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Lodi (Italy) 1972: A cold meteorite case closed

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ABSTRACT
This paper investigated the presumed meteorite fall that occurred in the town of Lodi (Lombardy, Italy) on 3 June 1972. The event has been classified as a pseudometeorite by the Nomenclature Committee of the Meteoritical Society. However, although some investigations may have carried out to ascertain the nature of the recovered specimen, no experimental analyses have been published so far. The aim of this work is therefore not only to further current knowledge of the Lodi pseudometeorite by reconstructing the event through the examination of untapped sources, but also to present the results obtained by the portable energy dispersive X-ray fluorescence spectroscopy (pED-XRF) and X-ray diffraction analyses that were performed on the sole recovered specimen to pinpoint its origin. The latter was sent by its owner to the Museo di Scienze Planetarie in June 2021 thus showing the importance of naturalistic museums not only to preserve meteorite collections, but also for closing key knowledge gaps in meteoritics and planetary sciences using the proper analytical techniques.

Key words:
Lodi, pseudometeorite, meteorite, pED-XRF, XRD, meteorite collecting, museums.

RIASSUNTO
La meteorite Lodi (1972): un caso risolto

L'articolo investiga la presunta caduta di un meteorite avvenuta a Lodi il 3 giugno 1972. L'evento è stato classificato come una pseudo-meteorite dal Nomenclature Committee della Meteoritical Society. Tuttavia, sebbene all'epoca fossero state condotte alcune investigazioni per accertare la natura del campione recuperato, nessun dato sperimentale è stato finora pubblicato. L'obiettivo di questo articolo è non solo quello di ricostruire l'evento attraverso l'esame di fonti inedite, ma anche di illustrare i risultati delle analisi ottenute attraverso l'impiego di tecniche analitiche quali la spettroscopia di fluorescenza a raggi X a dispersione di energia portatile e la diffrazione a raggi X per identificare l'origine del campione. Quest'ultimo è stato inviato dal suo proprietario presso il Museo di Scienze Planetarie di Prato nel giugno del 2021 affinché fosse scientificamente esaminato, dimostrando quindi l'importanza dei musei naturalistici non solo per la conservazione delle collezioni di meteoriti, ma anche per il progresso della ricerca nell'ambito della stessa meteoritica e delle scienze planetarie.

Parole chiave:
Lodi, pseudo-meteorite, pED-XRF, XRD, collezionismo di meteoriti, musei.

INTRODUCTION

A large and growing body of literature has investigated meteorites over the centuries, showing that the human fascination with the 'stones that fall from the sky' is old as the human thought (Burke, 1986). Having said that, it comes as no surprise that meteorites became objects of collecting interest even before their cosmic origin was ascertained at the end of the 18th century (Marvin, 2007). For instance, meteorites have been regarded as devotional and ritual objects by diverse prehistoric cultures such as the Hopewell people in Eastern North America (Prufer, 1961; McCoy et al., 2017), and many studies have been published on the use of meteorites in the production of objects of art and utility in various cultures and ancient civilizations (e.g., Buchner et al., 2012; Jambon, 2017; Chen et al., 2018; Mayne et al., 2020).

In their overview of some of the world's most important meteorite collections, McCall et al. (2006) outlined that the preservation of meteorite specimens in naturalistic museums began in the second half of the 18th century. Since then, the pivotal role played by these institutions in the curation of meteorites as a scientific heritage (Franza & Pratesi, 2021a) has never been ceased, to the point that today it is possible to identify in the Advanced Curation the cross-disciplinary field that intends to improve acquisition, investigation, and curation practices of astromaterial collections (McCubbin et al., 2019). These activities are not limited to the conservation measures and valorization actions that aim at the safeguard of meteoritic samples specimens, while ensuring their accessibility to the future generations of scholars and amateurs (Llorca et al., 2020; Marrocchi et al., 2020; Franza & Pratesi, 2021b; Franza et al., 2021a), but they also include the characterization of those specimens that have been recovered on eyewitness accounts to ascertain their cosmic origin. In this regard, McCubbin et al. (2019) note that "one of the most important 'sample return spacecraft' may be the Earth itself" because, during its annual orbit around the Sun, it collects around 40.000 tons of extraterrestrial material ranging from small particles, less than 0.2 mm in size (i.e., interplanetary dust particles - IDPs), to large meteorites (Zolensky et al., 2006). According to Bradley et al. (1996) and Vernazza et al. (2015), the greater part of the IDPs come from comets and asteroids, while all the meteorites that have been recovered on the Earth to date originate from asteroids, the Moon or Mars. The recovery of the extraterrestrial material that reaches the ground is thus one of the primary and most important goals of planetary sciences, because it provides key clues to understanding the formation and evolution of the Solar System (e.g., Neveu & Vernazza, 2019).

However, the recovery of fallen astromaterial is not an easy task. Research such as that conducted by Bland et al. (1996) has shown that less than 1 in 500 meteorites presenting a mass greater than 100 g are successfully recovered. To bridge the gap, since the middle of the 20th century networks of optical cameras, such as the Prairie Fireball Network, the Meteorite Recovery and Observation Project (MORP), the Tajikistan Fireball Network, the Finnish Fireball Network, and the Desert Fireball Network have been developing with the aim of surveying meteors and recovering meteorites (Halliday et al., 1978; Wetherill & ReVelle, 1981; Brown et al., 2011; Bland et al., 2012; Kokhirova et al., 2015; Trigo-Rodríguez et al., 2015). The Prima Rete Italiana per la Sorveglianza sistematica di Meteore e Atmosfera (hereafter PRISMA), which is a member of the Fireball Recovery and InterPlanetary Observation Network (FRIPON), was designed to contribute to the detection of meteorite falls in Italy, and it made possible the discovery of two meteorite fragments that fell near the village of Cavezzo on 1 January 2020 (Gardiol et al., 2016; Carbognani et al., 2020; Colas et al., 2020; Gardiol et al., 2020; Barghini et al., 2021; Pratesi et al., 2021). In his review, Codato (2020) noted that PRISMA, which currently counts more than 50 all-sky cameras, is operating since 2016 and therefore the meteorites that have been discovered prior to this date were recovered thanks to eyewitness observations. In this regard, the Meteoritical Bulletin Database (MBD), which is the official source of information regarding all the accepted meteorites by the Nomenclature Committee of the Meteoritical Society, indicates that in addition to the 43 approved meteorites, 22 events, whose possible extraterrestrial nature has not yet been ascertained, have occurred in Italy. Among the data related to these events, which are summarized in Table 1, it is interesting to note that 4 entries (Brianza, Legnano, Trentino and Lodi) are classified as pseudometeorites, i.e., an object that has been claimed to be a meteorite, but which is non-meteoritic in origin. Remarkably, none of these events, apart from the Marsala meteorite (1834) (Franza et al., 2021b), has been deeply investigated to date to confirm or deny their cosmic nature. The goal of this

Name	Year	Place
Lucania	-56	Basilicata
Italy (956)	956	Italy
Italy (963)	963	Italy
Aglar	1112	Friuli-Venezia Giulia
Viterbo	1474	Lazio
Crema	1511	Lombardia
Milan	1525	Lombardia
Piedmont	1583	Piemonte
Crevalcore	1596	Emilia-Romagna
Calce	1635	Veneto
Pentolina	1697	Tuscany
Terranova di Sibari	1755	Calabria
Brianza	1760	Lombardia
Novellara	1766	Emilia-Romagna
Fabriano	1776	Marche
Turin	1782	Piedmont
Massa-Lubrense	1819	Campania
Marsala	1834	Sicily
Civitavecchia	1855	Lazio
Legnano	1855	Veneto
Trentino	1971	Trentino-Alto Adige
Lodi	1972	Lombardia

Tab. 1. Italian doubtful and pseudometeorites as reported in the Meteoritical Bulletin Database.

paper is therefore to call into question the presumed meteorite fall that occurred on 3 June 1972 in Lodi. Drawing upon two strands of research (i.e., analysis of archival documents and analytical investigations), this case study attempts to reconstruct the event examining untapped sources as well as to present to the scholars' community the data obtained through both the portable energy dispersive X-ray fluorescence spectroscopy (pED-XRF) and the X-ray diffraction analyses, which were performed on the sole recovered specimen. These findings were used to ascertain the reliability of the event and to determine whether its origin was extraterrestrial.

