst the Arabs, signifies CITY.

† The bearing and distance on D'Anville's map, from Fattatenda, to *Ca-*

Cacullo then, is the fixed point, from whence this part of our geography is to set off; and is about 7 or 8 miles to the north of *Sambanoura;* which appears in M. D'Anville's general map of Africa. Its latitude was found by Major Houghton, to be 13° 54′: and it agrees well with M. D'Anville's map. In point of relative position to the sea coast, it is not far short of 400 geographic miles, in direct distance, above the mouth of the Gambia river, on the west; and 370 from *Sierra Leona*, on the SSW.

Here it is proper to remark, that through the total want of observations of longitude, or of any accurate means of determining the distances between places that lie nearly east and west from each other, in the interior parts of Africa, we are compelled to rely on authorities that are much too vague to be adopted, but in cases of necessity; such as the tracings of crooked rivers, like those of Senegal or Gambia: or caravan journeys, without any specification of the number of hours employed in travelling. However, on a former occasion, I made no scruple to adopt M. D'An-

cullo, is about East 30° north, 100 geographic miles. But it appears, that the upper part of the course of the Gambia river, should be placed more to the north than his map gives it; and that Fattatenda and Cacullo, should be farther asunder by about 27 miles.

ville's position of fort St. Joseph on the Senegal river; as it accorded with Ben Ali's report* of its being 40 caravan journies from Arguin; taking those days at 13 geographic miles, in direct distance; according to a canon which I established (rather vaguely), for the reducing of caravan travelling, to direct distance. †But since the inquiry that I have made into the rate of travelling of camels on the Arabian Desert,‡ I find that 14 miles may be allowed; and, in consequence, 40 geographic miles should be added to the sum formerly taken; by which correction fort St. Joseph ought to fall at more than 40 geographic miles to the eastward of the position adopted for it in the map, which I had the honour to compile for the Association, in the year 1790.

It appears also that M. Delisle, in his map of the courses of the Senegal and Gambia rivers, published in 1726, allows a yet greater space between fort St. Joseph and the sea, than the corrected distance gives; for he allows about 85 geographic miles more than M. D'Anville. And as the result of Ben Ali's 40 days from Arguin, at the corrected

* Proceedings of the African Association, 1790, page 218.

† Ibid. page 219.

‡ Philosophical Transactions, Vol. lxxxi, p. 129.

rate of 14 miles, falls as nearly as possible between D'Anville's and Delisle's; we shall, by allowing the corrected rate, adopt also the mean between these two celebrated geographers. Fort St. Joseph will therefore stand at about 42 geographic miles to the eastward of its former position. And we shall find in the sequel, that this will agree better with the interval between fort St. Joseph and Tombuctoo, than the former position did.

Cacullo, which is situated on the Falemé river, is a geographical point, deduced from fort St. Joseph, in the geography of M. D'Anville, and in the Travels of Labat: and therefore must of course be removed farther to the east, with it: but as we have just remarked, that M. D'Anville allowed too little distance between Major Houghton's station on the Gambia, and Sambanoura on the Falemé river, it is obvious that the positions on the Gambia, do not require to be removed so much farther to the east, as those on the Senegal river.

There appear to be two distinct routes from Medina, in Woolli, to Tombuctoo: of which, the northern again branches out into several others, after passing Bambouk and fort St. Joseph. It was by one of these northern routes that

Major Houghton meant *originally* to proceed: and by that particular one, which leads to the Senegal river at Gajaga (the *Jaga* of D'Anville and Delisle) situated about as far above Sambanoura, as this last is above Medina.* From Gajaga, his route would have been along the southern bank of the Senegal river, by Saba and Boromia;† and then crossing it to Galama, would have passed through the country of BAMBARA, to Tombuctoo: but of the particulars of this part of the route, he was uninformed.

