Travels in Search of a River

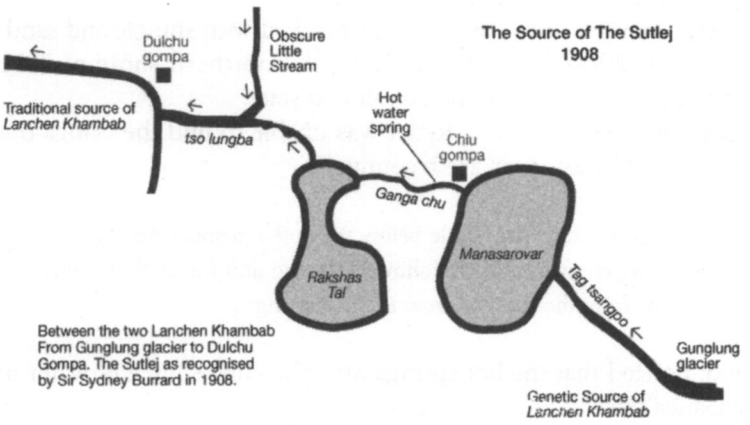
The river Sutlej, its source and course, has been a subject of great interest to me. It is perhaps the only large river, cutting across three large countries – Tibet, India and Pakistan – whose origin has been a matter of speculation for over two centuries. Even in recent times, when satellite and aerial images clearly show the courses of rivers in the remotest of lands, the source of the Sutlej remained shrouded in mystery.

The Lanchen Khambab, or the river flowing out from the Elephant's mouth, as the Sutlej is known in Tibet, arises close to Mt. Kailash. Early pilgrims from India who crossed the Himalayas and travelled to Mt. Kailash, noticed the numerous tributaries that watered this river and called it Satadru – *sata* meaning hundred and *dru*, river. The basin of the west-flowing Sutlej in Tibet occupies the trough between the Himalayas in the south and the Kailash range in the north.

By **Manosi Lahiri**

Unlike other major rivers, the Sutlej's source has been a matter of debate. Often maps indicate two alternate sources of the river, approximately fifty kilometres apart. From time immemorial Lanchen Khambab had been known to be near Dulchu *gompa*, northwest of Lake Rakshas Tal. But in the last two-and-a-half centuries, the 'scientific' view had veered around to Lanchen Khambab being at Gunglung Glacier, southeast of Lake Manasarovar, a view expressed in 1908 by Sir Sydney Burrard in his book, *A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet*. Nevertheless, the prevailing belief is that the Gunglung Glacier is the genetic source of the river. For religious purposes, however, the traditionally known source is the spring near Dulchu *gompa*, about fifty kilometres further downstream from the origin. This implied that melt waters from the Gunglung Glacier were carried by the Tag *tsangpo* to Lake Manasarovar, which then flowed through the Ganga *chu* to Lake Rakshas Tal. From a channel in the northwest of this second lake, the Rakshas Tal, the waters of the Sutlej then flowed to Dulchu *gompa* and continued further west.

Does this actually happen today? Is there a flow of water, even seasonally, through this entire link? That was the question that fascinated me as I traversed the area around Lakes Manasarovar and Rakshas Tal in the year 2000, although the topography of the land did not appear to suggest it. In an effort to find a plausible explanation, I have relied on past accounts of this area, made numerous field observations and used logical reasoning to reach a



conclusion. There are several published accounts of travellers and topographer-surveyors relating to the Kailash-Manasarovar-Sutlej territory, which make for fascinating reading, and yield several clues to the discovery of the present source of the Sutlej.

Further, my exploration of the area in the years 2000 and again in 2002, revealed three broken links in the river's course that led me to question the 'scientific' view that was proposed by the British surveyors in 1908.