The Lodi pseudometeorite was sent by its owner, Mr. Giovanni Bettinelli, to the Museo di Scienze Planetarie (henceforth named MSP) of Prato to verify its nature. MSP keeps more than 500 meteorite specimens, several impact rocks and more than 7000 minerals. Since its establishment in 2005, MSP has increasingly become an important center for research in meteoritics and for the diffusion of planetary science literacy nationwide (e.g., Pratesi et al., 2005; Grady et al., 2014, Carpino, 2015; Moggi Cecchi et al., 2015; Carpino & Morelli, 2016; Carpino et al., 2020). The characterization of possible new meteorite specimens (Moggi Cecchi et al., 2017), which have been recovered by non-professional scientists, is one of the activities led by MSP that most bridges citizen science to new publics (Hetland & Schrøder, 2020). As suggested by Sforzi et al. (2018), naturalistic museums have a long history of collaboration with amateur-expert communities that pre-dates the professionalization and institutionalization of science in 19th century (e.g., Hellis, 2014) and the modern definition of the term citizen science as well (Eitzel et al., 2017). By drawing on these concepts, Riesch and Potter (2014) outlined how public participation in scientific research can be considered as a win-win situation in which formal scholars can benefit from both the knowledge of highly skilled amateur scientists and the support of the general public, while the participants are involved in public engagement activities that make them part of a real and meaningful scientific research. Furthermore, Kloetzer et al. (2021) pointed out how natural history museums run different types of citizen science projects such as public events, monitoring programs, field research, inventory projects, and data processing (e.g., the transcription of museum tags, ancient catalogues, and other archival documents) to digitize collections (Ballard et al., 2017; Pierroux et al., 2020). In this context, the engagement of the general public in museum-led activities aiming to collect and recognize possible meteorite specimens offers new opportunities to develop innovative and ever-more involving citizen science projects for gathering data to improve our knowledge of the chemical and physical processes, which occurred during the formation of the early Solar System.

MATERIALS AND METHODS

Case presentation

Diverse national newspapers and local gazettes (e.g., La Nazione, 4 June 1972; Il Cittadino, 9 June 1972) reported that a meteorite fell on Caviaga, a village in the municipality of Cavenago d'Adda, which is about 5 kilometers far from Lodi, on the morning of 3 June 1972. As reported in these articles, the specimen was found in the backyard of a farm by Maria Bambina Telga, a 27-year-old woman who was walking with Margherita, her 16-month-old baby girl. Telga told the reporters she heard a hissing sound and then a loud bang. The woman also stated that she had seen a stone falling from the sky and almost hitting her. After getting better from such a fright, Telga moved closer to the object that was plunged in the ground about 20 centimeters away from her. She remembered that it was smoking and giving off an intense smell of sulfur. Bucked up, Telga tried to pick up the stone, but without succeeding because it was "as hot as iron removed from the forge to shape horses' hooves" (see Il Cittadino, 4 June 1972). So, she called her husband Francesco Bettinelli, a 26-year-old man working as a tractor driver in the farmhouse, who removed the fiery stone from the ground using an iron bar. After ten minutes, it was still hot. Subsequently, the couple brought the recovered specimen to Emilio Groppelli, who was the farm's owner. He doubted that it could be a meteorite since it appeared to be a volcanic rock. However, the hypothesis of the specimen's extraterrestrial origin continued to be supported by Bettinelli, who replied to the reporters that he had immediately recognized the stone as a meteorite, since he had watched a television show that talked about these celestial bodies just a few days earlier. As it was predictable, the event caused a stir. The specimen was thus placed into a glass jar – which was usually used to preserve jam – and showed to the neighbors. Telga described the stone as blackish, about the size of a hand's fist, and quite heavy. Some fragments were sent to the research laboratories of Caviaga methane center (Centro Metanifero di Caviaga) for further analysis. Telga also told the local gazettes that she had received a money offer (10.000 Italian lire) for the purchase of the meteorite, but she refused – although she needed it as a mother of two young children – thinking that the stone would have brought her luck. The reporters then interviewed Bruno Martinis (1920–2013), who was a professor of geology at the University of Milano. He said that such meteorite falls were unusual for the Italian peninsula and, if the extraterrestrial nature of the finding had been confirmed, it would have been a rare half-pound find. Martinis concluded his interview by stating that he would have analyzed the recovered specimen in Milano. Nevertheless, to the best of our knowledge, neither his investigations

nor those at the aforementioned research center were ever performed.
In addition to the record listed in MBD and to the newspaper articles that have been cited in this study, the event is reported in Grady (2000). Here, its extraterrestrial nature seems to have been discredited by two letters that were sent to the Mineralogy Department of the Natural History Museum (NHM) in London on 3 and 31 July 1972. Both were written by Gemma Rosa Levi Donati (1929–2017), who was a professor of geology at the University of Modena and Reggio Emilia. Although Levi Donati contributed to the study and classification of Italian meteorites in 1970s (e.g., Levi Donati & Jarosewich, 1971, 1972), none of her works focused on the Lodi pseudometeorite. Furthermore, the letters she sent to NHM had been lost (H. Bates, personal communication, 8 June 2021).
This is how the story seems to end, but Giovanni Bettinelli, who is Telga's eldest son, reached out MSP asking that the specimen he had been keeping since 1972 was analyzed to ascertain its origin.

Specimen's description

The sole recovered specimen after the presumed meteorite fall occurred in Caviaga in 1972 was brought by its owner to MSP in June 2021. It is a heavy compact blackish specimen, which shows on its external surface some yellowish and brownish areas (fig. 1). No sign of previous sampling is detectable. After a first non-contact investigation performed by pED-XRF, a fragment was picked up by the lowest part of the specimen to perform XRD analysis. Residuals of this fragment after the XRD analysis have then been embedded in polyester resin and are now preserved at MSP. The whole specimen of the Lodi pseudometeorite weights 461 g and its size are 8x5x4 cm. After the analytical investigations were completed, the specimen was returned to Mr. Bettinelli by parcel post.

