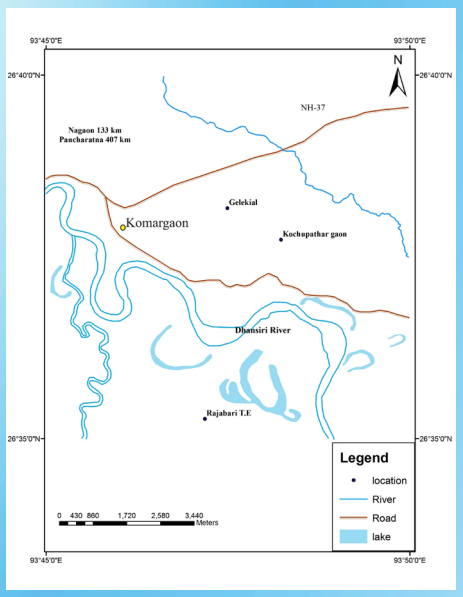
Komargaon, Assam (India) witnessed a new meteorite fall

'Meteorites are early members of the Solar system, thought to have formed within 20 Ma of the origin of Solar System and their age ranges between 4.53 and 4.57 Ga. Majority of Meteorites are probably derived from the Main Asteroid belt, located between Mars and Jupiter. A significant number of meteorites have also been reported from other terrestrial bodies like Moon and Mars. Therefore, study of the meteorites provides more insights in to the early Solar system. Quick oxidation of meteorites in terrestrial environment warrants for fresh meteorite falls rather than finds and are important not only to enhance the database of World's meteorite fall, but also to understand the dynamics of the Main Asteroid belt through the estimate of frequency and trajectory of falls. There is a uniformity of time of fall of meteorites (afternoon to day time chondrite fall yields a value ~ 0.61), however global anomaly between afternoon to day time fall is largely controlled by climatic variations.

A look at the World Meteorite Database reveals the relative abundance of fall - find statistics of two broad groups of stony meteorites, chondrites (equivalent of Earth's mantle) and Achondrites (equivalent of Earth's differentiated mafic- ultramafic crust). Stones account for 94% of total meteorite falls, comprising 86% chondrites and 8% achondrites whereas finds of stony meteorites are 70% including 60% chondrites and 10% achondrites. Interestingly, the rate of meteorite fall in Indian subcontinent ($0.19/10^6 Km^2/yr$) is recorded higher as compared to the global fall rate ($0.037/10^6 km^2/yr$). This disparity accounts for several factors mainly involving longer day light hours, higher population density and public awareness. Our earth constantly encounters extra terrestrial fragments or stones of different types and sizes, some of which survives through the atmosphere and reach finally to the Earth's surface. During the sojourn through the Earth's atmosphere at high velocity the outer surface of the stones undergoes melting due to high friction and forms "fusion crusts" of several generations associated with repeated fragmentations besides implantation of several markings like regmeglypts, striations, flow lines, stagnation zones, oil patches etc. On November 13, 2015, at 12:00 hrs, IST, villagers of Bali Chapori near Komargaon town (lat: 26°39′N; long: 93°46′E) of Golaghat District, Assam witnessed the fall of a huge meteorite. (Fig.1). According to the eye witness account of the local villagers, "It was a bright sunny day when we heard a thunderous sound in the sky and found a burning piece of material is coming at a tremendous speed from the clear sky to the ground". Very soon it fell and hit the soft ground nearby in a wide open area ploughed for plantation of mustard oil seeds. Immediately we rushed to the spot where the meteorite hit the ground. The fireball penetrated the ground and got buried inside a small hole, 1.5 ft in diameter and 3 feet in depth. Subsequently, the material was recovered and cleaned when the local police from the nearby police station reached to the spot within half an hour and took the material into their custody. According to the local news report published in Dainik Janambhumi, dated Nov. 14, page 13 it was a single piece stony meteorite, 10″ x 9″ x 8″ in dimension, with a total recovered weight of 12.095 kg. The present meteorite fall probably represents the third fall in northeast Assam (Table 1).

a



b

Fig. 1 :Location map of the Komargaon Meteorite fall (a) location in toposheet (b) location in google earth

The location of the fall of the meteorite and the crater is shown in Fig.2a while the inside of the crater is shown in Fig.2b Megascopic studies in hand specimen identify the Komargaon meteorite as an Ordinary chondrite covered with at least three generation of fusion crusts of different colour, texture and thickness. Older most crust is smooth, dull brown, thick (~ 1mm) fusion crust with almost no regmaglypt and represents the rear surface during flight through the atmosphere (Fig.3). In contrast, the younger most crust is irregular with several shallow simple regmaglypts, black, thin and a bit glossy with the flow lines radiating away from it. The face marked with the convergence of flow lines indicates the front side during its last stage of flight through the atmosphere. Tiny brownish spots in the grayish fractured surface are the signs of oxidized metal and sulphides present in the silicate matrix. A fresh cut

slice of the sample exposes the internal composition and texture where numerous shining specs of metal are clearly seen integrated in a grayish white recrystallised silicate matrix (Fig. 4). There are some rounded oil patches on the fusion crust denoting the presence of chondrules altered by frictional heat in the atmosphere. On the contrary, the chondrules inside the meteorites are noticeable as indistinct rounded outlines in the matrix of similar mineralogy in spite of high degree of chondrule- matrix integration. The other interesting feature is the presence of shock veins, often bifurcating in nature. In addition, some irregular fracture lines on the fusion crust are generated due to hammering at police station.

a b

Figs. 2.(a) Photograph of the location of the crater and a local villager Nabin Borah who witnessed the fall of the meteorite. (b) Photograph of the inside of the crater

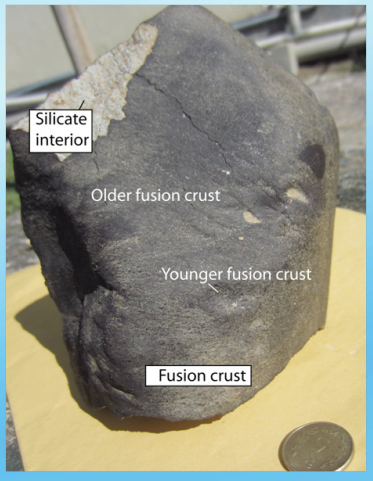


Fig. 3 Hand specimen of Komargaon Meteorite Fragment for study at Dibrugrah University

Table 1 Recent Record of Stony Meteorite Falls in Northeast India

Number of falls	Year	Meteorite Name
1	1999	Sabrum (23°05'N/ 91°40'E) in Tripura
2	2001	Dergaon (26°41′N/ 93°52′E) in Assam
3	2007	Mahadevpur (27°40′N/ 96°47′E) in Arunachal Pradesh
4	2015	Komargaon (26°01′N/ 93°02′E) in Assam

Detailed laboratory studies are presently under progress jointly at Department of Applied Geology, Dibrugarh Univeristy, Assam and at Physical Research Laboratory, Ahmedabad.

Fig. 4 Cut slice of Meteorite showing shining Fe-Ni metal specs

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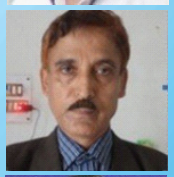

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