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For many centuries, pilgrims knew that the Lakes Manasarovar and Rakshas Tal were connected by the Ganga *chu*. A *chu* in the Tibetan language is neither a stream nor a river; it is 'little water'. For the longest period in history, a well-perpetuated myth declared that the Ganga's source was Manasarovar. As this *chu* was the only visible outlet from the lake, it was named the Ganga *chu*. A widely held belief in Tibet is that when the waters flow from Manasarovar to Rakshas Tal through the Ganga *chu*, it augurs well for the country. Apparently, in a year of exceptionally heavy rain, the *chu* is known to have water in it. One can safely conclude that in the last few centuries it was at least an ephemeral stream, if not perennial.

For years, mostly contradictory data on the presence of water in the *chu* was received. Some explorers claimed to have seen water in the *chu* – Harballabh in 1796 and Henry Strachey in 1846 – some relied on hearsay that there was water present in it, while other explorers such as Dr. William Moorcroft and Hyder Jung Hearsey in 1812, found it dry with its mouth blocked with shingle and sand. In the year 2000 and again in 2002, the northern shore of Lake Manasarovar was found to be in a similar state.

In 1904, Colonel C.H.D. Ryder was unable to find the Ganga *chu* outlet from Manasarovar. He recounts:

> ... struck the channel a mile below the outlet, a small stream only partly frozen over, and we followed this up and found that it did not flow from the lake but from the hot spring ...

I, too, noticed that the hot springs were the chief source of water in the Ganga *chu*.

In 1906, Charles Sherring wrote:

> It is a fact that at this present moment no water is actually flowing between the two lakes, the reason being that storms blowing from the east have thrown up sand at the mouth of the passage to a height of about four feet, but the best native information on the spot gives it as a fact that after heavy rains the water traverses the channel.

Nevertheless, I saw a trickle in a few places in the channel in the rainy season; perhaps it had not rained heavily enough.

Along the northwestern circumference of Manasarovar are the raised beaches that are a distinguishing characteristic of these lakes, the highest being over four-and-a-half feet above water level. Similar beaches, with regular steps about a foot high, form an enormous amphitheatre along the southeastern shore of Rakshas Tal, indicating that the land has risen while, at the same time, the water in the lake has also fallen, as water marks on the cliffs along the shores record. The falling water levels of the lakes could also be attributed to less rainfall over the past century. However, elevation measurements with an ordinary GPS receiver at the two ends of the *chu* revealed that the land was 15,072 feet at Manasarovar and 15,026 feet at Rakshas Tal, leading to the all-important observation: why did the water from the former not flow into the latter?

A line of hot springs run along the western shore of Manasarovar – and could well be present at the bottom of the lake – accounting for the ice in it melting earlier than that in Rakshas Tal. A survey of the hot springs in the hamlet adjacent to the Ganga *chu* showed several points from which hot water bubbled out, mainly on the northern side, collecting in a large, stagnant pool. Waterfowl swam in the pool, oblivious to the sulfuric odour.

There was a stone dam, about a foot high, built right across the *chu* at the hamlet, and people sat on the stones to fill their jerry cans with water. Although the banks were covered with sand, the hamlet was built on highly metamorphosed igneous rock, much like the outcrop on which the Chiu *gompa* was perched. On the north bank of the Ganga *chu*, next to a massive crystalline quartz outcrop, one could hear the water boil and bubble away, almost as if a kettle was on a stove. I discovered water flowing *eastward* from the hot springs

in the village *towards* Manasarovar. The stream was no more than a few inches deep here and dried up at the base of the Chiu *gompa*, a couple of hundred metres from the lake shore.

Water from the hot springs also flowed *westward* in a trickle from the hamlet through the Ganga *chu* to Rakshas Tal. I dipped my walking stick to check the depth and direction of the flow of water, and it was nowhere more than two or three inches deep! Nevertheless, the valley was well formed, indicating that at one time substantial quantities of water had flowed through this stream. The water, though, dried up in salt encrustation long before it reached Rakshas Tal.