Experimental techniques

To evaluate the sample's presumed cosmic origin, the chemical composition of the minerals occurring in the specimen was obtained using a Bruker ELIO Non-contact micro-XRF Scanning Spectrometer equipped with a Rh-target anode X-ray source (10-50 kV, 5-200 μA) and a 17 mm^2 SSD detector (energy resolution < 140 eV for Mn Kα).
The non-contact measurements are non-invasive and completely non-destructive. Moreover, no sample preparation is required. Therefore, this physical technique is particularly suitable for analyzing artworks (Moioli & Seccaroni, 2000) and meteorites (Zurfluh et al., 2011) as well. This instrument allows reliable qualitative trace element detection in a range of detectable elements as far as Na (Z = 11) to U (Z = 92). The spectra were recorded with the ELIO software which provides the automatic peak ID and a quick visual indication of elements.
The following acquisition parameters were used during the 20 analyses performed on the specimen: spot size of the X-ray beam was 1 mm; 30 s at 40 kV and 50 μA (overall spectral range from 0 to 40 keV); 30 s at 20 kV and 100 μA (light elements present in the spectral region from 0 to 10 keV); 30 s at 50 kV and 40 μA with a Mo filter (element in the spectral region from 10 to 40 keV).
XRD analysis of the detached sample was performed at the laboratories of the Earth Sciences Department of the University of Firenze by means of a Philips PW 1050/37 diffractometer, equipped with a data acquisition system X'Pert PRO Panalytical, Cu anode, and graphite monochromator.

RESULTS

The first set of visual investigations examined the external surface of the specimen to determine whether it showed characteristics like those of a fresh fallen meteorite. In this regard the specimen does not

Fig. 1. Lodi pseudometeorite.

present neither evidence of fusion crust - which is the most important feature yielded by the passage through the atmosphere - nor signs of ablation.
The appearance is characterized by the presence of a mineral assemblage, and this is the reason why 20 pED-XRF analyses have been performed in different points of the specimen. All analyses showed the presence of Pb and/or S, Zn, Ca, in different amounts (fig. 2). Noteworthy, oxygen cannot be detected with this technique while – due the poor resolution of the EDS spectrometry – Pb and S cannot be distinguished each other.
Nevertheless, an XRD analysis (fig. 3) was performed on the picked-up fragment allowing to ascertain the nature of the mineral assemblage where three mineral phases – corresponding to galena, sphalerite, and calcite – seem to coexist.
The results of these analyses show the occurrence of an assemblage of Pb-Zn sulphides and, considering that these minerals are not present in meteorites, the terrestrial nature of the specimen can be confirmed.

DISCUSSIONS

The most striking result to emerge from the data is the terrestrial origin of the analyzed specimen. The mineralogical phases that have been detected are consistent with ore deposits located in the municipalities of Lecco and Bergamo. In these areas, between 1930s and 1980s were operating several mines for the extraction of metals from minerals like sphalerite and galena (Candela, 2008; Maida & Veneziani, 2012). Samples such as the one that has been found in Caviaga are then present in the Adda river and its tributaries (Garzanti et al., 1999).
What has just been stated seems to be confirmed by the geological map of Lodi and its surroundings. In the lithological and morphological map of the Quarry Plan of the Municipality of Lodi (2003), it can be observed the presence of gravelly deposits relative to the past and most recent alluvium of the current Adda valley. Therefore, it is possible to assume a 'geological contamination', with samples containing for the greater part galena and sphalerite, of the site where the presumed meteorite specimen was found.
Another interesting result is the possible support given by the pED-XRF technique as a tool to characterize presumed meteorite specimens (mainly when the minerals are so different from those occurring in meteorites) in a non-invasive way. If the utilization of different types of spectroscopic methods in mineralogy, geology and in cultural heritage conservation is a well-established topic (e.g., Borgheresi et al., 2007; Lo Giudice et al., 2012; Re et al., 2013; Angelici et al., 2015; Casadio et al., 2017), the study of their application in meteoritics and planetary sciences tends to focus on specific methodologies such as SEM-EDS (Scanning Electron Microscope with Energy Dispersive Spectroscopy, EPMA-WDS (Electron Probe Micro Analysis with Wavelength Dispersive Spectroscopy), micro-Raman, LIBS (Laser Induced Breakdown Spectroscopy), XANES (X-ray absorption near edge structure), and Mössbauer spectroscopy (e.g., Giuli et al., 2000; Hochleitner et al., 2004; Giuli et al., 2008; Moggi Cecchi, 2014; Galazka-Friedman et al., 2017; Gardiol et al.; 2017; Dell'Aglio et al., 2018). Few researchers (e.g., Allegretta et al., 2020) have addressed the use of the pED-XRF analysis to determine the nature of presumed meteorite specimens, so the heuristic potential of this technique to discriminate

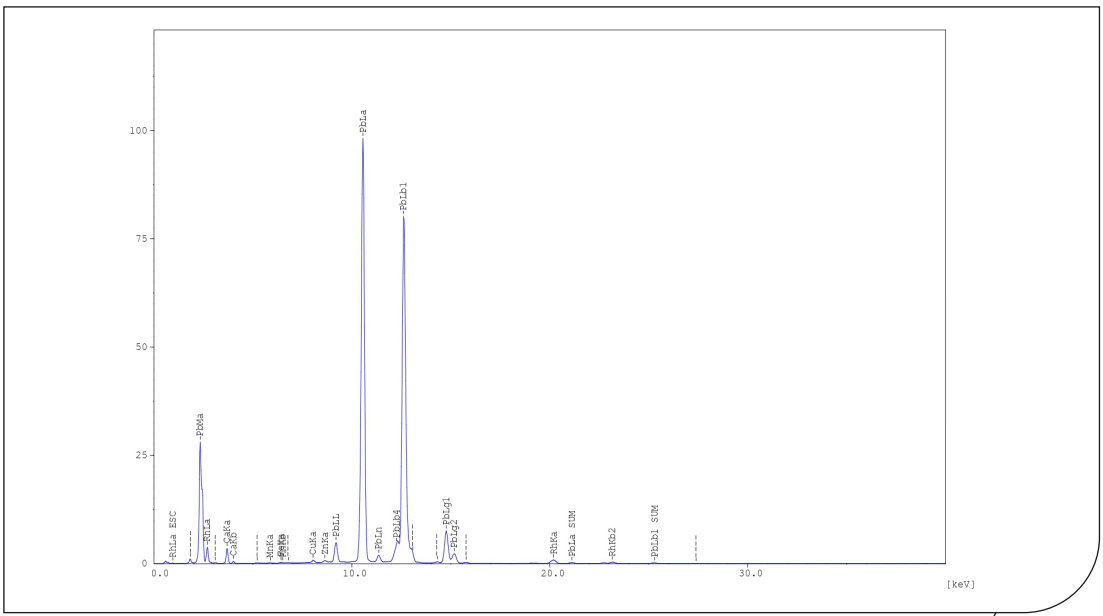

Fig. 2. pED-XRF spectrum of a portion of galena showing the overlapped peaks of Pb and S.

between meteorite and meteor-wrong findings has yet to be explored.

