

IX.

ON THE

SOURCES OF THE GANGES,

IN THE

HIMÁDRI OR EMODUS.

BY H. T. COLEBROOKE, ESQ.

IN presenting to the Asiatic society, the interesting narrative of a journey to explore the sources of the *Ganges*, I shall prefix to it a few introductory observations to explain the grounds, on which the undertaking was proposed by the late Lieut. Colonel COLEBROOKE, by whom it would have been performed in person, had he not been prevented by the illness, which terminated in his death.

On examining the authority, upon which the course of the *Ganges* above *Haridwár*, has been laid down in the geographical charts now in use, it appeared to Lieut. Colonel COLEBROOKE, that the authority was insufficient, and the information wholly unsatisfactory. The early course of the river, as delineated in all the modern maps of *Asia and India*, is taken from D'ANVILLE's correction of the *Lama's* map, modified however, in RENNELL's construction, upon information collected by the missionary TIEFFENTHALER. That the *Lama's* delineation of the *Ganges* was totally undeserving of the confidence which has been placed in it, will be apparent from a brief review of its history.

A map of *Tibet*,* which had been constructed by persons in the retinue of a *Chinese* envoy, was put into the hands of *Father REGIS*, one of the missionaries at *Pekin*, in 1711. Upon his report of its defects, the places being laid down from common estimation, without any actual measurement of distances, the *Emperor KANGHI* resolved to procure one more accurate and satisfactory. With this view, he sent into *Tibet* two *Lamas*, who had studied geometry and arithmetic in a *Chinese* college, patronised by his third son. They were ordered to prepare a map of the country, from *Si-ning* to *Lasa*, and thence to the source of the *Ganges*; and were enjoined to bring some of the water of that river.

The map, which they executed, was delivered to the missionaries for examination in 1717; and from this, compared with itineraries and other information, the missionaries prepared the map of *Tibet* which is published in *DU HALDE*'s description of *China*.

While the *Lamas* were engaged on their survey, a revolution took place in *Tibet*, which was invaded with temporary success by the king of the *Eluths*. The country of *Lasa* was ravaged; the temples were plundered; and all the *Lamas*, who were found, were put into sacks and thrown upon camels, to be transported into *Tartary*. The two *Lamas* employed in making the map of *Tibet*, narrowly escaped the fate of their brethren. On the first rumour of the incursions of the ravagers, they hastened the conclusion of their work; and they contented themselves with making a map of the source of the *Ganges* and the countries around it, upon oral information, received from *Lamas* inhabiting the neighbouring temples, and upon written notices found at the grand *Lama*'s

* *Observ. geogr. and hist. sur la carte du Tibet: dans l'hist. de la Chine*, 4. 570, &c.

at *Lasa*. They omitted however to take the latitude of mount *Kentaissé* or *Kanieshan*, (so the *Chinese* name the chain of mountains which runs to the west.) They even omitted the latitude of the temple where they halted, and whence they inquired the course of the *Ganges*, which flows from the western side of that mountain. The *Jesuits*, therefore, considering this as a capital defect, were desirous that the map should be re-examined by a learned geographer in *Europe*: and that task was accordingly undertaken by *D'ANVILLE*.

In the prosecution of the task, he was led, by obvious reasons, to remove the head of the *Ganges*, from latitude $29\frac{1}{2}^{\circ}$, which is its place in the *Lama's* map, as published by *DU HALDE*, to a more northerly position, and carried it as high as 32° nearly. But he preserved, and even enlarged, the sweep given to the river in the *Lama's* delineation of its course, and carried the northern branch of it still higher, to latitude 36° nearly.

In Major *RENNELL's* first map of *Hindustan*, *D'ANVILLE's* construction was in this instance copied almost exactly. Major *RENNELL*, however, was not insensible to the unsatisfactory character of the authorities, which *D'ANVILLE* followed; and, in his memoir published in 1783, declared his distrust of those materials, which, for want of better, he had been under the necessity of employing; and intimated a suspicion, that the *Ganges* does not make so large a sweep to the north-west as has been given to it.

