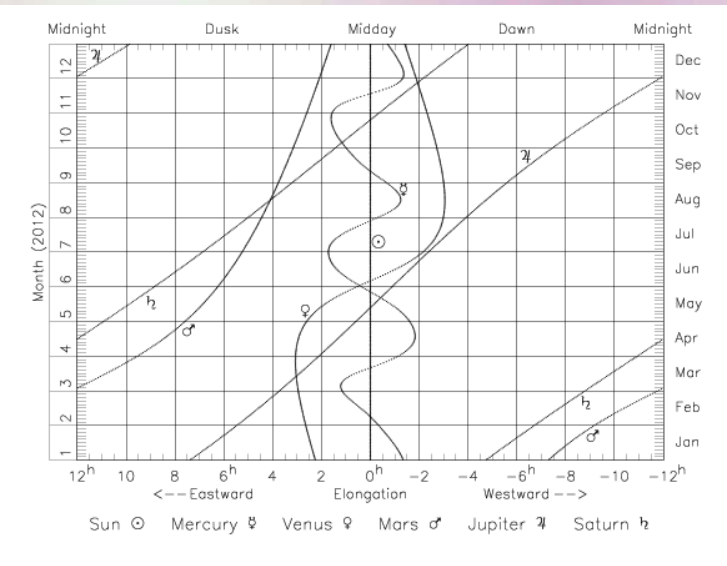


***Figure 3:*** *Astronomical calendar for locating planets in the sky for the year 2012.*

We have been able to manually obtain the position of planets within an accuracy of ≤ 1°, at most using a calculator. This method can be used to reckon planetary positions up to ±50 years of the starting epoch.

**Further Reading:**


1. Fränz M. and Harper D., *Planet. & Space Sci.*, **50**, 217 (2002).
2. http://en.wikipedia.org/wiki/Ecliptic_coordinate_system.
3. Nicholson, I., *'Unfolding Our Universe'*, Cambridge Univ. Press, (1999).
4. Simon J. L. et al, *Astronomy & Astrophysics*, **282**,663 (1994).
5. Singal, T. and Singal, A. K., *Prayas*, **3**, 176 (2008) (arxiv:0910.2778v1).
6. '*The Indian Astronomical Ephemeris for the year 2007'*, IMD, Kolkata (2007).



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## Katol Meteorite Shower

Meteorites are the remnants of the solar system objects. Their study provides us insight into the formation and evolution processes of their parent bodies and of the solar system. The world collection of meteorites is close to 40000 individual falls and finds (see Box 1 for fall, find definition and Table 1 for distribution on the Earth). After falling on the Earth, the meteorite gets exposed to weathering processes that may alter its original characteristics partially. Hence, it is very important to recover the meteorite pieces from the field immediately after its fall. A fresh meteorite fall is always an important new addition to enhance our knowledge and is well sought after by planetary scientists.

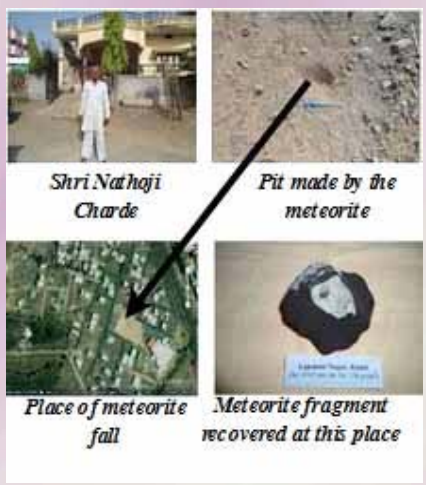
On May 22, 2012, at 14:10 hrs., IST, a large meteorite shower occurred at Katol [ Lat. 21° 15.781', Long. 78° 35.284'], near Nagpur. This is the 20th meteorite fall in India in last two decades. A meteorite fall is a spectacular light and sound show in the sky and one should be fortunate enough to witness a fall event. The citizens of Katol town and surrounding villages were a lucky few to experience a meteorite fall, though most were frightened by the thunderous sound on a bright sunny afternoon. Due to the bright sun, the light show was missed, but the sound had created fear and initial rumors predicted crash of an aircraft. Only next day, when the fragments were recovered and examined, it was realized that meteorite fall has taken place in the locality. A team from PRL (Dr. Anil Shukla, Geo-Sciences Division and the authors) visited Katol to recover samples from the meteorite shower and to document the event though the eye witnesses.

***A fully fusion crusted fragment of Katol as found in an agriculture field***

Discussions were also held with the scientists from GSI, Nagpur who had collected the first fragments from the local villagers. Here, we provide the eye witness account of the event and also try to convey the excitement of a meteorite search campaign. A detailed scientific investigation is in

progress at PRL to classify this meteorite and also to imply the scientific importance of this meteorite.