This study has confirmed the non-extraterrestrial nature of the purported meteorite specimen that was recovered in Caviaga in 1972. Despite this, it serves to highlight the pivotal role played by media in the dissemination of science news about possible meteoritic events. As showed by Kierman (2000), Day (2019) and Franza et al. (2021b), this is a sensitive topic for both historic and more recent presumed falls. In the case of the Lodi pseudometeorite, local newspapers did a credible job in reporting the account of the fall as told by the witnesses together with the opinion of an expert scientist as a follow-up to the event. Presumably their readers were interested and followed these discussions as well. However, media may also report meteorite events that – although not confirmed – are then covered by several press agencies around the world, such as the news of a bus driver who was apparently hit and killed by a meteorite in southwest India in 2016 (Hauser, 2016). The cases in which meteorites appear to cause damage to property or persons seem to get a high-profile media coverage. For instance, the news of the study that Unsalan et al. (2020) carried out on the first man hit and killed by a meteorite in Sulaymaniyah (Iraq) in 1888 was reported by several press agencies worldwide. In the same vein, Muravyev and Grokhovsky (2020) have systematized and critically revised data about various episodes of damage to the property or human health because of meteorite falls from 16th century to 2019. This is not a minor finding because the possibility that Telga and her baby girl could be injured by the presumed meteorite fall was one of the aspects that interested the press most. The event that occurred in Caviaga in 1972, although terrestrial in origin, can be therefore considered as a part of the brand-new research about the possible connections between forensic and planetary sciences.

The newspaper articles published in 1972 in fact contained several elements (e.g., the meteorite was hot and smoking when it was found) which help to make clear what happened in Caviaga. The descriptions provided in the articles prove that the specimen recovered by Mr. Bettinelli could only be the one supposed to have fallen. In fact, according to the story, the specimen had dug a little hole in the ground and was still smoking when it was collected. However, the investigations showed the terrestrial origin of the specimen and therefore confirm that the Lodi meteorite is a pseudometeorite, which means "an object that has been claimed to be a meteorite, but which is nonmeteoritic in origin" according to the Meteoritical Bulletin Database (see website 1). Therefore, this study has proven that the Lodi fall must be discarded.

CONCLUSIONS

In conclusion, this paper has given an account of the event that occurred at Caviaga in 1972 and has succeeded in ascertain the nature of the sole recovered specimen, which is not extraterrestrial in origin. Furthermore, this study has stressed the importance of naturalistic museums in the promotion of knowledge and scientific culture (e.g., Cain & Rader, 2017, and references therein).

The investigation of presumed meteorite specimens that have been recovered by amateur astronomers, also as part of citizen science programs (Colas et al., 2015; Fries et al., 2017; Gritsevich, 2017; Bouley

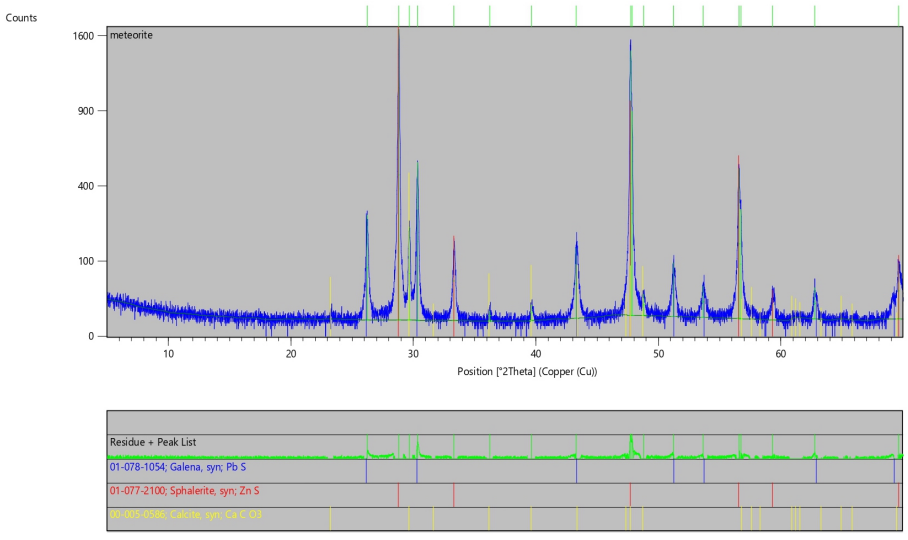

Fig. 3. X-ray powder diffraction pattern showing the peaks of calcite, sphalerite and galena.

et al., 2019; Brian et al., 2019; Marmo et al., 2019; Gardiol et al., 2021), by museum institutions such as MSP plays a relevant role in improving a public understanding of meteoritics. Broadly speaking, naturalistic museums have a general responsibility to contribute to science outreach and popularization, making research findings accessible also to non-expert audience, who might benefit from these data according to the concept of Responsible Research and Innovation, which has been formulated by the European Commission in 2017. The case of the Lodi pseudometeorite has thus shown how planetary science works, and the way in which naturalistic museums' agenda can meet the demands of society, culture, and the general public alike.

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REFERENCES

Allegretta I., Marangoni B., Manzari P., Porfido C., Terzano R., De Pascale, O., Senesi G.S., 2020. Macro-classification of meteorites by portable energy dispersive X-ray fluorescence spectroscopy (pED-XRF), principal component analysis (PCA) and machine learning algorithms. *Talanta*, *212*: 120785.

Angelici D., Borghi A., Chiarelli F., Cossio R., Gariani G., Lo Giudice A., Re A., Pratesi G., Vaggelli G., 2015. μ-XRF Analysis of Trace Elements in Lapis Lazuli-Forming Minerals for a Provenance Study. *Microscopy and Microanalysis*, *21*(2): 526-533.

Ballard H.L., Robinson L.D., Young A.N., Pauly G.B., Higgins L.M., Johnson R.F., Tweddle J.C., 2017. Contributions to conservation outcomes by natural history museum-led citizen science: Examining evidence and next steps. *Biological Conservation*, *208*: 87-97.

Barghini D., Carbognani A., Di Carlo M., Di Martino M., Gardiol D., Pratesi G., Riva W., Stirpe G., Volpicelli A., and the Prisma Team, 2021. *PRISMA: an Italian network for the recovery of freshly fallen meteorites*. EuroPlanet Science Congress 2021, 13-24 September 2021, EPSC2021-201.

Bland P.A., Smith T.B., Jull A.J.T., Berry F.J., Bevan A.W.R., Cloudt S., Pillinger C.T., 1996. The flux of meteorites to the Earth over the last 50000 years. *Monthly Notices of the Royal Astronomical Society*, *284*(2): 551-565.

Bland P.A., Spurný P., Bevan A.W.R., Howard K.T., Towner M.C., Benedix G.K., Greenwood R.C., Shrbený L., Franchi I.A., Deacon G., Borovička J., Ceplecha Z., Vaughan D., Hough R.M., 2012. The Australian Desert Fireball Network: a new era for planetary science. *Australian Journal of Earth Sciences*, *59*(2): 177-187.

Borgheresi M., Di Benedetto F., Caneschi A., Pratesi G., Romanelli M., Sorace L., 2007. An EPR and SQUID magnetometry study of bornite. *Physics and Chemistry of Minerals*, *34*(9): 609-619.

Bouley S., Baratoux D., Steinhausser A., Zanda B., Colas F., 2019. *Vigie-Cratère, When Citizens Become Meteoritic Impact Explorers*. Large Meteorite Impacts and Planetary Evolution VI. Proceedings of the conference held September 30-October 3, 2019 in Brasília, Brazil. LPI Contribution No. 2136, id.5048.

Bradley J.P., Keller L.P., Brownlee D.E., Thomas K.L., 1996. Reflectance spectroscopy of interplanetary dust particles. *Meteoritics and Planetary Science*, *31*(3): 394-402.

