

MEMOIRS
OF THE
GEOLOGICAL SURVEY
OF
INDIA.

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MEMOIRS
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GEOLOGICAL SURVEY OF INDIA.

A CATALOGUE OF INDIAN EARTHQUAKES *from the earliest time to the end of A. D. 1869, by the late THOMAS OLDHAM, LL.D., F.R.S., &c., Superintendent of the Geological Survey of India.*

In the preparation of the following catalogue, the authorities which have been accessible to me were—‘The Earthquake Catalogue of the British Association, by Robert and J. W. Mallet, London, 1858.’ This catalogue only comes down to the close of 1842. For years subsequent to that date, the valuable series of catalogues published by Professor Perrey of Dijon, which appear in different numbers both of the ‘Mémoires de l’Académie de Dijon,’ and in the ‘Bulletin,’ and in the ‘Mémoires Couronnées, de l’Acad. de Belgique,’ have been consulted. The valuable papers of Baird Smith, in the Journal of the Asiatic Society of Bengal, on Indian Earthquakes have also been useful, but unfortunately do not come down later than 1843; also the papers of Dr. G. Buist in the ‘Trans. Bombay Geog. Soc.’ The files of the well-known weekly paper, *The Friend of India*, from 1843, for the use of which I am indebted to the courtesy of the Editor, G. Smith, LL.D., have been carefully gone over. The travels of Vigne, Moorcroft, Masson, Burnes, Thomson, Hooker and others, private communications as well as unpublished official records and the pages of the ‘Asiatic Journal,’ the ‘Asiatic Annual Register,’ and numerous other periodicals, have all contributed more or less to the list. In *all cases*, excepting when such is specially stated, the original papers or books in which the descriptions are given have been referred to.

When completed in this way, a few copies were printed and distributed to several public offices and private individuals, more especially to the principal officers of the Public Works Department, with a request for any additional information which the records of their offices might afford. From a few, valuable additions were received, which have since been embodied in the catalogue.

While convinced that, if we desire to reap any harvest of accurate results from the cultivation of this difficult but promising portion of terrestrial physics, we must carry our investigations to a much more advanced stage than merely cataloguing the phenomena, I still think that much information can be gained from such lists. And as they have never before been attempted for the Indian Empire, with the exception of the admirable summary for 1842 by Baird Smith, I have devoted some time to the following catalogue. I am conscious of its deficiencies, notwithstanding the care given to its preparation. In fact, no such lists can be rendered satisfactory by individual efforts; they necessarily demand the co-operation of many. I would therefore feel from any who may have it in their power to contribute information. And with a view to a continuance of similar returns for future years, I will feel indebted to any one who will communicate to me the facts regarding any earthquake which they may experience within the limits of British India or its dependencies.

For the curious and valuable information regarding several of the earthquakes which occurred in the earlier centuries of our era, the pages of Al Macin and Abul Faraj have been consulted. But I am specially indebted to H. Blochmann, Esq., for his invaluable aid in tracing out the interesting histories of these striking phenomena. He has ever been most willing to give me the full benefit of his extensive reading and acquaintance with oriental literature, and I fear I have more than once been induced, by his own readiness to assist, to trespass on his valuable time more than I wished.

The catalogue is only brought up to the end of the year 1869.

CATALOGUE OF INDIAN EARTHQUAKES.

A. D.

893 ? 894.

...

INDIA.—Under the year 893, A.D., in the catalogues of earthquakes, a very severe shock is stated to have occurred in India. The capital is said to have been destroyed, and 180,000 men to have perished; preceded by an eclipse of the sun, &c., &c. And as authorities for this statement, Abul Faraj and Al Macin are quoted. I have, however, been unable to find any reference to this earthquake in the only edition of Abul Faraj to which I have access, (Pocock's Translation, Oxford, 1663); nor can I see any account of it in Al Macin (Erpenius' Translation, Leyden, 1625). But, on referring the question to my friend Mr. Blochmann, he furnished me with the following references: In the *Tárikhul Khulafá*, or History of the Caliphs, it is said: "And during this year (A. H. 280) a letter came from Daibul that there was an eclipse of the moon during the month of Shawwál, and that the next morning the world was in darkness, which continued till about 4 o'clock in the afternoon: and there blew a *black* wind, which lasted till a third of the night had passed away, and the wind was followed by a great earthquake which caused the whole town to disappear. The number of people which were dug out from the ruins was 150,000 men." Again, in *Alkámil-fi-l Tárikh* by Ibn-ulathír (possibly the largest historical work of the Arabians), it is said: "And in the Shawwál of this year (A. H. 280) there was an eclipse of the moon, and the people of Dabíl and the whole world awoke in darkness. And the darkness lasted for a long time, and when it was 4 o'clock in the afternoon there blew a black wind,¹ which continued to a third part of the night. And when the third part of the night had come, there was an earthquake, and the town was destroyed, so that only about 100 houses remained, and after this the earth shook five times more

This may have been a drifting shower of volcanic ashes.

A. D.

893 ? 894.

... and the total number of people that were found killed below the ruins amounted to 150,000."—(Tornberg's edition of *Alkámil*, Vol. VII., p. 323.)

There is here a perfect agreement as to date. Indeed it seems probable that both writers derived their information from the same source. The month of Shawwál, in the year of the Hijra 280, commenced 90 days before the 13th of March, 894, A. D., that is, on the 14th of December 893. Hence the earthquake must have been at the close of the year 893, or in the few first days of 894, A. D.

But these two authorities differ in the name of the large town said to have been destroyed, one calling it "Daibul," the other Dabíl. Now, Daibul, according to Yáqút's Geographical Dictionary (a famous Arabic work), lay "on the coast of the Indian Ocean. It is a famous town, and the waters of Láhor and Multán reach it, and flow into the Bahr-i-Hind" (Indian Ocean). This is the ancient town of *Daipul*. In all probability this was the town visited by this severe earthquake, still it is very strange that the narrators refer to no sea-wave having covered the land.

According to the same authority, Dabíl is, 1st. a town in Armenia, near Arrán¹ (between the Euphrates and Tigris); and 2nd, a sandy district in Arabia, between Yamámah and Yaman. This would render it probable that the earthquake was in Armenia, although there seems nothing to lead one to conclude that this Dabíl was a town of such importance or size as to contain more than 150,000 inhabitants.

1505. *July* 6th.—In the catalogues this very severe earthquake is referred to, but without a date, 'about the middle of the year.' In Sultán Báber's memoirs also no date is given. And, again, in *Firishtah* (Dow's edition, II., 75), an earthquake is stated to have occurred at Agra on the 15th July, which it seemed probable was the same as that reported in Kábul, Afghanistan, &c. Elphinstone also (*India*, II. 586) notices the same earthquake as occurring at Delhi. Mr. Blochmann, at my request, has been able to trace out the history of this occurrence fully and to fix the date.

¹ Arrán, Harrán Harra, (Greek, *αρρονιμῶς*), signifies volcanic region.

A. D.

1505. July

6th.—In the *Mir-át-ul-'Álam*, a MS. in the library of the Asiatic Society of Bengal, it is stated—"In the beginning of this year (911) an immense earthquake happened in the confines of Kábul. The walls of the fortress and of most houses of the Bálá Hiçár and in the town fell down, and thirty-three times in one day did the earth tremble. For a whole month twice a day pieces of earth slipped down, and a large number of men was killed, and between Pimghán and Bekfaut (?), a piece of land about sixty cubits broad tore off and slipped down as far as you can shoot an arrow, when suddenly at the former place several springs appeared. And from Istargháb to the Maidán which is nearly six *fursangs*, the ground presented depressions and elevations as high as an elephant. And in the same year an earthquake was also felt in Hindústán."

In *Baḏáoní* (*Bibliotheca Indica*, Vol. 1, p. 319), we find it recorded: "On the third day of the month Çafar, 911, A. H., there was an immense earthquake in the whole of Hindústán, so much so that the mountains trembled, and high, firm, buildings came down. The earth broke open in several places, and immense fissures appeared. Villages and groves slipped from their places, and people thought the day of resurrection had come. But from the memoirs of Sultán Bábár it would seem that the earthquake was not confined to Hindústán, but was felt just as powerfully in Kábul and Persia. Since the creation of the world there never was so dreadful an earthquake."

In the memoirs of Báber (*Erskine's edit.*, p. 170), it is said: "At this period (Muharram, 911), there was such an earthquake that many ramparts of fortresses, the summits of some hills and many houses both in the towns and villages, were violently shaken and levelled with the ground. Numbers of persons lost their lives by their houses and terraces falling on them. The whole houses of the village of Pemghán (or Pehmán, south or south-west of Kábul) fell down, and seventy or eighty respectable landholders were buried under the ruins. Between Pemghán and Bektob, a piece of ground about a stone's throw in breadth separated itself, and descended for the length of a bowshot, and springs burst out, and formed a well in the place which it had occupied. From Istarghaób (north of

A. D.

1505. *July* *6th.* Kábul) to the plain, being a distance of about six or seven *farsangs*, the whole space was so rent and fractured, that in some places the ground was elevated to the height of an elephant above its old level, and in other places as much depressed; and in many places it was so split that a person might have hid himself in the gaps. During the time of the earthquake, a great cloud of dust rose from the tops of the mountains; many rising grounds were levelled. That same day there were thirty-three shocks, and for the space of a month, the earth shook two or three times every day and night."
- Firishtah also (Lucknow edition, p. 183) mentions this earthquake as occurring at Agra during the reign of Sultán Sikandar Lodhí "on Sunday, the third day of Çafar."
- These dates combined fix the occurrence very accurately, as having taken place on the 6th July. The year 911 of the Hijra commenced on the 4th June 1505, A. D. Mubarram (1st month) has 30 days, Çafar (2nd month) has 3 days, or the 3rd of Çafar, 911, was the 33rd day from the 4th of June = the 6th July. Firishtah adds, "On Sunday." Now, according to Prinsep's Useful Tables (p. 198), the year 911, A. H. commenced on Wednesday, the 4th of June; therefore the 33rd day of the year coincides with Sunday, the 6th July, 1505, old style. Firishtah died soon after, 1600, A. D.
1552. CASHMIR.—Mentioned in Prinsep's Tables; no particulars.
1618. *May* *26th.*—BOMBAY, &c.—Accompanied a severe hurricane; 2,000 lives and 60 vessels lost at Bombay.
1663. *February 7th ?.*—LAKHUGAR.—One day's journey from Gauhati; in the evening. *Jour. As. Soc. Beng.*, XLI, pt. 1, page 95.
1664. *date. ?.*—Seven days' journey from DACCA.—Shocks recurred for 32 days—*Brit. Ass. Catal.*, 1852, 84, quoting *Collect. Academ.*
1668. *May* .—SAMÁJÍ.—Delta of Indus. "At this time (between 1st and 10th Zi Hajjah, A. H., 1078) a report was received from the Soobah of Tattah that the town of Samáwání (or Samájí) which belongs to the Parganah of Láhori had sunk into the ground with 30,000 houses during an earthquake." *Maásir A'lamgiri, Edit. Bibl. Indica*, p. 74. This time corresponds to 2nd to 11th May, 1668.

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1669. *June* 4th.—UPPER INDIA.—In the *Mir-át-ul-' Alam* (Mirror of the World) by Bakhtáwar Khán,—MS. never printed,—it is said: “A strong earthquake took place on the 14th Muharram of Aurangzib's 12th year, in the districts surrounding the fort of Mandrán. A chasm appeared in the ground about fifty cubits long and two yards broad. The inhabitants tied stones to ropes five and six hundred yards long, in order to ascertain the depth. But the ropes were too short, and the depth was not ascertained. After four days the chasm closed without apparent cause.” The 12th year of Aurangzib commenced on the 1st Ramazan, 1079, A. H., and the 1st Muharram (new year's day) of this 12th year falls on the 22nd May A. D. 1669. The 14th Muharram was, therefore, the 4th June 1669.¹
- 22nd.—CASHMIR.—On the 3rd Çafar a very violent earthquake felt all over Cashmir, lasted all night. *Maásir i A'lamgiri*.
- 23rd.—ATOCK.—On 4th Çafar (1080, A. H.) an earthquake; a fissure 50 yards long was formed in the ground. *Maásir i A'lamgiri*. The 4th Çafar was the 33rd day of the year, and so corresponded to June 23rd.
1684. *date?*—SURATE.—(Surat?) in Further India.—*Brit. Ass. Catal.*, 1852, 96, quoting *Collection. Academ.*
1720. *July* 15th.—DELHI.—“At this very time (*viz.*, 22nd Ramazan, 1132, 12—1 Noon. A. H., Friday), whilst in most mosques of the Capital, (Delhi) the *Khutbah*” (Friday prayers for the reigning

¹ The same historical MS. mentions two remarkable meteoric phenomena during Aurangzib's reign, which may be quoted here. In the month of Ramazan of the eighth year of Aurangzib, a large star in the shape of a flame fell from the air into a tank near the fort of Kalyánigarh, which lies in the Soobah of Dakhin. The mere fall caused the waters to overflow “the banks, the water itself remained in motion for two pahars” (ta do pahar? six hours)!

The eighth year of Aurangzib was 1075, A.H., and the Ramazan of that year commenced on the 4th February and ended 5th March 1665, A.D.

Again, it is said: “In the ninth year (of Aurangzib) a flame appeared in the Parganah of Malkí (Bahár). “The flame was one imperial yard long (34 inches) and one yard broad. It passed along like a whirlwind for six *kos*, and burnt the trees, &c., which it met in its course.”

The ninth year of Aurangzib—1076, A. H.—lasted from 22nd January, 1666, A. D., to 10th January 1667, A. D.

Both these events appear to have been undoubtable meteoric falls, although the description of the effects is decidedly highly coloured!

A. D.

1720. *July 15th.* sovereign) "was being read" (between 12 and 1 o'clock mid-day) "and the people stood in lines ready for prayers, a dreadful earthquake took place. So people thought, judging from the roar below the ground, the shaking of the walls, and the cracking of the roofs of high buildings. During the day and the following night the houses shook nine or ten times, and the ground was going to and fro. It is well known that the walls of the fortress and many houses were destroyed, and innumerable people lost their lives both at Sháhjahánábád" (New Delhi) "and at Old Delhi. The writer of this history, who had mounted a horse, saw with his own eyes that the bazaar road from the Kábuli gate in the north up to the Lal Derwáza in the south broke open in several places: the walls of the fortress were much injured, as also the Sháhrpanáh Derwáza, and the battlements of the Fathpur mosque tumbled down, and killed ten or twelve men, and wounded many more. It is also noticeable that for one month and ten days afterwards, the ground shook every day four or five times, and the houses trembled and the people got so afraid, they would no longer sleep in their houses. Though the shocks decreased after that period, the earth shook occasionally for the next four or five months."—*Kháfi Khán's Muntakhab ullubáb.* The exact date is thus arrived at: The year 1132, A. H., commenced on Tuesday, 3rd November 1719, old style: hence the 1st January 1720 is the 60th day, counting from November 3rd. But the 22nd Ramazan is the 257th day of the year, hence the date was the 197th (257—60) day of the year 1720, *i. e.*, 15th July. This was Friday. This earthquake is noticed in Elphinstone's India, Vol. II., page 586. The month is given, but no day; hence the testimony of the eye-witness Kháfi Khán becomes very interesting
1737. *October 11th.*—CALCUTTA, &c.—"In the night between the 11th and 12th October 1737, there happened a furious hurricane at the mouth of the Ganges, which reached 60 leagues up the river. There was at the same time a violent earthquake, which threw down a great many houses along the river side; in Golgota (Calcutta) alone, a port belonging to the English, two hundred houses were thrown down, and the high and magnificent steeple of

A. D.

1737. *October 11th.* the English Church sunk into the ground without breaking. It is computed that 20,000 ships, barques, sloops, boats, canoes, &c., have been cast away. Of nine English ships then in the Ganges, eight were lost, and most of the crews drowned. Barques of 60 tons were blown two leagues up the river; three were lost with their men and cargoes; 300,000 souls are said to have perished! The water rose 40 feet higher than usual in the Ganges."

