GAZETEER

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ARTHER JULES DASH

BENGAL DISRICT GAZETTEER

DARJEELING

By

ARTHUR JULES DASH
CHAMBER OF THE PUBLIC SERVICE COMMISSION
AND LATE OF THE INDIAN CIVIL SERVICE

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PREFACE

This Gazetteer is a compilation of contributions from a number of individuals and my own has mainly been the application of some knowledge of the District and its administration to the task of collating and editing the contribution of others.

I place on record my indebtedness to many contributors for thei willing assistance and my apologies or the alterations and excisions that the process of editing has made necessary.

Limitation of space prevents me publishing a list of the names of those who have assisted. It is a long one and includes the names of officers of the Indian and Provincial Governments, of officers of local bodies and of many residents of the District, all of whom have given time and labour generously.

A. J. DASH.

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Glossary.

Basti	Village or group of houses..
Bhadralok	Gentleman, not a cultivator.
Chaukidar	Viilage policeman.
Daffadar	Head chaukidar.
Dara	Ridge.
Darzi	Tailor.
Dhura, dura	Lines, quarters.
Ghum, ghoom	Mat of leaves and split bamboo worn on head and back to keep off rain.
Hat	Market' not held every day.
Jhora	Stream, torrent.
Jhum	Cultivation by burning forest and sowing or planting crops in the burnt area.
Jotedar	Owner of jote right who may he a middleman or an actual cultivator.
Khas Mahal	Private Estate, i.e., Government's estate directly managed.
Khola	Stream.
Kukat	Timber other than sal.
Kukri	Nepali knife.
Mandal	Village headman.
Mani	Buddhist monument.
Niz	Private, own
Panchayat	Committee (of five).
Rayat	Tenant cultivator.
Sadar	Headquarters.
Salami	Premium.
Tauzi	Deputy Commissioner's list of Estates; hence Estate.
Tar	Flat, level place.
Thana	Police-station; investigating centre.

CHAPTER I.

PHYSICAL DESCRIPTION.

POSITION AND BOUNDARIES. The district of Darjeeling lies between 26° 31' and 27° 13' north latitude and between 87° 59' and 88° 53' east longitude and its total area is about 1,200 square miles. The principal town and administrative headquarters of the district is Darjeeling town at 27° 3' north latitude and 88° 16' east longitude.

In shape, the District is an irregular triangle. The northern boundary commences on the west at the peak of Phalut nearly 12,000 feet high, the trijunction of the boundaries of Nepal, Sikkim and India. This boundary runs east from Phalut along a ridge descending to the Rammam river. From there the boundary follows the course of that river until it joins the Rangit and then follows the Rangit until it reaches the Tista. Proceeding east of that junction the boundary follows the Tista upstream until its junction with the Rangpo Chu; thence it proceeds first up the Rangpo Chu and then up the Rishi Chu to a spur of the Rishi La which is the trijunction of the boundaries of Sikkim, Bhutan and India. From the Rishi La (10,300 feet), the boundary with Bhutan follows down the Ni Chu in a south-easterly direction until it meets the Jaldhaka river; it follows that river southward until the Jalpaiguri District is reached in the Khumani forest.

On the west the District is bounded by Nepal. From Phalut the western boundary follows the southward ridge until it joins the Mechi river which continues as the boundary right down into the plains and up to the south-west corner of the District. On the south, the District is bounded by the Jalpaiguri District of Bengal from the Khumani Forest on the east to the village of Phansidewa on the Mahanadi river and westward of Phansidewa by the Purnea District of Bihar. The area of the District is not marked by any natural features as a region complete in itself. 0 It consists of a portion of the outlying hills of the lower Himalayas and a stretch of territory lying along the base of the hills known as the Terai. The range of altitude is considerable. The Terai is only 300 feet above sea-level but there are parts of the District in the hills which are nearly 12,000 feet high. Geographically, the Terai belongs to the plains of India but geologically it is a sort of neutral country; the greater part of it being composed neither of the alluvium of the plains nor of the rocks of the hills, but of alternating beds of sand, gravel and boulders brought down from the mountains. It is traversed by numerous rivers and streams flowing out of the hills; it is unhealthy and in places marshy.

North of the Terai, the Himalayas stand out in a succession of bold spurs, the appearance of which has been compared with that of the weather-beaten front of a mountainous coast. The change from hills to plains is very abrupt and can be appreciated more vividly by observation on a clear day from above. From Kurseong or other viewpoint, the observer looking southwards will see the .hills descending steeply below him and suddenly ending and from their foot the plains stretching away without any undulation to the southern horizon.

The hill portion of the District is a confused labyrinth of ridges and narrow valleys. There are no open valleys, no plains, no lakes and no precipices of consequence. Most of the ridges are forest clad though on lower slopes the forests have often been cleared for tea and other cultivation. The main ridges wind and zig- zag in all directions, giving off a number of long spurs on either flank. For the most part the ridges stretch from north to south while the courses of the principal rivers are in the same direction: but many of the spurs and of the torrents flowing between them run east and west and even in some areas from south to north. The valleys have a great range of altitude, climate and aspect and some are thousands of feet deep. Hills and valleys are covered in many places with a dense mass of forest, festooned with moss and lichens and dripping with moisture.

MOUNTAIN SYSTEM. In spite of the confused nature of the mountain masses, certain clearly defined features can be observed. If a reference is made to the contour maps on the pages following, it will be seen that the highest ground is in the north-west where the Singalila ridge enters the District at Phalut. The ridge is nearly 12,000 feet high at Phalut and further south at Sandakphu: from there it descends to Manibhanjan (6,000 feet) as the boundary between Nepal and the District. The ridge continues southward to the level of the plains first as the boundary and then as the top of slopes on the left bank of the Mechi river.

From Manibhanjan eastward, there is a ridge which undulates up to the pass at Ghum and then rises more steeply to the heights of Senchal and Tiger Hill (8,000 feet). It then turns southward, gradually descending to Mahaldiram and Dow Hill above Kurseong and then still further southwards down to the plains. From this main ridge spurs branch down on either side, the more prominent on the east side being the Takdah-Pashok ridge descending to the junction of the Rangit with the Tista and the Sittong spur further south. Darjeeling town is on a spur running north from the Manibhanjan Senchal ridge which divides below the town into the Takvar and the Lebong spurs before they descend to the Rangit river.