These findings lead me to conclude that while Manasarovar is at a higher altitude than Rakshas Tal, the hot springs, in turn, are at a slightly higher elevation than Manasarovar. This explains why the sulphuric waters from the hot springs at the hamlet flow both in an easterly direction towards Manasarovar, and a westerly direction towards Rakshas Tal. But water does not normally flow from Manasarovar to Rakshas Tal.

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The next part of the investigation of the Sutlej's course was to trace its outflow from the northwestern section of the Rakshas Tal, at the southern edge of the Barkha plains. Tibetans avoid this lake as they consider it unlucky, and there are no roads or tracks leading to this area. At the edge of the lake were bushy-tailed fox, musk deer, large Greylag geese and other waterfowl. The traditionally accepted outflow from the northwest of Rakshas Tal had dried up and any empirical evidence of the Sutlej flowing out was not visible. Interestingly enough, this river course is marked on many maps even today – perhaps as the result of a myth that, perpetuated long enough, comes to be accepted as reality. This outflow channel has been recorded as dry for at least a century-and-a-half by several explorers such as Hyder Jung Hearsey (1812), Colonel C.H.D. Ryder (1904), Sven Hedin (1906-1908) and Swami Pranavananda (1949), who had made detailed observations of the area.

My own observations have indicated the presence of marshes and salt flats along the shores of the lake here, with some pools of water in the sand flats. In fact, the slope of the land and riverbed indicate

the water along this channel should flow *towards* Rakshas Tal from the northwest, as noticed by the Swiss geologists Heim and August Gansser in 1938. The 'fathomless bogs' in the northwestern corner of Rakshas Tal were described thus:

> Here must once have been the *outlet* of the great lakes. Now the rivers flow in the *opposite* direction.

Henry Strachey had noted in 1846 that the channel had dried up and these are his observations about Rakshas Tal:

> The effluence to the Langchen river is from the north point, which I crossed, however in October, without finding any running stream, or any marked channel for one, though the flatness of the ground, its partial inundation in shallow pools, and obvious descent of the level *towards* the river, entirely corroborated the native accounts of an intermittent effluence in seasons of flood.

According to Tibetan texts, about a 1000 years ago, surveyors reported the Rakshas Tal–Manasarovar area as follows: 'The territory looks like a hollow land filled with lakes and surrounded by snow mountains.' That was a remarkably accurate description of the morphology of the area and of particular interest to my investigation. As the lakes occupy the lowest parts of the hollows it is logical to state that the streams from the surrounding mountains flow into the lakes. *And that there is no stream flowing out of Rakshas Tal today.*

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Dulchu *gompa* (14,820 feet), at the water spring of the traditional Lanchen Khambab, was built by a small rocky knoll. The local boys, who helpfully identified the Lanchen Khambab and the *gompa* for us, said that there was water in the channels all the year round though it froze in winter.

The Sutlej itself is actually several slim spaghetti-like water channels, occupying an elongated depression between the hills. Narrow channels flowed in the western direction and joined to form a well-established riverbed, marking the southern limit of the Barkha plain. This shallow valley stands out in the landscape by its colour:

an extravagant swathe of green on a grey-brown background. The water from the surrounding hills collects here, and clearly, the water table is very close to the surface. The local people have encircled the spring with boulders and also marked it with a pole tied with a prayer flag on top. They accept this point as the true and traditional source of the Lanchen Khambab.

No other streams flowed into the valley occupied by the Sutlej at Dulchu. There was a wide dry riverbed from the east though, from the general direction of Rakshas Tal. It was strewn with large round pebbles, indicating that a significant volume of water had carried them there. That dry riverbed, I surmised, would have been the original bed of the Sutlej when it was linked to the lakes. The Hindi-speaking monk, who had lived at Dulchu *gompa* for 15 years, said that the dry riverbed joined another stream that flowed from the Barkha plains into the northwest corner of Rakshas Tal. This was just the kind of apparently inconsequential anecdotal information that I was looking for.