The steeple of the church was described as being "lofty and magnificent," and as constituting before this period the chief ornament of the settlement.¹—*Gentleman's Magazine*, 1738-39.

This most destructive earthquake and hurricane has not been recorded in the principal Earthquake Catalogues.

1762. *April 2nd.*—BENGAL, ARRACAN, AND BURMAH.—A very destructive and violent earthquake felt all over Bengal, Arracan, &c., chiefly or most severely in the north part of the east coast of the Bay of Bengal. In Calcutta, water in tanks rose 6 feet; direction said to have been north and south; lasted ten minutes. At Ghirotty (Gorhatty), 18 miles above Calcutta, river rose more than 6 feet perpendicularly. At Dacca, water rose so suddenly as to carry up hundreds of boats, and many lives were lost. Islambad (Chittagong) suffered very severely; great explosions heard at first; openings in the earth were formed 10 to 12 cubits in length, and chasms were filled with water. Water was spouted out like a fountain and fine sand or mud; earth continued to sink day by day little and little. Sixty square miles said to have been per-

¹ To the description of this hurricane in the *Gentleman's Magazine* there is a very amusing addition, which I will quote in the exact words of the original: "A French ship was drove on shore and bulged; after the Wind and Waters abated, they opened their Hatches and took out several Bales of Merchandise, &c., but the Man who was in the Hold to sling the Bales suddenly ceased working, nor by calling to him could they get any Reply: on which they sent down another, but heard nothing of him, which very much added to their Fear; so that for some time no one would venture down. At length one more hardy than the rest went down, and became silent and inactive as the two former, to the Astonishment of all. They then agreed by Lights to look down into the Hold, which had a great Quantity of Water in it, and to their great Surprise they saw a huge Alligator staring as expecting more Prey. It had come in through a Hole in the Ship's side, and 'twas with Difficulty they killed it, when they found the three Men in the Creature's Belly!! *Gentleman's Magazine* 1738, June; *Historical Chronicle*, p. 321.

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1762. April 2nd.—manently submerged. At DoHazari houses fell; cavity
—contd. opened 200 cubits in length and filled with water. Two
volcanoes (?) said to have opened on the Seeta Kunda
Hills. At Nahar Charcak (Bakar Tschurak) the island
clove as under and was swallowed up by the waters.—
Phil. Trans., 1763, vol. viii, 251; *Asiatic Annual
Register*, vol. vi, p. 60. Minor shocks continued up to
19th.

To this severe earthquake is attributed an elevation of the
coast of Arracan, stated to extend over more than 100
miles in length, with varying amount. Captain Halsted,
who was engaged in a survey of that coast in the *Childers*,
gives the results for the area he examined "from the
Terribles, off the north coast of Ramree, to Foul Island."
The general direction of the shoals, and coast here, is
north-west by north to south-east by south. The elevation
was greatest about the centre. At the Terribles it was 13
feet; at various points of the north-west of Cheduba 22
feet, diminishing to 9 feet at Foul Island at south. Men
were living at the time of Captain Halsted's visit who
had fished over the then dry land. A third elevated beach
was traced also on the west coast of Cheduba half way
down and on Flat Island. Oysters were found adhering
to a pinnacle of rock, about 40 feet high, on a line about
13 feet above the second line of beach (that produced in
1766), which was itself marked in a similar way.—*Jour.
Asiat. Soc., Beng.*, x, 433, &c.

With the exception of the extremely vague story of men being
'alive who had fished over the then dry land,' it is entirely
a matter of assumption to attribute this elevation to the
earthquake now just described. Captain Halsted's visit
was in 1841.

1762. July 13th.—CALCUTTA.—Not severe; two or three shocks.—*Phil. Trans.*,
2-30 P.M. viii, 251.
1764. June 4th.—BANKS OF GANGES.—Several violent shocks; many houses
overthrown, and large numbers of men and cattle killed.—
Asiat. Ann. Reg. viii, 98.
1780. ? CASHMIR.—Date unknown; severe.—*Jour. Asiat. Soc.*,
Beng., xii, 1044.
1800. October 19th.—ONGOLE.—Severe; lasted nearly a minute; occurred during a
4-10 A.M. violent cyclone.—*Asiat. Ann. Reg.*, 1801, iii, *chronicle*, 43.

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1803. *May 22nd.*—UPPER GANGES.—Lasted six or seven seconds; rumbling noise like distant thunder.—*Raper, Asiat. Res.*, xi, 511.

1803. *September 1st.*—MATURA (MUTTRA).—Very violent; lasted several minutes. 0-30 *Midnight.* Many pukka buildings thrown down: very extensive fissures in fields, through which water rose with considerable violence, and in quantity sufficient to be used by cultivators. Principal mosques, erected by Gházi Khán, destroyed, and a considerable part of the dome was swallowed up during the opening of the earth. Several slighter shocks followed.¹—*Asiat. Ann. Reg.*, 1803, vi, *chronicle*, 58.

1-35.—CALCUTTA, &c.—The same was felt at Calcutta and neighbourhood; river much agitated; water, with many fish, thrown out of tanks; church clock stopped at 1-35 night.—*Ibid.*, vi, 35.

—KUMAON.²—The earthquake, given as occurring in this year without date in Kumaon, where many buildings were ruined, was most probably the same.—*Brit. Ass. Catal.*, 1854, p. 54.

UPPER VALLEYS OF GANGES, SIRMOOR, AND GURHWAL.
—Very violent; 200-300 people destroyed at Barabal. Badrinath also suffered severely; several villages swallowed up.—*Raper, Asiat. Res.*, xi, 509; *Gleanings in Science*, ii, 50; *Asiat. Res.*, xiv, 139; *Jour. Asiat. Soc., Beng.*, xii, 1031.

Elphinstone (*India*, Vol. II) states that the Qutb Minar at Delhi was deprived of its upper portion by an earthquake. No authority is given, and I have searched in vain for any detailed record. I have been able, by the friendly aid of Maulavi Kabiruddin, to find in a modern work entitled *Asár-u-Sanáíd*, by Sewad-ud-dowlah, printed at Delhi in 1847, a passing notice of this fact. But this merely records that Sultán Sikandar, son of Beloli, had the upper portion of the Qutb renewed after it had been injured by lightning, and that “subsequently it was again injured by lightning and *an earthquake*,” after which it was repaired by the English. No date is given, or interval after the repairs by Sikandar. General Cuninghham states that this injury to the Qutb Minar happened on

This is the earthquake referred to in Mallet’s Catalogue under 1803 on the banks of the Upper Ganges, but without date; given under the month of July.

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1803. *September 1st.* the 1st August 1803, but he gives no authority. There
—*contd.* can be little doubt that it was the result of the earth-
quake here noticed. And the authorities quoted are clear
as to its having been on the 1st September, not August.—
Archl. Rept. Jour. Asiat. Soc., Beng., 1864, xxxiii,
App. lix.
1807. *December 10th.*—MADRAS.—Three distinct shocks occurred in middle of a
Between 12 and 1 Night. terrible cyclone, and accompanied by very heavy sea-waves.
—*Asiat. Ann. Reg., x, 1808.*
1808. *April 13th.*—CALCUTTA.—Not very violent: rumbling noise succeeded.
2 A. M. CHANDERNAGORE, &c.—House walls rent, a “northern room
most considerably.”—*Asiat. Ann. Reg., 1808, x, 60.*
- “ *June 4th.*—BANDA.—Two smart shocks; felt also at Secrora.
2-40 P. M. DINAGEPORE.—Here said to be from south-west to north-
east.—*Asiat. Ann. Reg. 1808, x, 67.*
1809. GUREHWAL.—Falconer states that the Bishnoo Gunga River,
one of the great branches of the Ganges, was blocked up
below Gosheenath by landslip caused by an earthquake,
and that the water rose 40 feet above its usual level.—
Jour. Asiat. Soc. Beng., x, 618; no date or authority is
given.
1810. *April 2^d.*—CALCUTTA.—Just after cessation of a north-wester: two
7-25 P. M. shocks, very distinct, quick: appeared first to be from
north-east to south-west, and then the opposite; duration
6 seconds and 30 seconds. Felt very distinctly at Garden
Reach, close to Calcutta, by three persons sitting at one
corner of a table and by the three sitting at the opposite
corner, but not by the remainder of the party (11). Noise
accompanied shock, said to be ‘like muffled bells.’¹
Felt also at Dum-Dum, Barrackpore, Moorshedabad, Ram-
nuggur, &c.—*Asiat. Ann. Reg., 1811, xii, 10, 463.*
- “ *May 13th.*—CALCUTTA.—Said to be perpendicular: three successive
9-45 P. M. shocks, and then undulatory motion lasting 8 to 10 seconds,
and finished with a loud rumbling noise. Felt also in all
the vicinity.—*Ibid., xii, 464.*
1811. *February 1st.*—CALCUTTA.—Severe; continued for about 30 seconds.—*Asiat.*
2-20 P. M. *Ann. Reg., 1811, xii, 69.*

¹ This is evidently the earthquake quoted in published catalogues as occurring on April 8th; according to the authority given it was on the 1st.

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1816. *May 1st.*—PENANG.—Very smart, passed to north-west: chiefly confined to the northern and central parts of island; lasted 15 to 20 seconds; felt at sea also.—*Asiat. Jour.*, iii, 66.
- „ *September 12th. to 15th.*—RUNGPEE.—Several shocks felt; last day severe.—*Ibid.*, 498.
- „ *September 16th. 4 A.M.*—MADRAS.—Sharp; made every one sick: buildings struck with lightning.—*Ibid.*, 498.
- „ *May 26th. Between 10 and 11 P.M.*—GUNGOTRI—*Upper Valley of Ganges.*—Two shocks. Rocks hurled in every direction from the peaks. Smartly felt in all parts of the mountains, as well as in the plains of North-Western Provinces.—*Herbert, Asiat. Res.*, xiv, 98.
- „ *May 27th & 28th.*—Slight shocks recurred frequently. Huge landslips resulted; one said to extend for half a mile, and to reach to summits of hills 4,000 feet high.—*Ibid.*
- „ *July 11th.*—CALCUTTA, &c.—Slight shocks.—*Garnier, Meteorol.*, 118, quoted in *Br. Ass. Catal.*
- „ *August* —MADRAS.—*Ibid.*
1819. *June 6-15-50 P.M.*—CUTCH.—Aid over a large portion of Northern India.—This was one of the most severe and destructive earthquakes on record in India. The main focus of disturbance must have been near Cutch, where the damage done was terrific. Bhooj, the chief town, was reduced to ruins, 2,000 people perishing; shock lasted from 2 to 3 minutes with a heavy appalling noise. At Ahmedabad, a city famous for its noble architectural remains, spires of great mosque of Sultá were overthrown; other mosques also destroyed. People assembled for a wedding feast, all perished in ruins. At Surat, motion heavy, but destruction of buildings slight. At Broach, motion very heavy. At Poonah, only slightly felt. The shock extended right over the north of India; was felt sharply at Sultanpur in Oudh, Jaunpore, Chunar and Mirzapur, and at Calcutta.

In Cutch, first shock at few minutes before 7 P.M. of 16th: shocks continued of lesser intensity until 2 th, when, it is stated, the 'volcano called Denodur burst into action, and the shocks ceased.' (Denodur, however, is not a volcano). In the western portion, the town of Sindree and adjoining country were inundated by a tremendous rush from the ocean, and all submerged, the ground sinking apparently about 14 feet. While to the north of

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1819. *June 16th.*—this tract, about 5 miles, a long low ridge or swell of
 —*contd.* perhaps 15 miles in width, was *said to* have been raised
 and to extend 50 miles east and west. It passed immediately across the channel of the Indus. The natives called this the Allah Bund, or Mound of God. The elevation was nowhere more than 10 feet. It was afterwards cut through by the Indus, and was found to be composed of clay with imbedded shells. In the Runn of Cutch, numerous jets of blackish, muddy water were thrown out from fissures, and cones of sand, 6 and 8 feet high, were thrown up.—*Trans. Lit. Soc., Bombay*, iii, 90; *Burnes' Travels*, vol. i; *Lyell's Principles of Geology*.
- The details of this earthquake have been so often quoted, and with such exaggeration of statement, that I would advise those who desire to investigate the facts to resort to the original authorities.
1819. *June 17th, 18th, 19th.* Shocks continued to be felt at intervals, but none serious.
- „ *June 20th.*—On this day the hill Denodur is said to have burst into volcanic action, and the shocks immediately ceased. (Recent examination could find no trace of volcanic action in this hill.—*See Mem. Geol. Survey, India*, vi, 25.)
- The shock of 16th is stated to have been felt very sharply also at Pondicherry, Pulicat, Coimbatore, but this is most probably a different earthquake—*MacMurdo, Trans. Lit. Soc., Bombay*. Also sensibly felt in Nepal, and Khatmandu, &c.—*Asiat. Jour.*, ix.
- „ *August 3rd.*—TIRHOOT.—Felt in different parts, not severe.—*Ibid.*, ix, 384 (1820).
1820. *January 27th.*—BHOOR.—Accompanied by a loud noise like thunder.—*CUTCH. Trans. Lit. Soc., Bombay*, iii, 90.
- „ *November 13th.*—BHOOR.—Several slight shocks.—*Asiat. Jour.*, xi, 628, (1821.)
- „ *December 31st.*—NELLORE.—First shock at times stated, then undulatory motion followed by a second shock, more violent than the first, and longer: duration altogether about 3½ minutes; supposed to be from north to south, from the swinging of pictures on the walls.—*Asiat. Jour.*, xii, 88, (1821).
- „ *December 31st.*—NOAKALLY.—Felt also here.—*Ibid.*