Two other branches of the northern route, used by the *Slatees* (or slave merchants), are the following: one crosses the Senegal river at Golombole, a little above Dramanet (which is only another name, and probably that used by the natives, for fort St. Joseph), and thence along the *Red* river by JAFFNOO, DESSET, *Sego*, *Masina*, and *Genné*, or *Jeenie;* which last, is the capital of BAMBARA, and situated on the Niger, 25 days navigation, against the current, from Tombuctoo. All of these routes pass through the country of BAMBARA. A second route of the *Slatees* crosses the Senegal river at *Loutou*, near the falls of *Felou* (between *Ga-*

* Houghton; letter of 27th April, 1791.

† See D'Anville and Delisle's maps.

jaga and fort St. Joseph) and thence through CASSON, the original country of the FULLAS, to BAMBARA.*

The southern route from Woolli to Tombuctoo, was communicated to Major Houghton by SAMBOO, king of BAMBOUK; and is as follows:

From *Fattatenda* on the Gambia, by *Barraconda*, on the same river, to *Ferbanna-Tenda* (not the capital of Bambouk, but situated on the Falemé river, about 43 miles above, or to the southward of, Sambanoura); thence by several places, whose names are unknown to us,† to *Concoudou* (in Delisle's map) and thence, by several others, equally unknown, ‡ to GADOU, a province in the eastern quarter of Bambouk: and here, our knowledge on the map, ends. *Gadou*, or *Gadoua*, may be 100 miles, or more, to the E by S of Sambanoura: and is found both in D'Anville's and Labat's maps. The remaining points in this route, are MANDING (understood to

* The reader will find, besides the old general map of the northern part of Africa, now corrected for the purpose of explaining this Memoir, a map on a more extended scale, serving to explain the particulars of these routes.

† They are, Tendeba, Camina, Gibedou, Courdou, to Concoudou.

‡ Namely, from Concoudou, to Sillore, Silloumana, Concomania, Gangaran, to Gadou.

be part of the country of MANDINGA), Badou, Jaliba, *Sego* (a point also, in the northern route), Yamina, Sansanding, Sahra, *Jeenie* (capital of Bambara), Tonkedo, and Tombuctoo.

Unfortunately, no idea is given either of the distances on these routes, or of the lines of direction; further than that Major Houghton says, that the Joliba river runs from *south* to *north*, before it reaches Jeenie; and then *eastwardly* to Tombuctoo:* therefore, to supply, as well as we can, these defects, we can only have recourse to our former position of Tombuctoo, placed on the authority of several routes, and approaching within 30 miles† of the position fixed by M. D'Anville; doubtless, on the foundation of materials, which were perfectly distinct from those collected by the Committee. Nor will the correction of the caravan rate of travelling, occasion any great alteration in its position; since it was determined by very long lines of distance; so long indeed, as to go beyond the reach of our experiments: but it may, however, be inferred, from such experiments as were made, that Tombuctoo lies *somewhat* more to the west, that

* Letter of the 15th July from Ferbanna.

† In his general map of Africa, 1749. See also the proceedings of the African Association, pages 225 and 226.

is, nearer to fort St. Joseph, than is stated in the map. On the other hand, the information concerning its distance from Bambouk, transmitted by Major Houghton, will not admit of its being placed more to the west: therefore it is allowed to remain in its former position, being about 42 caravan days from the capital of Bambouk (Ferbanna), and in a N E by E direction, both from that, and Medina.

It is probable, that the route of the *Slatees*, through Casson, may lie to the left, or northward of this line of direction: and it is equally probable, that the early part of the southern route, taking it up at Ferbanna-Tenda, deviates considerably to the *right*, or southward of the direct line. Madegammo, Major Houghton's new guide from Bambouk to Tombuctoo, told the king, that he should employ no more than 90 days in going to Tombuctoo, and returning again to Bambouk: which, as he would no doubt make some stay there, to refresh himself and his beasts of burthen, and to allow Major Houghton time to make observations; implies a distance of less than 45 days; perhaps 42, at most. Ben Ali reports it to be 48 from fort St. Joseph, which place is about the same distance from Tombuctoo, that the capital of Bambouk is; but Ben Ali went by the Jaffnoo and Desset route, the most circuitous of any: and I should, at all events,

prefer the report of Major Houghton's guide, to that of Ben Ali, who spoke from a recollection of twenty years.