ANQUETIL DU PERRON had previously, in 1776, pronounced the *Lama's* work to be faulty, erroneous, and in short unworthy of credit. It is needless to repeat his arguments; which are forcible and con-

vincing, rising naturally out of the account given of the *Lama's* survey by its publishers. It is indeed evident that the sources and subsequent course of a river could not be laid down by the ablest geographer, with any approach to accuracy, from oral information, collected on the opposite side of a mountain, or rather chain of lofty mountains, in which it was said to take its origin. That such information, hastily gathered by inexperienced geographers, as the *Lamas* were, must be grossly inaccurate, seems indisputable. They do not pretend to have seen any part of what they here describe. Their route, as traced in DU HALDE's map of their survey, does not approach nearer to their celebrated lake *Mapama* than a quarter of a degree, and terminates at a mountain marked *M. Kentais*; which, as before remarked, is the name of a chain of mountains, known to the *Chinese* as the western range in *Tibet*, and which is exhibited in DU HALDE's map, and in the still ruder copy of the *Lama's* original delineation, published by SOUCIET,* as intervening between their last station and the lake in question. In short, all that is fairly deducible as authentic information, is, that the *Lamas* reached the chain of mountains which forms the south-western boundary of *Tibet*; and halting at the foot of the range, learned, from the inquiries which they there made, that the *Ganges* takes its rise in the opposite side of that chain of mountains. But the whole of their sketch of the river's course, from the 36th degree of longitude (from *Pekin*) where their route terminates, to the 43d, in which they make the two furthest branches of the *Ganges* turn due south after a westerly course, and thence return by an easterly course to the same longitude, with little difference of latitude, must be deemed vague and imaginary,

* SOUCIET, observations, vol. 1. p. 138 and 208. pl. 8. fig. 5. and *Bernoulli*, vol. 2. Carte generale, fig. 6.

being at best founded on oral information, and very imperfect notices, hastily collected in a season of danger and perturbation.

ANQUETIL DU PERRON, who, as before observed, rejected, on good grounds, the *Lama's* authority for the sources of the *Ganges*, published in 1784, the result of the geographical researches of father TIEFFENTHALLER, a *Jesuit* missionary in *India*. With the usual partiality of a first publisher, he places great faith in the accuracy of the missionary's itinerary and maps. They were certainly not undeserving of attention. But TIEFFENTHALLER had not surveyed in person, either the *Sarayu*, of which he gives the course from the lake *Mánasaróvara* to the plains of *Hindustan*, nor the *Ganges* above *Dévaprayága*, the course of which he delineates to the *Gangoutri*. I shall subsequently adduce proof of the latter part of this assertion. The former part of it has never been doubted.

Major RENNELL, on the erroneous supposition that TIEFFENTHALLER did himself visit *Gangoutri*, has relied on the position assigned by him to that place. In the doubt even whether TIEFFENTHALLER might not actually have taken the latitude of *Gangoutri* by observation; Major RENNELL did not venture to alter the parallel in which the missionary has placed it (33°), though he conjectured it to be too far north: and proceeded to adjust to that position the supposed course of the *Ganges*, from the *Lama's* lake *Mapama*, imagined to be the same with the *Mánasaróvara*, to the cataract described by TIEFFENTHALLER at *Gangoutri*.*

It is strange that Major RENNELL should have

* *Gangotri seu Cataracta Gangis, quam etiam Os Vaccæ appellant: ex rupe præceps actus, in foveam amplam et profundam illabitur. Jacet in 33° circiter gradu. lat. borealis, 75° long. TIEFF. cited by Bernoulli. 2. 280.*

ever supposed, that the missionary had visited *Gangoutri* in person. ANQUETIL DU PERRON, who was in correspondence with him, says positively, that he did not. (D'autant qu' il n'a pas été lui-même à la source du Gange, que présente sa carte.*) It appears likewise, from TIEFFENTHALER'S own statement, that the route above *Haridwâr* was not surveyed with a compass. He says so in express words, regarding the road from *Haridwâr* to *Dénaprayâg*, of which he gives the estimated bearings,† (very erroneously, however, as will be hereafter shown;) and he states no bearings for the remainder of the way to *Srinagar*, *Bhadrinâth*, and *Mând*, which, from the general correctness of his information respecting names of places on this route, he might be supposed to have actually travelled. The route which he gives from *Srinagar* to the cow's mouth, contains few names of places, and no indication of his having travelled it: and towards the close, he expressly refers to the information of others; which he would not have done, if he had personally visited the spot, as supposed by Major RENNELL. His words, in *Bernoulli's* translation,‡ are these: "L'on se trouve
 " enfin auprès du rocher auquel l'opinion trompeuse
 " des Indous attribue la forme d'une tête de vache.
 " Selon le rapport de personnes judicieuses, ce rocher
 " est partagé en deux parties; de la fente qu'elles
 " forment, sort un filet d'eau (instar stillicidii erum-
 " pit aqua) tombant de la hauteur de 3 aunes, dans
 " une fosse qui est audessous. C'est de cette fosse
 " que les gens puisent dans des flacons de verre,
 " l'eau qu'ils transportent dans les pays les plus
 " éloignés. On ne peut aller au de là de ce rocher,
 " que l'on pourroit nommer la Cataracte du Gange,
 " et il n'est pas possible de remonter jusqu' à la
 " source de ce fleuve. De tems à autre il arrive bien
 " que quelquesuns, courant à une perte certaine,
 " passent audelà de ce rocher merveilleux, dans l'idée