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1821. *January 10th.*—TRAVANCORE.—Slight shocks, less than a minute; noise like the passage of a heavy carriage over a drawbridge, *Ibid.*, xii, 193.
- „ *August 13th.*—KAIRA.—Lasted about a minute, said to be east and west.
- 3 P.M. DAMAUN.—Felt also at Damaun, and in Bombay Presidency.
- 2-45 P.M. AHMEDABAD.—Slight and tremulous; lamps, &c., set in motion.—*Asiat. Jour.*, xiii, 293, (1822).
1822. *January 29th.*—MADRAS, CHITTORE, VELLORE, &c.—Several shocks: very heavy rumbling noise; broke up roofs, &c., said to be from south-east by south to north-west by north.—*Ibid.* xiv, 370.
- „ *April 3rd.*—BENGAL.—Several shocks felt generally over Bengal, Calcutta, Jessore (three distinct shocks, loud noise); Berhampore (lasted 2 minutes, said to be north-north-west to south-south-east); Comillah (said to be east and west, people could not stand); Bhaugulpore, Gya (apparently from north).—*Ibid.*, xiv, 493.
- „ *August 16th.*—CALCUTTA.—Commenced with a rushing noise like a whirlwind; walls of houses began to move from north to south; became more violent; two shocks, second most severe, whole lasting about 30 seconds.—*Ibid.*, xv, 293, (1823).
1823. *February 9th.*—CEYLON.—Felt at Kandy, Colombo, Rutnapura, Negumbo, &c., accompanied by subterranean noise like a cannonade. Felt also severely at sea by Ships *Winchilsea* and *Orpheus*. The latter felt a second shock at 2-5, and a third about 3 P. M., very slight.—*Edinb. Jour. Science*, iv, 261, 264; *Quar. Jour. Roy. Inst.*, xvi, 174.
- MADRAS.—The same earthquake, just noticed at Ceylon, was felt at Madras, where it lasted only a few seconds; also at the Nilghiri hills, Nagercoil, south Travancore, &c.; appeared to travel southwards, with a rumbling noise. At Kotagherry (Nilghiri hills) there were two distinct shocks with an interval of about two minutes.—*Asiat. Jour.*, xvi, 376, 482, (1823.)
- [N. B.—This shock is erroneously quoted in the Brit. Ass. Catalogue (1854, p. 148), as occurring on March 9th, and as occurring in North Eastern India.]
- „ *March 2nd.*—MADRAS AND CEYLON.—Severe shocks felt at Travancore 20 minutes later than at Madras.—*Arch. d. Découv.*, 1824, 210, quoted in *Brit. Ass. Catal.*
- „ „ *9th.*—See above, February 9th.

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1823. *April* 3rd.—CALCUTTA.—Shocks from north to south, and *vice versa*, up to 10 o'clock.—*Garnier, Meteorol., p. 137, in Brit. Ass., Catal.*
- „ *April* 22nd.—PENANG.—Two shocks.—*Asiat. Jour.* xvii, p. 137, (1824).
5-3 A.M.
- „ *November* 26th.—CALCUTTA.—A shock, rather sharp, accompanied by subterranean noises.—*Ibid.*, p. 518.
12-10 Noon.
- 1825 *January* 3rd.—GOWHATTY.—From eastward.—*Ibid.*, xx, 88, (1825).
12 Noon.
- „ *January* 5th.—MYMENSING.—Two shocks: first at 7 P.M., second at midnight.—*Ibid.*
- „ *January* 8th.—MYMENSING.—Gentle at first, severe afterwards: apparently from the north.—*Ibid.*
- „ „ 8th.—COMILLAH.—Four shocks, last rather severe: apparently from the north-east.—*Ibid.*, xix, 839.
6-50 P.M.
- „ 6-46 P.M. LUCKNOW.—Shock felt at 6-46 P.M.
- „ *March* 22nd.—DELHI.—Sharp, with loud rumbling noise; appeared to go towards the south-west.—*Ibid.*, xx, 452.
12-35 P.M.
1826. *October* 29th.—NEPAL, &c.—First great shock followed by eight minor vibrations; first vertical; others came from south to north. In Katmandu several houses fell, also temple near city. At Patun fourteen houses fell. Smaller shocks succeeded.—*Ibid.*, xxiii, 672, (1827).
2 A.M.
1827. *January* 6th.—VIZAGAPATAM.—Sharp shocks, apparently from the sea; shocks lasted only a few seconds, but the undulation continued for some time.—*Ibid.*, xxiii, 864, (1827).
5 P.M.
- „ *January* 19th.—CALCUTTA.—Said to be west-south-west and east-north-east; felt also at Burdwan.—*Ibid.*, xxiii, 855.
11-22-19.
- „ *Middle of* —CALCUTTA.—An earthquake.—*Brit. Ass. Catal.*, 1854, 179.
month. Probably the same as the last mentioned.
- „ *April* 17th.—KÁBUL.—Slight.—*Masson, Beloochistan, &c.*, iii, 8.
- „ „ 19th.—KÁBUL.—Very smart. “It is considered correct and deferential to the will of Heaven to sit tranquil during their occurrence.”—*Ibid.*
- „ *September, before*—LAHORE, &c.—Fort Kolitaran, near city, destroyed; about the 26th. 1,000 perished in ruins. A hill shaken down, which falling into river Rowée (? Ravee) produced an inundation of 100 coss of lands.—*Brit. Ass. Catal.*, 1854, 183, quoting *Madras Gazette.*—? *Asiat. Jour.*, xxv, 377, (1828).

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1828. *June 6th.*—CASHMIR.—Very severe; shook down many houses, and killed many people—perhaps 1,000 people and 1,200 houses. Earth opened in many places about the city, and fetid water, rather warm, rose rapidly from the clefts and then subsided. Clefts soon closed and left no traces. Just before sunrise another shock, accompanied by terrific explosion louder than a cannon; twenty such shocks on that day, each with an explosion; river sometimes appeared to stand still and then to rush forward. For the two months succeeding there never were less than 100, often 200 shocks in the day, each accompanied by an explosion. Number then decreased to about 10 in the 24 hours, and shocks gradually ceased. One bad shock on 15th, and three of the explosions out of whole number were very bad.—*Vigne's Travels, Kashmir*, i, 281.
- „ *July 8th.*—CALCUTTA.—Three shocks; lasted two minutes; appeared to be from east to west.—*Asiat. Jour.*, xxvii, 88, (1829.)
- 2 P.M. MYMENSINGH.—Three shocks, apparently from north to south; the last shock most severe. Another shock 12 minutes afterwards.—*Ibid.*
- 2 P.M. „ 2—14—4 P.M. SYLHET.—Sharp; lasted one minute: *mean* time given.—*Ibid.*
- „ *July 20th.*—BHOOR.—Nearly emptied water out of a tumbler which was half full. East to west; violent.—*Asiat. Jour.*, xxvii, 227, (1829); *L. and B. Jahrb.*, 1833, 125.
- 1 P.M. „ *Aug. 22nd.*—MALABAR COAST.—Smart shock felt all along Coast. At Vingorla, bungalows violently shaken; lasted quarter of a minute, with loud rumbling noise.—*Asiat. Jour.*, xxv, 377, (1828.)
- „ *September 18th.*—CALCUTTA.—Smart double shock; vertical.—*Ibid.*, 370; *L. and B. Jahrb.*, 1833, 125.
- 7-15 A.M. „ *October 8th.*—Dacca AND VICINITY.—Four distinct shocks in succession; lasted about quarter of a minute; appeared to be from south to north.—*Asiat. Jour.*, 1828, xxv, 509.
- 5 P.M. „ *October 29th.*—NEPAL.—Von Hoff quotes no authority for the statement he gives of this earthquake, but from his accounts, which correspond in all particulars with that given in the Asiatic Journal for the earthquake of October 1826, in Nepal, it is evident that the same event is referred to.—*Brit. Ass. Catal.*, 1854, 197.
- 2 A.M.

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1832. *February 21st* choking up valleys. Great part of population o Badakshan destroyed.—*Trans. Geol. Soc., Lond., 2 ser., iii, 492.*
—*contd.*
1832. *July 2nd.*—LOHUGHAT.—Earth shook for twelve seconds, accompanied
11 P.M. by a sound like that of rushing water, which lasted three seconds before the shocks and as many after.—*Brit. Ass. Catal., 1854, 233; McClelland's Kumaon, p. 297.*
- „ *August 18th.*—LOHUGHAT.—Another vibratory shock, lasting five seconds;
7 A.M. weather sultry.—*Ibid., p. 208.*
- „ *September 23rd.*—LOHUGHAT.—Another shock, as on 2nd July.—*Ibid.*
10 P.M.
1833. *May 30th.*—LOHUGHAT.—Earth shook rather violently for about twelve
12 P.M. seconds; noise like rushing water.—*McClelland's Kumaon, p. 208.*
- „ *August 26th.*—NÉPAL, AND ALL OVER THE CENTRE AND EAST OF NORTH-
5-30 P.M. ERN INDIA.—At Katmandu, accompanied (11 P.M.) by a loud subterranean noise, compared with the noise produced by the discharge of 100 pieces of artillery. More than 100; houses were levelled in a moment, and equal or worse destruction in other places. Trees and even the smallest shrubs rocked from their very roots. At Chupra, a chasm of considerable size was said to have been formed in the earth. In Tirhoot, water thrown out of tanks, 4 feet deep, the water of which was 3 feet below the edge. Birds thrown right out of their nests. Men could not keep their feet. At Buxar, shocks said to have been felt violently at one side of river and not at the other. Preceded by very hot close weather, and in many places succeeded by stormy winds and heavy rain.

The direction of the motion is very variously stated. At Tirhoot, said to have been from east to west: at Buxar, from north to south: at Patna, apparently east and west: at Calcutta, north-east to south-west: at Katmandu, apparently east to west: all shocks came from east or north-east! Each of the shocks lasted only three or four seconds generally, but some are stated to have lasted one minute. At Lucknow, four shocks are reported: at Calcutta, three; at Purneah, three. In all places, several shocks of greater violence, besides numerous slighter ones. At most of the places, the earth was in almost continuous agitation for 24 hours.

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1833. *August 26th*—So far as can be ascertained, the time of the principal and
—*contd.* most violent shock, the second, was (reduced to Calcutta
time) as follows at the several places:—

	<i>h.</i>	<i>m.</i>	<i>s.</i>
Calcutta	11	34	48
Monghyr	11	34	0
Rotas Hills	11	30	0
Arrah	11	29	0
Goruckpur	11	39	0
Allahabad	11	28	0
Rungpur	11	18	0
Katmandu	10	57	0

But these are only approximately accurate. See *Jour. Asiat. Soc., Beng.*, ii, 439 and 564, xii, 1049, &c.

- „ *August 27th*.—KATMANDU.—Three shocks, 4-53 A.M., 5-20 A.M., 5-26 A.M.
Ibid.
- „ „ *28th*.—Ditto.—Two shocks, 7-15 A.M., 4-55 P.M.—*Ibid.*
- „ „ *30th*.—Ditto.—Four shocks, one at 9 A.M.—*Ibid.*
- „ „ *31st*.—Ditto.—Two slight shocks during the night.—*Ibid.*
- „ *Sep. 1st to 11th*.—Ditto.—Ten shocks, all slight.—*Ibid.*
- „ *September 20th*.—MEERUT.—Lasted about 15 seconds; not felt in Calcutta—
Night. Asiat. Jour., xiii, 158, (1834).
- „ *October 4th*.—KATMANDU, MONGHYR, ALLAHABAD.—Lasted half a minute;
7-3 A.M. violent; as bad as that of 26th August.—*Jour. Asiat. Soc., Beng.*, xii, 1053.
- „ *October 4th*.—JANPUR.—Sudden and smart.—*Asiat. Jour.*, 1834, xiii, 24.
- „ „ *18th*.—KATMANDU, GORUCKPUR, ALLAHABAD.—Lasted nearly a
4-40 A.M. minute; violent; apparently from east to west.—*Ibid.*;
Jour. Asiat. Soc., Beng., xii, 1053.
- „ *October 24th*.—SINGAPORE.—A slight shock, succeeded by a tremulous
8-35 P.M. motion, which lasted about a minute; and then two other
shocks, slighter than the first.—*Asiat. Jour.*, xiv, 21,
(1835).
- October 26th*.—KATMANDU.—Slight; 10-37 A.M.—*Jour. Asiat. Soc., Beng.*,
xii, 1053.
- November 8th*.—KATMANDU.—Slight; 3-55 A.M.—*Ibid.*
- November 16th*.—KATMANDU.—Severe; about midnight.—*Ibid.*
- „ *26th*.—KATMANDU.—Of the up and down kind; 11-45 P.M.—*Ibid.*
1834. *July 8th*.—RUNGPUR.—Two shocks: fissures formed in ground, from
„ *July 21st*. which smoke and flames were thrown out; and then
fissures closed!—*Asiat. Jour.*, xiii, 91, (1834).

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1835. *January 4th.*—LOHUGHAT.—Slight; lasted 15 to 20 seconds; seemed to be
7 A.M. north and south.—*McClelland's Kumaon*, p. 208.
- „ *January 14th.*—LOHUGHAT.—More violent; appeared to be from north-
1-30 A.M. west; noise like distant thunder; motion tremulous, and in
crossing the strata seemed to affect one at a time.—*Ibid.*
- „ *August 26th.*—SINGAPORE.—Slight; only a few seconds.—*Asiat. Jour.*,
xix, 128, (1836.)
- „ „ —PENANG.—No date—*Jour. Asiat. Soc., Beng.*, xiv, 607.
1836. *January 24th.*—CHANDERNAGORE, SOOK SAGUR, &c.—Plaster shaken off
houses, &c.—*Asiat. Jour.*, xx, 187.
- „ KÁBUL.—Both Vigne and Masson state that shocks oc-
curred frequently at Kábul; no particulars.—*Vigne's
Travels*, p. 812; *Masson*, iii, 8.
1837. *June 15th.*—GANJAM.—A severe shock.—*Henderson's Chronological
Tables.*
- „ *September* —PENANG.—Shocks continued seven days. Volcanic eruptions
End of month. near Acheen.—*Asiat. Jour.*, xxv, 232; *Jour. Asiat. Soc.*,
Beng., xiv, 607.
- „ *December 14th.*—KÁBUL.—Three shocks felt at night.—*Burnes' Travels.*
Night.
1839. *January 14th.*—SUDDYA, U. ASSAM.—Preceded by rain and heavy snow:
9 P. M. motion apparently from south-west to north-east.—
Hannay, Jour. Asiat. Soc., Beng., xii, 907.
- „ *March 23rd.*—BURMAH.—During my visit to Amarapoora in company
with Colonel A. Phayre, and the mission to the Court of
Burmah in 1855, I had the opportunity of seeing the
abundant evidences of the fearful destruction caused by
this earthquake, which were even then very marked
although sixteen years after its occurrence. In the won-
derfully truthful and interesting narrative of that mission,
published by Colonel Yule, R.E. (London, Smith, Elder
and Co., 1858), most remarkable illustrations of this
destruction will be found. And in the appendix (page 349)
a detailed account is given by myself from the notes of
Mr. Spears, who was in Amarapoora at the time of the
occurrence. I was, unfortunately, not then aware of the
importance of such careful measurements of bearings and
angles as would now be sought for. And I allowed the
splendid opportunity to pass, which the study of the

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1839. *March* *23rd* stupendous mass of brick-work in the temple of Mengoon
 —contd. would have afforded to determine the direction and probably the velocity of the shocks. This, “doubtless one of the hugest masses of solid brick-work in the world” (Yule, *loc. cit.*, p. 160), has been rent and shattered in the most wondrous way, and yet was just in the condition favourable for such investigations. I still have hopes of obtaining careful measurements of it. Mr. Spears, in reply to queries, asking his experience during the shock, and directing his attention specially to certain points, favoured me with the following brief narrative, which I give here in full, as illustrative of one of the most destructive earthquakes within Burmese limits. The same account has been already given in the appendix to Yule’s Narrative (page 349). Mr. Spears says:—

“On Saturday morning, 23rd March 1839, at about 4 o’clock A.M., Amarapooora was visited by an earthquake that surprised the oldest inhabitants by its strength. Burman history mentions nothing of the kind having taken place before. I was in bed and asleep at the time, but was soon awake by a tremendous roar, and the tiles from the roof of the house coming down about my ears; the motion so great that I had some difficulty in finding the door, but whether vertical or horizontal, I had not presence of mind sufficient to judge at the time. I did not even know it was an earthquake until it was finished. The shock may have taken up about 30 seconds in all.