Major Houghton, in a *private* letter from Medina, says, that he shall be at Tombuctoo in a month, from that place; which would reduce its distance from Bambouk, much below any of our calculations (that of M. Delisle excepted); but I conceive that this statement was calculated merely to soothe the person, to whom it was addressed: and that we are by no means to receive it as a geographical document.

Jeenie, or *Genné*, (for Mr. Magra and Major Houghton spell the name of the capital of Bambara, differently) occurs, both in the northern, and in the southern route: and therefore we may infer, that it is not far out of the direct line between Bambouk and Tombuctoo; which, as we have said, is about NE by E and SW by W. It is also situated on the river of Tombuctoo, called in Major Houghton's account, JOLIBA (in other words, the NIGER, or a principal branch of it): for Mr. Magra's information, collected from Hajy Asif, states it to be 25 days navigation *above* Tombuctoo; and consequently on a continuation of the same river that passes by Tombuctoo. We learn also from the same authority, that although the navigation required 25 days against the stream,

to Jeenie, the land journey might be performed in ten days: and here we establish a point on the Niger, 10 land journies to the southwest of Tombuctoo. We find also, the name *Masina* in Major Houghton's account; *Masheena*, in Hajy Asif's; belonging to a large town, on the same river, at 10 days navigation above Tombuctoo: which coincidence of names, and general positions, ought to warrant *some degree of confidence* in the general scope of the intelligence; although want of language, or of memory, may have occasioned some errors in the particulars.

GADOU we have supposed to be 100 miles or more to the eastward of Sambanoura; and beyond this point, the maps give us no information: so that the interval between Gadou and Jeenie, remains to be discussed. The king of Bambouk informed Major Houghton, that MANDING (or the country of MANDINGA, as we have it), lay beyond Gadou: that is, evidently, to the eastward of it. The Major also learnt from other authorities, that GADOU and MANDING were neighbouring countries to Bambouk. Mandinga, or the country of the Suso's,* is indeed very extensive; and appears to embrace that of Bambouk, on the south, south-east, and east.

The shereef MAMADOO, whom Major Houghton met at

* The word is so spelt in Major Houghton's letter (27th April); *Souses* in D'Anville.

Medina, and with whom he had formerly some intercourse at Morocco, and whose ordinary place of residence, is Tombuctoo; told the Major that either at MANDI, or at *Jeenie*, he might embark on the JOLIBA river, and proceed *with the stream* to Tombuctoo: moreover, that there were *decked* vessels on that river. The Major tells us in another place, that by *Mandi*, *Manding* was meant.* And if this be really the case, the source of the *Joliba* (our *Niger*) cannot be far removed from the eastern frontier of Bambouk. Major Houghton certainly conceived the fact to be so, both by his reasoning, and by his intention† (in his letter of the 15th July, from Ferbanna, the capital of Bambouk). And his guide, Madegammo, confirms this opinion strongly; for he says, that large vessels navigate the river, from *Manding*, to *Jeenie*, and *Tombuctoo*. We may also remark the name *Jaliba*, in the king of Bambouk's account of the route; it occurring very soon after *Manding*: possibly it may mean either the place where the route led to the side of the Joliba‡ river; or to the place of embarkation on it.

* In his Letter, 15th July, 1791.

† He had now determined on the southern route, pointed out by the king of Bambouk: meaning to get into that route at *Concoudou*, which place may be found in Delisle's map of Senegal. According to the order in which the king recited the names, *Concoudou* should lie between *Ferbanna-Tenda*, and *Gadou*: and the maps confirm it.

‡ Joliba, or Jaliba, in the language of Mandinga, signifies *the great River*.