East of the Tista, the highest ground is at the Rishi La (10,300 feet), the trijunction of Bhutan, Sikkim and India. From here one of the more prominent ridges runs south-east and cuts off the Jaidhaka valley from the rest of the District. Another ridge descends to Labha just under 7,000 feet above the sea. From here an important spur leads south-westward down to the plains and another north-west to Rissisum where it joins a ridge running north-east to south-west. The north-eastern end of this ridge descends to the Rishi river beyond Pedong and the south-western spur passes through Kalimpong and descends abruptly into the Tista valley.

RIVER SYSTEM. The rivers of the District drain ultimately to the south, though the west to east ridge across it causes a series of Tista tributaries rising on its northern face to flow northwards and others flow east or west before joining the main river.

Dominating all the other rivers in the District is the Tista which rises in a glacier in north Sikkim 21,000 feet above sea-level and drains the whole of Sikkim. It forms the boundary of the District from the point where it is joined by the Rangpo down to its junction with the Great Rangit flowing in from the west. From that point it lies entirely in the Darjeeling District until it leaves it at Sivok, ultimately entering the Brahmaputra in Rangpur District. In Darjeeling District, its principal tributaries are the Rangpo and the Rilli on its left bank and the Great Rangit, the Riyang and the Sivok on the right bank. The river is bridged by a suspension bridge near Melli. In the gorge, where both banks are in the District, there are three bridges, two of reinforced concrete carrying heavy road traffic and one suspension bridge carrying only animals and pedestrians.

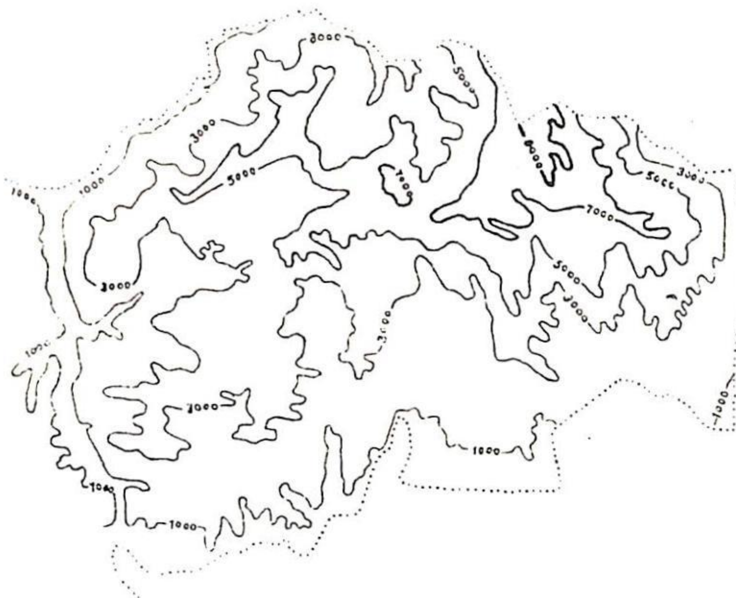
The Tista is a broad mountain torrent with numerous shallows and rapids. Its current is swift and dangerous, running in places at 14 miles an hour and it is liable to sudden rises in level due to its flow being constricted in a gorge.

In the dry season its waters are sea green. It begins its annual rise when the north Sikkim snows melt. The advent of the rains brings a bigger rise and the water then acquires a milky hue from detritus in suspension. Below its junction with the Rangit the river traverses the District in a deep gorge where it is not 100 yards broad: but as soon as it debouches into the plains it widens and becomes two or three hundred yards from bank to bank. It is not navigable by boats in the District, although for bridge building boats have been used and for other purposes rafts are operated on occasions.

The scenery along the banks of the Tista is extremely beautiful. The gorge is narrow and winding and the steep sides are clothed in dense forest broken at intervals by side valleys. Up the gorge and the side valleys can occasionally be obtained glimpses of high mountain masses: near at hand the vegetation and insect life is gorgeous in its tropical splendour.

DISTRICT DARJEELING excluding KALIMPONG SUBDIVISION

KALIMPONG SUBDIVISION



Of the tributaries of the Tista, the Great Rangit is the most important. It enters the District from Sikkim at the point on the northern boundary where it receives the Rammam on its right bank. Below that junction, it flows eastwards, receiving the Little Rangit and the Rangnu as tributaries from the Darjeeling side. The Rammam rises under Phalut mountain, the Little Rangit under Tanglu and the Rangnu tears down from Senchal in a valley several thousand feet deep: though its roar is heard and its valley is visible from end to end, the stream itself cannot be seen from above, so deep has its channel been cut.

The Great Rangit is a graceful mountain torrent with a stony or sandy bed. Its banks are usually clothed in forest hut here and thre can be found patches of cultivation. Its meeting with the Tista provides one of the most picturesque scenes along its course. Here there is a great difference in the colour of the waters of the two rivers, that of the Tista being cloudy while the water of the Rangit is dark green and very clear. There is no less marked a difference in the temperature of the two rivers, the water of the Rangit being appreciably warmer than that of the Tista. The colour and the coldness of the latter are no doubt due to the number of glaciers drained by it: while the Rangit is chiefly supplied by the rainfall of the outer ranges of the Senchal and Singalila hills and hence its water is warmer and clearer, except in the height of the rains.

East of the Tista, are rivers debouching from the foothills which,like it, flow into the Brahmaputra. All are torrents subject to violent changes in volume, for the hills here intercept very heavy rainfall and the catchment areas of the rivers are small. The most important of these eastern rivers is the Jaldhaka whose catchment area is cut off from the rest of the District and reaches up to Gnatong in Sikkim. From points on the Tibetan trade route near Gnatong 12,000 feet above sea-level one can look down and see, in a deep val1y, the course of this river like a silver shaft pointing southward in a straight line. The banks are steep and clothed in jungle right down to the plains.

The Jaidhaka carries the largest volume of water of all this group of eastern foothill rivers. Those nearest the Tista, the Lish, the Gish and the Chel emerge from the hills carrying great volumes of stones, mud and sand torn from their catchment areas by erosion and landslides. The Lish and the Gish fill up their beds higher and higher with detritus and engineers find it difficult to make additions to bridges fast enough to keep pace with the rise in the level of the river beds.