“When I did get into the open air, I found the heavens without a cloud, and although there was not a breath of wind, the trees shook as if it were blowing a gale. The dust rising all round from the destroyed houses gave the sky a peculiar appearance, not easily to be forgotten.

“From the appearance the ruins presented in the morning, I have little doubt the motion was from north to south. The river did rise a little, as if its bed had been obstructed, but did no damage to the boats, even to those that were deeply laden. I never heard of a wave, but the banks of the river between Amarapooora and Ava were rent in many places, presenting chasms of from 5 to 20 feet in width, from which large quantities of water and sand of a

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1839. *March*
—*contd.*

23rd blackish appearance had been ejected. The earthquake was not accompanied by any perceptible smell.

“Judging from the appearance the city walls of Amarapooora and Ava presented the next morning after the great shock, I am decidedly of opinion that it must have been felt stronger in the latter than in the former city.

“At Tsagaing, I will not say that it was not stronger than at Ava, either on the hill tops or on the river side. My reason for supposing this is, that the pagodas on both sides of the river presented the same appearance; that is, they were all deprived of their ‘htees’, and the same quantity of brick-work from the top.

“This earthquake was felt at Bamo and Rangoon; in fact, all over the Burman territory. In Rangoon, the time observed was very nearly the same as here; it did no damage, but was strong enough to ring pagoda and some house bells, and alarm the inhabitants.

“From all I have been able to learn, I think Ava must have been about the centre.

“After the great quake, we had strong shocks all day every five or twenty minutes, but none coming up to the first in violence. They were, almost invariably, preceded a second or two by a sound resembling a cannon fired at a distance; or, at other times, as if a number of carriages were passing over a rough bridge under ground. There were two distinct kinds of earthquakes: that preceded by the cannon-like sound had little or no rolling motion, but more resembled some one thumping up from below, as it were: it made the houses ‘dirrl’ and set the slates and glasses a dancing. The other came like the wave of the sea, with a motion generally from east to west; at least that was my impression at the time.

“The under-ground sounds seemed to come always from the eastwards.

“For four or five days we had nothing but earthquakes every fifteen to thirty minutes; and for six months after, scarcely a day passed without one. In fact, it is only the last three years that we have been tolerably free from them.

“The impression left on the people was, that it was very unsafe to live in brick buildings, unless a wooden frame

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1839. *March* 23rd work is put up inside of them, which is always done now
—*contd.* by any Burman wishing to have a pukka house.

“There never was a correct list of the number of people killed; but there must have been from three to four hundred. Ava suffered most from having some brick Kyoungs, where a great number of Poongyis were destroyed.”—*Amarapooa, 24th September, 1855.*

In a MS. Journal of Captain McLeod, in the Foreign Office, Calcutta, there is a brief and very uncircumstantial notice of the same earthquake.

“At about half-past one this morning, we were suddenly roused from our sleep by two terrible shocks of an earthquake. Though numerous concussions continued to take place, none were so severe as the two first. In the morning, not a pagoda was to be seen standing whole. Every brick building in the town had either been thrown down burying in their ruins numbers of people, or rent and damaged so as to render their being taken down necessary.

“The pagodas crowning the height of Tsagaing shared the fate of those at Amarapooa. In the neighbourhood of the Residency, extensive and deep fissures had spread out from which large quantities of water had been discharged, and the earth in many places bore up with water springing up from the centre. The wells were choked up and dry.”—*MS. Journal of Captain McLeod for 1839.*

Again he notices a shock of earthquake which occurred on March 25th, during his visit to the King.

He states that “the King of Burmah informed him that their religious treatises told him that earthquakes occurred every twenty or thirty years, and were severer on the sea-coast than inland. The Burmese attributed earthquakes to the movement of some animal in the earth, but that foreigners maintained that they proceeded from the sudden union of certain matters in the bowels of the earth, and as a proof of this hypothesis, that they buried certain preparations in the earth, which after a few days would cause the same sensation as an earthquake, and throw open the earth, &c. That during earthquakes eyesight grew dim, and an oppression in the chest was also felt.”

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1839. *March 23rd.* I do not find further notices of any earthquakes in Burmah, although, probably, the forms in which phenomena attending the death of kings are stated by Padre San Germano to be recorded in the Royal Chronicle, may be taken as proof of their not unfrequent occurrence.¹

—*contd.*

The large lake called Endan-gyi, west of Mogoung, is said to cover the site of a large Shan town called Tumansya. The Natives affirm that it was destroyed by an earthquake.²—*Yule's Narrative, App.*, p. 349.

AVA, BURMAH, AMARAPOORA, &c.—Two very severe shocks at the hour mentioned, succeeded by a series of minor ones up to 8 o'clock, and almost daily shocks afterwards for many months. Scarcely a brick building in the town was left standing. The current of the Irawadi was reversed at a time. In several places great earth-fissures were produced 10 to 20 feet wide, from which large quantities of water and grey earth were thrown out, emitting a sulphureous smell. Ava and Tsagain were destroyed, 200 to 300 persons killed, not a temple left. Felt also at Moulmein and for more than 1,000 miles north and south. The direction of shocks said to be from north to south.—*Asiat. Jour.*, xxx, 194; xxxii, 118 (1839.)

A letter from the Revd. E. Kincaid, Baptist Missionary in Burmah, published in Silliman's Journal, gives a forcible account of this violent and destructive earthquake. He says the earth reeled "from east to west. Everything built of brick, houses, monasteries, temples, pagodas, and city walls, all crumbled down." Letters up to the 11th of April stated, that "the noise has not yet ceased, and that shocks of considerable force were felt day and night, with seldom so much as an hour's intermission. From south of Ava and Bamo to the north are said to have been entirely overthrown."—*Silliman's Jour.*, xxxviii, 385.

At Kyouk Phyou a smart shock of an earthquake, immediately followed by a magnificent burst of fire from the range of volcanic hills to the south-west of the station,

¹ "When there is an earthquake in Pegu," Valentyn says, "they think that the King will die, or will lose his throne, or will oppress them, or that there will be a famine, or something else."—!!

² Journal, Asiatic Society, Bengal, vol. VI, page 274.

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1839. *March 23rd* which continued to rise and fall in huge jets for half an hour, accompanied by reports resembling discharge of distant artillery.—*Asiat. Jour.*, 1837, xxix, 289.
—*concl'd.*
1839. *May 11th.*—JAMALPUR.—Direction at Jamalpur, Mymensing, said to 9-30 A.M. COMERCOLLY. have been, west to east, or from north-west 9-50 A.M. SYLHET. to south-east.—*Asiat. Jour.*, xxx, 15.
9-55 A.M.
- „ *June 3rd.*—SUDDIYA. (U. ASSAM).—Season unusually wet from March. —*Hannay, Jour., Asiat. Soc., Beng.*, xii, 907.
1840. *January 14th.*—UPPER ASSAM.—Two shocks; felt by Mr. Masters at Nazera.—*Ibid*, 1055.
6 A.M.
- „ *January 26th.*—KÁBUL.—Sharp; lasted several minutes; preceded and followed by slighter shocks; several houses down.—*Asiat. Jour.*, xxxii, 104 (1840.)
- „ *February 3rd.*—UPPER ASSAM.—Shock felt by Mr. Masters at Nazera.—*Hannay, Jour. Asiat. Soc., Beng.*, xii, 1056.
- „ *March 4th.*—SUDDIYA (U. ASSAM).—Apparently from south. A second 1 P.M. after interval of ten minutes. A total eclipse of sun about an hour before, during which the air was unusually cold and disagreeable.—*Ibid.*
- „ *March 23rd.*—Under this date a violent earthquake is recorded as having occurred in Burma in the Edinburgh New Phil. Jour. xxxvi, 234, and is so quoted in Brit. Ass. Catal., 1854, 294. But this is obviously the same as noticed above on same day and month in the previous year. 1839.
1841. *February 9th.*—GOWHATTY.—Sharp and stunning, as if a blow had been struck under the jaw; a low rumbling noise.—*Jour. Asiat. Soc., Beng.*, xii, 907.
- September 15th.*—TRAVANCORE.—General Cullen records a shock.—*Trans. Bomb. Geol. Soc.*, xiii, *App. C*, p. 9.
- October 12th.*—UPPER ASSAM.—Slight shock felt by Mr. Masters at 6 A.M. Nazera.—*Hannay, Jour. Asiat. Soc., Beng.*, xii, 907.
1842. *January 2nd.*—DELHI.—Slight shocks.
- „ „ *4th.*—SEEBBSAGUR.—Weather cold and gloomy. A smart shock; 7-30 P.M. undulatory.—*Hannay, Jour. Asiat. Soc., Beng.*, xii, 907.
- „ *January 4th.*—UPPER ASSAM.—Slight.—*Jour. Asiat. Soc., Beng.*, xii, 260, DELHI, ARAVULLI MNS. 1026.
- „ „ *16th.*—NORTH-WEST PROVINCES.—Muttra lasted 30 to 40 seconds 7 to 8 P.M. between 7 and 8 o'clock; at Mainpuri slight and seemed to come from west; at Chunar and Mirzapur, felt

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1842. *June 16th.* about 8 o'clock, at Chunar accompanied by a noise like
 —*contd.* that occasioned by the rapid flight of birds; Jaunpur at
 half past 8, three distinct vibrations were felt which passed
 from west to east, but were unaccompanied by any noise;
 at Sultanpur, in Oudh, it was felt at 8-17 p. m., and the
 soldiers' huts were much damaged.—*Official Records.*
- „ *February 4th.*—UPPER ASSAM.—Recorded by Mr. Masters at Nazera.—*Offi-*
 8. A.M. *cial Records; Jour. Asiat. Soc., Beng.,* xii, 907.
- „ *February 19th.*—KÁBUL, JELLALABAD, PESHAWUR, N.-W. INDIA.—At KÁbul
 said to have lasted three minutes; several shocks; rocked
 the fort in a frightful manner. At Jellalabad, at midday
 lasting about a minute and a half, every one thrown down;
 bastions of fort, and walls and houses overthrown; one-
 third of town destroyed; fully one hundred shocks within
 one month. At Peshawur very destructive; “earth
 trembled like an aspen leaf;” several killed. At Ferozpur
 severe; at Ludiana said to have been north to south;
 at Delhi not severe, appeared to consist of several distinct
 undulations. The hot springs of Sonah, the temperature
 of which is usually from 104°—110° Faht., became on
 the date of the earthquake as cold as the ordinary wells
 of the country; the amount of water diminished greatly,
 and at times the springs were completely dry. These
 appearances continued for 25 days, when the wells had
 resumed their usual state.

The shock was scarcely felt at Saharanpoor; was felt
 slightly at Mussoori, and also at Shalkar on the border of
 Little Thibet. Superficial area affected was at least 216,000
 square miles; general course from west to east (erro-
 neously given as east to west.—*Jour. Asiat. Soc., Beng.,*
 xii, 273), modified by local conditions.

Jellalabad was, so far as known, nearest the focus, and the
 times reduced to Jellalabad time, at which the shock reached
 other places noted, appear to have been as follows:—

	Period of shock.			Interval of time.			Approximate distance in degrees of Long.	
	h.	m.	s.	h.	m.	s.		
Jellalabad . . .	11	40	0
Peshawur . . .	11	41	12	0	1	12	1	12
Ferozpur . . .	11	48	40	0	8	40	4	05
Delhi . . .	11	53	56	0	13	56	6	46

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1842. *February 19th.*—Scarcely felt in Sind; at Quetta inconsiderable.—*Asiat. Jour.* All instruments disturbed violently, but mean positions unaltered, at Simla Observatory.—*Boileau, Brit. Ass. Rep.*, 1845, 4.

Shocks continued frequent until the 24th.

For full detail, see *Baird Smith, Jour. Asiat. Soc., Beng.*, xii, 260, &c., 1843; see also *Sale's Jellalabad; Edinb. New. Phil. Jour.*, xxxiv, 107; *Brit. Ass. Rep.*, 1845, 4; *Asiat. Jour.*, xxxviii, pt. 2, 120.

- „ *March 3rd.*—KÁBUL.—Severe shocks continued every day. *Vincent Eyre*: Military operations before Kábul, quoted by *Baird Smith*—*Jour. Asiat. Soc., Beng.*, xii, 1043.
- „ „ *5th.*—MUSSOOREE, SIMLA, N.-W. PROVINCES.—Very sharp and sudden; a 'magnified' jarr. Felt almost simultaneously at Simla, Mussooree, Deyrah, Saharunpoor, &c. Houses at Landour and Deyrah injured; motion from north to south.—*Jour. Asiat. Soc., Beng.*, xii, 275; *Asiat. Jour.*, xxxviii, 17.
- „ *April 20th.*—KÁBUL.—A severe shock. *Vincent Eyre*, &c.
- „ *May 21st.*—BENGAL, &c.—Slight motion from south-west to north-east. Between 8 and 9 P.M. Felt at Patna, Gya, Jaunpur, Danjiling; at latter place at 9-10 P.M.—*Jour. Asiat. Soc., Beng.*, xii, 277.
- „ *May 23rd.*—BENGAL, &c.—Another shock.—*Ibid.*
- „ *June 4th.*—KÁBUL.—A severe shock.—*Vincent Eyre*, &c.
- „ „ *10th.*—KÁBUL.—A smart shock during the night.—*Ibid.*
- „ „ *29th.*—KÁBUL.—A shock of earthquake.—*Ibid.*
- „ *July 4th.*—NEAR DELHI.—A violent trembling, accompanied by a rumbling noise; motion appeared to be from west to east.—2-50 P. M. *Jour. Asiat. Soc., Beng.*, xii, 280.
- „ *July 21st.*—JELLALABAD.—Severe shock.—*Ibid.*
9 P.M.
- „ *July 25th.*—DELHI.—Smart, with loud rumbling noise.—*Ibid.* 281.
3-45 A.M.
- „ *September 7th.*—MUSSOOREE.—Slight; vertical; or from west to east; lasted 1-58 P.M. five seconds; occurred during a severe storm.—*Ibid.*, 282.
- „ *September 18th.*—DARJILING.—Smart; apparently from north-west to south-east.—4-30 A.M. *Ibid.*, 282.
- „ *September 26th.*—DELHI.—Smart; accompanied by a tremendous rumbling; 9 A.M. lasted two minutes; from west to east.—*Ibid.*, 283.

