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A REVIEW OF TWO ITALIAN 'KILLER METEORITES': CREMA 1511 AND MILAN 1633–1664

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Abstract: Two meteorite impacts that took place in Italy in the sixteenth and seventeenth centuries are reported in many historical and modern sources. These were the Crema Bolide of 1511, which was described by many witnesses, and the fall in Milan which probably occurred between 1633 and 1664. Many references report that in both incidents a monk was hit and killed by the respective meteorite. Due to the lack of solid evidence and to the anecdotal nature of the accounts, both of these incidents are considered doubtful. In this paper I review what is known about these events, and conclude that the older incident is likely to have been misreported by Alexander von Humboldt in 1845 and by many other authors thereafter.

Keywords: planetary science, meteorites, Crema bolide, Milan Meteorite, human deaths from meteorites

1 INTRODUCTION

There are many historical cases of people being directly hit by meteorites (e.g. La Paz, 1951; Lewis, 1996; Muravyev and Grokhovsky, 2020; Yau et al., 1994). The probability of this occurring is actually non-negligible. Yau et al. (1994) computed this probability as 0.019 (one impact every 52 years) for meteorites more massive than 0.5 kilograms, and with the global population of 1994. Today the probability is increased to one impact every 32 years using the same equations by Yau et al. Halliday et al. (1985) changed the lower limit of the meteorite mass to 100 grams and found one impact every 9 years. With the equation by Yau et al., this value would be one impact every 14 years. Bigger meteorites, weighting ≥10 kilograms, would hit a person every 614 years.

A key element of these calculations is the total flux of meteorites that fall on Earth on a yearly basis. Halliday et al. (ibid.) estimated that this flux can be quantified as 5.8×10^3 meteorites/year. Wells and Zolensky (1988) computed 63×10^3 meteorites/year. However, the statistics of these calculations is simplistic, since it does not take into account some complex variables, e.g. that most people live a large part of their lives inside buildings, and hence protected from meteorites.

The oldest record of fatalities caused by meteorites is reported by Yau et al. (1994) and refers to 14 January 616, when Chinese astronomers reported that a meteorite fell in China killing 10 men. Nevertheless, most other reports of impact fatalities are considered doubtful since no solid evidence is provided.

Injuries rather than fatalities caused by meteorite impacts also are usually documented only in an anecdotal way, through poor quality accounts by witnesses or local stories of a doubtful nature. Usually, the key issue is the lack of the meteorites themselves, lost through time (e.g. see Unsalan et al., 2020) or which sometimes never existed (Hauser, 2016). The one recent clear exception is the well-documented Sylacauga Meteorite, which hit Mrs Ann Elizabeth Fowler Hodges in 1954 (Swindel and Jones, 1954). The meteorite is preserved in the Natural History Museum of Alabama, and photographs of Mrs Hodges' severe bruising appeared at the time in many newspaper articles and in reports written by the authorities.

The focus of this study is two meteorite impacts that took place in Italy, both in the current administrative region of Lombardy. The earlier is the Crema Bolide, an impact event that occurred in September 1511. The other fall took place in the mid-seventeenth century in Milan. It is said that each of these events caused the death of a monk.

2 THE 1511 CREMA BOLIDE

The meteoritic event took place in 1511 and is documented in many historical accounts. Some authors (Botley 1970; Newton, 1891) have linked this event with the *Madonna di Foligno*, an oil painted by Raphael dating to 1511 or 1512 and now kept in the Vatican Pinacoteca. In the middle of the painting, above the eyes of a putto, a flaming object is seen falling over a mediaeval town. The meteoritic interpretation of this feature was first proposed by Holden (1890). Given the time proximity of the meteorite impact (1511) and the date of the painting (1511 or 1512), and atmospheric phenomenon painted by Raphael, Newton (1891) pointed out that it is very likely that Raphael either saw the fireball or was in contact with one or more individuals who witnessed the event.