The rivers to the west of the Tista, the Mahanadi, the Balasan and the Mechi all flow into the Ganges. The Mahanadi has its source near the mountain of Mahaldiram to the east of Kurseong. Its catchment area is small but receives a high rainfall in the monsoon. After leaving the hills, the Mahanadi flows south as far as Siliguri, where it changes its direction more to the south-west and forms the boundary between the Terai and the Jalpaiguri District as far as Phansidewa.

The Balasan rises near Lepehajagat on the Ghum-Simana ridge and its valley west of Kurseong is larger than that of the Mahanadi although it does not receive so heavy a rainfall. After entering the Terai it divides into two streams. One, called the New Balasan, joins the Mahanadi just below Siliguri: the other branch, the Old Balasan, continues southward and passes out of the District to join the Mahanadi lower down in the Purnea District. The new channel is said to have been caused 100 years ago by Meches damming up the stream for fishing. However that may be, it is a fact that, at the present time, the volume of water flowing in the Old Balasan is considerable and fluctuations in its volume occur which are dangerous to roads and bridges crossing it.

On the extreme west is the Mechi river, part of the District boundary with Nepal, whose chief tributary coines from beyond the frontier. Landslips in Nepal bring down much detritus into the Mechi, the bed of which near the mouth of its gorge is, in the dry season, characteristic of the rivers of the hill face-a stretch of loose and water-worn stones intersected with water channels. The spread of stones surges down southward and where the river emerges from the hills, attacks fields and forests, being at one point pushed further into the attack by another stone stream of delta formation, the mouth of a second tributary from the Nepal side of the main river.

GEOLOGY. Te geological formations of the Darjeeling District consist of unaltered sedimentary rocks, confined to the hills on the south, and different grades of metamorphic rocks over the rest of the area. The outcrops of the various rocks form a series of bands more or less parallel to the general line of the Himalaya and dipping one beneath the other into the hills. A characteristic feature of the southern area is that the older formations rest on the younger, showing a complete reversal of the original order of superposition.

The great range was elevated during the Tertiary period, on the site of ancient sea that had accumulated sediments of different geological ages. The mountains are made of folded rocks piled one over another by a series of North-South horizontal compression movements and tangential thrusts which also folded the strata on the sea-floor and caused their upheaval by stages. At many places the formations have been intruded by granites. The mountains have incorporated some of the rocks of Peninsular India, which seem to have extended northwards as far as the Himalayan sea. Frequently the strata within the range are inverted due to the overturning of the folds and their dislocation. Features of such inversion, bringing the older beds above the younger, characterise the whole length of the outer Himalaya. As a result of forward movements of the folded range towards the south, a portion of the earth's crust in front of the Himalaya sagged, producing a depression now masked by the Indo-Gangetic alluvium.

The present relief of high peaks and deep valleys has been carved by wind, water and snow, three principal agents of denudation. The products of disintegration of the mountains have been swept over the submontane tract as the rivers debouch into the plains. The Terai and the plains at the foot of the Himalaya were given their present form after the final unheaval of the range and consist of almost horizontal layers of unconsolidated sand, silt, pebbles and gravel.

The foothills, north of the Terai, are made of similar but well- cemented and more compact alluvial detritus consisting of soft, grey, massive sandstones, mudstones, shales, mottled clays, conglomerates and subordinate bands of earthy limestone and lignite. The rocks are of Tertiary age and have been included in the Nahan stage of the Siwalik system of the outer Himalaya. The material was laid down along the foot of the rising Himalaya, by an old river system draining the young mountains, and was incorporated in the foothills during the later stages of uplift.

Resting over the Siwalik beds is a group of still older rocks consisting of coarse, hard sandstone, sometimes silicified into quartzites, of carbonaceous and splintery slates, of shales and of impersistent seams of powdered coal. The beds have been invaded in places by minor intrusions of basic igneous rocks. The shales have yielded plant fossils similar to those found in the Damuda stage of the great coal-bearing Lower Gondwana system of Peninsular India, ranging from Permo- Carboniferous to Permian in age.

North of the Gondwana-outcrops, the hills are occupied by a group of low grade metamorphosed sediments represented by quartzites, slates, phyllites and foliated rocks composed of flaky minerals such as graphite, chlorite and sericite. Occasional minor bands of altered basic igneous rocks also occur. The group overlies the Gondwanas and is known as the Baling series. In the Western Dooars it contains dolomite in addition to its other components and is then known as the Baxa series. The exact age of the Daling and the.Baxa series is not known, but they are considered to be much older than the Gondwanas. Their occurrence in the Eastern Himalayas is widespread.

The Daling series rests under a variety of foliated and banded metamorphic rocks, partly sedimentary and partly igneous in origin. These rocks a,e known under the general name of Darjeeling gneiss. The foliated types are usually mica-schists in which the principal mineral is mica, either muscovite or biotite or both. In these schists the flakes of mica and small quantities of other minerals are arranged tightly packed as the leaves in a book. The banded rocks are gneisscs and have been formed by injections of granites fluid along the micaceous layers of the schists. Where soaking has been thorough, the gneisses approach granites in composition and are made of biotite, muscovite, quartz and felspars. The sedimentary varieties of the Darjeeling gneiss contain such minerals as garnet, sillimanite, kyanite and staurolite, the presence of which indicates that the rocks were subjected to higher temperature and pressure than the Daling rocks. The Darjeeling gneiss also carries subordinate bands of quartzite.

The formations of the southern area, with minor exceptions, are inclined at high angles towards the north and north-west. The Tertiaries fringe the older rocks on the south, continuously from close to the Mechi river eastward to the Jaldhaka. The Gondwanas constitute a narrow band between the Dalings and the Tertiaries running from Pankhabari to the Jaldhaka. The Baxas, overlying the Gondwanas, occur only at the extreme eastern end of the District. The Dalings occupy the entire length of the District following more or less the same trend and inclination as the younger rocks. The Darjeeling gneiss occupies the greater part of the district. On the journey between the plains and Darjeeling, the Tertiary beds crop out between Sukna and Chunabati, the coal-bearing Gondwanas below Tindharia, the Daling rocks between Tindharia and north of Gayabari, and the Darjeeling gneiss over the rest of the distance.