Let us now examine the information to this point, communicated to Mr. Magra, at Tunis, by the traveller Hajy Asif, who had resided 13 years at Tombuctoo; and who had also ascended the Niger, through its whole navigable course above that city: and we may add, whose intelligence is totally unconnected with Major Houghton's.

He says, that the river of Tombuctoo is traceable to the country of BOMACOO, 38 journies by water, against the stream, from Tombuctoo. That he has himself made that voyage. That the country of BOMACOO abounds with gold (agreeing with Major Houghton's description of BAMBOUK): that it is no more than 20 days journey from the English settlements on the sea coast: and that the river springs from a very high ridge of mountains. This intelligence moreover, appeared so novel and interesting to Mr. Magra, that he questioned Hajy Asif a second time, and received similar answers. He also said, that in ascending the river, the sun rose at the back of his head, and set in his face: but although this shews a course that had much *westing* in it, yet as the route lay *within the tropic*, nothing particular can be inferred from it, unless the season was known. There can be no doubt, from the circumstances relating to Jeenié, but that the Niger runs to the north-east,

from that point to Tombuctoo:* and if *Manding* be meant for *Mandinga*, of which there can be little doubt, the whole course of the river, from its head to Tombuctoo, must be nearly the same.

There appears indeed too short a distance given between Tombuctoo and Bomacoo, to answer to the interval of space between Tombuctoo and Bambouk, according to our present ideas of the geography. For, 38 days navigation against the current of a river cannot be supposed equal to more than 26 or 27 caravan journies in direct distance:† and we have a kind of a rule given us, by what Hajy Asif says; that although he has gone up the river to Jeenié in 20 days.‡ yet he has gone the same distance by land in ten days. We

* Major Houghton says "the river runs from S to N a little above Jeenié, where it turns to the east, to Tombuctoo." Letter 15th July, 1791, from Bambouk.

† It must be a crooked inland navigation that requires three days to perform the same quantity of direct distance that a caravan goes through in two days; allowing 15 geographic miles for each day, on a journey of 40 days.

‡ Hajy Asif states the distance of Jeenié from Tombuctoo, at 25 days navigation: but he said also, that he had *once* gone, in 20 days. We must here recollect that the periods required, must be very different in the different seasons, according to the state of the river, or the prevailing winds: and if inundations take place, the difference may be still greater. [See Memoir of the Map of Hindoostan, under the article, *Inland Navigation*.

are not informed, however, whether these are meant for *caravan* journies, or *ordinary* ones, which may be taken at one third more than those of the caravan.

After allowing 27 days for the distance of the source of the Joliba or Jaliba river, from Tombuctoo, we have still an interval of distance equal to 15 caravan days to account for, between the mountains at its source, and Bambouk: and out of these 15, Gadou appears to be little more than 6, from the capital of Bambouk: so that 9 remain between Gadou and Manding, where the head of the Joliba is said to be. It may be objected as improbable, that in such a space, no name of any town or district, appears, in the king's enumeration of places on the road. But to this may be answered that between Fattatenda and Ferbanna-Tenda, no intermediate place is mentioned, although they appear to be 8 journies asunder: so that no inconsistency appears *here;* although there is much difficulty in referring *Bomacoo* to *Bambouk*, whilst other countries intervene, and those of considerable extent, according to general report. But considering the imperfect state of our knowledge of the subject, I shall not take up the time of the Association, with attempting to reconcile these apparent differences: and shall only beg leave to remark, that although by the context, Bo-

macoo should be nearer to Tombuctoo, than Bambouk is described to be, by our geography; yet several circumstances seem to prove that Bambouk and Bomacoo, are *one* and the *same* country; such is that of the similarity of names; the great plenty of gold, in the countries respectively described by Major Houghton, and Hajy Asif, under those names; together with the report concerning the position of Bomacoo; which is said to be within 20 days journey of the European settlements on the sea coast. To this we may add, the quarter from whence the river flows, which answers to that in which Bambouk is situated. We are also apprised of the loose manner in which distant nations are accustomed to think, and to speak of, each others boundaries; therefore, Bambouk may, in the ideas of the people of Tombuctoo, be extended much further to the east, than we have been accustomed to think.