In his *Ueber Feuer-Meteore, und über die mit Denselben Herabgefallenen Massen*, the 'Father of the Meteoritic Science' Ernst Chladni (1819) reports many accounts of the 1511 im-

pact event, which he found in the Ambrosian Library in Milan. Some of these accounts are reported also by Newton (1891) and Botley (1970). One of the testimonies is that by Gianni Andrea de Prato, a shoemaker in Milan:

> But before that I will continue writing, I will say that the fourth day of September at the second hour of the night, and also at the seventh, such a splendour of moving flame appeared in the air over Milan that it seemed that day had been renewed, and by some was seen the likeness of a great head, which caused great wonder and fear in the city, and the same things happened the following night at the ninth hour, and after a few days stones fell from the sky beyond the river Adda, some were gathered in the Cremasco of eleven pounds and eight pounds weight, of a colour like burned stone. (Newton, 1891: 93).[1]

Girolamo Cardano (Cardanus), a key figure of Italian Renaissance, reports in his *De Rerum Varietate*:

> We saw in the year 1510 when about 1,200 stones fell from the sky into the area of the river Abdua, one of them weighing 120 pounds, and another sixty were brought to the satraps of the kings of the Gauls as a miracle, most of them; rusty color, exceptional hardness, sulphurous smell; a huge fire had preceded in heaven at the third hour; the noise of falling stones was heard at the fifth hour. It is surprising that such a mass could be sustained in the air for two hours. Within twenty months I drove back the Gauls. Three years later I returned, first with various fortunes, then I was driven back again, to the place of the event. Our city, on the borders of which stones had fallen, had never been more severely afflicted with taxes, fire, famine, siege and pestilence. (Cardano, 1557; cited in Newton, 1891: 93).

The number of 1,200 stones is surely exaggerated, but speaking more generally, as Newton, Botley and others report, the account by Cardano is not really reliable. He was only 10 years old at the time of the event, and his account was written in 1557, hence his report should be interpreted as a second-hand testimony, i.e. what he remembered and what adults told him about the event when he was a child and later. The error in the dating the event to 1510 instead of 1511 is symptomatic of this.

Newton reports two other testimonies. One is by Bigot de Morogue who quotes from Père Bonaventure de Saint-Amable:

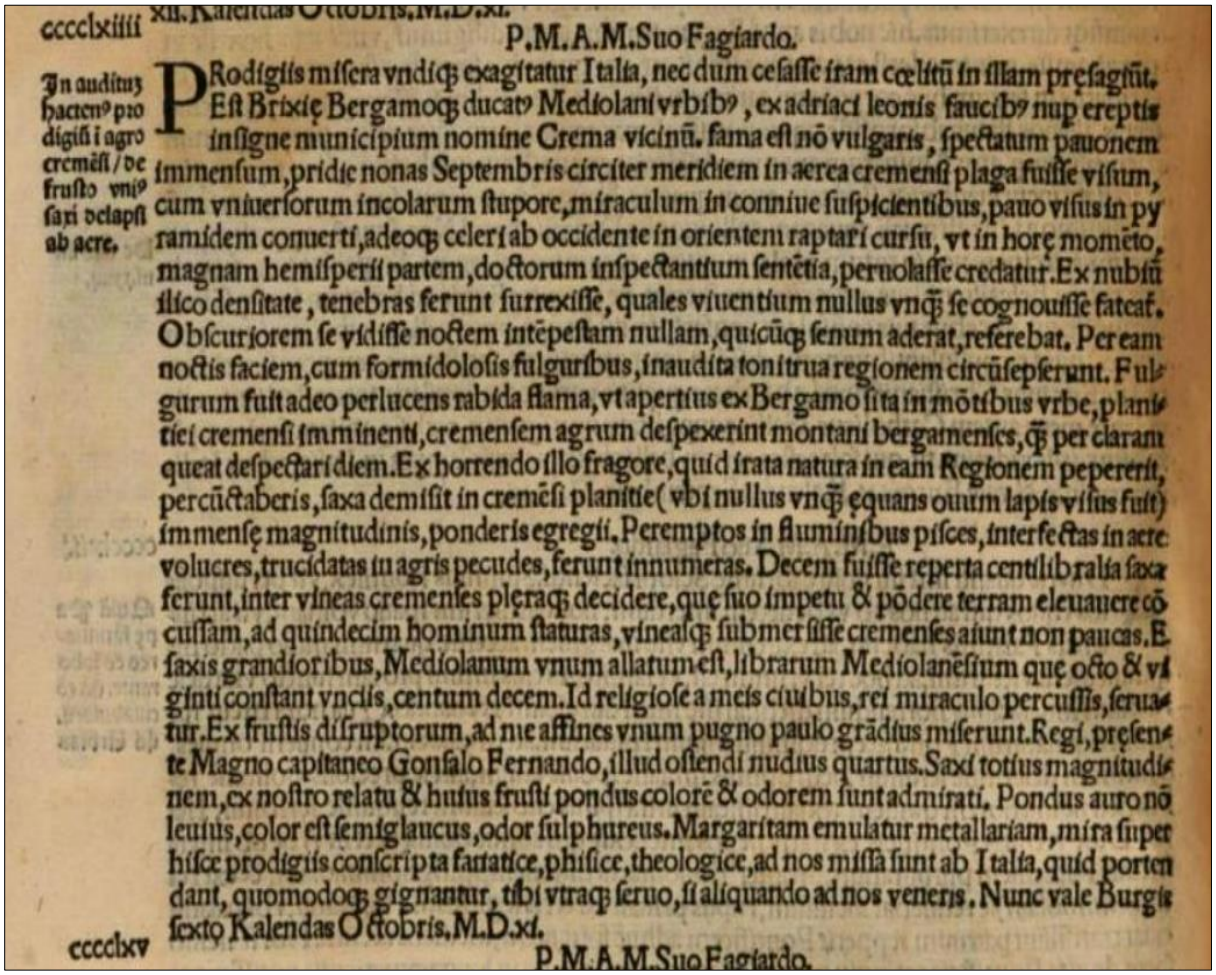
> On September 4, 1511, at Crema, in Lombardy, during a terrible storm, stones of considerable size fell on the plain: six of these stones weighed one hundred pounds. One was carried to Milan, which weighed one hundred and ten pounds. Their odour was similar to that of sulphur. Birds were killed in the air, sheep in the fields, and fish in the water. (Newton, 1891: 93).