* Bernoulli 2. p. 276.

† Ibid 1. p. 148,

Ibid 1. p. 150.

“ de pénétrer jusqu’ aux montagnes de Kelasch
 “ (Cailás,) où on prétend que Mahadeo a sa demeure,
 “ et de se frayer par là une voye à la félicité
 “ éternelle; mais ces gens périssent, soit par les
 “ dévailemens des neiges, soit par le froid ou par la
 “ faim.”

At the period of the publication of a second edition of his memoir, in 1792, Major RENNELL was possessed of correcter information, concerning the position of *Srinagar*, (visited in 1789, by Captain GUTHRIE and Mr. DANIEL;) which enabled him to detect the gross error committed by TIEFFENTHALER, who placed *Srinagar* N. N. W. instead of E. N. E. from *Haridwár*. He was thence led to entertain a very just distrust of other information, resting on the same authority; and to expect, from future researches, the acquisition of more correct knowledge. Reviewing the information then before him, Major RENNELL concluded, that the *Bhágirat’hi* and *Alacanandá*, the one from the N. the other from the N. E. join their streams at *Dévaprayága*, and then form the proper *Ganges* of *Hindustan*, which afterwards issues through mount *Sewalick* at *Haridwár*. That the *Alacanandá* is the largest of the two streams, and has its source in the snowy mountains of *Tibet*, and is traceable to *Bhadrínáth*, nine journies above *Srinagar*. That the *Alacanandá* is probably the same river which appears in DU HALDE, under the name of *Menchou*. That the *Bhágirat’hi* has a source far more remote than the *Alacanandá*. Major RENNELL adds, ‘ as to the head of the *Ganges* itself, ‘ we cannot forget the particulars communicated by ‘ the *Lamas*, sent by CAMHI; whose report, al- ‘ though defective in geometrical exactness, has not ‘ fallen under any suspicions of error or misrepresentation, in plain matters of fact; and their report ‘ was, that the *Ganges* issues from the lake *Mapama*, ‘ and runs westward: afterwards turning to the south, ‘ and south-east. The messenger, sent by TIEFFEN-

'THALLER, appears to have corroborated this report; though without intending it.' *

In conformity with this notion, maps, which have been since published (as **ARROWSMITH's** map of *Asia* in 1801, and of *India* in 1804;) continue to represent the *Ganges* within the chain of snowy mountains, flowing for many hundred miles, according to the *Lama's* notion of its course, from lake *Mapamu* to *Gangoutri*.

This appeared to Col. COLEBROOKE, as to myself, to rest on very slender foundations. We thought it very improbable, that a stream less than the *Alacandâ*, as the *Bhâgirat'hî* was represented to be, should have its source so much more remote than the larger stream: and that, flowing for many hundred miles, through a mountainous region, it should receive no greater accessions from mountain torrents. It seemed very extraordinary, that the missionaries **DESIDERI** and **FREYRE**,† who visited *Ladak*, where they resided nearly two months,‡ and who travelled for twenty-six days in the snowy mountains, from the ascent of mount *Cantel*, (fourteen days from *Câshmîr*,) to the town and fort of *Ladak*;§ and who

* Memoir of a Map, p. 370.

† Lettres Edif. XV. 183. Nouv. Edit. xij. 434.

‡ From 25th June, to 17th August, 1715.