Brian D., Bland P., Sayers R., 2019. *Fireballs in the Sky: Citizen Science with the Desert Fireball Network*. EPSC-DPS Joint Meeting 2019, held 15-20 September 2019 in Geneva, Switzerland, id. EPSC-DPS2019-1178.

Brown P., McCausland P.J.A., Fries M., Silber E., Edwards W.N., Wong D.K., Weryk R.J., Fries J., Krzeminski Z., 2011. The fall of the Grimsby meteorite—I: Fireball dynamics and orbit from radar, video, and infrasound records. *Meteoritics and Planetary Science*, *46*(3): 339-363.

Buchner E., Schmieder M., Kurat G., Brandstätter F., Kramar U., Ntaflos T., Kröchert J., 2012. Buddha from space—An ancient object of art made of a Chinga iron meteorite fragment. *Meteoritics and Planetary Science*, *47*(9): 1491-1501.

Burke J.G., 1986. *Cosmic debris. Meteorites in history*. University of California Press, Berkley, 455 pp.

Cain V., Rader K.A., 2017. *Science Communication and Museums' Changing Roles*. In: Kahan D., Scheufele D.A., Jamieson Hall K. (eds.), The Oxford Handbook of the Science of Science Communication, Science Communication and Museums' Changing Roles. Oxford University Press, New York, pp. 205-212.

Candela A., 2008. Ricerche di archeologia mineraria nell'area occidentale delle Prealpi Lombarde: scenari di conservazione e riqualificazione del "paesaggio culturale". *Archeologia Postmedievale*, *12*: 67-97.

Carbognani A., Barghini D., Gardiol D., Di Martino M., Valsecchi G.B., Trivero P., Buzzoni A., Rasetti S., Selvestrel D., Knapic C., Londero E., Zorba S., Volpicelli C.A., Di Carlo M., Vaubaillon J., Marmo C., Colas F., Valeri D., Zanotti F., Morini M., Demaria P., Zanda B., Bouley S., Vernazza P., Gattacceca J., Rault J.L., Maquet L., Birlan M.,

2020. A case study of the May 30, 2017, Italian fireball. *The European Physical Journal Plus*, *135*: 255.

Carpino S., 2015. Meteoritica: una sperimentazione integrata per una diversa modalità di promozione e diffusione della cultura scientifica. *Museologia Scientifica*, *n.s.*, *9*: 111–112.

Carpino S., Morelli M., 2016. Comunicazione e accessibilità al Museo di Scienze Planetarie di Prato. In: Bon M., Trabucco R., Vianello C. (a cura di), Atti del XXIII Congresso ANMS, Allestire per comunicare nei Musei scientifici. Venezia 13-15 novembre 2013. *Museologia Scientifica Memorie*, *15*: 92-95.

Carpino S., Bemere M., Pacini V., 2020. Un Museo per bisogni speciali. In: Capasso L., Monza F., Di Fabrizio A., Falchetti E. (a cura di), Atti del XXIX Congresso ANMS, L'accessibilità nei musei. Limiti, risorse e strategie. Chieti 23-25 ottobre 2019. *Museologia Scientifica Memorie*, *21*: 198-201.

Casadio F., Daher C., Bellot-Gurlet L., 2017. *Raman Spectroscopy of cultural heritage Materials: Overview of Applications and New Frontiers in Instrumentation, Sampling Modalities, and Data Processing*. In: Mazzeo R. (ed.), Analytical Chemistry for Cultural Heritage. Topics in Current Chemistry Collections. Springer, Cham, pp. 161-211.

Chen K., Wang Y., Liu Y., Mei J., Jiang T., 2018. Meteoritic origin and manufacturing process of iron blades in two Bronze Age bimetallic objects from China. *Journal of Cultural Heritage*, *30*: 45-50.

Codato M., 2020. *Analisi di bolidi con la rete nazionale PRISMA*. Tesi.di Laurea. Corso di Laurea in Astronomia, Università degli Studi di Padova, A.A. 2019-2020.

Colas F., Zanda B., Bouley S., Lewin E., Vaubaillon J., Marmo C., Rotary M., Labenne L., Julien J.F., Linares M., Steinhausser A., Raul J.L., Vernazza P., 2015. *Vigie Ciel a collaborative project to study fireballs and organise meteorite recoveries*. European Planetary Science Congress 2015, held 27 September - 2 October, 2015 in Nantes, France, id.EPSC2015-604.

Colas F., Zanda B., Bouley S., Jeanne S., Malgoyre A., Birlan M., Blanpain C., Gattacceca J., Jorda L., Lecubin J., Marmo C., Rault J.L., Vaubaillon J., Vernazza P., Yohia C., Gardiol D., Nedelcu1 A., Poppe B., Rowe J., Forcier M., Koschny D., Trigo-Rodriguez J. M., Lamy H., Behrend R., Ferrière L., Barghini D., Buzzoni A., Carbognani A., Di Carlo M., Di Martino M., M. Knapic M., Londero E., Pratesi G., Rasetti S., Riva W., Stirpe G.M., Valsecchi G.B., Volpicelli C.A., Zorba S., Coward D., Drolshagen E., Drolshagen G., Hernandez O., Jehin E., Jobin M., King A., Nitschelm C., Ott T., Sanchez-Lavega A., Toni A., Abraham P., Affaticati F., Albani M., Andreis A., Andrieu T., Anghel S., Antaluca E., Antier K., Appéré T., Armand1 A., Ascione G., Audureau Y., Auxepaules G., Avoscan T., Baba Aissa D., Bacci P., Bădescu O., Baldini R., Baldo R., Balestrero A., Baratoux D., Barbotin E., Bardy M., Basso S., Bautista O., Bayle L.D., Beck P., Bellitto R., Belluso R., Benna C., Benammi M., Beneteau E., Benkhaldoun Z., Bergamini P., Bernardi F., Bertaina M.E., Bessin P., Betti L., Bettonvil F., Bihel D., Birnbaum C., Blagoi O., Blouri E., Boacă I., Boată R., Bobie B., Bonino R., Boros K., Bouchet E., Borgeot V., Bouchez E., Boust D., Boudon V., Bouman T., Bourget P., Brandenburg S., Bramond Ph., Braun E., Bussi A., Cacault P., Caillier B., Calegaro A., Camargo J., Caminade S., Campana A.P.C., Campbell-Burns P., Canal-Domingo R., Carell O., Carreau S., Cascone E., Cattaneo C., Cauhape P., Cavier P., Celestin S., Cellino A., Champenois M., Chennaoui Aoudjehane H., Chevrier S., Cholvy P., Chomier L., Christou A., Cricchio D., Coadou P., Cocaign J. Y., Cochard F., Cointin S., Colombi E., Colque Saavedra J.P., Corp L., Costa M., Costard F., Cottier M., Cournoyer P., Coustal E., Cremonese G., Cristea O., Cuzon J.C., D'Agostino G., Daiffallah K., Dănescu C., Dardon A., Dasse T., Davadan C., Debs V., Defaix J.P., Deleflie F., D'Elia M., De Luca P., De Maria P., Deverchère P., Devillepoix H., Dias A., Di Dato A., Di Luca R., Dominic F.M., Drouard A., Dumont J.L., Dupouy P., Duvignac L., Ega A., Erasmus N., Esseiva N., Ebel1 A., Eisengarten B., Federici F., Feral S., Ferrant G., Ferreol E., Finitzer P., Foucault A., Francois P., Frîncu M., Froger J.L., Gaborit F., Gagliarducci V., Galard J., Gardavot A., Garmier M., Garnung M., Gautier B., Gendre B., Gerard D., Gerardi A., Godet J.P., Grandchamps A., Grouiez B., Groult S., Guidetti D., Giuli G., Hello Y., Henry X., Herbreteau G., Herpin M., Hewins P., Hillairet J.J., Horak J., Hueso R., Huet E., Huet S., Hyaumé F., Interrante G., Isselin Y., Jeangeorges Y., Janeux P., Jeanneret P., Jobse K., Jouin S., Jouvard J.M., Joy K., Julien J.F., Kacerek R., Kaire M., Kempf M., Koschny D., Krier C., Kwon M.K., Lacassagne L., Lachat D., Lagain A., Laisné E., Lanchares V., Laskar J., Lazzarin M., Leblanc M., Lebreton J.P., Lecomte J., Le Dû P., Lelong F., Lera S., Leoni J.F., Le-Pichon A., Le-Poupon P., Leroy A., Leto G., Levansuu A., Lewin E., Lienard A., Licchelli D., Locatelli H., Loehle S., Loizeau D., Luciani L., Maignan M., Manca F., Mancuso S., Mandon E., Mangold N., Mannucci F., Maquet L., Marant D., Marchal Y., Marin J.L., Martin-Brisset J.C., Martin D., Mathieu D., Maury A., Mespoulet N., Meyer F., Meyer J.Y., Meza E., Moggi Cecchi V., Moiroud J.J., Millan M., Montesarchio M., Misiano A., Molinari E., Molau S., Monari J., Monflier B., Monkos A., Montemaggi M., Monti G., Moreau R., Morin J., Mourgues R., Mousis O., Nablanc C., Nastasi A., Niacşu L., Notez P., Ory M., Pace E., Paganelli M.A., Pagola A., Pajuelo M., Palacián J.F., Pallier G., Paraschiv P., Pardini R., Pavone M., Pavy G., Payen G., Pegoraro A., Peña-Asensio E., Perez L., Pérez-Hoyos S., Perlerin V., Peyrot A.,