The last account reported by Newton is that by Stanislai de Lubienietski who quotes Bartholomew Keckermann:

> 1511. Suessanus Scaligeri's teacher recalled that in Lombardy in 1511 a comet flew through the air like a fiery peacock, from which, when it disappeared, three stones of sulphur fell, one of these weighed 160 pounds, the second 60 pounds, the third 20 pounds. (*ibid.*).

In Volume 3 of his masterpiece *Cosmos*, Alexander von Humboldt (1851) reports the account by Pietro Martire D'Anghiera (Peter Martyr Anglerius), an historian associated with the Spanish court. D'Anghiera brought a sample of the meteorite to Ferdinand II of Aragon, which is now lost. In his *Opus Epistolarum* (see Figure 1) D'Anghiera (1530) describes this event (my English translation):

> Italy is convulsed with wretched prodigies, and while they have concealed the wrath of heaven they are projecting upon her. There is near Brescia and Bergamo, cities led by Milan, a notable municipality named Crema, which has just been rescued from the jaws of the Adriatic lion. It is a popular story, that an immense peacock was seen, about the ninth of September, about noon in the airy quarter of Crema, and to the astonishment of all the inhabitants, who were watching a miracle in the air, the peacock was seen to be turned into a pyramid, and so swiftly was it carried away from west to east, that in the wake of a storm magma is believed to have flown through part of the atmosphere, according to the opinion of the doctors who inspected it. Immediately there arose from the clouds an intense darkness, the like of which no living man admits that he has ever known. An old man who was present reported that he had never seen a darker night.



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In auditu hactenꝰ prodigiũ i agro cremẽſi / de fruſto vniꝰ ſari delapſi ab aere.