§ Le grand Thibet, commence au haut d'une affreuse montagne, toute couverte de neige, nommée Kantel. Un côté de la montagne est du domaine de Kaschemire, l'autre appartient au Thibet. Nous étions partis de Kaschemire, le 17 Mai de l'année 1715, et le 30, fête de l'Ascension de Notre-Seigneur, nous passâmes cette montagne, c'est-à-dire, que nous entrâmes dans le Thibet. Il étoit tombé quantité de neige sur le chemin que nous devions tenir; ce chemin, jusqu'à Leh, qu'on nomme autrement Ladak, qui est la forteresse où réside le Roi, se fait entre des montagnes, qui sont une vraie image de la tristesse, de l'horreur, et de la mort même. Elles sont posées les unes sur les autres, et si contigues, qu'à peine sont-elles séparées par des torrens, qui se précipitent avec impétuosité du haut des montagnes, et qui se brisent avec tant de bruit contre les rochers, que les plus intrépides voyageurs en sont étourdis et effrayés. Le haut et le bas des montagnes sont également im-

describe the horrid aspect of the country, and its eternal winter;* should make no mention of so remarkable a circumstance as that of the *Ganges* flowing near to the town, and, for a considerable part of the way, at very little distance from their route. Yet such is the course of the river and position of *Ladak*, according to the *Lama's* map. The *Lama's* report, too, so far from being unimpeached, as is argued by Major RENNELL, seemed, on various accounts, and for reasons long ago set forth by ANQUETIL DU PERRON, liable to great suspicion of error and misrepresentation. The information collected by them on the eastern side of a chain of mountains, concerning a river not seen nor identified by them, and said to flow on the western side of the same chain, was likely to be replete with error and misrepresentation; and at best was assuredly less to be depended on, than information procured on the hither side of the mountains, and in sight of the river to be identified. Now, it is acknowledged by Major RENNELL, that, until the result of the expedition sent by the emperor CAMHI (KANG-HI) was known in *Europe*, it was believed, on the faith of the *Hindus*, that the springs of the *Ganges* were at the foot of mount *Himdlaya*.†

praticables; on est obligé de marcher à mi-côte, et le chemin y est d'ordinaire si étroit, qu'à peine y trouverait-on assez d'espace pour poser le pied; il faut donc marcher à pas comptés et avec une extrême précaution. Pour peu qu'on fût un faux pas, on rouleroit dans des précipices avec grand danger de la vie, oh du moins de se fracasser les bras et les jambes, comme il arriva à quelquesuns qui voyageoient avec nous. Encore si ces montagnes avoient des arbrisseaux auxquels on pût se tenir; mais elles sont si stériles, qu'on n'y trouve ni plantes, ni même un seul brin d'herbe. Faut-il passer d'une montagne à l'autre? on a traverser des torrens impétueux qui les séparent, et l'on ne trouve point d'autre pont que quelques planches étroites et tremblantes, ou quelques cordes tendues et entrelassées de branchages verts.

* Quant à la nature du climat, il est fort rude, ainsi qu'on peut l'inférer de ce que j'ai dit. L'hiver est presque la seule saison qui y règne tout l'année. En tout temps la cime des montagnes est couverte de neiges. Lettres edif. xij. 440.

† Memoir of a Map, p. 314.

The *Hindus*, when questioned, do indeed refer to the fabulous accounts, which are to be found in their mythological poems, entitled *Purán's*; and which have been thence copied into graver works, including even the writings of their astronomers; and, according to those accounts, the *Ganges* has a long previous course, from the *Mánasaróvara*, or from another lake called *Bindusaróvara*, before it issues from the *Himaliyya*. But these are too much mixed with fable, and too full of contradictions and inconsistencies, to be considered as intended for grave geographical information; and no *Hindú* has pretended, that the course of the river could now be traced between the cow's mouth and the sacred lake.

Even *PRA'N-PU'RI*,* who professed to have visited *Mánasaróvara*, and who attempted to assign the relative positions of *Cailása* and *Brahmedan'da* to which he referred the sources of the *Bhágirat'hí* and *Alacanandá*, declared, that the river at *Gangoutrí*, which was visited by him, on his return from *Cashmír*, is there so narrow, that 'it may be leaped over.'†

In his account of the *Mánasa* lake, this pilgrim may have adapted his communications to leading questions which had been previously put to him: and in what he affirmed concerning the rivers *Sarayu* and *Satadru* issuing from the *Mánasaróvara*, as well as respecting the fountains of the *Ganges* on mount *Cailísá*, he may have been guided by the *Pauránic* fables. But regarding *Gangoutrí*, he professedly describes what he saw; and what he thus describes, is incompatible with the notion of a distant source of the river. For a stream, so narrow that it may be crossed at a single leap, is a mere rivulet or brook, whose remotest fountain can be but few miles distant.