The Baling series appears in the Tista valley between Kalijhora and Rangpo, and extends into Sikkim. It is present in the Rangit valley below Darjeeling and the Ghum Range where it has southerly dips. Everywhere in both the valleys it occurs below the Darjeeling gneiss. From the disposition of low grade metamorphic rocks underlying highly metamorphosed ones, some geologists consider the Dalings and the Darjeeling gneiss as two distinct series and maintain that the latter has been pushed over the former and separated from them by a thrust plane. Others, however, regard the Darjeeling gneiss as the granite-injected and highly metamorphosed upper part of a great sedimentary succession, of which the Dalings represent the lower part. No final decision has yet been reached in the matter and the age and relations of the Darjeeling gneiss are uncertain.

A geologial map of the Distriet will be found in the front of the gazetteer.

MINERALS, MINES AND QUARRIES. The minerals of the District include coal, graphite, iron and copper ores but none has so far been exploited with profit. The Gondwana beds contain coal which has a variable ash content. The beds are contorted, faulted and inclined at high angles. The coal is badly crushed and has been rendered powdery, friable and flaky: it does not seem usable for commercial purposes except when coked or converted into briquettes. The high inclination of the coal seams, their impersistence due to faulting and their inaccessibility are factors which militate against economical development. At the end of the last century a company endeavoured to work the Daling coalfield below Nimbong in the Kalimpong Subdivision, but all work was given up owing to mining and transport difficulties. A mining lease has recently been granted to work coal in the same area.

Graphite of an inferior quality occurs in the semi-graphitic schists of the Rakti river. As far as is known it is of no economic value.

Iron-ore, varying from a strong ferruginous clay to an impure brown hematite, is found at Lohargarh to the south-west of the District below Pankhabari and, according to old reports, was formerly worked. High grade magnetite and micaceous hematite, free from sulphur and phosphorous, form a band about 20 feet thick at Samalbong about a mile east-south-east of Sikbar to the east of the Tista. The ore is said to have produced iron of the best quality in the past.

Copper-ores, chiefly chalcopyrite, occur in the rocks of the Daling series near Ranihat, on the western side of Mahanadi, near the mouth of the Baffupani: at Pashok: at a place 2 miles north-east of Kalimpong: on the left bank of the Tista river, east of Mangpu: in a ravine near Samther: and in the neighbourhood of the Chel river. No attempt has yet been made to exploit the deposits by modern methods. Concessions were taken out in the past but working was unsuccessful. The number of mines and old workings deserted by the local people shows that even they did not find copper smelting in the Darjeeling hills lucrative.

There are three possible sources of lime in the District, viz., the dolomite of the Baxa series, the limestone bands in the Tertiary rocks and the calcareous tufa deposited by springs at numerous localities, chiefly at the junction of the Gondwana and the Tertiary rocks. The tufa is fairly pure and contains over 90 percent, of carbonate of lime.

The District does not possess high class building or ornamental stone but practically all formations yield stone that can be used for building purposes. Stone is procurable everywhere in the hills from rocks near at hand such as the Daling beds, which yield coarse slate and quartzite, or the harder Tertiary and Gondwana sandstones near the foot of the hills to the common Darjeeling gneiss, which can easily be split and dressed into conveniently sized blocks for use in buildings, revetments and protection walls. The Communications and Works and the Forest Departments of the Bengal Government maintain several quarries for road metal for which quartzite and gneiss are commonly used.

EARTHQUARKS. Within living memory, the District has not fallen within the epicentral tract of a major earthquake affecting north- eastern India. But minor earthquake shocks, smart as well as mild, have been recorded from time to time since 1842. A sharp shock, felt on the 27th February 1849, caused many well-built walls to crack. Several shocks were felt between March and October in the year 1863. During the Cachar Earthquake of the 10th January 1809, smart hocks were recorded at Darjeeling, Kurseong, Pankhabari and Siliguri. During the same year minor tremors were felt at Darjeelng between the months of March and August. Cracks appeared in several buildings at Darjeeling and Kalimpong during the Dhubri Earthquake of the 3rd July 1930.

The District was included within the higher isoseismals of the Assam Earthquake of the 12th June 1897 and the Bihar-Nepal Earthquake of the 15th January 1934. It was severely shaken on both occasions, the worst affected parts being Darjeeling town and its neighbouring spurs and the railway station at Tindharia. At Darjeeling a number of badly constructed houses totally collapsed. In many buildings cracks formed or walls fell out and bungalows were damaged by the fall of masonry chimneys crashing through roofs. Although the loose nature of the Darjeeling soil is partly responsible for much of the destruction by earthquakes, a noticeable feature of the 1934 earthquake was that, in the area of maximum damage, ferro - concrete structures stood almost unharmed. So also were well- constructed recent buildings of brick or dressed stone. On this occasion, the top layers of the sub-soil on the crest of the Darjeeling ridge and its outlying spurs, mostly on the western side of the town, developed fissures damaging buildings.

The station building at Tindharia was damaged during the earthquakes of 1897 and 1934. Landslips took place near Tindharia station soon after the earthquake of 1897 and a ground fissure, over 300 yards long, appeared below the station yard in 1934.

During, the earthquake of 1934, Kurseong and Kalimpong escaped with minor cracks in buildings but landslips occurred at several places in the Tista valley below Kalimpong.

Serious damage to buildings has never been reported from Siliguri, but, during the earthquakes of 1897 and 1934, ground fissures appeared at several places in the submontane tract to the north, near and beyond Sukna, and the cart road was much cut up.

EROSION AND LANDSLIPS. The District is exposed to constant danger from landslides, most of which take place during or soon after the monsoon. Scars left by landslides are common features of the landscape in every part of the District. Gravity, in causing slips, is aided by the steepness o slopes and soaking of the mantle rock, essential conditions of instability being lack of support in front and lubrication behind. The parts f the hills usually affected either are composed of soft rocks such as schists, shales and clays or support thick mantles of soil and weathered rocks on steep slopes.

Several of the types into which Swiss geologists classify landslides can be recognized in the Darjeeling Himalaya. The simplest are the Rock Falls, or Felsstürze of the Swiss: these are falls of boulders, large or small, from steep slopes. Boulders on hill-sides are usually isolated from the bedrock by a zone of decomposed material behind and beneath them. Traffic is often held up on the Cart Road to Darjeeling by rock falls of this type, which are not uncommon during the rains.