PRodigiis miſera vndiq; exagitatur Italia, nec dum ceſſaſſe iram cœlitũ in illam preſagiũt. Eſt Brixię Bergamoq; ducatꝰ Mediolani vrbibꝰ, ex adriaci leonis faucibꝰ nup ereptis inſigne municipium nomine Crema vicinũ. fama eſt nõ vulgaris, ſpectatum pauonem immenſum, pridie nonas Septembris circiter meridiem in aerea cremenſi plaga fuiſſe viſum, cum vniuerſorum incolarum ſtupore, miraculum in conniue ſuſpicientibus, pauo viſus in pyramidem conuerti, adeoq; celeri ab occidente in orientem raptari curſu, vt in horę momẽto, magnam hemiſperii partem, doctorum inſpectantium ſentẽtia, pernolaſſe credatur. Ex nubiũ illico denſitate, tenebras ferunt ſurrexiſſe, quales viuentium nullus vnq; ſe cognouiſſe fateat. Obſcuriorem ſe vidiſſe noctem intẽpeſtam nullam, quicũq; ſenum aderat, referebat. Per eam noctis faciem, cum formidoloſis fulguribus, inaudita tonitrua regionem circũſepſerunt. Fulgurum fuit adeo perlucens rabida flama, vt apertius ex Bergamo ſita in mõtibus vrbe, planitiei cremenſi imminenti, cremenſem agrum deſpexerint montani bergamenſes, q̃ per claram queat deſpectari diem. Ex horrendo illo fragore, quid irata natura in eam Regionem peperierit, percũctaberis, ſaxa demiſit in cremẽſi planitie (vbi nullus vnq; equans ouum lapis viſus fuit) immenſę magnitudinis, ponderis egregii. Peremptos in fluminibus piſces, interfectas in aere volucres, trucidatas in agris pecudes, ferunt innumeras. Decem fuiſſe reperta centilibralia ſaxa ferunt, inter vineas cremenſes pleraq; decidere, quę ſuo impetu & põdere terram eleuauere cõcuſſam, ad quindecim hominum ſtaturas, vinealq; ſubmerſiſſe cremenſes aiunt non paucas. E ſaxis grandioribus, Mediolanum vnum allatum eſt, librarum Mediolanẽſium quę octo & viginti conſtant vnciis, centum decem. Id religioſe a meis ciuibus, rei miraculo percuſſis, ſeruatur. Ex fruſtis diſruptorum, ad me affines vnum pugno paulo grãdius miſerunt. Regi, preſente Magno capitaneo Gonſalo Fernando, illud oſtendi nudius quartus. Saxi totius magnitudinem, ex noſtro relatu & huius fruſti pondus colorẽ & odorem ſunt admirati. Pondus auro nõ leuius, color eſt ſemiglaucus, odor ſulphureus. Margaritam emulatur metallariam, mira ſuper hiſce prodigiis conſcripta fatatice, phiſice, theologice, ad nos miſſa ſunt ab Italia, quid portendant, quomodoq; gignantur, tibi vtraq; ſeruo, ſi aliquando ad nos veneris. Nunc vale Burgis ſexto Kalendas Octobris. M.D.xi.

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Figure 1: The letter by Pietro d'Anghiera in *Opus Epistolarum* (after D'Anghiera, 1530).

About that time of the night, with fearful lightning, the thunder was heard all over the country. And it flashed so much that from Bergamo you could see the entire plain of Crema, even in the midst of the thick darkness that enveloped everything. From that terrible crash, you may ask what angry nature produced in that region. It dropped rocks on the plain of Crema (where no stone equal to an egg had ever been seen) of immense size and excellent weight. Innumerabe fish were killed in the rivers, birds were cut off in the air, and cattle were slaughtered in the fields. They say that ten hundredweight of stones were found, and most of them fell among the vine-yards of Crema, which, with their power caused the earth to rise up, and throw fifteen men to the ground, and they say that not a few of the vineyards of Crema were drowned. Of the larger stones, one was brought to Milan, which weighed one hundred and ten Milanese pounds. There was religious fervour by the citizens, struck by the miracle of the matter. From the broken pieces, they sent me one piece as big as a man's fist. To the king, in the presence of the great captain Gonfalo Fernando, I showed it to other men. They were astonished at the size of the whole rock, from our report, and the weight of this piece, its color and smell. The weight is not lighter than gold, the colour is semiglaucous, the smell is sulphurous.

Finally, Surius (1574) also reported that in 1510: "In the same year, large rocks rained down in the valleys, one weighed 120 pounds."

In all of the above accounts there is no mention anywhere of the death of a man. Table 1 reports all the sources examined in this study. It is evident that the earliest source that reports a fatality is the first volume of *Cosmos* by von Humboldt, which appeared in 1845, but without providing a reference for the death of a monk. The account is deepened in Volume 3 where von Humboldt reports the account by D'Anghiera (from a reprint dated 1670). He analyses

Table 1: A list of all the sources that mention the Crema Bolide fall. The third column reports if the relevant reference states that a friar or a monk was killed by the meteorite. The fourth column reports the reference of this information, when the injury is reported.