One very strong point in this argument, is, that the several reports of king Samboo, the shereef Mamadoo, and the guide Madegammoo, agree in saying that the river which runs by Tombuctoo, rises at or near *Manding*; which appears unequivocally to be a part of the country of *Mandinga*, or that of the Susos: and probably the eastern frontier of it towards Bambara. And as Mandinga is well known to join

to the country of Bambouk, and even to extend *beyond* it, in respect of Tombuctoo, we are certain at least, that the Joliba or Niger, springs from a country, which has a part of its territory as far removed from Tombuctoo, as Bambouk is.

No particulars concerning the course of the Senegal river, are known, above the falls of *Gouinea*, near the eastern frontier of Bambouk: unless that, as the middle route of the Slatees from Bambouk to Tombuctoo, lies for some distance along its banks, a course from the north of east, may be inferred, as far as Galama; which D'Anville places at 160 geographic miles above Gouinea; but Delisle, (I think with more appearance of probability) at no more than 40. Above Galama, D'Anville supposes the river to come from the east; but Delisle from the ESE. Either of these, carry it clear of the supposed head of the Niger; but we possess no kind of authority for determining which of the two is right.

Delisle also considered the space between Bambouk and Tombuctoo, as being much more contracted than the latter maps have made it. Delisle probably went into extremes: but I suspect that the two countries in question do really

lie much nearer to each other than the distances, set forth in the present documents, authorize us to believe.

The country of BAMBARA, of which Genné or Jeenié, is the capital, occupies most of the tract along the upper part of the course of the Niger or Joliba river: reaching (according to Hajy Asif) within 6 water journies of its source. DESSET, or TESSET, and JAFNOO, are situated to the west of it. Major Houghton speaks of Bambara as a country immediately beyond CASSON:* which, if true, proves that Bambara approaches near to MANDINGA, also: and is in favour of our supposition concerning the proximity of Bambouk to Tombuctoo.

The Joliba river receives several considerable streams from the west, before it reaches the neighbourhood of Tombuctoo; where, according to the shereef MAMADOO, it divides into two branches, the smallest of which passes close to Tombuctoo, whilst the main branch proceeds to HOUSSA, a very considerable city, situated according to his report, a few days journey from Tombuctoo.

Having in some degree, approximated the position of the

* Letter of the 27th April, 1791.

source of the Niger; and also ascertained its course to be from *west* to *east*; our next head of inquiry will naturally be, concerning its future course, and final exit. Major Houghton, as appears by his correspondence, almost flattered himself that he should find in this river, the remote source of the Nile; or that branch of it denominated the White river: however, it is improbable, in every respect. The distance of 1800 geographic miles, in a direct line, from the source of the Joliba to the place of influx of the White river; great as it certainly appears, is not so improbable a fact, as that the Nile, after receiving so great an accession of water, as that brought by the Niger and its tributary streams, collected in a course of 1800 miles, should not be a river of much greater bulk and depth than it manifestly is. In the next place, we understand that the river of *Cashnah*, runs to the *west;* which if true, we ought to expect a lake, or receptacle common to both rivers (that of Cashnah and Tombuctoo) between the two cities of these names. And lastly, the river of Tombuctoo is said to be swoln (by the periodical rains) to its highest pitch in August: that is, at the time when the Nile is also at its highest pitch in Egypt. Now, the waters of the Tombuctoo river, would require a full month to run from that country to Egypt: and therefore the swelling of the Nile, appears to be more imme-

diately the effect of the rainy season in Abyssinia. Mr. Bruce informs us, that the greatest quantity of rain falls there in July and August: this water, we are assured, is carried off by the Nile, as the communication is a point ascertained: and it has not half the distance to run, from Upper Abyssinia to Egypt, that the waters of the Tombuctoo river, have, from that country to the place of junction of the White river: which junction is even within the country of Abyssinia.