Peth F., Pic V., Pietronave S., Pilger C., Piquel M., Pisanu T., Poppe M., Portois L., Prezeau J.F., Pugno N., Quantin C., Quitté G., Rambaux N., Ravier E., Repetti U., Ribas S., Richard C., Richard D., Rigoni M., Rivet J.P., Rizzi N., Rochain S., Rojas J.F., Romeo M., Rotaru M., Rotger M., Rougier P., Rousselot P., Rousset J., Rousseu D., Rubiera O., Rudawska R., Rudelle J., Ruguet J.P., Russo P., Sales S., Sauzereau O., Salvati F., Schieffer M., Schreiner D., Scribano Y., Selvestre D., Serra R., Shengold L., Shuttleworth A., Smareglia R., Sohy S., Soldi M., Stanga R., Steinhausser A., Strafella F., Sylla Mbaye S., Smedley A.R.D., Tagger M., Tanga P., Taricco C., Teng J.P., Tercu J.O., Thizy O., Thomas J.P., Tombelli M., Trangosi R., Tregon B., Trivero P., Tukkers A., Turcu V., Umbriaco G., Unda-Sanzana E., Vairett R., Valenzuela M., Valente G., Varennes G., Vauclair S., Vergn J., Verlinden M., Vidal-Alaiz M., Vieira-Martins R., Viel1 A., Vîntdevarč D.C., Vinogradoff V., Volpini P., Wendling M., Wilhelm P., Wohlgemuth K., Yanguas P., Zagarella R., Zollo A., 2020. FRIPON: a worldwide network to track incoming meteoroids. *Astronomy & Astrophysics, 644*: A53.

Day B., 2019. *Surveying Outreach and Citizen Science Opportunities for Planetary Defense*. EPSC-DPS Joint Meeting 2019, held 15-20 September 2019 in Geneva, Switzerland, id. EPSC-DPS2019-1488.

Dell'Aglio M., López-Claros M., Laserna J.J., Longo S., De Giacomo A., 2018. Stand-off laser induced breakdown spectroscopy on meteorites: calibration-free approach. *Spectrochimica Acta Part B: Atomic Spectroscopy, 147*: 87-92.

Eitzel M.V., Cappadonna J.L., Santos-Lang C., Duerr R.E., Virapongse A., West S.E., Kyba C, Bowser A., Cooper C.B., Sforzi A., Metcalfe A.N., Harris E.S., Thiel M., Haklay M., Ponciano L., Roche J., Ceccaroni L., Shilling F.M., Dörler D., Heigl F., Kiessling T., Davis B.Y., Jiang Q., 2017. Citizen Science Terminology Matters: Exploring Key Terms. *Citizen Science: Theory and Practice, 2(1)*: 1.

Fries M., Bresky C., Laird C., Reddy V., Hankey M., 2017. *Meteorite Fall Detection and Analysis via Weather Radar: Worldwide Potential for Citizen Science*. American Geophysical Union, Fall Meeting 2017, abstract #ED31D-0303.

Franza A., Pratesi G., 2021a. Meteorites as a scientific heritage. *Conservar Patrimonio, 36*: 106-121.

Franza A., Pratesi G., 2021b. Mineralogical, petrological and planetological heritage. The (Italian) story so far. *Rendiconti Lincei. Scienze Fisiche e Naturali, 32*: 95-116.

Franza A., Petti C., Pratesi G., 2021a. More than just a rock collection. The meteorite collection of the Italian geologist Teodoro Monticelli (1759-1845). *Earth Sciences History, 40(1)*: 39-67.

Franza A., Morelli M., Faggi D., Pratesi G., 2021b. To be or not to be, that is the question: The Marsala meteorite (Italy, 1834) and the role of the doubtful meteorites in the history of meteoritics. *Meteoritics and Planetary Science, 56(5)*: 1-15.

Galazka-Friedman J., Woźniak M., Duda P., Rzepecka P., Jakubowska M., Karwowski L., 2017. Mössbauer spectroscopy—a useful method for classification of meteorites? *Hyperfine Interactions, 238*: 67.

Gardiol D., Cellino A., Di Martino M., 2016. *PRISMA, Italian network for meteors and atmospheric studies*. In: Roggermans A., Roggermans P. (eds.), Proceedings of the International Meteor Conference, Egmond, the Netherlands, 2-5 June 2016, pp. 76-79.

Gardiol D., Barghini D., Colombetti P., Taricco C., Mancuso S., Rubinetti S., Di Martino M., 2017. Improvement of the extraction method of faint signals in γ-activity measurements of meteorites. *The European Physical Journal Plus, 132*: 269.