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1842. *September 27th.*—DELHI.—Another slight shock in same direction.—*Jour. Asiat. Soc., Beng.*, xii, 283.
- „ *October 9th.*—BARODA.—Smart.—*Asiat. Jour.*, xxxix, pt. 2, 409.
- „ „ *23rd.*—CHITTAGONG.—Motion east to west; stopped clocks' vibrating north and south.—*Jour. Asiat. Soc., Beng.*, xii, 284.
- „ „ *23rd.*—GOWHATTY, &c.—Motion tremulous; lasted about half a minute.—*Ibid.*, 284.
- „ „ *25th.*—JELLALABAD.—Severe; local.—*Ibid.*, 284.
1-30 A. M.
- „ *October 29th.*—GOWHATTY.—Motion appeared to be from north to south.
7-30 P. M. Gentle and repeated after half a minute.—*Ibid.*, 908.
- „ *November 6th.*—DELHI.—Slight; local.—*Ibid.*, 285.
1-30 P. M.
- „ *November 11th.*—CALCUTTA, DARJILING, GOWHATTY, CHITTAGONG, MONGHYR, &c.—Direction east-north-east to west-south-west. “Two or three vertical shakes or heaves of the earth, with a noise like the rumbling of a passing carriage, and one strong horizontal shake from east to west, or from north-east to south-west. The whole took place within about a minute of time.” Three shocks felt at Botanic Gardens, near Calcutta; river much agitated. A remarkable luminous appearance observed in part of the river, which passed, and on its closing the ship, a general and severe tremor felt throughout.—(Ship *Southampton*). Felt severely at Serampore; at Darjiling not severe, motion apparently south to north. Felt also at Pubna; severe, south-west to north-east; at Burrisaul ground heaved; river greatly agitated; loud rumbling noise. At Gowhatty, slight, tremulous. At Chittagong, more severe, north to south. At Monghyr, part of fort wall overthrown. Felt also sharply at sea by the *Agincourt*, about 50 miles south-east of floating light ship.—*Jour. Asiat. Soc., Beng.*, xii, 285; *Asiat. Jour.*, 1843, xi, pt. 2, 25.
1843. *January 4th.*—SINGAPORE. Two shocks near midnight.—*Perrey; Mem. MALACCA. Cour., Bruxelles*, viii.
- „ *January 6th.*—PENANG, SINGAPORE.—Slight but extremely severe at Pulo Nias, off the coast of Sumatra, where there were two shocks accompanied by a sea-wave.—*Jour. Asiat. Soc., Beng.*, xiv, 605.

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1843. *January 8th.*—PENANG, SINGAPORE, &c.—At night; very slight. Said to be from east to west at Singapore; from north to south at Penang.—*Jour. Asiat. Soc., Beng.*, xiv, 605.
- „ *February 6th.*—KHYOUK-PHYOO.—Magnificent eruption and slight quaking at Ramree; lasted till 1 in the morning; said to occur once in ten years.—*Ibid.*
- „ *February 8th.*—AHMEDABAD.—Four shocks within eight minutes; from north-east to south-west; slight and local.—*Ibid.*
- „ *Before March 12th.* DECCAN.—A shock over the Deccan.—*Ibid.*
- „ *April 1st.*—DECCAN.—Widely extended: at Sholapur, preceded by a noise, which seemed to come from south-east and lasted two minutes. Walls and towns thrown down. At Maktal at 4h. 45m. a simple trembling, with a dead noise. At Singroorgurh motion very strong, and at Shorapur; does not appear to have extended to Hyderabad. At Bellary, 4h. 45m. a noise resembling escape of steam, increasing to that of moderate thunder, with an undulatory movement from south-east to north-west, shook the whole cantonment. At Karnool, a shock of some seconds, at near 5h.; noise like distant artillery from north-east; felt also at Belgaum. Hurraykur was the most southerly point at which it was felt. Bellary was nearest to centre.—*Ibid.*
- „ *April 6th.*—UPPER ASSAM.—At Jeypur, at 8 or 9 in the evening, a strong shock, followed four or five minutes afterwards by another much more violent, lasting two minutes; appeared to be from east to west. At Sibságur, about 8h. 30m., several strong shocks during five minutes. At Dibrooghur at 8, a strong shock from west or south-west.—*Ibid.*
- „ *April 7th.*—UPPER ASSAM.—Another shock at Jeypur and at Dibrooghur. At 1h. 15m. another shock at Sibságur.—*Ibid.*
- „ *April 11th.*—LANDOUR.—Very sharp from north to south; lasted 30 seconds; extended to Hurdwar; and also to neighbourhood of Delhi and Meerut.—*Ibid.*
- „ *May 12th.*—PENANG.—A succession of waves, north-west to south-east; lasted five or six seconds.—*Ibid.*
- „ *June 3rd.*—TITALYAH.—Foot of Sikkim Himalaya; slight shock; three seconds: from north-east to south-west.—*Ibid.*
- „ „ *15th.*—SIBSÁGUR.—Strong and vertical.—*Ibid.*
- 11 A. M.

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1843. *June 16th.*—JEYPUR.—(Upper Assam).—One of the most violent felt in Assam. At Sibságur 8-45 evening, another violent shock.—*Jour. Asiat. Soc., Beng.*, xiv, 605.
- „ „ *17th.*—SIBSÁGUR.—Very sharp shock; movement slight and undulatory, followed by a violent blow; seems to have come from south-west or west.—*Ibid.*
- 8 P.M.
- „ „ *17th.*—Baird Smith, in his Register of Earthquakes for 1843 (*Jour. Asiat. Soc., Beng.*, xiv., 605, *et. seq.*) gives, on the authority of Mr. Masters and an anonymous correspondent, an earthquake on the evening of the 16th of June, which is said to have been the most severe noticed in Assam by the observer. As it is impossible to suppose that Captain Harvey could have failed to observe this, we must conclude that either Captain Harvey or Mr. Masters and the anonymous correspondent have made an error in the date.
- „ „ *19th.*—COLOMBO (Ceylon). Three slight shocks half an hour after midnight, in space of a minute and a half.—*Ibid.*
- 0h. 30m.
- „ *August 10th.*—DARJILING.—A horizontal movement, lasting 20 seconds from north-west to south-east. Felt also at Patna and in Tirhoot.—*Ibid.*
- 4-30 P.M.
- „ *September 2nd.*—ASSAM.—A strong shock at night.—*Ibid.*, p. 908.
- „ „ *3rd.*—ASSAM.—Another, coming from the south, preceded by loud noise in the air.—*Perry, Mem. Cour., Bruxelles*, viii.
- 7-30 P.M.
- „ *October 30th.*—SANDOWAY.—Violent shock from north to south, lasted two minutes; felt at Ramree, but slightly; more strongly in Cheduba; scarcely sensible in the Yoma range, but very sharp at Gukiong, on sea, 90 miles to south.—*Jour. Asiat. Soc., Beng.*, xiv., 605.
- 7-45 A.M.
- „ *November 14th.*—GOWHATTY.—A single shock.—*Ibid.*
- Between 1-3 A.M.*
- „ *December 18th.*—GOWHATTY.—Violent, with dead sound from south to north.—*Ibid.*
- 4-20 P.M.
1845. *April 19th to 25th.*—LUKPUT (Cutch).—Sixty-six shocks, some of which were destructive.—*Perry, Mem. Cour. Brux.*, viii.
- A shock is stated to have been felt at Joguee, in Assam, which appeared to come from the Cossia hills; but without date, except the year.—*Ibid.*
- „ *July 24th.*—SERAMPORE, CALCUTTA.—Smart shock, succeeded by two less severe shocks.—*Friend of India.*
- 4-30 A.M.

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1845. July 26th.—SERAMPORE.—Another shock ; motion appeared to be from north.—*Friend of India*.
2 A.M.
- „ August 6th.—SERAMPORE.—A pretty smart shock.—*Ibid*.
11-30 P.M. SYLHET.—Same shock felt severely at Sylhet ; several houses injured ; also portico, &c., of church.—*Ibid*.
GOWHATTY.—Ten or twelve shocks had been felt during the preceding 48 hours (date, August 8th), one of them so severe as to have knocked down the new church spire.—*Ibid*.
- MIDNAPORE.—A letter states that the earthquake of the 16th (? 6th) was immediately followed by an inundation of the Cossye, more severe than had previously been known. (The connexion of the two phenomena is not established.)—*Ibid*.
- GOWHATTY.—Shocks very frequent ; some very severe ; 18 felt in one week ; rumblings of earth incessant. For last week these commotions have proceeded from the south.—*Ibid*.
- „ August 22nd.—GOWHATTY.—Severe ; lasted about half a minute ; motion 12-30 Noon. tremulous ; no undulations ; day hot ; no rain ; rumbling sound, as of distant thunder.—*Ibid*.
- „ 3-5 P.M. —GOWHATTY.—Another shock : slight.—*Ibid*.
- „ August 24th.—GOWHATTY.—Smart shock : earth said to have opened and 6. A.M. thrown up water near the hills. The direction of all these shocks is said to have been from west-north-west to east-south-east ; some said north to south.—*Ibid*.
- „ October 28th.—SYLHET.—A smart shock ; lasted 20 seconds.—*Ibid*.
1846. May 27th.—NERBUDDA.—At foot of a hill called Dhumoh-pahari, a tremendous noise and rumbling in hill ; in morning, hill found to have opened and engulfed trees of immense size, supposed to have been a landship, but found not to be so. Dhumoh-pahari (smoking mountain) is 500 feet above level of plain. No traditions of previous eruption ; hill rent for $\frac{3}{4}$ ths of a mile.—*Jour. Asiat. Soc., Bengal*, xvi, 380.
- „ October 17th to 19th.—MYMENSINGH.—Torrents of rain during previous week. From the morning of the 16th to 10 A. M. of 19th, no less than 15 shocks, with five or six more occurring at night.

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1846. *October 18th.*—The most severe was that at 2h. 15m. on Sunday, the 18th; every house in the station suffered. The Collector had to live in a boat, the Magistrate to move into a tent; lasted a minute, and was followed about an hour later by another. Frightful loud rumbling noise.
- CALCUTTA, SERAMPORE, &c.—Same shock as did so much damage at Mymensingh was felt also at Calcutta and in the vicinity; a smart shock lasting eight to ten seconds. Also felt at Dacca, more severely; "earth actually heaved;" houses all in motion; all masonry buildings cracked in every direction.—*Friend of India.*
- „ *December 10th.*—ASSAM.—Severe shock; loose sandbanks along the Burrampootra fell in several places: the Debroo was agitated as by a high wind. The Jansie, a small river in the Seeb-saugor district, observed next morning to have risen 6 inches; and water of the Dakkho, which rises near the other, had sunk proportionately.—*Friend of India, January 14th, 1847.*
1847. *March 30th.*—PUNJAB.—A shock causing more fright than injury.—*Perrey.*
- „ *May 5th.*—CALCUTTA, &c.—Very different from ordinary shocks.—5 P. M. None of the usual rumbling sound and undulatory motion; was "as if a chimney had suddenly fallen down on the roof of the house with a crash, which shook it to its foundation." Said to have been very sharp.—*Friend of India.*
- „ *October 31st.*—NICOBARS.—Continuous shocks, producing great landslips. Fire said to have been seen on the top of one of the mountains of Great Nicobar.—*Junghuhn's Java; Hochster, Novara Reise; Geol. Th. ii, p. 93.*
- ASSAM, NOWGONG.—Public buildings destroyed, &c.—*Thornton's Gazetteer* under Assam. No date given.
1848. *February 20th.*—CALCUTTA, &c.—A smart shock, felt elsewhere also.—*Friend of India.* 5 P. M.
- „ *April 26th.*—MOUNT ABOO.—First shock at 11 P. M. on 26th, preceded by a heavy rumbling noise coming up from the south-west; bungalows all cracked; things thrown from tables, &c.; temple of Dilwara much injured. Slight shocks continued up to 2 A. M. of the 27th, when another occurred, so sharp as to compel every one to "hold on;" shocks continued during day.—*Ibid*; also *Perry.*

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1848. *April 26th.*—Felt also at Deesa, Ahmedabad, Cambay, Mundlaisir, Sehore, Bhopal, Pahlunpur, &c.
- „ *January 3rd.*—KHYOUK-PHYOO.—Severe shock: damaged civil magazine and also sluice of salt golah.—*Friend of India*; also *Perry*.
- „ *November 30th.*—CALCUTTA.—Shock said to have been vertical; not felt at 12-2 Midnight. Serampore.—*Ibid.*
1849. *January 22nd.*—CALCUTTA.—Slight shock.—*Ibid.*
8-15 A. M. GOWHATTY DISTRICT.—Sharp shock. At Jogee lasted nearly one minute. At Burpettah (8 o'clock) the movement commenced by a slight undulation of the soil, accompanied by a dead sound, which continued for a minute, and terminated by a violent shock from north to south; followed by a second which caused the bells to ring; lasted altogether 1 to 1½ minute.—*Perry*; *Mem. Dijon Acad.*, 2 Ser., Tom. 1, p. 15, &c., *Jour. Asiat. Soc., Beng.*, xviii., 172.
- „ *January 23rd.*—JOGEE, BURPETTAH.—Another strong shock from south-east to north-west. At Burpettah did not occur until 11 o'clock and seemed to come from north (? a different shock) from Himalaya and not from the Cossia hills.—*Jour. Asiat. Soc., Beng.*, xviii., 172.
- „ *January 26th.*—JOGEE.—Sharp; long and in same direction as preceding; 5 A. M. the noise resembled that of heavy artillery.—*Ibid.*
6 A. M. BURPETTAH.—Two slight shocks. At Gowhatty, they were preceded for two or three seconds by a sound which continued for about the same time after the ground ceased to undulate.—*Friend of India*.
- „ *February 27th.*—DARJILING.—Very sharp; many well-built walls cracked.— 9-10 P. M. *Hooker's Jour.*, i, 276.
- „ *February 28th.*—TITALYA.—Three sharp jerking shocks from the south, with 9-8 P. M. hollow rumbling sound: felt at Darjiling at 9h. 10m.—*Ibid.* i, 276.
- „ *April 24th.*—EAST INDIES?—*Perry, loc. cit.*
- „ *November 23rd.*—TRAVANCORE.—From west-north-west to east-south-east.— *Trans. Bombay Geogr. Soc.*, xiii, App. c, 9.
- „ *December 26th.*—BOMBAY.—Very slight.—*Perry, Bull. Acad. Belg.*, xvii, i, 225.
1850. *May 7th.*—CALCUTTA, &c.—A hot blast of wind, said to have been accompanied by an earthquake, and subsidence of a tract