To this reasoning might be objected the tenor of

* As. Res. vol. 5. p. 43 and 44.

† Ibid. p. 43.

the *Hindu* fables, which assign to the *Ganges* a long course, from lake to lake, and from mountain to mountain, before its final descent from the snowy cliffs of *Himālaya*.* I answer, that a legend, which makes the *Ganges* gush from heaven on mount *Meru*, and, there dividing into four streams, and falling from the stupendous height of *Meru*, rest in as many lakes, from which it springs over the mountains through the air, just brushing their summits,† is undeserving of serious consideration. If it be proposed to receive fabulous accounts as entitled to some notice, because they must be supposed to be grounded on a basis of truth, however false the superstructure which has been built on it; I reply, that no presumption can be raised on the ground of an acknowledged fable. After every gross impossibility has been rejected, what remains is merely possible, but not therefore probable. It is more likely to be false than true, since it was affirmed by evidence demonstrably unworthy of credit.

The utmost then, which can be conceded, is that the conjectural basis of a geographical fable may be used, with very little confidence however, as a guide to inquiry and research. Upon this principle, it might not be unreasonable to institute researches, with the view of ascertaining whether any lake exists within the snowy mountains, an imperfect knowledge of which may have been the foundation of the fables concerning the *Mánasa* and *Vindusaróvara* lakes of the *Hindu* poets, and the *Mapama* and *Luncadeh* of the *Lamas*: and, if any such lake exist, whether a river issues from it, as generally affirmed; and whether that river be the *Alucanandá*, as hinted not only in *Purānas*‡ but in the astronomical work of *BHA'SCARA*,§ or the *Sarayu*, as intimated in

* As. Res. 8. p. 351.

† Ibid, p. 321.

‡ Ibid, p. 351.

§ The holy stream from the foot of *VISHNU* descends from the mansion of *VISHNU* on mount *Meru*, whence it divides into four

other *Purānas*,* and as affirmed both by PRA'NPŪ'RĪ and by TIEFFENTHALLER'S emissary.

On a review of the whole subject, it appeared that the *Ganges* had been traced from *Hindustān*, by *Hindu* pilgrims, into the snowy mountains, which run in a direction from N. W. to S. E. on the frontier of *India*; and had been approached, on the side of *Tibet*, by *Lama* surveyors, whose route terminated at mount *Kentaisse*, a range of snowy mountains on the west and south of *Tibet*. The intervening space seemed to be the region of conjecture, of fable, and of romance. Whether a vast tract of alpine country intervenes, or simply a ridge of lofty mountains, clothed in eternal snow, could not be judged from the uncertain positions at which the routes terminate, neither of which had been ascertained, to any satisfactory degree of geographical precision. However, the latter position seemed the more probable conjecture, from the proximity of *Bhadrināt'h* to the termination of the *Lama's* route. For the temple of *Bhadrināt'h* was placed, by TIEFFENTHALLER, at

' streams, and, passing through the air, reaches the lakes on the summits of the upholding mountains. Under the name of *Sirā*, that river proceeds to *Bhadrāsua*: as the *Alacanāndā*, it enters *Bhārata-versha* (*Hindustan*.) As the *Chacshu* it goes to *Cétumāla*; and as the *Bhadrā*, to the Northern *Curus*.'

Sidd'hānta-sirōmani; *Bhuvana cōsha*. 37 and 38.

* * In the midst of the snowy (*Himavat*) range of mountains is mount *Cailāsa*, where *CUVERA* dwells; the God of riches, with his attendant demigods.

' There is a peak named *Chandraprabha*, near which is situated the *Ach'hōda* lake, whence flows the river *Mendācini*. On the bank of that river is situated the divine wood, the vast grove *Chaitrarat'ha*.*

' On the north-west of *Cailāsa* is mount *Cucudmān*, whence *RUDRA* sprung. At the foot of that mountain is the *Mānasa* lake, from which the *Sarayu* flows: and on the bank of that river is the forest of *Vaibhrāja*.