We ought not to omit a curious circumstance relating to the seasons, in that part of Africa visited by Major Houghton: for, it appears, that the changes there, are very similar to those in India, styled the monsoons. He says, the dry easterly winds were over, at the latter end of April; when the sea breezes, or south-west winds began to set in. Moreover, when in Bambouk, he says, that the rainy season had set in, the 3d of June: and that it would be over in September. Hajy Asif informed Mr. Magra, that at Tombuctoo the rainy season begins in August, and would last 40 days. This carries it to a period rather beyond probability: and possibly the time was given vaguely from recollection, at a distant period of time: but Major Houghton's account is likely to be accurate, as given on the spot, and whilst his

senses were affected by the very circumstances he described. It may admit of some doubt, how far the seasons in Bambouk and Tombuctoo may agree, at the distance of several hundred miles, and separated by high mountains; but so great a diversity as two months, in the commencement of the rainy season, appears improbable; especially as the periods of commencement and termination, agree so nearly in Bambouk and in Abyssinia.*

Concerning the precise situation of Houssa, the accounts of different travellers, are in some respects, contradictory. But those who allow Houssa to be a city (for we shall find that some reckon it a country only), say that it lies on, or near, the great river that passes by Tombuctoo. The shereef MAMADOO informed Major Houghton that Houssa lay on the Joliba river; or, in other words, on the same river that passes by Jeenié and Tombuctoo: and at a few days voyage *below* the latter. This account seems very positive; and agrees, as Major Houghton says, with other accounts that he had received, concerning it. It does not appear, however, that

* About $2\frac{1}{2}$ inches of rain fell in May; $5\frac{1}{4}$ in June; $12\frac{1}{4}$ in July; $12\frac{3}{4}$ in August; 5 in September; on a mean of two years, in Abyssinia. [Bruce's Travels, vol. iv. near the end.] In Bambouk, &c. the rains began 3d June, and were expected to end in September.

the shereef had ever visited Houssa: but from the degree of credit given him by Major Houghton, his account certainly ought to have weight. The question then is, in what direction does the river run, from Tombuctoo? but this, I believe, cannot be answered, from any documents that the Association is in possession of.

From all that has yet appeared, the great river, designed by us under the name of NIGER, communicates with the country of Cashnah, as well as that of Tombuctoo, and Houssa: but whether by a continuous course, or by the intervention of a lake or inland sea, we know not: for what the particulars of its course may be, through an interval of 700 miles, or more, it is impossible to guess. Its wanderings may be great and various; and may admit the position of Houssa to fall either to the north or south of Tombuctoo. But I should expect to find it on the south or south-east; because this supposition agrees best with Mr. Magra's communications; and does not contradict Mamadoo's. Shabeni's account of the bearing,* must be laid entirely out of the question; because, although he says in one place, that Houssa lies on the *south* of Tombuctoo; he in other places gives such an idea of the direction of his route, in respect

* In Mr. Beaufoy's MSS.

of the rising and setting of the sun, as shews either a NW or SW bearing; according to the season.

Mr. Magra's Information, obtained from merchants who had visited the central parts of Africa, and were then at Tunis, describes Houssa as a *country*, not a *city*; and they all place it in a *south* direction from Tunis: that is between Cashnah and Tombuctoo. One person says it is a considerable empire: the country of the Negroes. Another, that it is the *negro* name of the same country, which the *Arabs* call Soudan. Shabeni says, that Houssa is included in Soudan: but as I conceive Soudan to be a *region*, which includes several political divisions of country, and Cashnah amongst the rest; this proves nothing, as to the particular position of Houssa. But it is clear by these accounts that there is such a *country* as Houssa: and equally so, from Mamadoo's, and from Shabeni's reports, that there is a city of the same name, likewise. The Tunis travellers might either have heard of, or visited the *country* of, Houssa; although they might not have heard of the *city* of that name. And this is more probable; if the name of Houssa be extended to a whole region. It is not uncommon for us, to extend the name of a *province* or *kingdom*, to a *region*: India, Tartary, Barbary, and Guinea, may severally convey

the same collective idea to us, that HOUSSA, or SOUDAN, does to an African.