**Eye witness details**: We visited the region during May 30-31, 2012, exactly a week after the meteorite fall. There has been no rain since the event and hence the original fall conditions were intact. Firstly, it was important to identify the area over which the meteorite fragments would have fallen or talk to the people who have collected the samples. During our journey from Nagpur to Katol, between Kalameshwar to Katol, we interviewed many people on the way at different small villages / settlements around the road. Many people heard the thunderous sound which lasted for around 30 to 50 seconds. But they could not give any substantiate clue about the meteorite trajectory. By chance, we met a security guard, whose friend has met an eye witness to the fall of a fragment. This lucky lead resulted in all the subsequent events being smooth and put us in direct touch with some witnesses.




1. At Katol, first we met Mr. N. R. Charde at Lakhmi Nagar who witnessed the falland visited the site where the meteorite fell. The meteorite fragment weigh around 673 gm and is biggest reported so far. The meteorite fell just in-front of his house in the city and made a pit on the ground. The pit is 4 cm deep and has a diameter of about 6 cm.. The shape of the pit ravealed that the impact was oblique. The angle of impact could be between 30 to 70 degrees and the fall was from east to west direction. Mr. Charde heard the sound during the meteorite fall, but could not see the light. Immediately after the fall he recovered the fragment, and deposited the same with a local reporter for handing over to the authorities. The meteorite piece eventually reached GSI, Nagpur. This big fragment had one broken side and was mostly covered with fusion crust. A spherical object of about a cm , most likely a metal blob could be easily seen on the broken surface. The broken fragment of this big piece is not yet recovered. We searched for more fragments at this location but none were found .

*Further search at the site*

*Mr. G. Alamadhi showing the place where meteorite hit the ground.*

*Mr. C. A. Kachua and Mr. B. M. Bagale showing the place where the meteorite fragment hit the ground.*

2. We visited another site, an agriculture field belonging to Mr. D. Savarkar. A worker in this agriculture field, Mr. G. Alamadhi heard the sound during the fall of the meteorite. As per his notice,


one fragment fell on the field which he collected [Lat. 21$^{o}$ 14.879', Long 78$^{o}$ 34.130'] and transferred to local journalist. The other fragment hit the electrical cables passing over the agriculture field but could not be recovered. We also searched for more fragments at this place but since it was a ploughed agriculture field we could not succeed.

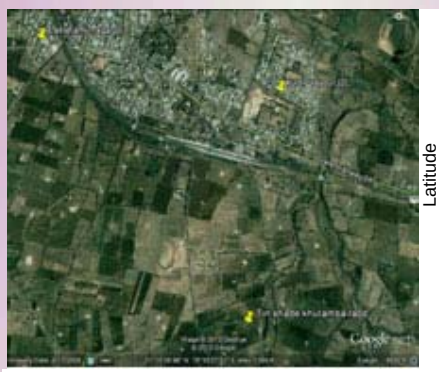
*One of the meteorite pieces pierced the tin shed*

*Owner of the shed Mr J. Shaik who collected the fragment.*

*The meteorite excavated the brick from the ground.*

3. We also visited another site where the meteorite made a hole through a tin roof and then excavated one brick from the ground. This looks awesome suggesting high energy for the meteoritic impact .

4. Mr.. B. M. Bagale, the gardener of the local school found a meteorite fragment a day after the fall, behind the school while working on the ground. He narrated that the particular rock fragment looked different than whatever he saw so far and hence felt curious about it. He handed over the rock [meteorite] fragment to the school guard Mr. C. A. Kachua. He broke the fragment into several pieces and distributed among local residents and kept two pieces weighing few grams with himself. After examining his two fragments we recognised them as genuine meteorite fragments. This was the first samples that we could receive.



***Google map showing the town and the places from where Katol meteorite fragments were collected***

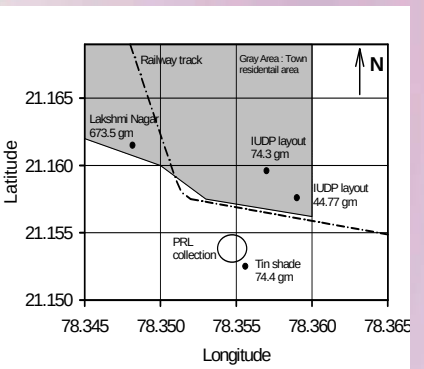



***Figure 1.** Longitude and latitude distribution of collected fragments of Katol meteorite*

| **Table 1. Meteorites fall and find distribution on Earth** | |
|---|---|
| **Finds** | |
| **Region** | **Number** |
| **Hot desert** | 8032 |
| **Cold desert** | 27604 |
| **Continents** | 2809 |
| **Total** | 38445 |
| **Falls** | |
| **Region** | **Number** |
| **Continents** | 1100 |
| **Total [Finds + Falls]** | 39545 |