' North of *Cailāsa* is the golden peak, at the foot of which is the lake *Vindusaras*, where the king *BHAGIRAT'HA* sojourned during many years, when he went thither to fetch *Gangā*.'

Matsya-purāna; *Bhuvanacōsha*.

* *CUVERA's* garden.

an estimated distance of 57 miles, and by Colonel HARDWICK, at nine journies, from *Srinagar*; which is situated, according to RENNELL, in $30\frac{1}{4}^{\circ}$ N. and 79° E. and the route of the *Lama* surveyors ends in the 36th degree of long. W. of *Pekin*, (81° E. of *London*) and lat. $29\frac{1}{2}^{\circ}$ according to DU HALDE's map. Still however, there was room for the supposition of a lake interposed, out of which a branch of the *Ganges*, perhaps the *Alacanandá*, might really issue, conformably with the whole current of popular belief.

This view appeared to present an object of inquiry, deserving the labour of the research. An actual survey of the *Ganges*, above *Haridwar*, (where it enters the *British* territories,) to the farthest point to which it had been traced by *Hindú* pilgrims, and to its remotest accessible source, was an undertaking worthy of *British* enterprise. Perhaps the national credit was concerned, not to leave in uncertainty and doubt a question which the *English* only have the best opportunity of solving: and one at the same time so interesting, as that of exploring the springs of one of the greatest rivers of the old continent, and whose waters fertilize and enrich the *British* territories, which it traverses in its whole navigable extent.

These considerations, partly the suggestions of his own mind, and partly pressed on his attention by me, induced Lieut. Col. COLEBROOKE to undertake the proposed enterprise, for which the sanction of government was accordingly solicited and obtained. But, in consequence of illness, as already intimated, the execution of it devolved on his assistant Lieut. WEBB, who was accompanied on the journey by Capt. RAPER and Capt. HEARSAY. The journal of Capt. RAPER has furnished the narrative which is presented to the society.

The result of the survey is briefly stated in a letter from Lieutenant WEBB to my address.

‘ Should you deem the intelligence collected in this tour worthy of communication, you may perhaps wish, that, in addition to the map, I should give a summary of the geographical information required: and these, with the account which I formerly sent you of the trade carried on with the transalpine countries,* compose my exclusive share of the communication.

‘ The abstract of material positions ascertained is as follows; and I am perfectly satisfied with the correctness of all the results, excepting that of *Cédár-náth*; and even this cannot fail of being a very near approximation.

<i>Gangoutri</i>	Lat.	31	4	N.	{ Long. from } Greenwich	78	59	E.
<i>Jamoutri</i>	-	31	23	N.		78	31	E.
<i>Cédár-náth</i>	-	30	53	N.	- - -	79	19	E.
<i>Bhadrináth</i>	-	30	43	N.	- - -	79	38	E.
<i>Déoprayág</i>	-	30	9	N.	- - -	78	31	E.
<i>Srinagar</i>	-	30	11	N.	- - -	78	43	E.
<i>Almora</i>	-	29	36	N.	- - -	79	42	E.
<i>Source of the</i>	}	30	7	N.	- - -	79	23	E.
<i>Rámangá R.</i>								
Formation of the <i>Gogra</i> river by the								
junction of the two streams at						29	55	N. 79 52 E.
<i>Baghéswar</i>	-	-	-	-	-			

‘ Considering the most important information gained, to be a knowledge that the sources of the *Ganges* are southward of the *Himálaya*, I subjoin my reasons for adopting this opinion:

1st. ‘ It had been universally experienced, during our journey, that the supply of water from springs, and numerous tributary streams, was sufficient, in a

* Inserted in a note in the following narrative of the journey.

course of eight or ten miles, to swell the most minute rivulet into a considerable and unfordable stream, et vice versa. Now the course of the *Bhágirat'hi* and *Alacanandá* rivers was followed, till the former became a shallow and almost stagnate pool, and the latter a small stream; and both having, in addition to springs and rivulets, a considerable visible supply from the thawing snow, it is therefore concluded, by analogy, that the sources of these rivers could be little, if at all, removed from the stations at which these remarks were collected.