Gardiol D., Barghini D., Buzzoni A., Carbognani A., Di Carlo M., Di Martino M., Knapic C., Londero E., Pratesi G., Rasetti S., Riva W., Salerno R., Stirpe G.M., Valsecchi G.B., Volpicelli C.A., Zorba S., Colas F., Zanda B., Bouley S., Jeanne S., Malgoyre A., Birlan M., Blanpain C., Gattacceca J., Lecubin J., Marmo C., Rault J.L., Vaubaillon J., Vernazza P., Affaticati F., Albani M., Andreis A., Ascione G., Avoscan T., Bacci P., Baldini R., Balestrero A., Basso S., Bellitto R., Belluso M., Benna C., Bernardi F., Bertaina M.E., Betti L., Bonino R., Boros K., Bussi A., Carli C., Carriero T., Cascone E., Cattaneo C., Cellino A., Colombetti P., Colombi E., Costa M., Cremonese G., Cricchio D., D'Agostino G., D'Elia M., De Maio M., Demaria P., Di Dato A., Di Luca R., Federici F., Gagliarducci V., Gerardi A., Giuli G., Guidetti D., Interrante G., Lazzarin M., Lera S., Leto G., Licchelli D., Lippolis F., Manca F., Mancuso S., Mannucci F., Masi R., Masiero S., Meucci S., Misiano A., Moggi Cecchi V., Molinari E., Monari J., Montemaggi M., Montesarchio M., Monti G., Morini P., Nastasi A., Pace E., Pardini R., Pavone M., Pegoraro A., Pietronave S., Pisanu T., Pugno N., Repetti U., Rigoni M,, Rizzi N., Romeni C., Romeo M., Rubinetti S., Russo P., Salvati F., Selvestrel D., Serra R., Simoncelli C., Smareglia R., Soldi M., Stanga R., Strafella F., Suvieri M., Taricco C., Tigani Sava G., Tombelli M., Trivero P., Umbriaco G., Vairetti R., Valente G., Volpini P., Zagarella R., Zollo A., 2020. Cavezzo, the first Italian meteorite recovered by the PRISMA fireball network. Orbit, trajectory, and strewn-field. *Monthly Notices of the Royal Astronomical Society, 501(1)*: 1215-1227.

Gardiol D., Cuppone T., Ascione G., Barghini D., Carbognani A., Di Martino M., Di Carlo M., Pratesi G., Riva W., Rubino E., Russo P., Stirpe G., Valeri D., Volpicelli A., 2021. *A successful example of citizen science within the PRISMA network applied to the 15th March*

2021 bolide over Italy. EuroPlanet Science Congress 2021, 13-24 September 2021, EPSC2021-208.

Garzanti E., Gamba A., Malara F., Vidimar C., 1999. Evoluzione della mineralogia del detrito in sistemi fluviali segmentati da sbarramenti naturali o artificiali e attraverso la pianura: il bacino idrografico dell'Adda (Lombardia). *Geologia Insubrica*, *3*: 43-60.

Giuli G., Pratesi G., Corazza M., Cipriani C., 2000. Aluminium coordination in tektites: A XANES study. *American Mineralogist*, *85(9)*: 1172-1174.

Giuli G., Eeckhout S.G., Koeberl C., Pratesi G., Paris E., 2008. Yellow impact glass from the K/T boundary at Beloc (Haiti): XANES determination of the Fe oxidation state and implications for formation conditions. *Meteoritics and Planetary Science*, *4(5)*: 981-986.

Grady M., 2000. *Catalogue of meteorites*. Cambridge University Press, Cambridge, 689 pp.

Grady M., Pratesi G., Moggi Cecchi. V., 2014. *Atlas of meteorites*. Cambridge University Press, Cambridge, 384 pp.

Gritsevich M., 2017. *Detection and Characterisation of Meteors as a Big Data Citizen Science project*. American Geophysical Union, Fall Meeting 2017, abstract #ED24B-02.

Halliday I., Blackwell A.T., Griffin A.A., 1978. The Innisfree meteorite and the Canadian camera network. *Journal of the Royal Astronomical Society of Canada*, *72(1)*: 15-39.

Hauser C., 2016. That wasn't a meteorite that killed a man in India, NASA says. *The New York Times*, 16 February 2016.

Hellis H., 2014. Knowledge, character and professionalisation in nineteenth-century British science. *History of Education*, *43(6)*: 777-792.

Hetland P., Schrøder K.C., 2020. *The Participatory Turn: Users, publics, and audiences*. In: Hetland P., Pierroux P., Esborg L. (eds.), A History of Participation in Museums and Archives. Traversing Citizen Science and Citizen Humanities. Routledge, London, pp. 168-185.

Hochleitner R., Tarcea N., Simon G., Kiefer W., Popp J., 2004. Micro-Raman spectroscopy: a valuable tool for the investigation of extraterrestrial material. *Journal of Raman Spectroscopy*, *35(6)*: 515-518.

Jambon A., 2017. Bronze Age iron: Meteoritic or not? A chemical strategy. *Journal of Archaeological Science*, *88*: 47-53.

Kierman V., 2000. The Mars Meteorite: A case study in controls on dissemination of science news. *Public Understanding of Science*, *9(1)*: 15-41.

Kloetzer L., Lorke J., Roche J., Golumbic Y., Winter S., Jögeva A., 2021. *Learning in Citizen Science*. In: Vohland K., Land-Zandstra A., Ceccaroni L., Lemmens R., Perelló J., Ponti M., Samson R., Wagenknecht K. (eds.), The Science of Citizen Science. Cham, Springer, pp. 283-308.

Kokhirova G.I., Babadzhanov P.B., Khamroev U.K., 2015. Tajikistan fireball network and results of photographic observations. *Solar System Research*, *49*: 275-283.

Levi Donati G.R., Jarosewich E., 1971. The Valdinizza Meteorite: Mineralogy, Chemistry and Microtextures. *Meteoritics*, *6(1)*: 1-14.

Levi Donati G.R., Jarosewich E., 1972. Mineralogical And Chemical Researches On L-Chondrites: Girgenti. *Meteoritics*, *7(2)*: 109-125.

Llorca J., Campeny M., Ibáñez N., Allepuz D., Camarasa J.M., Aurell-Garrido J., 2020. The meteorite of Barcelona (1704): History, discovery, and classification. *Meteoritics and Planetary Science*, *55(4)*: 705-725.

Lo Giudice A., Re A., Angelici D., Calusi S., Gelli N., Giuntini L., Massi M., Pratesi G., 2012. In-air broad beam ionoluminescence microscopy as a tool for rocks and stone artworks characterisation. *Analytical and Bioanalytical Chemistry*, *404*: 277-281.

Maida F., Veneziani A., 2012. *Minerali della provincia di Bergamo*. Novecento Grafico, Bergamo, 96 pp.

Marmo C., Colas F., Bouley S., Vaubaillon J., Zanda B., Vernazza P., Gattacceca J., Rault J.L., Blanpain C., Caminade S., Lecubin J., Malgoyre A., Meyer F., Steinhausser A., Birlan M., Maquet L., Audureau Y., Kwon M.K., 2019. *The FRIPON Project or Pride and Prejudice in Citizen Science.* In: Molinaro M., Shortridge K., Pasian F. (eds.), Astronomical Data Analysis Software and Systems XXVI, ASP Conference Series, Vol. 521. Proceedings of a conference held 16-20 October 2016 at Stazione Marittima Conference Centre, Trieste, Italy. Astronomical Society of the Pacific, San Francisco, pp. 165-168.

Marrocchi Y., Bonal L., Gattacceca J., Piani L., Beck P., Greenwood R.C., Eschrig J., Basque A., Nuccio P.M., Foresta Martin F., 2020. The Piancaldoli meteorite: A forgotten primitive LL3.10 ordinary chondrite. *Meteoritics and Planetary Science*, *55(8)*: 1-12.