The dry riverbed was once locally known as the *tso-lungba* – *tso* in the Tibetan language is lake, and *lungba*, a valley. So, it was the valley connecting to the lake. From Dulchu in the west, we drove eastward by the dry river channel. We then reached the confluence with a stream on its north bank that flowed eastward along the old Sutlej bed into Rakshas Tal. This set up the questions: why was the Sutlej's bed dry west of the confluence with the little stream? How had this link to the lakes been disrupted so emphatically?

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At that moment, we stood at a geomorphologically significant place – the equivalent of a historical divide that nobody seemed to have noticed earlier. So, here I document the most dramatic feature of hydrology relating to the source of the Sutlej.

In the past, when the Sutlej's channel joined the northwest corner of Rakshas Tal to Dulchu *gompa*, water flowed along the *tso-lungba*. In time, the climate became drier, as evidenced by the shrinking of the surface of so many lakes and the complete drying up of previously ephemeral streams. At the same time, the Himalayan range rose slowly but surely, including the areas immediately bordering its

northern limits. This was also associated with the fall in the level of the water in the lakes.

Not very long ago, perhaps in the last few hundred years, a small, but torrential, little tributary joined the *tso-lungba* in its northern bank. I named this the 'Obscure Little Stream' (OLS). The OLS deposited a vast amount of gravel at its confluence with the Sutlej. This little north-south stream choked the much bigger Sutlej's east-west channel with conglomerate and sand, and *tso-lungba* could not carry its waters to Dulchu anymore. Today, this same little OLS flows through the Sutlej's channel above the confluence into Rakshas Tal, thus reversing the flow of water for this short stretch of the erstwhile Sutlej. The western part of *tso-lungba*, below the confluence, till the springs of Dulchu, turned dry because the supply of water had ceased. This dry section is biologically dead.

The sheer difficulty of accessing this area has made the exploration of this dramatic and unexpected event in geological history remain unrecorded so far. Satellite images of the area from the Indian Space Research Organization (ISRO) clearly show the dry western section of the *tso-lungba*, and the east-flowing OLS. These images supported my interpretation of the nature of surface hydrology in this area and helped in identifying the true source of the Sutlej. Today, all the features mentioned here can be seen on web-mapping sites such as Google Earth and Virtual Earth.

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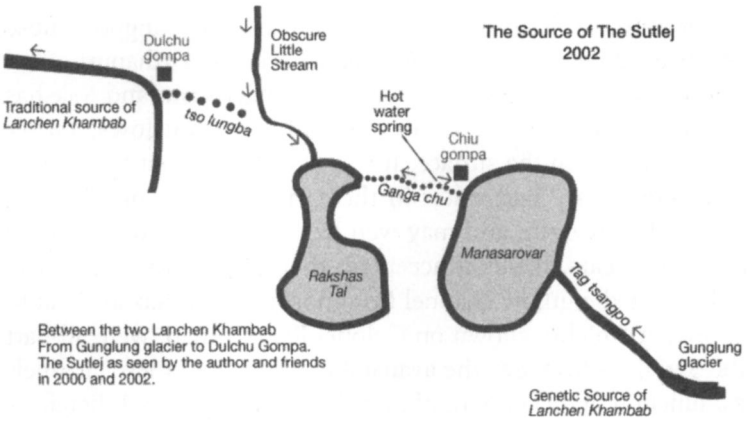

Between the two Lanchen Khambab
From Gunglung glacier to Dulchu Gompa.
The Sutlej as seen by the author and friends
in 2000 and 2002.

One may well ask: why did this reversal take place? The answer to this question lies in the changing nature of the physical world. This is a geologically active area, as indicated by thermal springs and earthquakes. The rise of the Himalayas, documented and accepted, has also affected the rivers in its proximity – certainly the Sutlej. Deposition of impressive amounts of moraine and sand has interfered with natural flows, and new channels have been established. Raised beaches, incised meanders, and paired terraces of banks on the sides of entrenched streams tell a story of adjustments to rising land.