2d. ' The channel of a great river is usually a line to which the contiguous country gradually slopes; and perhaps on this account, in the mountainous country, (as information and experience have taught me,) the sides of a river always furnish the most practicable road in the direction of its course.* Now, if the *Bhágirat'hi* and *Alacanandá* rivers had a passage through the *Himálaya*, it should follow, that the channel of its stream would form the *Ghálti* by which the snowy range became passable. But, since this principle holds good in practice, and since it is utterly impossible to cross the snowy range in a direction which the channel of these rivers might be supposed to assume, I consider that at least all former reports are determined fictitious.

3d. ' I have conversed with two or three intelligent natives, whose information I have found correct in other instances, and who have, in pilgrimages and on business, traversed the northern skirt of the *Himálaya*; and I have their assurances, that no river, except one, exists westward of the *Mánasáròvara* lake; that this stream is called the *Saturuz (Satalaj)* river; and that it turns southerly west of *Jamoutri*.

* The only exception to this maxim is perhaps in the case of a cataract, such as the falls of *Niagara*, where a river descends precipitously from an elevated ledge of rock. But no such cascade of the *Ganges* has been found. H. C.

'The extreme height of the *Himálaya*, is yet a desideratum; but by a mean of numerous altitudes of a conspicuous peak, taken at different hours of the day with an excellent instrument, its distance being previously ascertained, by observation, from the well determined extremities of a sufficient base, in the level country of *Rohilkhund*, and allowing an eighth of the intercepted arch, which is supposed to exceed the mean of terrestrial refraction; its height is calculated at twenty-one thousand feet above those plains.

'The usual rise of the rivers at *Déoprayág*, ascertained by measuring with a line the distance between the water's limits on a perpendicular scarp, is about forty-five or forty-six feet; the nature of the channels not admitting of any increase in breadth. They are subject to irregular and temporary swells, of sometimes ten feet perpendicular, in heavy or sudden falls of rain.'

I entirely subscribe to the arguments of Lieutenant WEBB, which to my apprehension are conclusive. No doubt can remain, that the different branches of the river, above *Haridwar*, take their rise on the southern side of the *Himálaya*, or chain of snowy mountains: and it is presumable, that all the tributary streams of the *Ganges*, including the *Sarayu* (whether its alledged source in the *Mánasaróvara* lake be credited or disbelieved,) and the *Yamuná*, whose most conspicuous fountain is little distant from that of the *Ganges*, also rise on the southern side of that chain of mountains.

From the western side of the mountains, after the range, taking a sweep to the north, assumes a new direction in the line of the meridian, arise streams tributary to the *Indus*, and perhaps the *Indus* itself.

From the other side of this highest land, (for it is hardly necessary to remark, that the remotest foun-

tains of rivers mark the highest ground;) a declivity to the north or west gives to the mountain torrents, and finally to the rivers which they compose, one or other of these directions. It is probably true, that the sources of the *Sampoo* or *Brahmeputra* and its tributary streams, are separated only by a narrow range of snow-clad peaks from the sources of the rivers which constitute the *Ganges*, or which serve to swell its stream: and the whole province of *Ladak*, elevated and rugged as it is, most likely declines from its southern limit to both the north and west.

This notion is supported by the information received from traders who traffic between *Hindustan* and *Tibet*, as Lieut. WEBB has remarked; and it is countenanced by routes from *Cáshmir* to *Ladak*, with which Major WILFORD furnished me, and which were collected by him from merchants accustomed to travel between these countries.

In short it can scarcely be doubted, that the snowy mountains, seen from *Hindustan* and especially from *Rohilkhand*, are the highest ground between the level plains of *India* and the elevated regions of southern *Tartary*. Whether the altitude of the highest peaks of *Himálaya* be quite so great as Lieut. WEBB infers from observation, I will not venture to affirm. The possible error from the uncertainty respecting the quantity of the refraction is considerable; and, owing to disappointment in the supply of instruments, no barometrical observation could be made to confirm or check the conclusions of a trigonometrical calculation. Without however supposing the *Himákaya* to exceed the *Andes*, there is still room to argue, that an extensive range of mountains, which rears, high above the line of perpetual snow, in an almost tropical latitude, an uninterrupted chain of lofty peaks, is neither surpassed nor rivalled by any other chain of mountains but the *Córdilleras* of the *Andes*.