Another, type, the sliding of rock masses, termed Felsschlipfe in the Alps, is quite frequent in the Tista valley between Sivok and Kalijhora, where the hills consist of interbedded sandstones and shales inclined at high angles in the same direction as the hillslops. The scouring of underlying bands of soft shales by rainwater causes the overlying sandstones to slip and slide down the hillsides. Sliding also occurs among the harder gneisses and quartzites when they are fractured and faulted or traversed by highly inclined joint and cleavage planes.

A third type, Soil Slips or Schuttrutschungen, is caused by slow downward movements of soil or unconsolidated material along unprotected hillslopes. Such movements are familiar on the Cart Road, particularly between Mahanadi and Rangtong, where portions of the road may sink from a few inches to several feet. The subsidence usually takes place where a steep embankment has been constructed on decomposed or soft rocks such as shales, clays or micaceous schists and is left without sufficient protection. Elsewhere in the hills, surface waters, percolating through shattered rocks in a crushed zone, sometimes issue as springs at lower levels and carry large quantities of comminuted rock particles in suspension. This causes subsidence at the higher levels and slips at lower levels: both are the result of the undermining action of spring water at the foot of the slopes. A settlement of this nature was recorded in the faulted area between the two branches of the Kagjhora in Darjeeling, where subsidence at the higher levels produced serious cracks in the surface soil.

The slow downward creeping movement of soil sometimes give place sudden and violent landslips called Schuttstürze by the Swiss geologists. Such landslips may occur on slopes covered with thick soil and weathered rock and may affect hillsides of considerable extent. During his travels in the Lower Himalaya, Sir Joseph - Hooker came across several enormous landslips. "The most prominent effect of the steepness of the valleys", he wrote, "is the prevalence of landslips which sometimes descend for 3,000 feet, carrying devastation along their course: they are much increased in violence and effect by the heavy timber trees which sway forwards, loosen the earth at their roots and give impetus to the mass." As such landslips may take place without previous warning, loss of life and damage to property in inhabited areas may be appalling. Fortunately catastrophic landslips are not frequent in the towns of the Darjeeling District, where, after the disastrous landslips of the 24th September 1899 in Darjeeling town, measures have been taken to protect hillslopes on the lines suggested by an expert Committee appointed by the Government of Bengal.

The landslips known as Schuttsturze are explained in the following way. The soil-cap is the direct product of the atmospheric decomposition of rocks. There is a transition from the superficial layer of soil formed by the weathering of the rocks near the surface through a zone of decomposed rocks, known as the sub-soil, to the bed-rock. The soil-cap is in process of continual growth through chemical action of percolating waters on the bedrock. As the rate of erosion of soil by rain-water is lower on hill slopes covered with vegetation than on bare slopes, thick mantles of soil and other products of rock decay accumulate on wooded slopes. This material can remain stable so long as its angle of safety is greater than the inclination of the slope on which it rests. The formation of a soil-cap does not itself contribute to any increase in the surface slope but its removal from the foot of a hill by streams increases the average slope of the hillside and disturbs the angle of repose of the soil-cap. Consequently the soil-cap on the upper part of a hillside, when subjected to the undermining and erosive action of a stream, is liable to a slow process of creep (Schuttrutschungen) with the regular succession of wet and dry seasons. During each monsoon, as a result of the expansion which follows saturation, the soil-cap slowly moves downwards in the direction of least resistance. In the succeeding dry season, the soil contracts on drying and the downward movement is checked. Movements of the soil down the slope continue in this way year after year until conditions of stability are exceeded, when landslips occur to restore equilibrium. The magnitude of a land slip depends on the thickness of the soil-cap, the amount of saturation of the soil, the steepness of the hillslope, the nature of the underlying rocks and the erosive power of the streams and waterfalls in the area.

Practically all the landslips in the District are caused by a combination of some or all of the above. The disastrous landslips of September 1899 which occurred on the eastern side of Darjeeling town were of the type known as Schuttstürze. These landslips were confined to the soil-cap covering the gneisses which form the Darjeeling ridge and their immediate cause was traced to the excessive rainfall which, following an unusually heavy monsoon, deluged the town for three days commencing on the 23rd September.

The hillslopes already had a thick mantle of soil in a state of unstable equilibrium and heavy rains precipitated the slips. Damage to property was considerable while the loss of life amounted to 72, 45 deaths occurring on the eastern side of the ridge.

The landslips in the Happy Valley, west of the Cart Road at Darjeeling, are due to head erosion of the Katchary jhora and its tributaries. In this area the cliffs are of highly fractured and fissured gneissic rocks, which have been decomposed to considerable depths below the surface by percolating rain-water. The ground behind the cliffs is highly decomposed and, during the rains, becomes saturated, whilst the water in the jhora below undermines the cliffs. The rockface becomes gradually detached from the ground behind and small or large sections of rock slide into the jhora.

In the reserved forests in the Kalimpong Subdivision, landslips are caused by disintegration of the different, rocks as a result of weathering and by the continual steepening, by river erosion, of the hillslopes supporting the weathered material. The increased angle of slope imparts instability to the weathered material which, having no outward support, slips into the valley below.

Landslips cannot entirely be prevented but they can be checked by proper protective measures. Turfing and afforestation of bare slopes, well-directed and efficient drainage, reduction of the steepness of hillslopes by terracing, outward protection of the soil-cap by means of revetments and buttresses, protection of the harder rock outcrops, systematic quarrying in hillsides and control of the erosive action of streams and waterfalls are some of the measures which give useful protection.

Local damage by erosion is mainly noticed when roads or railways are affected and the engineers responsible for communications have much of their time taken up in dealing with breaks arising from slips. They have become accustomed to coping, cheaply and swiftly, with damage often quite extensive and apparently alarming.

More serious effects of erosion are to be noticed in the behaviour of certain of the rivers debouching from the hills. The Mechi river bed on the west boundary of the District has been filled and its course deflected by a huge volume of detritus originating in a great landslip in Nepal. The result has been loss of cultivated land on the Darjeeling side of the river and great damage to the Mechi reserved forest through which the river is being deflected.

The Lish and Chel rivers on the eastern side of the District have been bringing down much debris and thereby have damaged the road and bridging crossing the rivers at the foot of the hills This is directly due to heavy erosion in the hills.