- A. D.
1850. *May* 7th of land near Oolabariah: no shock felt at Serampore.—
Friend of India.
1851. *January* 8th.—CHITTAGONG, &c.—Sharp, preceded by a dull thumping
sound; lasted about twenty seconds; motion apparently
from south; felt also at Mymensing, Dacca, and Calcutta.
—*Hooker's Jour.*, ii, 349.
- ” ” 17th.—LAHORE AND ALL PUNJAB.—Widely extended, but not severe
shocks.—*Perrey, Bull. Acad. Belg.*, xix, i, 355.
- ” ” 21st.—LAHORE AND ALL PUNJAB.—Similar, but stronger.—*Ibid.*
- ” *February* 2nd.—SEHWAN.—Phooljee, near Sehwan; sharp.—*Bomb. Geogr.*
Soc., x, 284.
- ” ” 4th.—LAHORE.—Appears to have extended all over Punjab—
Perry, loc. cit.
- ” ” 6th.—PUNJAB.—Appears to have extended all over Punjab.—
Ibid.
- ” ” 9th.—CALCUTTA.—Tremulous motion, not undulatory; preceded by
an explosion like the blowing up of a powder magazine;
lamps swung, chiefly from east-north-east to west-south-
west.—*Ibid.*, page 356; *Friend of India.*
- ” ” 14th.—NAINI TAL.—Shock accompanied by storm with lightning
and thunder; at same time immense inundations; baro-
meter on 12th at minimum height in Bombay and Cal-
cutta.—*Perry, l. c.*, p. 356.
- Locality spelled Narnee Jal by mistake in Perry's Cata-
logue.
- ” ” 17th.—LAHORE, MOOLTAN, CALCUTTA.—Not severe.—*Ibid.*
- ” *April* 19th.—GWADUR.—Three shocks; several houses destroyed.—*Bomb.*
5 P. M. *Geogr. Soc.*, x, 284; *Perry, loc. cit.*, page 21.
- ” *April* 22nd, OOTHUL IN BELLA.—*Ibid.*
- ” ” 27th.
- ” *October* 15th.—CHERRA POONJI.—Motion distinct from south and east;
3-12 P. M. a second shock at 3h. 35m.—*Oldham. Khasi Hills.*
App. P., xiii.
- ” *July* 4th.—CHERRA POONJI.—Slight.—*Ibid.*
- ” *October* 9th.—NUNGKLOW.—Wave from south-east. Rumbling noise last-
3 P. M. ed thirty-five seconds.
- ” *October* 15th.—CHERRA POONJI.—Motion distinct from south and east; a
3-12 P. M. second shock at 3h. 35m.—*Ibid.*
1851. *December* 13th.—BELUCHISTAN. CUTCHEE AT FOOT OF MURREE HILLS.—
Noticed.—*Bom. Geogr. Soc.*, iii, *Buist*, x, 284, *Perrey,*
Mem. Dijon Acad., 2 Ser., ii, 61.

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1852. *January 24th.*—UPPER SIND. MURREE HILLS.—Duration brief, but was
3-45 A. M. severe, causing death to a large number, especially in the
Murree hills; fort of Kahun destroyed, and people with
herds taking shelter in a cave in the hills buried; 350
people destroyed. Direction east to west.—*Trans. Geogr.
Soc., Bombay, x, 284; Perry Bull. Brussels Acad.,
1853, xx, 40.*
- „ *February 9th.*—CALCUTTA, SERAMPORE, &C.—Slight shock.—*Friend of
1-55 P. M. India.*
- „ *March 31st.*—N.-W. PROVINCES, MEERUT.—Severe shock; felt strongly
at Meerut; clocks and watches (?) stopped; panes of glass
smashed to pieces.—*Friend of India; Perry, loc. cit.*
- „ *May* .—DARJILING, &C.—Threw down several thousand square
yards of south-western face of Kunchinjinga.—*Sherwill,
Jour. Asiat. Soc., Beng., xxii, 540.*
- „ *August 9th.*—Dacca.—Preceded by a dead sound; shock strong; oscilla-
4-37 A. M. tion lasted fifteen seconds; strong all that time. Abbé
Kuch says:—“I was in bed at the time, the bed lying
south to north; shocks appeared to come from north-west;
some said from north-west, some south.”—*Perry, loc. cit.*
1854. *November?* —BOMBAY.—Slight shocks before 1st December.—*Perry.*
1855. *August 26th.*—SINGAPORE.—Not severe.—*Asiat. Jour.*
- „ *September 18th.*—AMARAPOORA.—Slight.—*Yule's Narrative, App., 349.*
- „ *October 5th.*—AMARAPOORA.—Slight.—*Ibid.*
1856. *March 17th.*—MADURA.—Near midnight; noise seemed to come from east
to west.—*Bomb. Geogr. Soc., xiii.*
- „ *April 7th.*—KANGRA, SIMLA, KOTGHUR.—Four shocks at Kangra,
one rather sharp; slight at Simla. At Kotghur, walls
cracked and chimneys injured.—*Friend of India.*
- „ *August 11th.*—TREVANDRUM.—Low rumbling sound from south and east,
5-51 P. M. about three seconds before the shock; shock and noise
twenty seconds.
- „ *August 25th.*—TREVANDRUM.—Another at 4-25-10; one or two more in
4-25 P. M. the month.—*Brown, Brit. Ass. Rep., 1860; Trans., 74.*
- „ *September 1st.*—TRAVANCORE.—North-west by north to south-east by
0-25 Noon. south; pendulum 17 feet long swung for four minutes.—
Brown, Trans. Geogr. Soc., Bombay, xiii, App. C.
1857. *August 16th.*—CEYLON.—(? 14th). None said to have occurred since Feb-
ruary 1848.—*Friend of India.*
1858. *March 16th.*—BALASORE.—A short pounding from the south, with usual
7-8 A. M. rumbling noise.—*Trans. Bomb. Geogr. Soc.*

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1858. August 11th.—SIMLA.—Two shocks, first slight, between 5 and 6 P. M.; lasted 4 seconds; walls cracked, &c.—*Friend of India; Trans., Bombay Geogr. Soc.* Extended to Madras: (P) not felt at Bombay.—*Perry, Mem. Cour. Belg.*, xii, 54.
- ” ” 13th.—MALABAR.—Houses shaken ‘for an hour.’—*Offl. Records.*
7-0 A. M.
- ” August 22nd.—TEZPUR.—*Ibid.*
8 A. M.
- ” ” 23rd.—LAHORE.—Slight; 6-30 P. M.—*Ibid.*
- ” ” ”.—JACOBABAD.—Almost imperceptible.—*Ibid.*
2 A. M.
- ” ” ”.—MALABAR.—Shocks for about an hour; shook all houses.—
7 A. M. *Ibid.*
- ” August 24th.—WALTAIR.—Slight shock in forenoon.—*Ibid.*
- ” ” ”.—BRITISH BURMAH.—A very severe and destructive earthquake in many parts of Burmah. The shock was most severely felt in the north of British Burmah, about Thayet Myo and Prome, but was experienced at all stations, the intensity decreasing from the north southwards: general direction appears to have been from east-north-east to west-south-west, being the mean of directions as noticed by different persons. The time is given as 3-38 P. M. at Thayet Myo; 3-45 A. M. at Rangoon: at Rangoon or Moulmein no damage appears to have been done. At Henzada tops of pagodas were knocked down or canted over. At Prome, about 3-38, lasted about a minute, sharp and severe. The Shue-the-thlap pagoda much injured; the only three pucca houses in the station uninjured, especially those on the bank of the river. Captain Ardagh, Deputy Commissioner, says, he felt his house rattle very much as if a horse or other animal had got under it and was knocking against it. But the motion was too great for this, and he was going out to see what was the cause, when he felt the floor wave beneath him, and just then heard the crash of a number of bottles, &c. Dr. McQueen says, he distinctly saw the east end of the house raised first and then the west.

THAYET MYO.—“Lasted about 45 seconds; three distinct undulations or waves, preceded by a rocking or tremulous motion of very short duration. Some persons who were in

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1858. August 24th
—*contd.*

the open air experienced a current of hot air and a rushing sound as of a large flight of birds immediately preceding the shock. The rumbling and clattering noise was instantaneously followed by a tremulous vibratory movement, which in its turn was almost immediately replaced by the passage of the first earth-wave which threatened every house with destruction. The houses rocked distinctly. Most of the pagodas greatly injured; the tops of these fell to the south-west, and more than one was reduced to ruins, breaking down the south-west corner of their enclosures. These buildings had, I believe, their stability shaken by the first wave and fell by the second. Lighter bodies like bottles, &c., fell towards the north-east, as if they had fallen with the first wave. Mess table in mess house of XVth Regiment, Madras Native Infantry thrown out of its position and canted. At pagoda, near Assistant Commissioner's house, north wall looks as if upheaved, and is separated from the body of the structure by a wide chasm. In Major Cooper's pucca house north wall has bulged and partly fallen outwards, and portico has separated from main wall of building in same direction. The *Diana* steamer lying at the ghât in 9½ fathoms felt "as if driving in a gale of wind." She swung completely with her head down stream, and remained so till midnight, when the course of the river which had been reversed and ran with a current of three miles an hour was restored to its natural direction. Mud was brought up to surface of water and to north of cantonment, where the river is shallow; the bed of the river was distinctly seen to rise out of the water. It resumed its old level after the shock had passed. Partial eclipse of moon same evening. "Past season has been an unusual one, the rainfall has been far below the average; barometer gave no indication of any change" (Dr. Ranking's private letter, September 7th, 1858). Lieutenant Falconer, Executive Engineer, says:—"North and south walls injured much more than east and west; quoins suffered more than any other portion of buildings; all terraced roofs cracked, principally at corners near base of parapet; cracks from parapet to parapet cutting off triangular pieces over the corners of the buildings."

A. D.

1858. August 24th
--contd.

ALLAN MYO.—“Vibrations violent, rapid, upheaving jerks from east to west in rapid succession; crisis of earthquake about sixteen seconds after commencement; feeling was as if the convex side of an immense circle was passing with great impetus under your feet. Vibrations had a rolling feeling, as if the waves violently jerked, were passed rapidly under you in a different direction to the feeling caused by the crisis of the shock.”—*G. Barr, Collector of Customs, Thayet Myo, 13th September 1858.*

AVA AND PAGAN MYO, &C.—Shock was felt at Ava, but slightly; some slight injury done to the old temples at Pagan.

TOUNGOO—First shock produced effect of heavy weight suddenly let fall, or of a man stamping violently. Three seconds after this earth-wave came and lasted three or four seconds; vibration similar to that felt on wooden bridge when a heavy train passes.

AKYAE.—Motion said to be from south to north; lasted about a minute and half; unusually severe; dislodged bricks out of masonry walls of Collector's office and shook down some plaster.

KHYOUK-PHYOO.—Assistant Commissioner's house rocked so that he and others were thrown down, and with difficulty got out of the house. Masonry buildings injured; water welled up in several places in various parts of town.

RAMREE.—The Principal Assistant at Ramree reported the entire disappearance of False Island, situated south-east of the island of Cheduba, Lat. $18^{\circ} 38' N.$, Long. $93^{\circ} 55\frac{1}{2}' E.$, no trace of it having been seen after the 24th August; and he thinks the disappearance of it may be attributed to this earthquake. (March 16th, 1859).

In the *Madras Presidency* a slight shock is said to have been felt on the 24th August from north to south, and at the Adyar, close to Madras, also very slight at 4 or $4\frac{1}{4}$ P.M. The magnetic instruments at Madras Observatory were distinctly disturbed, not the meteorological.

In *Bombay*.—A very slight shock is said to have been felt at Carinjah Island, opposite Bombay, between 4 and 5 P.M. This, however, could scarcely have been from the same centre.

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1858. *August 24th* In *Punjab*.—On enquiry being made, it was reported that the shock was felt, but so slightly as not to have excited any notice. At Paneeput, Rhotuk, Jullunder, Umritsur, Lahore, Jhelum, Jhung, Rawul Pindee, Peshawur, the time is differently stated from 2 o'clock to 6 o'clock P.M. At Hissar said to have been felt at 9 A.M. I think from all this we may safely conclude that the shocks of the afternoon of 24th August were not felt in the Punjab.

In the North-West Provinces it was not felt; the only place where any shock is stated to have been felt about same time is Mozuffernuggur, where a very slight shock is reported about 4 o'clock P.M.; said to have been from north-east to south-west.

BENGAL.—It would serve no really useful end to give in detail the various statements sent in by district and local officers from all parts of Bengal. To take extreme localities, I may mention that the shock was just felt at Darjiling. At Hazareebagh, it was felt as two distinct waves; duration less than half a minute, and apparently from east to west. At Chota Nagpore, it was felt so slightly that no notes were taken. At Singhbhum, Cuttack, Balasore, not felt. At Cachar, not noticed. At Sylhet, 3-30 P.M. lasted thirty seconds. An earthslip, 20 feet long by 4 feet broad, fell from one of the teelahs. In Assam, seems not to have been felt. In Cossia hills (Cherra) only slight, about 3-45 P.M. At Tavoy, on Tenasserim Coast, it was so slight as to be scarcely perceptible, and was not felt at Mergui to south.

CHITTAGONG.—3h. 40m. P.M.—Three distinct shocks, first preceding others by eight or ten seconds, second and third being one continuous roll; more severe than any shock since 1852; motion apparently east-north-east to west-south-west; clocks stopped in several houses.

These observations enable us to mark out with tolerable accuracy the limits of the seismic area affected by this severe shock. And although, unfortunately, but little is on record of any accurate measurement of the direction, still by grouping the observations, we can arrive at a satisfactory conclusion, I think, that the seismic focus of the 24th August 1858 must have been under the ranges of hills lying between the Irawadi and the Bay of Bengal, in or

A. D.

1858. *August 24th.* about the parallels of Prome and Thayet Myo 4 A.M.
Official Records.
- „ *August 25th.*—JACOBABAD.—Said to be very slight.—*Friend of India.*
 2 A.M.
- „ *August 26th.*—PROME, &C.—A second shock, slight; lasted four seconds.—
 8-30 A.M. *Ibid.*
- „ *August 26th.*—TEZPUR.—*Official Records.*
 4 A.M.
- „ *August 27th.*—THAYET MYO.—Slight.—*Ibid.*
 9 A.M.
- „ *August 29th.*—LAHORE.—Sharp shock.—*Ibid.*
 6-30 P.M.
- „ *October 3rd.*—GANJAM.—Slight.—*Ibid.*
 3-30 P.M.
- „ *October 12th.*—CHICACOLE.—Sharp.—*Ibid.*
 4-30 P.M.
- „ *December 30th.*—In the three talooks of Kistnaghery, Tengoricottah, and
 7 A.M. Tripatur, in the Salem district.—*Ibid.*
- „ *December 31st.*—KHANDEISH.—Slight.—*Ibid.*

In December 1858 and January 1859, several earthquakes occurred in Salem, Coimbatore, and North Arcot districts, Madras; general motion from south to north.