Source	Kind of Source	Man Killed?	Reference
D'Anghiera (1530)	Account, letter	No	
Cardano (1557)	Account, memory	No	
Surius (1574)	Review	No	
Chladni (1819)	Book, review	No	
von Humboldt (1845a)	Book, review	Yes	No source
von Humboldt (1845b)	Magazine	Yes	von Humboldt (1845a)
von Humboldt (1851)	Book, review	Yes	D'Anghiera (1670)
Phipson (1867)	Book	Yes	Cardano (1557); D'Anghiera (1530); Surius (1574)
Holden (1890)	Paper	No	
Newton (1891)	Paper, review	No	
Heide and Wlotzka (1995)	Book, review	Yes	No source
Khan (1935)	Paper	Yes	Phipson (1867); von Humboldt (1849);
La Paz (1951)	Paper, review	Yes	Phipson (1867)
Hey (1966)	Paper, review	No	
Botley (1970)	Paper	No	
Spratt (1991)	Paper	Yes	Heide and Wlotzka (1964)
Lewis (1996)	Book, review	Yes	No source
Boyarchuck (1999)	Book	Yes	Untraceable
Muravyev and Grokhovsky (2020)	Book, review	Yes	Boyarchuck (1999); Hey (1966)

the account by d'Anghiera, but there is no mention of the death of a friar. Hence, it is not clear where this information came from.

3 THE MILAN METEORITE OF 1633–1664

A completely different story is the one that took place around the middle of the seventeenth century in Milan. Surprisingly, in this case a friar also may have been killed, but with much stronger evidence than is associated with the 1511 bolide. The seventeenth century event was reported briefly in a letter to the magazine *Sky &Telescope* (Cavagna and Vicentini, 1985) and, more extensively, by de Michele (1973) from the Museum of Natural History in Milan. Chladni (1819) and Humboldt (1845) also mention this fall. De Michele (1973) reports the account by Paolo Maria Terzago (1664), a physician who visited the friar killed by the meteorite:

> But because one of these stones that shot from the clouds and caused the sudden death of a Franciscan Friar at Santa Maria della Pace in Milan is preserved for the curiosity of everyone in our Museum, it seems evident that the thunderbolt must have been a solid petrified object, and not a fluid, albeit this is an elementary matter, and in order that everyone understands it more easily, I will narrate what happened. Enlightened therefore as this Religion was, the other Fathers of the Convent flocked there with curiosity and compassion, and among them again Mr. Manfredo intervened. They all gazed at the body, curious to trace the hidden and true cause of such a death; when behold, from the discovery of a sore on one thigh, or from gangrene, or blackening by fire, they realised that he must have been wounded in that area; and appeasing the curiosity of the onlookers, he opened the wound with a larger cut to trace its depth: they found that it ended at the bone … where there was an almost spherically shaped stone, the cause of the sudden horrible death: it was extracted and found to weigh a quarter of an ounce: it ended with a tight circumference, and the surface looked like the silver money with the name of Filippo that is spent in the state of Milan, the roundness however from one angle, which was observed to be almost obtuse, was somewhat fragmented; varied so much in colour, that one part resembled that of furnace bricks, and the other part had a light, shiny crust covered with a ferrous colour, not dissimilar to the description given to them by the great Ulisse Aldroando. It was broken in half, and gave off an unbearable smell of sulphur.

The meteorite was reported to be as big as a 'Filippo' silver coin, which is about 44 millimetres in diameter. And it was said to weigh about a quarter of an ounce, i.e. ~7 grams.