Sidi Cassem, whom Mr. Magra styles "*an intelligent man*," and who speaks of Houssa as a country, says, that HE was 60 days in going from Agadez to Houssa, *through Cashnah*.

Upon the whole, we ought, perhaps, to suspend our judgment on the geographical position of Houssa, until we are in possession of more authentic documents concerning it.

These communications do not, in any degree contradict the former ones, as far as they went towards establishing some capital geographical points, in the middle and northern parts of Africa. On the contrary, the positions of *Cashnah* and *Agadez*, are rather confirmed, by the notices transmitted by Mr. Magra, from Tunis: for Agadez, by his account, being 48 journies of the caravan from Godemshe, and this last place 23 or 24 from *Tunis*; Agadez will stand at about 976 geographic miles from Tunis: and it will be found at 995 on the map, inserted in the proceedings of the Association, 1790. Cashnah, indeed, by the present account, is said to be 22 days from Agadez; and thus would stand

at 1300 from Tunis; whilst the former account, gave 1230: but even this difference is not to be regarded, in such an extent of distance. The bearings transmitted by Mr. Magra, would remove both of these places more to the west, or nearer to Tombuctoo, than they stand in the map.

Godemshe is said to bear S 4° E from Tunis; the distance 23 to 24 days: the mean of which, according to my former proportion of 15 miles *per* day, in direct distance, gives 352 miles from Tunis. As the travellers report, that the road, after passing *Cabes*, leads *more to the right*, Godemshe should lie to the west of the meridian of Tunis.* Concerning this, we must however remain in uncertainty, until we know the distance of Godemshe, from Tripoly, or Mesurata.

Fifty-three journies are given for the interval between Godemshe and Tombuctoo, which by the construction is 880 miles, and would require near 16 miles for each journey; although the rate, on so long a line of distance, is taken at 13 in the former Memoir.† Here it is proper to re-

* Or it may be, that the change in the directions of the sea coast, may have led the travellers to suppose, that a change took place in the direction of the route. (See the map.)

† Proceedings of the African Association, 1790, page 219.

mark, that the same kind of error appeared, in the application of the *canon*, to the interval between Tombuctoo and Mourzouk, on a former occasion; and where, on a journey of 64 days (as reported by Ben Ali) 15 miles *per* day were required. It is probable, therefore, that I shortened the horizontal distance too much, on the long lines of distance; as indeed, the experiments on the Arabian Desert, seem to prove.*

J. RENNELL.

London, May 11th, 1793.

P. S. When the above was written, it had escaped my knowledge, that intelligence had been received from Major Houghton dated 1st Sept: 1791: that is, about 6 weeks after the date of his letter from the king of Bambouk's capital. The intelligence came, in a very short note from the Major, to Dr. Laidley, on the Gambia river. Being written in pencil, it was almost obliterated, before it came to the Doctor's hands. The name of the place from whence the note was dated, appeared to Dr. Laidley, to be *Simbing*. Short as the note was, it contained the intelligence of Major Houghton's being in good health: and also of his having been robbed of all his goods.

* Philosophical Transactions, vol. lxxxi. page 129.

I cannot trace out any such place as *Simbing*, either in the existing maps, or in any part of the intelligence communicated to the Association : but at the distance of time at which it was written, from the date of the former dispatch, it may be supposed that the Major was far advanced on his way to Tombuctoo.

If we could suppose that a part of the initial had been obliterated, it may have originally been *Timbing :* in which case, it may answer to the *Timbi* of D'Anville, placed at about 8 journies short of Tombuctoo : but this appears very uncertain.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