We searched several areas around the school premises where Mr. B. M. Bagale found a fragment and were successful in locating few more fragments. We gave the basic information related to meteorite identification to whomsoever we met during our field search. Since this fall was during the summer season, the outside temperature was as high as 48$^{o}$C. Therefore, we could only visit the field during the morning time and stayed in the city in the afternoon to interview more eyewitnesses and gather maximum information about this event. We also visited GSI, Nagpur to examine the fragments collected by them and to discuss their field experiences. GSI, Nagpur loaned us a sample for non-destructive analysis of cosmogenic radionuclides.

Since, the meteorite shower took place in a varied land cover with city dwellings, railway tracks, roads, agriculture field and barren land with several obstacles, it was difficult to scan through the entire region.for recovering the meteorite fragments. Our interactions with many residents of the region revealed that almost each household found a fragment, which were either handed over to the local authorities or to search teams possibly from cities like Hyderabad, Pune, Mumbai and Delhi, but their affiliations are not known. From the number density of fragments inferred within this small location that we scouted, we infer that the total mass could be quite substantial. No chondrules are seen in preliminary investigation of this meteorite. The recovered fragments are white to gray-white in the interior region. The fusion crust looks black, brownish-black with oily shining. It has tiny shining metal grains spread all over the meteorite surface. Detailed scientific investigations are in progress at PRL, Ahmedabad. The proposed name and the classification of a this new meteorite is to be submitted to an international Nomenclature Committee of "The Meteoritical Society" for acceptance (see box 2).

For all the team members, who were the first timers on a meteorite hunt, it was an exciting experience to actually find a fragment of the meteorite in the field.

We thank several local residents of Katol, local news paper reporters, VSPM School authorities, local DSP and particularly, Mr. Nilesh Kerade, for their help, during the meteorite search.

**Box 1. Fall and Find definition for meteorites**

**Fall:** A meteorite that has been actually seen to fall and collected is called a 'fall'. There are not many falls in the world collection.

**Find:** A meteorite that has fallen some time ago, but collected subsequently is called a 'find'. The world collection is mostly dominated by finds.

**Box 2. Meteorite naming procedure**

A new meteorite is named after a nearby geographical locality. Every effort is made to avoid unnecessary duplication or ambiguity and to select a permanent feature such as a town, river, cape, mountain, or island which appears on widely used maps and is sufficiently close to the recovery site to convey meaningful locality information. The proposed name and the classification of a new meteorite (either fall or find) has to be submitted to an international Nomenclature Committee of The Meteoritical Society for acceptance and listing in the official publication "Meteoritical Bulletin".

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## *Modern Day Data Centers*

Information Technology (IT) operations are a crucial aspect of most organizational operations, either in business or in science research. A business or science research organization relies on round the clock (24 x 7 x 365) availability of vast amount of information or data located at a centralized place called a Data Center. Many organizations send their valuable data in an encrypted form to a data center that is geographically far away from their own location for an off-site backup. One of the main requirements is that the data should be highly secured and must be available whenever required without any disruption. Data, today, is invariably stored on storage devices attached to computer servers. A data center must therefore keep high standards for assuring the integrity and functionality of its hosted computer environment.A data center, depending on the size of the data it houses, can occupy one room of a building, one or more floors, or an entire building. Most of the equipment in a data center is in the form of servers racked up into standard 42U 19-inch rack cabinets which are usually placed in single rows forming corridors between them. This allows the maintenance staff access to the front and rear of each cabinet. Servers differ greatly in size of multiples of 1U. (Electronic Industries Alliance (EIA) defines a standard 1U rack with 1.75 inch in height, 19" width and 40" depth. Consequently, a standard 42 U rack has 78.74" height, 19" width and 40" depth). The physical environment of a data center is very strictly controlled by the designers and organizers of the Data Center. A typical data center is characterized by following subsystems in it:

- Precision Air conditioner- temperature and humidity control
- Uninterruptible Power System
- Compute and storage infrastructure
- Network infrastructure
- Fire protection system
- Safety and security

The details of the subsystems are given below:

**Air-conditioning system:**

Air conditioning is used to control temperature and Relative Humidity in the data center. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommends a temperature range of 20-25$^0$C and humidity range of 40-60% as optimal for data center conditions. Air-conditioning in a