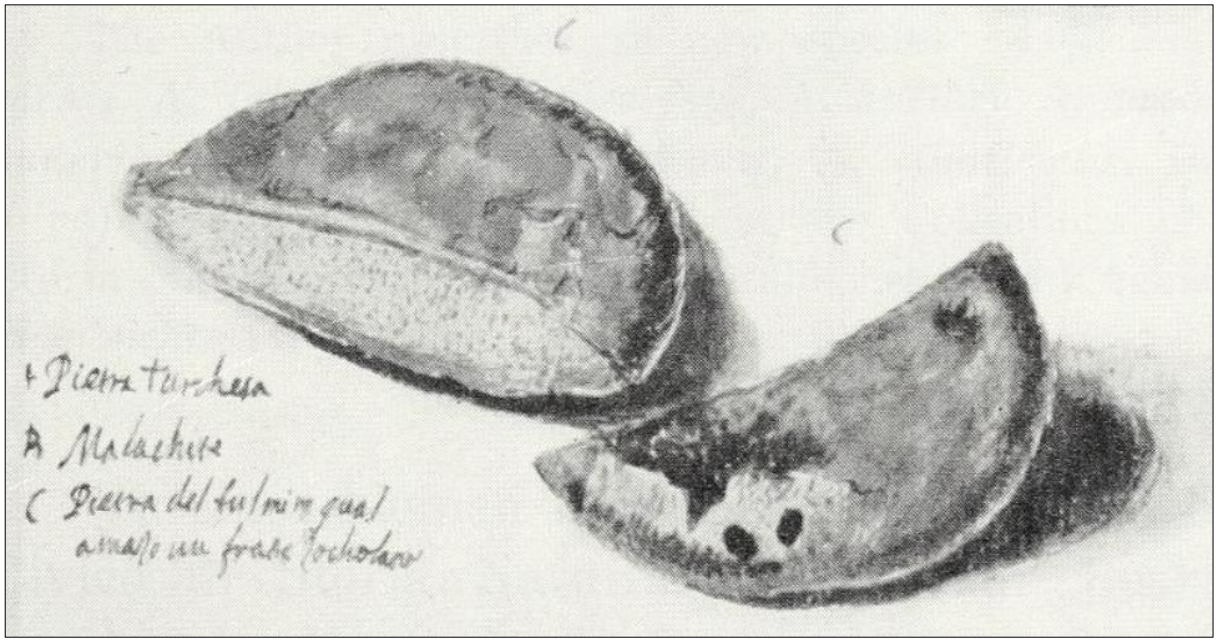

Figure 2: The drawing of the meteorite that fell in 1633 or 1664 in Milan (after de Michele, 1973: 43).

This weight is definitely too low for a meteorite of that size, as de Michele observed. The meteorite was preserved in the Settala Museum in Milan until 1751. Then in 1807 Carlo Amoretti published a note in which he confessed that the meteorite had been lost.

An account also was published by Chaldni (1819), who had access to the Ambrosian Library thanks to Amoretti. Chladni did not know the exact date of the fall, hence he said that it happened in the mid-1600s. Therefore, many sources report that the friar was killed in 1650. However, Greg (1860) believes that this event happened on 4 September 1654. The date 4 September is likely a duplication of the 1511 fall, but it is not clear why he selected the year 1654, since he mentions this event without providing any sources. That said, it is most likely that the fall occurred between 1633 and 1664 (de Michele, 1973), with the upper limit corresponding to the publication date of Terzago (1664) and the lower limit to the death of Ludovico Settala in 1633 because the news of the event had been reported to his son Manfredo and not to Ludovico (as would be expected, since Ludovico was an authority in the field of medicine).

De Michele also found a drawing of the meteorite in the Ambrosian Library, made by A. Costa. As shown in Figure 2, the meteorite had broken into two pieces, and an English translation of the associated caption refers to the "lightning stones that killed a zocholian [Franciscan] father". By analysing the drawing, de Michele concluded that this meteorite was a pyroxene or pyroxene-olivine chondrite.

4 CONCLUDING REMARKS

The lack of firm evidence is usually the main issue relating to meteoritic events that happened in historical times. This means that we have to rebuild the events through the accounts by witnesses, which due to their anecdotal nature, must always be considered doubtful. The problem is worse when in the chain of references, some details are misreported.

This likely happened in the case of the 1511 Crema Bolide. Indeed, no killed friars were mentioned in any accounts before the publication of Alexander von Humboldt's *Cosmos …* in 1845. The hypotheses we can formulate about this are:

(1) von Humboldt found some additional accounts of witnesses of the Crema event, which are not listed by Chladni (1819), but he did not mention these sources in his book; or
(2) von Humboldt accidentally mixed up the Crema Bolide and the Milan fall of 1633–1664, adding a friar as a fatal victim of the 1511 fall.

The second hypothesis seems more plausible. Indeed, if hypothesis (1) were true, why would Humboldt have avoided citing the source(s) of his information, given that this was a novelty with respect to Chaldni's work? And finally, although not impossible, it is very unlikely that two monks were killed by meteorites in such close geographical and temporal proximity to each other. Hence, we can say that the most likely conclusion is that no monk was killed

during the fall of the 1511 Crema meteorite, and Humboldt simply misreported this event.

5 NOTES

1. Following *JAHH* policy, in this paper only English translations of quotations in other languages are given. All such translations were made by the author, who is happy to supply copies of the originals on request.

6 ACKNOWLEDGEMENTS

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