The Balasan river, emerging from the hills below Kurseong, divides into two branches. This bifurcation entails a continual danger that the river will a change its course and damageproperty and road. While it is not possible to say that this situation is. due to any erosion, it may be true that, if the head waters had been more heavily afforested, the danger would not be so great.

Little can be done to remedy the more extensive effects of erosion after they have occurred. One or two small areas have been made over to the Forest Department for remedial measures by protection and afforestation. In 1940, an area of 188 acres was handed over at Dalapchan near Kalimpong, where damage to a Government road had been recurring and was costing large sums in repairs. In 1942, small areas totalling 173 acres were similarly handed over in the Kalimpong Development Area. Work has been taken in hand and it has been found necessary, before commencing afforestation, to construct revetment walls and contour drains. No general preventive action against erosion has yet been undertaken.

CLIMATE AND WEATHER. Tourists and casual visitors to Darjeeling town find two seasons congenial for their purposes-spring and autumn. The monsoon period is popularly (and correctly) known as a period of heavy and almost continuous rain and mist. - The winter after December is usually too cold and unpleasant for visitors: indeed most permanent residents make arrangements for spending as long a period as possible during the months of January and February 't lower altitudes or in the plains.

A more detailed explanation of weather conditions in the District as well as in the town of Darjeeling is justified by the peculiarities of climate which most parts of the District experience.

Weather conditions generally are noteworthy because of the position of Darjeeling in relation to the land mass of the Tibetan plateau and of the powerful effects of the monsoon current. Conditions in different parts of the District show wide variation and their diversity is due not only to differences of altitude (normally considered to affect temperatures at the rate of about 3 degrees Fahrenheit for every difference of 1,000 feet) but also to the configuration of neighbouring mountains which deflect winds and affect rainfall and temperature locally to an appreciable extent.

The southern parts of the District (and particularly the Terai) are t low altitude and are more directly affected by conditions which regulate weather in the plains. Climate in the more northerly parts of the District depends on the extent to which the shape and height of local mountain masses impede or enhance the southerly influences.

AIR MOVEMENT. During the period November to May upper winds over the Himalayan region are predominantly westerly. At extreme heights these winds are invariably strong and often rise to gale or hurricane force. At these heights some falling off in speed usually occurs in the months of March, April and May and with the setting in of the monsoon (in June) there comes a conspicuous reduction in wind speed persisting until the approach of, winter.

At altitudes of 8,000 to 20,000 feet in the Eastern Himalaya, wind directions are steady from November to the first half of February and fairly steady from the second half of February to May. During the monsoon, wind direction is most unsteady and the monsoon current occasionally rises to great heights (even above the highest Himalayan peaks). On such occasions the air current over the Eastern Himalaya becomes southerly or south-easterly and easterly or north-easterly over the Western Himalaya. In October, with the withdrawal of the monsoon, the westerly movement begins and becomes progressively steady as winter conditions set in.

At the height of Darjeeling and in the Terai, calm conditions are frequent. Calm does not occur so often at Kalimpong. Average wind force at Darjeeling does not exceed 6 miles per hour: the mean velocity is higher at Kalimpong and lower in the Terai. Local storms however occur in all parts of the District.

Surface winds in the Darjeeling District have usually an easterly component. From November throughout the winter the prevailing direction in Darjeeling town is east-north-east. In the spring up to June there is a tendency for a west or south-west component to enter and in the monsoon (June to September) the prevailing direction is east-south-east.

Wind directions are probably caused by a large easterly Himalayan air mass which descends as an easterly or north-easterly current usually down the Brahmaputra valley. This air current is responsible for the majority of storms in the Bay of Bengal and for the deflection of monsoon depressions towards the west. Except in the winter months this current is the coolest of the various air masses in the region of India.

In the pre-monsoon months, a southerly air from the Bay of Bengal brings moisture inland in varying quantities. The impact of this current on the cool north-easterly current gives rise to local storms in the plains of Bengal and is, with a diurnal convection of air between the hills and the plains at the foothills, the main cause of the frequent local storms which take place in the District during March, April and May. By the middle of June or the beginning of July, the Bay of Bengal air current has usually merged into the Bay branch of monsoon.

The southern part of the Terai is occasional affected for a few days by a hot dry wind which, during hot weather months, blows from the west over Bihar. This wind, more common in the south Terai, rarely reaches as far to the east as Jalpaiguri. It has a parching effect on vegetation and in particular on tea, causing the leaves to fall off the bushes.

In the Tista gorge and other river valleys, there is often a draught of air up an down which changes direction diurnally.

HUMIDITY,RAINFALL AND SNOW. Moisture conditions, viz., humidity, obscuration ad precipitation, follow closely from the air movement mentioned above. Humidity at Darjeeling town (altitude 7,432 feet) at 9 hours varies from 72 per cent. to 96 per cent. of saturation and at 18 hours from 82 percent to 96 percent. It is highest from June to September when the variation is from 93 percent to 96 percent. The lowest morning values are recorded in December and March. At Kalimpong (altitude 3,965 feet) percentages vary from 65 to 94 in the morning and from 59 to 93 in the evening. The lowest mean values in the mornings and 59-61 in the evenings) occur in March and April. The highest mean values (90-93) occur as at Darjeeling from June to September. At Pedong (altitude 4,760 feet) percentages are lowest in March (68) and highest from June to September (88-91). In the Terai the mean is lowest in March and April (73) and highest from June to September (89-91).

Fog occurs in the Terai from December to March on a few days only. In the hills occurrence is local. In Darjeeling and Kalimpong fog or mist is very common in July and August and is fairly frequent in June and September: it is rarest in December. In Darjeeling town the sky is not discernible on 20 days on the average in each of the months of July and August. Normal cloud occurrence at Kalimpong, Darjeeling and Gangtok is as follows:-

Cloud at 8 a.m. local time (whole sky cloudy 10.0).