Marvin U.B., 2007. Ernst Florens Friedrich Chladni (1756-1827) and the origins of modern meteorite research. *Meteoritics and Planetary Science*, *31(5)*: 545-588.

Mayne R.G., Corrigan C.M., McCoy T.J., Day J.M.D., Rose T.R., 2020. Qarabawi's Camel Charm: Tracing the meteoritic origins of a cultural artifact. *Meteoritics and Planetary Science*, *55(5)*: 1000-1010.

McCall G.J.H., Bowden A.J., Howarth R.J., 2006. *The History of Meteoritics and Key Meteorite Collections: Fireballs, Falls and Finds*. Geological Society of London, London, 520 pp.

McCoy T.J., Marquardt A.E., Wasson J.T., Ash R.D., Vicenzi E.P., 2017. The Anoka, Minnesota iron meteorite as parent to Hopewell meteoritic metal beads from Havana, Illinois. *Journal of Archaeological Science*, *81*: 13-22.

McCubbin F.M., Herd C.D.K., Yada T., Hutzler A., Calaway M.J., Allton J.H., Corrigan C.M., Fries

M.D., Harrington A.D., McCoy T.J., Mitchell J.L., Regberg A.B., Righter K., Snead C.J., Tait K.T., Zolensky M.E., Zeigler R.A., 2019. Advanced Curation of Astromaterials for Planetary Science. *Space Science Reviews*, *215*: 48.

Moggi Cecchi V., 2014. L'applicazione della spettroscopia Raman allo studio delle meteoriti e dei minerali delle collezioni Museo di Scienze Planetarie della Provincia di Prato. In: Del Favero L., Fornasiero M., Molin G. (a cura di), Atti del XXI Congresso ANMS, La ricerca nei musei scientifici. Padova 9-11 novembre 2011. *Museologia Scientifica Memorie*, *11*: 157-160.

Moggi Cecchi V., Carpino S., Pratesi G., Caporali S., Manenti F., 2015. Storia di una meteorite ritrovata: il caso della meteorite metallica Slaghek's Iron. In: Pratesi G., Ceccolini F., Lotti P. (a cura di), Atti del XXII Congresso ANMS, Il partimonio culturale dei musei scientifici. Firenze 14-16 novembre 2012. *Museologia Scientifica Memorie*, *14*: 166-168.

Moggi Cecchi V., Pratesi G., Carpino S., Caporali S., 2017. La classificazione delle meteoriti in conto terzi come veicolo efficace per l'incremento patrimoniale e per la valorizzazione scientifica delle collezioni dei musei naturalistici. In: Malerba G., Cilli C., Giacobini G. (a cura di), Atti del XXV Congresso ANMS, "COSE DI SCIENZA" Le collezioni museali: tutela, ricerca ed educazione. Torino, Sistema Museale di Ateneo, 11-13 novembre 2015. *Museologia Scientifica Memorie*, *17*: 144-147.

Moioli P., Seccaroni C., 2000. Analysis of art objects using a portable x-ray fluorescence spectrometer. *X-Ray Spectrometry*, *29(1)*: 48-52.

Muravyev L.A., Grokhovsky V.I., 2020. *Historical List of Harmful Meteorites*. In: Votyakov S., Kiseleva D., Grokhovsky V., Shchapova Y. (eds.), Minerals: Structure, Properties, Methods of Investigation. Springer Proceedings in Earth and Environmental Sciences. Springer, Cham, pp. 147-159.

Neveu M., Vernazza P., 2019. IDP-like Asteroids Formed Later than 5 Myr After Ca–Al-rich Inclusions. *The Astrophisical Journal*, *875*: 30.

Pierroux P., Hetland P., Esborg L., 2020. *Traversing Citizen Science and Citizen Humanities: Tacking stitches*. In: Hetland P., Pierroux P., Esborg L. (eds.), A History of Participation in Museums and Archives. Traversing Citizen Science and Citizen Humanities. Routledge, London, pp. 3-24.

Pratesi G., Morelli M., Rossi A.P., Ori G.G., 2005. Chemical compositions of impact melt breccias and target rocks from the Tenoumer impact crater, Mauritania. *Meteoritics and Planetary Science*, *40(11)*: 1653-1672.

Pratesi G., Moggi Cecchi V., Greenwood R.C., Franchi I.A., Hammond S.J., Di Martino M., Barghini D., Taricco C., Carbognani A., Gardiol D., 2021. Cavezzo—The double face of a meteorite: Mineralogy, petrography, and geochemistry of a very unusual chondrite. *Meteoritics and Planetary Science* (https://doi.org/10.1111/maps.13695).

Prufer O.H, 1961. Prehistoric Hopewell Meteorite Collecting: Context and Implications. *The Ohio Journal of Science*, *61*: 341-352.

Re A., Angelici D., Lo Giudice A., Maupas E., Giuntini L., Calusi S., Gelli N., Massi M., Borghi A., Gallo L.M., Pratesi G., Mandò P.A., 2013. New markers to identify the provenance of lapis lazuli: trace elements in pyrite by means of micro-PIXE. *Applied Physics A*, *111(1)*: 69-74.

Riesch H., Potter C., 2014. Citizen science as seen by scientists: Methodological, epistemological and ethical dimensions. *Public Understanding of Science*, *23(1)*: 107-120.

Sforzi A., Tweddle J., Vogel J., Lois G., Wägele W., Lakeman-Fraser P., Makuch Z., Vohland K., 2018. *Citizen science and the role of natural history museums*. In: Hecker S., Haklay M., Bowser A., Makuch Z., Vogel J., Bonn A. (eds.), Citizen Science. Innovation in Open Science, Society and Policy. UCL Press, London, pp. 429-444.

Trigo-Rodríguez J.M., Lyytinen E., Gritsevich M., Moreno-Ibáñez M., Bottke W.F., Williams I., Lupovka V., Dmitriev V., Kohout T., Grokhovsky V., 2015. Orbit and dynamic origin of the recently recovered Annama's H5 chondrite. *Monthly Notices of the Royal Astronomical Society*, *449(2)*: 2119–2127.

Unsalan Q., Bayatli A., Jenniskens P., 2020. Earliest evidence of a death and injury by a meteorite. *Meteoritics and Planetary Science*, *55(4)*: 886-894.

Vernazza P., Marsset M., Beck P., Binzel R.P., Birlan M., Brunetto R., Demeo F.E., Djouadi Z., Dumas C., Merouane S., Mousis O., Zanda B., 2015. Interplanetary Dust Particles as Samples of Icy Asteroids. *The Astrophisical Journal*, *806*: 204.

Wetherill G.W., ReVelle D.O., 1981. Which fireballs are meteorites? A study of the Prairie Network photographic meteor data. *Icarus*, *48(2)*: 308-328.

Zolensky M., Bland P., Brown P., Halliday I., 2006. *Flux of Extraterrestrial Materials*. In: Lauretta D.S., McSween H.Y. (eds.), Meteorites and the Early Solar System II. University of Arizona Press, Tucson, pp. 869-868.

Zurfluh F.J., Hofmann B.A., Gnos E., Eggenberger U., 2011. Evaluation of the utility of handheld XRF in meteoritics. *X-Ray Spectrometry*, *40(6)*: 449-463.

Websites (accessed 26.09.2021)

1) https://www.lpi.usra.edu/meteor/metbullclass.php?sea=Pseudometeorite

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