Shocks are also said to have been felt “during three days in the middle of August 1858 at 2 P.M., 10 A.M., and in the evening,” on the Malabar Coast.—*Ibid.*

End of August.—MANDALAY.—Daily shocks.—*Perrey. Mem. Cour.*, xxi, 17.
Beg. of Sep.

1859. *January 3rd.*—NORTH ARCOT.—In the Pooloor Taluk tiles were displaced,
 about 8 A.M. and a rumbling noise continued for twenty minutes. Also felt in the Wallowanad Taluk of Malabar and the Coimbatore district.—*Official Records.*
- „ *February 5th.?*—TRIPATUR.—Accompanied by a subterranean roar, like that
 5 A.M. of a fast carriage.—*Ibid.*
- „ *July 21st.*—GUNTOOR.—Sharp; felt at Comalpand; large stones said to
 4 A.M. have been rolled into the plains: loud rumbling noise: also felt at Condaveed.—*Mad. Jour. Lit. Sci.*, xxi, 165.
- CONDAVEED, in Guntoor.—The sound of an earthquake is said to have been heard on the 2nd, 3rd, 4th, 5th, 7th, 8th, 12th, 27th, 29th, 30th, and several other days in this month, but no shock is reported as having been felt but this one.—*Official Records.*

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1859. *August 2nd.*—GUNTOOR.—*Official Records.*
 " " *9th.*—GUNTOOR.—*Ibid.*
 " *December 17th.*—TRIPATUR, in Salem.—Single shock, rumbling noise, lasted
 5-6 A.M. 30 seconds; similar noise heard on 30th November, 5 P.M.—
Mad. Jour. Lit. Sci., xxi, 340.
 " *December 17th.*—SALEM.—Three shocks, first at 10 P.M., the second at 12 P.M.,
Night. and the third at 4 A.M., on 18th.—*Ibid.*
 1860. *January 17th.*—SHEVAROYS.—Two shocks, not severe.—*Mad. Jour. Lit.*
Night. *Sci.*, xxii, 140.—*Official Records.*
 " *January 20th.*—SHEVAROYS.—Slight.—*Ibid.*
 7 A.M.
 " *February 2nd.*—TRIPATI, in Madras Presidency.—Lasted for a minute; was
 5 P.M. from east to west, with loud rumbling noise; felt also at
 Chandragiri, and in vicinity.—*Official Records*; *Mad.*
Jour. Lit. Sci., xxi, 341.
 " *February 25th.*—BERHAMPORE, in Ganjam.—Vibration from west to east,
Between 11 accompanied by a loud rumbling noise, which lasted for
& 12 P.M. some seconds.—*Official Records.*
 " *July 9th.*—DHURMSALA, FEROPUR, &c.—Vibrations said to be from
Sunset. east to west! (The great fall of aerolites at Dhurmsala
 took place on the 2nd of this month).—*Friend of India.*
 1861. *February 16th.*—PENANG, MALACCA, SINGAPORE.—Sufficient to throw crock-
 7-30 P.M. ery off shelves, stop clocks, &c. There were three shocks,
 each lasting about thirty seconds; motion from north to
 south. Five minutes before the shock, there was an
 unusual commotion in the sea. Sky clear, and no wind.—
Friend of India.
 " *February 16th.*—CALCUTTA, &c.—Water in tanks at 7 P.M. rose about one
 foot above its level on one side of tanks, and sank as
 much on the other. Sides of tanks on which it rose and
 sank were east and west sides. The same facts were
 observed at Ballygunge, also at Kishnaghur, Nuddea,
 Madhubpur, near Cutwa, Birbhum, Gorai, to the north of
 Calcutta, and at Balasore to the south.—*Friend of India*;
Jour. Asiat. Soc., Bengal.
 " *March 4th.*—SHEVAROYS.—Slight shock: the cook's son explained the
 facts by saying "it was too much hot, and the earth had
 got headache like from too much quinine."—*Friend of*
India. Felt throughout the Salem District.—*Official*
Records.

- A. D.
1861. *April 18th.*—CALCUTTA.—Slight shock.—*Friend of India.*
12-5 *Mid-*
night.
- „ *July 24th.*—KISTNA DISTRICT.—Supposed to be from south-west to north-east, accompanied by a noise similar to the report of a cannon.—*Official Records.*
1862. *January 13th.*—KISTNA DISTRICT.—Undulatory movements, and low rumbling noise; lasted about ten seconds.—*Ibid.*
- „ *June 18th.*—DARJILING.—At night: severe.—*Col. Crommelin*: Another slight, on the morning of the 19th June.—*Official Records.*
1863. *March 29th.*—DARJILING.—Very severe: day had been very windy and 10 P.M. hot.—*Col. Crommelin.*
- „ *July 8th.*—DARJILING.—Severe: another shock at 8-50 P.M.—*Ibid.*
8-15 P.M.
- „ *August 11th.*—DARJILING.—Moderately sharp.—*Ibid.*
2-15 P.M.
- „ *August 21st.*—DARJILING.—Slight.—*Ibid.*
5-15 P.M.
- „ *October 17th.*—DARJILING.—Between 10 and 11 P.M.: slight.—*Ibid.*
- „ *November 18th.*—NIMAR AND BURWANI COUNTRY.—Accompanied by a loud noise like the trampling of a multitude of horses. In the Burwani country walls fell: shocks from north-west to south-east. Felt south of Nerbudda river, from Burwani in west to Poonassa in east; and north of the river, from Manpoor to Burwani: not noticed to south of the Satpoora range, as at Burhanpur: weather very sultry; heavy rain for two or three days after.—*Jour. Asiat. Soc., Beng., 1863, xxxii., 66.*
1864. *January 5th.*—TRICHINOPOLY.—Appeared to be from south to north, about 3-50 A.M. six seconds. Noise like a number of heavy artillery wagons.—*Official Records.*
- „ *January 5th.*—DACCA, &c.—Said to be east and west (south-west to east). *Night.* Sharp; people thought houses were coming down; one gentleman, sleeping east and west on a couch with castors, was suddenly driven, couch and all, against the western wall, when concussion sent him back again in the opposite direction. Motion near the river severe, felt at Narain-gunge: felt also at Salem.—*Friend of India.*
- „ *April 29th.*—AHMEDABAD, SURAT, &c.—Several persons thrown down; some felt sick. Shocks from the north-west: felt also

- A. D.
1864 *April* 29th. in Surat, Kaira, Kattywar, Mount Aboo.—*Trans. Geog. Soc., Bombay*, xvii, 288, *et seq.*
- „ *July* 23rd.—RANGOON.—Two shocks; doors rattled, &c., but no damage done. Felt slightly at Thayet Myo.—*Friend of India.*
- „ „ 25th.—At Gwadur and Mekran, sharp; portions of mountain said to have fallen with a great crash. (This is not strictly within Indian limits, but is noticed here merely to record the facts).—*Ibid.*
- „ *August* 30th.—PATNA.—Slight from north-west to south-east; lasted 13 seconds.—*Ibid.*
- „ „ 30th.—LUCKNOW.—Two smart shocks.—*Ibid.*
- „ „ 30th.—DARJILING.—Slight.—*Col. Crommelin.*
11 P.M.
1865. *April* 11th.—SIMLA.—Beds rocked; roofs cracked.—*Friend of India.*
4 A.M. MUSSOOREE.—Lasted a minute and a half; noise like thunder.—*Ibid.*
NAINI TAL.—Felt slightly.—*Ibid.*
- „ *August* 2nd.—PALAE HILLS.—Appeared to travel north-west.—*Official Records.*
4 P.M.
- „ *September* 9th.—DARJILING.—Slight.—*Col. Crommelin.*
9 A.M.
- „ *November* 16th.—DARJILING.—Slight.—*Ibid.*
7-8 A.M.
- „ *November* 17th.—JESSORE.—*Official Records.*
- „ *December* 4th.—LAHORE.—Two smart shocks.—*Friend of India.*
- „ „ 4th.—DHURMSALA—Four severe shocks; large rocks detached from hills.—*Ibid.*
- „ „ 4th.—CHAMBA.—Houses rolled like a ship passing over a succession of waves; much damage done.—*Ibid.*
- „ „ 12th.—SHILLONG.—Slight.
8 P.M.
- „ *December* 16th.—DARJILING.—Slight, but lasted for some time.—*Col. Crommelin.*
10 P.M.
- „ *December* 19th.—CHITTAGONG AND BENGAL GENERALLY.—At Chittagong a severe shock, which cracked most of the buildings of the station: five shocks were felt between 7-30 and 10-30 P.M. The first was severe, and lasting about 2½ minutes, and accompanied by a noise like that of a coming nor'wester; the other four were slight, lasting only 5 or 6 seconds. Most of the buildings in the station were badly cracked.

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1865. *December 19th.* At Comillah the verandah of the school-house alone was cracked. At Diamond Harbour and Contai the shock was slight; at the latter place said to have been accompanied by a rustling noise like the flight of birds. Felt also at Balasore, Midnapore, Shergotty, Bhaugulpore, Jalpaiguri, Dinajpur, Sylhet and Cachar, besides other places needless to enumerate; everywhere said to have been slight. The seismic vertical was probably situated somewhere in hills between Chittagong and Burmah.
- „ *December 20th.*—RAMPORE BAULEAH.—Not so severe as that of the 16th; 9 P.M. also felt at Dinajpore, Julpigoree, Serajgunge, Pubna, and Malda.—*Official Records.*
- „ *December 25th.*—KISHNAGUR.—Rather severe shock, accompanied by a loud *Between 4 & 5 A.M.* explosion.—*Ibid.*
- „ *December 27th.*—BARASOLE.—*Ibid.*
7-15 P.M.
1866. *January 6th.*—CHITTAGONG.—Another slight shock.—*Friend of India.*
- „ „ *23rd.*—MOULMEIN.—Slight.—*Friend of India.*
Noon.
- „ *January 23rd.*—CONTAI.—Slight, but accompanied by a loud rumbling sound, 8-10 P.M. like the passage of artillery over a metalled road.—*Official Records.*
- „ *May 23rd.*—BENGAL, &C.—In Calcutta shocks were slight. At Monghyr one house destroyed; at Darjiling two or three shocks felt, of which one was severe; at Jubbulpore some houses fell.—*Friend of India.*
- „ „ *23rd.*—KHATMANDOO, NEPAL.—A terrible shock; destroyed a large portion of the town.—*Ibid.*
- „ *September* —KHATMANDOO.—A letter, under date September 20th, mentions a severe shock of earthquake *lately.*—*Ibid.*
- „ *December 19th.*—CEYLON.—Very general over Ceylon; slight.—*Ibid.*
Night.
1867. *January 3rd.*—KENNALAPUD.—In the Kistna District,—slight.—*Official*
9 P.M. *Records.*
- „ *January 6th.*—VINUKONDA, Kistna District, slight shocks are said to be common.—*Ibid.*
1868. *June 29th.*—CACHAR.—Slight shocks in evening and at 3 next morning.
- „ „ *30th.*—SYLHET.—A few minutes after 12 midnight, three waves, rather abrupt; second shook all furniture: duration about

A.D.

1868. *June* 30th half a minute: tremulous motion for half a minute more, from west-south-west to east-north-east (?)
 DINAJPUR.—Slight; three distinct shocks, lasted about a minute: felt slightly at Rampore Bauleah, Malda, Nattore, Bograh, Pubna, and Rungpore.—*Proc. Asiat. Soc., Beng.*, 1868, 256.
 JULPIGOOREE.—Sharp, seemed to come from the south; roof, of lock-up shifted slightly towards the south.—*MSS. Corr.* Also felt at Darjiling and Cooch Behar.
- , *July* 31st.—HAZAREEBAGH.—Lasted ten seconds; appears to have come from the north or north-east. Felt slightly at Ranigunj, at Gobindpore; very perceptible at Bugodhur, preceded by a loud noise.—*Proc. Asiat. Soc., Bengal*, 1868, p. 257.
- „ *August* —PESHAWAR.—Portion of fort shaken down.—*Official Records.*
- „ *September 30th.*—MANBHUM.—Lasted one minute; direction apparently from east to west.—*Friend of India.*
 DAMUDAH.—Loud rumbling noise; lasted five seconds; travelled from south-west by south to north-east by north.—*Ibid.*
 HAZAREEBAGH.—Three distinct undulations, lasting forty-five seconds, with loud rumbling noise.—*Ibid.*
 BIRBHUM.—In Birbhum slight.—*Ibid.*
- „ *November 10th.*—MURWUT, BANNOO.—Said to have caused moisture in the soil to rise from 2 feet below to within 6 inches of the surface, so that the villagers were able to sow their crops. Mr. R. E. Egerton, Financial Commissioner of the Punjab, reports that the crops were sown, although no rain had fallen, as the time for sowing was very nearly past, and the villagers were afraid of losing them altogether. This is a very probable explanation, and shows clearly how many of the extraordinary stories current regarding the effects of earthquake may have arisen.—*Official Records.*
1869. *January 10th.*—ASSAM, BENGAL, DARJILING.—*Vide* pp. 1-98.
- „ *March 21st.*—DARJILING.—Slight; only one shock which resembled a 9-30 P. M. concussion.—*Official Records.*
- „ *March 23rd.*—DARJILING.—Slight; three shocks in a few minutes.—2-15 A. M. *Official Records.*
- „ *March 24th.*—JHELUM.—Said to have been severe.—*Ibid.*
Night.