	Kalimpong.	Darjeeling.	Gangtok.
January	2.6	4.1	3.1
February	2.7	4.3	3.2
March .	1.8	3.6	2.2
April ..	3.3	4.9	2.7
May ..	4.2	6.8	4.0
June ..	7.1	8.6	6.1
July ..	7.5	9.0	6.7
August ..	7.5	9.0	5.9
September	6.5	8.1	5.5
October	3.3	5.3	3.4
November	1.9	3.3	2.4
December	2.6	3.1	2.0
Year .. .	4.2	5.8	3.9

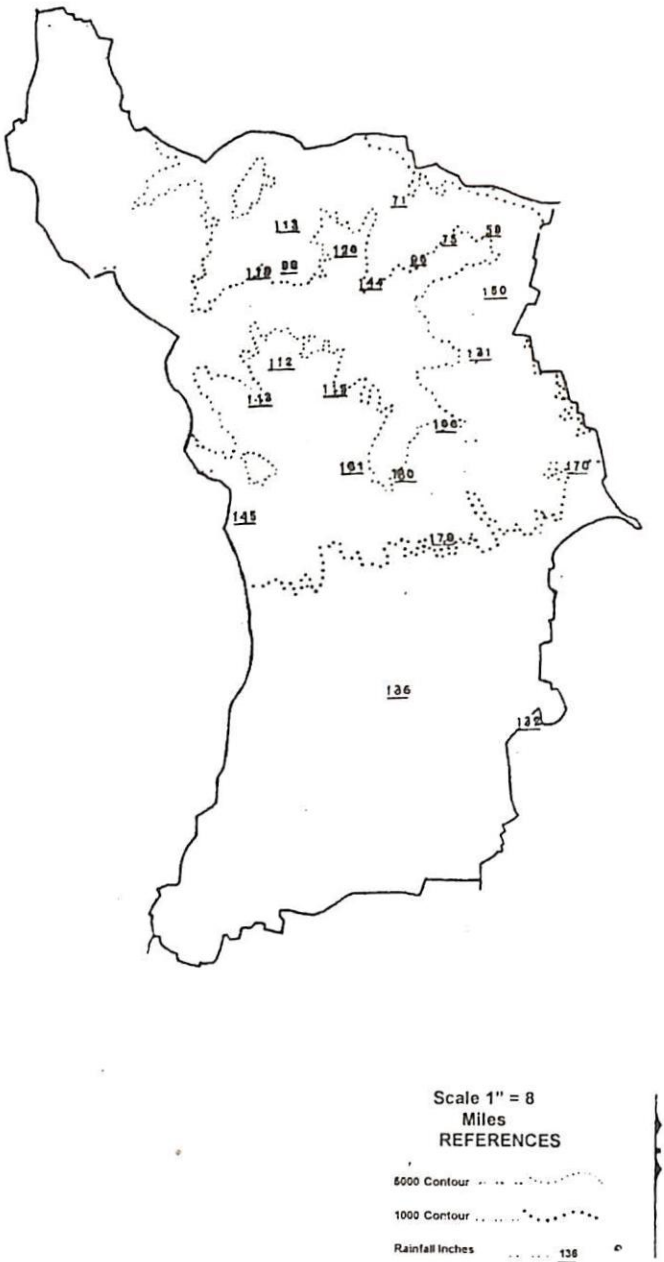
Precipitation is heavy throughout the: monsoon months in all parts of the District but average rainfalls vary considerably from place to place, being dependent on a number of local conditions such as the configuration and height of local mountain features.

Average annual rainfall figure: are given below for different parts of the District (height above sea-level in feet shown in brackets) -

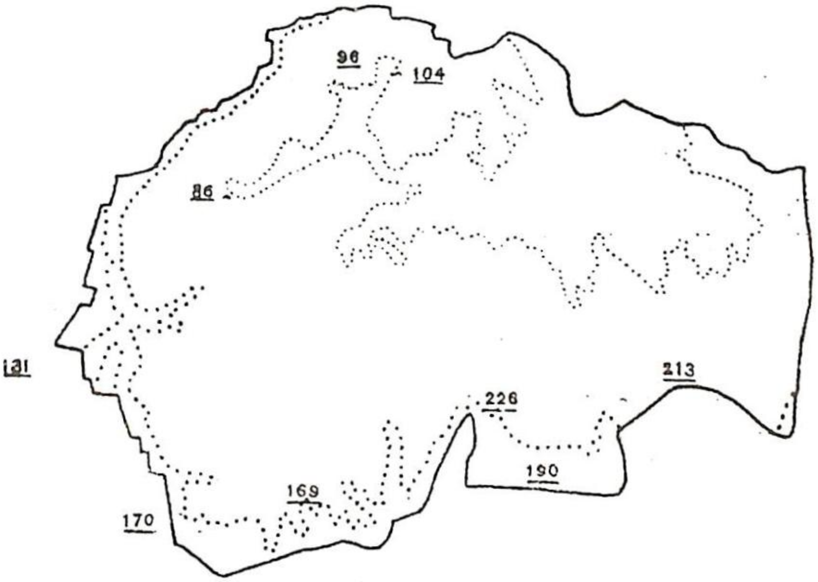
Terai	Inches		Inches.
Siliguri (396)	131.63	Baghdogra (500)	135.60
Outer Hill face -			
Samsing Tea Estate	212. 76	Fagu Tea Estate	226.20
Minglas Tea Estate		190.23	Bagrakot Tea Estate
168.52			
Rongtong R. S. (1404)	178.50	Sivok R. S. (500)	170.30
Outer Hills -			
Gyabari Tea Estate (Mechi)	145.00	Kurseong (4,920)	161.26
		(1923-27 212.4")	
Mahanadi Tea Estate		180.00	Mahaldirain Tea Estate
195.92			
(in 1938 234").		(5,213).	
Dhobijhora (6,066)		162.08	
Upper Balasan-			
Poobong Tea Estate	112.06	Selimbong Tea Estate	112.75
Balasan Tea Estate	111.00	Nagri	115.00
Inner Hills Rangit Valley -			
Darjeeling (7,376)	126.42		
Mim Tea Estate	110.30	Tumsong	111.00
Singtom Tea Estate	113.25	Kyel and Marybong	97.95
Inner Hills Rangnu Valley -			
Lopchu Tea Estate	96.13	Glenburn Tea Estate	74.99
Badamtam Tea Estate	70.75	Pashok Tea Estate	58.92
Rangiroon Tea Estate	144.39		
Tista Valley -			
Tista Valley Tea Estate	150.00	Mangpu Cinchona Factory	131.22
Inner Hills East -			
Kalimpong (3,933)	86.20	Pedong (4,760)	103.75
Munsong Cinchona	96.23		
Sikkim -			
Gangtok(5,667)	135.11		

A map follows giving the salient figures from the above from which it will be seen that rainfall is heaviest on the outer fame of the hills overlooking the plains and particularly heavy at the eastern end of this face where annual falls of over 300 inches are known to take place. Localities protected on the south by hills and mountains tend to have a lower rainfall as intervening high land intercepts some of the moisture. This is noticeable in the areas

DISTRICT DARJEELING excluding KALIMPONG SUBDIVISION



KALIMPONG SUBDIVISION



north of the ridge running east from Manibhanjan to Senchal and the Rishi La.