Climatic changes too are taking place. On the whole, it appears that there is a phase of 'drying' on at present. Water levels in the large lakes are lower, and many little streams appear to occupy disproportionately large valleys, with several streams that have disappeared permanently, or dried temporarily in sections.

Sir Sydney Burrard's conclusion that the alternate source of the Sutlej could be traced to the southeast of Manasarovar at Gunglung Glacier would have had merit in 1908, but for the considerable change in the geomorphology of the area. Today, it is very unlikely that the waters flowing from the Gunglung Glacier and from the Gurla Mandhata to Manasarovar, reach beyond the lake.

Where, then, does the Sutlej derive its waters from? Clearly not from Rakshas Tal or Manasarovar. I would select two important sources: the perennial springs at Dulchu, and streams from the *Gang Te Se* (Kailash) and the Himalayan range. By the time the Sutlej reaches Tirthapuri, several well-watered deep rivers fed by glaciers bring water to it from the Kailash range. These include the Chukta, Goyak, Trokposhar and Trokponup. However, the greatest volume of water comes from its Himalayan tributary, the Lanchen Tsangpo, whose confluence with the Sutlej is a few kilometres below Tirthapuri.

Sven Hedin had surmised that because Manasarovar and Rakshas Tal were freshwater lakes, they would have outflows, either subterranean, or on the surface. It was his opinion that the surface channels may have had water in them ephemerally, only during a season of heavy rain and may well have been quite dry in other seasons and years. If this is accepted, then clearly, the Ganga *chu* and the 'dotted' outflow channel from northwestern Rakshas Tal to the Sutlej at Dulchu, shown on Colonel Ryder's map, were all part of the Sutlej. In his view, the availability of water in these channels was a function of the amount of rainfall and snowfall, and therefore,

the result of seasonal variations in precipitation. This led Colonel Sir Sydney Burrard to conclude in 1908 that the genetic source of the Sutlej was the Gunglung Glacier.

If this basically sound argument is taken to its logical conclusion, then it is possible to understand this tantalizing geographical conundrum of the link of the Sutlej to the lakes. Hedin's explanation, based on seasonal change in precipitation, can be extended to climatic – a few decades – changes. When the climate was less arid, the Sutlej flowed uninterrupted from Manasarovar to Rakshas Tal to Dulchu *gompa*. Now, however, there are many evidences of lower precipitation. When the water level in the lakes had fallen impressive salt patches had appeared on the shores of Rakshas Tal, where earlier the Sutlej flowed in and out of the lake. Beaches and terraces were well established along both lakes. One could safely conclude that, with present low levels of precipitation and high evaporation, the surface channel of the Sutlej between the lakes and Dulchu *gompa* was always dry. The river had disappeared from this section.

The geographical problem was essentially a matter of defining the catchment area of a river. In the case of the Sutlej, at the two lakes, it was a question of availability of adequate water for it to be continuous or discontinuous. Under the present circumstances, the catchment of the Sutlej from Dulchu westward is not connected to the watersheds of the Manasarovar and Rakshas Tal. As a consequence, the two lakes cannot be considered a part of the Sutlej's catchment. The lakes, Manasarovar and Rakshas Tal, are areas of inland drainage and the Gunglung glacier's melt waters form part of their catchment. The Sutlej catchment, with its many watersheds, on the other hand, flows out into the Arabian Sea, after joining the Indus. If evidence and logic were the main ingredients for scientific reasoning, then, I believe, most would award the Dulchu channel status of the 'Lanchen Khambab' today. Dulchu, then, lays claim to both the traditional and scientific source of the Sutlej or Lanchen Khambab, the river flowing out of the Elephant's head.

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ENDNOTE:

In the year 2000, I visited Tibet along with Ravi Bhoothalingam, Madhu Sarin, Indu Lal and Omkar Goswamy. In the year 2002, I visited Tibet again, along with Madhu Sarin, Indu Lal and Ramesh Fonseca.

This time, we found the source of the Sutlej.