A. D.

1869. *March 25th.*—PESHAWUR, KOHAT and adjoining country.—*Official Records.*
4. A. M.
- „ *March 25th.*—DUGSHAI.—Two shocks. Said to be at 5-45 P. M.; also felt at Mussooree.—*Englishman.*
- „ *April 17th.*—SHILLONG.—Rather sharp, but of short duration.—*P. E. Carnegy in epist.*
- „ *April ?* .—PESHAWUR.—Part of fort destroyed.—*Ibid. Official Records.*
- „ *June 9th.*—CALCUTTA.—Not serious; quick; during a cyclone; another 3-15 P. M. slight shock at 3-37, and a third at 4-7.—*T. O.*
- „ *June 9th.*—DARJILING.—Slight, lasted about 3 seconds.—*Englishman.*
6-30 P. M.
- „ *July 4th.*—NASSICK. CHANDORE.—Slight shocks, lasting ten minutes; *Midnight.* appeared to move from east to west.—*Bombay Gazette.*
- „ *July 7th.*—NEPAL.—Perrey gives a tremendous shock at Katmandoo, which he says was nearly entirely destroyed, a large portion of the population being buried in ruins.—*Mem. Cour., XXI, 89.*
- „ *July 12th.*—DHOOLIA.—Slight, accompanied by a peculiar noise.—*Ibid.*
11-45 P. M.
- „ *July 25th.*—NAINI TAL.—Two smart shocks.—*Englishman.*
Morning.
- „ *August 9th.*—DARJILING.—Slight, followed by a much more severe shock *Evening.* on morning of 10th, at 8 A. M.—*Ibid.*
- „ *September 1st.*—NELLORE.—Said to be from west to east; walls and posts of 7-30 P. M. houses shaken.—*Ibid.*
- „ *September 2nd.*—NELLORE.—A slighter shock.—*Ibid.*
7-0 A. M.
- „ *October 5th.*—SIMLA.—Two slight shocks during a thunderstorm.—*Ibid.*
3-13 P. M.
- „ *December 19th.*—COCONADA.—Two shocks.—*Ibid.*
11 A. M.
- „ *December 20th.*—RAWUL PINDI.—Shock said to have lasted about half a minute; cracked walls and caused all people to run out of houses.—*Ibid.*
- ATTOCK.—A series of shocks at intervals of about twenty minutes.
- LAWRENCEPUR.—First shock fifteen seconds; others at five minutes interval.

A. D.

1869. *December 20th.*—CAMPBELLPUR.—For half an hour : building much damaged.
TALLAGUNJ.—Not felt.—*Official Records.*
- „ *December 24th.*—RAWUL PINDI, MURBEE, &C.—Some very heavy claps of
6-30-7 A. M. thunder preceded. (Is this the same as that of 20th ?).—
Englishman.
- „ *December 24th.*—OOSBOOR.—Said to have lasted forty seconds.—*Ibid.*
10 A. M.

Catalogue of Earthquakes, chiefly Eastern, although not Indian, which appear to have escaped notice in the preparation of published lists.

In addition to the earthquakes noticed in the fullest catalogue yet published (Mallet's British Association Reports, 1852, 1853, 1854), I have during my present researches met with the following, which it may be desirable to place on record here:—

A. D.

343. Abul Faraj (*ed. cit.*, page 87) says: In the sixth year of the Emperors Constantine, Constantius, and Constans, were great tremors at Antioch and many earthquakes, nor did the earth cease to tremble for a whole year, but nevertheless so that nothing perished.
375. *July 21st.*—In the reign of Valentinian, a great fall like small stones happened at Constantinople, and tremblings and earthquakes and gaps in the ground in many places: also the city of Nicia was engulfed (*absorptus est*).—*Abul Faraj, l. c.*, page 89); *Gibbon*, iii, 136.
441. In the twentieth year of the reign of Theodosius, junior, a great earthquake at Constantinople, such that all the people fled outside the city, and many places fell.—*Abul Faraj, l. c.*, page 91); also noticed in *Gibbon's Roman Empire*, iii, p. 560.
- 457? In the year Leo Cæsar came to the throne, which was the 879th (?) year of Alexander, a great earthquake in the city of Antioch; many places sank in the earth. Same year a great famine in the east, and hosts of locusts.—*Abul Faraj, (l. c.*, page 92).
551. *July 9th.*—In second year of the reign of Justinian the 3rd, a flame of fire, appeared in the sky near the arctic pole which remained the whole year, and darkness covered the earth from the ninth hour of the day till night, such that no one could see anything, and something like dust and ashes fell from the heavens. And in the third year of his reign the rains failed and winter was like summer, and a great earthquake occurred and serious pestilence.—*Abul Faraj, l. c.*, page 95); also *Gibbon*, iv, 549.
- 634-5. PALESTINE.—Al Macin (Erpenius, edit., page 22.) records an earthquake in Palestine in the year 13 A. H., which was from March 7th, 634, A. D., to February 24th, 635.

A. D.

713.? *July 9th.* ANTIOCH, SYRIA.—An earthquake, which lasted 40 days at Antioch, is recorded by Al Macin in the year of the Hijra 94. This year extended from 7th October 712, A. D., to 25th September 713, A. D. This is very probably the same disturbance which is quoted in Brit. Ass. Catal., 1852, page 11, on the authority of Theophanes and Anastasius, as occurring on the 28th February 713 in Syria.—(*Al Macin, edit. cit.*, page 86).

738. *January 16th.*—The date of this is stated by Al Macin (page 99, Erpenius' edition, Leyden, 1625) to have been the 21st day of Túba in the year 120, A. H. This is a mixture of Mahomedan and Christian eras. The month of Túba, in the "era of the Martyrs," lasts annually from the 27th December to the 26th January; and as the year 120, A. H., extended from the 29th December, A. D. 737, to 17th December, 738, the earthquake occurred (21st of Túba) on the 16th of January 738, A. D. Al Macin's account is: 'In the night a great earthquake destroyed many cities, the inhabitants perishing in the ruins, and many ships were sunk at sea. They say also that this earthquake was universal over all regions to the extreme east, and that 600 cities in the east were destroyed in that night, and men and animals innumerable.'—(*Al Macin, edit. cit.*, page 99.)

856. *December.* —'In the same year (A. H. 242), in the month Sha'bán, terrible earthquakes happened in Corinth and its towns, so that 45,000 people perished under the ruins.'*** In Persia, also Khorasán and Syria, 'earthquakes occurred this year, and unusual sounds, and in Alamana, with great destruction.'—(*Al Macin, edit. cit.*, page 189). The year 242 of Hijra was from 10th May 856 to 29th April 857. The first day of the month Sha'bán was the 28th day of the year; hence counting 208 days from the 10th of May 856, we find that this earthquake happened between the 3rd day of December 856 and the 1st of January 857, A. D. Quoted in Mallet's Catalogue, but not at Corinth, as Al Macin states.

Abul Faraj (Pocock's translation, Oxonia, 1663) describes this same earthquake, and attributes to it (page 170) the upturning of the mountain Akrao (Akraios), near Laodicea; whereas Al Macin (p. 190) says this occurred in 245, A. H., = 859, A. D.

A. D.
859 or
860.

—Al Macin says: 'The cities of the West were shaken by an earthquake, so that castles, houses, and bridges, fell'. It was felt also at Bagdad, Damascus, Tarsus, and the shores of Syria and at Laodicea. In the same year the springs at Mecca failed, so that a skin of water was sold for 100 statera. Same year also great earthquake at Antioch, which destroyed many people. Fifteen hundred houses said to have fallen, and more than 90 of the turrets of the wall fell. Terrible and tremendous sounds were heard from the ruins, and the people fled to the fields. The mountain Akraios was torn up and thrown into the sea, whence this was disturbed, and from it came a black, thick and foul-smelling smoke.—(*Al Macin, edit. cit.*, page 190). Abul Faraj (Pocock's edit., Oxford, 1663, page 170) mixes up this last event and the earthquake of 856 in the month of Sha'bán at Corinth, noticed above.

The year 245, A. H., which Al Macin gives for these events, commenced on the 8th April 859, and extended to the 27th March 860, A. D.

899. *November 14th.*—A great earthquake is recorded by Al Macin as occurring in Egypt 'from the middle of the night to the morning.' The date is given as the seventh day of Zulqa'dah (translated Dulkiad in Erpenius), A. H., 286. The month Zulqa'dah is the 11th month of the year, and the 7th of Zulqa'dah is the 54th day from the last day of the year. Now, 286 of the Hijra (a bis-sextile Mahomedan year) ends on the 6th January, A. D. 900; therefore the date of the earthquake was the 14th November, A. D. 899—(*Al Macin, edit. cit.*, p. 227).

941. *August 6th.*—A violent earthquake in Egypt. The date as given in Al Macin is 11th Zulqu'dah 329, A. H. This day is the fiftieth day from the last day of the year. Now, 329 (a bis-sextile year) ended on the 15th September, A. D. 942; therefore the earthquake occurred on the 6th of August 941, A. D.—(*Al Macin, edit. cit.*, page 260.)

989. A. H. 379 = 11th April 989, to 30th March 990, fourteenth year of Basileus the Emperor. One third part of Sta. Sophia fell and many buildings destroyed; also in Nicomédia (*l. c.*, page 314).²

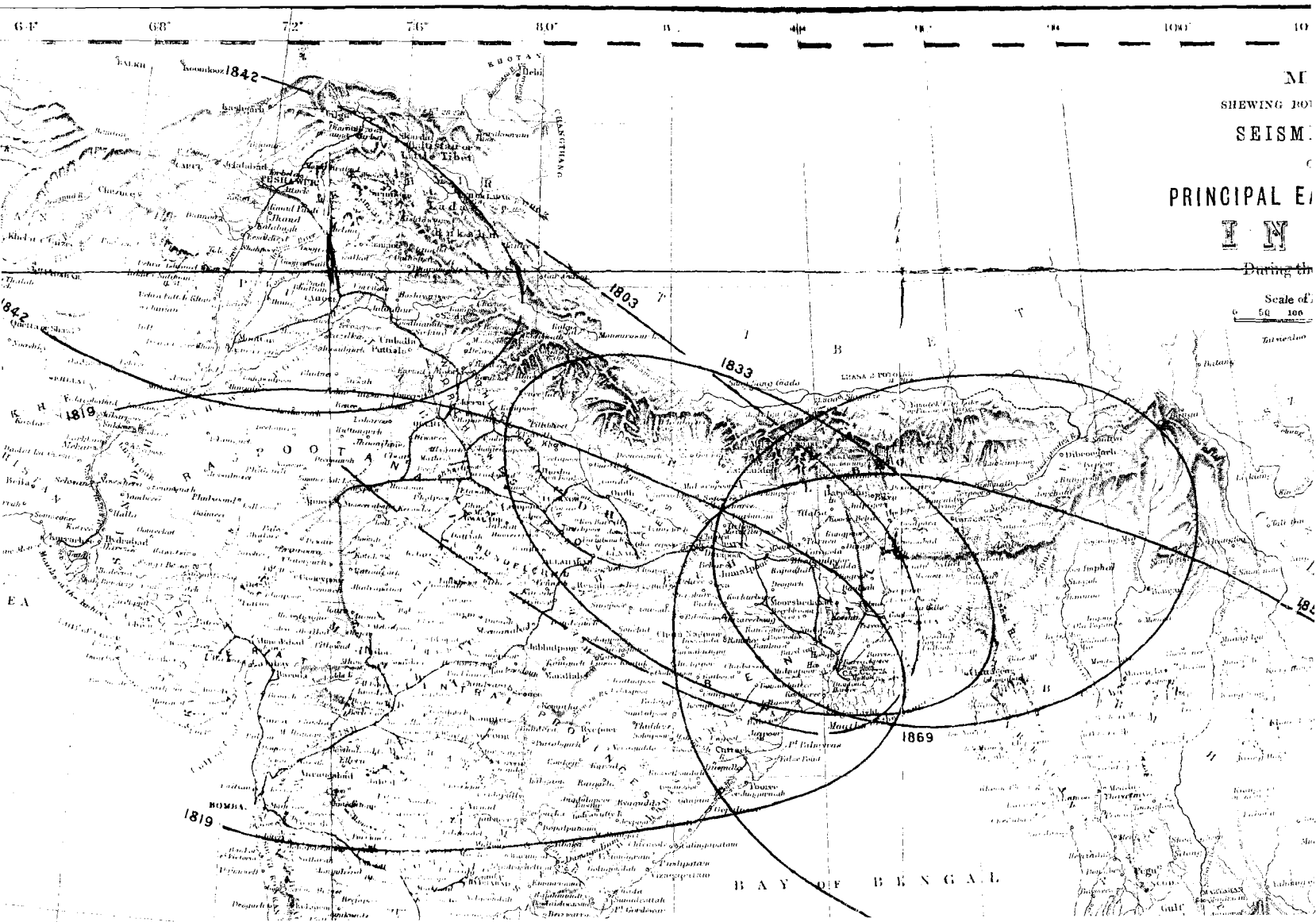
¹ Al Macin says, he quotes from Tabari '*qui fide est dignus.*'

² Gibbon (viii, 10) states that the church of Santa Sophia in Constantinople was destroyed by earthquake in 1346 A. D.

- A. D.
991. 5th April ‘On the 17th Muharram, great earthquakes at Damascus; 1,000 houses fell, and many perished under the ruins. The shocks did not cease before (*diem Veneris*) the 14th Çafar.’ (*Al Macin, edit. cit.*, page 316). The year 381, A. H., under which this is recorded, commenced 20th March, A. D. 991, and the 17th Muharram, therefore, was the 5th April, A. D. 991, and the 14th Çafar (the forty-fourth day of the year), was 1st May, A. D. 992. This severe earthquake is quoted (Brit. Ass. Catal., 1852, 17) as occurring in August 992 on authority of Vattier’s French edition of LeMacin (*Al Macin*). I have not had access to this edition, but the date is clearly given in *Al Macin*.—(*Al Macin, edit. cit.*, page 316.)
1111. September 1st—A great earthquake in Egypt recorded by *Al Macin* at the third hour of the day, *die Veneris*, Friday, on the 3rd day of Tút, 828. This is 828 of the era of the Martyrs, which commenced 29th August, A. D. 284 (the accession of Dioclesian). Tút is the first month of the year; therefore the 3rd of Tút was the 1st of September. And, adding 283 to 828, the year was 1111, A. D. (*Al Macin* says distinctly, *die Veneris*, Friday, which we have shown above, was the 1st September, 1111 A. D. Comparing this with J. Prinsep’s tables, we find the 10th July of this year was Monday; therefore the 1st of August was Tuesday, so also 29, therefore the 31st August was Thursday, and the 1st September, Friday, as before; an important and independent confirmation of the date given.—(*Al Macin, edit. cit.*, page 369.)
1285. In the east; said to have been widely extended. In the Brit. Ass. Catal., 1852, 35, this earthquake is quoted on the authority of Abul Faraj. But I can find no mention of it in that author; indeed, as this treatise ends with 1284, it is not possible he could have noticed it. I have been unable to find other evidence of its occurrence.
1549. In 956 A. H. (=A. D. 1549), an immense earthquake at Qáyin, in Khorásán (east of Persia) and killed 3,000 inhabitants. —’*Álam Árái Sikandari*, a work on the History of Persia.
1619. “In 1028 A. H. (=9th December 1611 to 27th November 1619), a terrible earthquake took place at Dúghábád in Khorásán. At several other places, throughout the whole year, there had been earthquakes, but especially in Khorá-

A. D.

san. The town of Dúghábád, after the earthquake, looked to be an immense heap of bricks. From 700 to 800 dead bodies were dug out from the debris. In one house alone about 70 corpses were found: there had been a bridal party, and, curious to relate, the bride alone was saved. She attempted to jump out of the window, when the house tumbled down; but the wood of the window frame did not break, and she was saved."—*Ibid.*



MAP
SHOWING
PRINCIPAL EARTHQUAKES

PRINCIPAL EARTHQUAKES
IN THE HIMALAYAN REGION

During the

Scale of
1:100,000

Vertical

BAY OF BENGAL