Snow is caused by depressions coming from the north-west and falls in the District on the average only on one or two days in the year and then only at higher altitudes and during the period December to March. There was a particularly heavy fall in Darjeeling town on the 7th of March 1913. On ground below 8,000 feet, snow rarely remains unmelted for more than a few hours.

Hailstorms occur throughout the District during the months of March, April and May. They are less frequent in the Terai than in the hills but very large hailstones sometimes fall in the Terai. Falls of hail vary locally in a capricious way and in the hills they are more common at the higher altitudes and often do much damage to vegetation.

Normally monthly distribution f rainfall (including snow and hail) at Darjeeling town is -

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct	Nov	Dec.
Darjeeling town	0.53	1.19	1.88	4.14	9.63	24.18	32.02	26.56	19.90	54.1	0.81	0.27

For comparison distribution figures for Kalimpong and Gangtok are also given-

	Jan.	Feb.	Mar	Apr.	May.	June.	July	Aug.	Sep.	Oct.	Nov.	Dec.
Kalimpong	0.45	1.50	1.13	2.59	4.45	15.55	22 07	19 17	10.93	2.55	0.20	0.24
Gangtok	1.00	2.54	5.12	11.43	19.45	20.62	24.90	22 69	19.50	5.34	1.83	0.89

The normal number of rainy days (monthly and annual) for Darjeeling and Kalimpong are : -

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec	Year.
Kalimpong	1.3	3.0	3.1	6.3	8.8	15.9	23.3	21.1	12.8	3.4	0.5	0.5	100. 2
Darjeeling	1.5	2.4	3.6	7.1	13.9	20.6	25.0	24.4	17.0	4.3	0.8	0.7	121.3

TEMPARATURE. Temperatures vary with altitude. In the Terai the highest maximum recorded has been 104.00 F. and the lowest minimum 36.0 F. At Kalimpong the highest maximum temperature 80° F. occurred in April and June and the lowest minimum 310° F. in December. In Darjeeling town the highest maximum temperature occurred in June (80.10 F.) and the record lowest minimum 19.9° F. in February.

The following are the monthly and annual normals of maximum and minimum temperature in degrees Fahrenheit for Kalimpong, Darjeeling and Gangtok:-

Maxima.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov	Dec.
Kalimpong (Alt. 3,038')												
average for year 69.5°	58.9	50.7	68.3	75.1	74.3	74.9	75.1	74.7	74.3	71.6	66.5	61.0
Darjeeling (Alt. 7,376')												
average for year 58.8°	46.6	48.4	56.3	62.5	64.0	65.5	66.3	65.9	64.9	61.3	55.1	49.2
Gangtok (Alt. 5,667')												
average for year 68.2°	57.5	59.1	66.3	70.4	72.4	73.9	74.6	74.6	73.9	70.8	64.7	60.3
Minima.												
Kalimpong (Alt. 3,938')												
average for year 57.6'.	45.9	47.4	52.7	58.2	62.1	65.39	66.9	66.9	65.4	60.3	52.5	45.8
Darjeeling (Alt. 7,876')												
average for year 47.4°	34.7	35.5	42.1	48.5	52.1	56.2	57.7	57.4	55.7	49.9	42.7	36.37
Gangtok (Alt. 5,667')												
average for year45.8°	32.2	84.9	41.7	47.1	50.5	54.9	58.0	55.6	53.6	48.4	40.8	34.1

The information given above can serve as a prelude to a general description of weather ii the District, which follows more or less closely the course of weather in the plains in that there is a cold weather, a hot weather and a rainy season. There are however in Darjeeling town two short periods, and these the most delightful in the year, which correspond in some ways to the autumn and spring of temperate latitudes. The cold weather ha two parts : the first at the end of the rains is mild and pleasant, the atmosphere being tolerably clear and generally free from the mist and cloud which is so common at most other times of year. This is the autumn. The second part begins in December when the first hoar-frost brings in winter. Quite often the air is cloudless, dry and bracing. In the early morning it is very cold but later, if there is sunshine, it can be pleasantly warm. January and February are often far less pleasant especially when fog and cloud obscure the sun. Snow falls occasionally in these months and life in horses not built to keep out the cold has some hardship when the range of temperature outside is from a maximum of 34 to a minimum of 32 Fahrenheit and the temperature inside a. bedroom is found to be 38 in the early morning. Snowfalls are not common and snow rarely lies long on the ground. In 1837 more than a foot of snow was recorded and in February 1887 snow lay for three weeks on the higher ranges near Darjeeling.

Spring begins in March when there are often strong winds. At the beginning of the month rhododendrons and magnolias are in full flower in the forests nearby and garden flowers begin to bloom. April and May give a short-lived summer with frequent showers of rain (and often hail). In June the monsoon begins and for three months Darjeeling is exposed to heavy monsoon rain and is usually shrouded in mist In September a change is expected. The rain gives way to showers which become less and less frequent. The sun shows itself more often and by October the rains come to an end.

Weather in Darjeeling even when apparently most settled cannot be relied on and cloud and fog may at any time rise from the deep humid valleys and hang for days over the station.

In the District, abrupt changes of altitude, aspect and exposure to moist winds give rise to a wide variety of climatic conditions many of remarkable severity. In the Terai and lower valleys the heat is tropical and on the outer face of the hills monsoon rainfall is very heavy. On the high mountains exposed to the moist southerly winds from the plains rainfall may be lower but a condition of cold humidity obtains which is only found in a few parts of the world. Climate in intermediate situations varies through a wide range.

STORMS. Although normally wind force is small in all parts of the District, storms occur from time to time accompanied by heavy rainfall and winds of great force. Such a storm took place in September 1899 when in the 24 hours preceding 8 a.m. of 25th September 1899, 19.40 inches of rain fell at Darjeeling (the maximum fall during 24 hours recorded during 48 years). This followed heavy rainfalls on the 23rd and 24th September: these coming

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