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Diamonds are a Museum's Best Friends. Historical-scientific study of the diamond collection at the Natural History Museum of the University of Firenze

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ABSTRACT
This paper focused on the historical-scientific study of the diamond specimens preserved at the Mineralogical and Lithological Section of the Natural History Museum of the University of Firenze, analyzing the theoretical trajectories that the specimens have traced since their entry into the museum, along with the relationships with the people who have recovered and studied them in the past. The study therefore "unpacked" this diamond collection, considering the specimens included in it as material, scientific and social representations. This approach is made possible through the analysis of the role attributed to the diamond samples by the Florentine Natural History Museum over the centuries, along with the investigation of their function in contemporary scientific speculation, thanks to the study of the connections they continue to have with curators, scholars and visitors.

Key words:
diamond, geoheritage, Liebmann collection, gemology, University of Firenze.

RIASSUNTO
I diamanti sono i migliori amici di un museo. Studio storico-scientifico della collezione di diamanti conservata presso il Museo di Storia Naturale dell'Università degli Studi di Firenze

Questo lavoro si concentra sullo studio storico-scientifico dei campioni di diamante conservati presso la Sezione di Mineralogia e Litologia del Museo di Storia Naturale dell'Università degli Studi di Firenze, analizzando i percorsi teoretici che gli esemplari hanno compiuto a partire dal loro ingresso nel Museo, assieme alle relazioni che gli stessi hanno intessuto con le persone che ne hanno fatto oggetto di musealizzazione e studio nel passato. Il lavoro ha quindi "spacchettato" la summenzionata collezione di diamanti, considerandone i campioni come rappresentazioni materiali, scientifiche e sociali. Il perseguimento di questa metodologia interdisciplinare è stato reso possibile sia grazie all'analisi del ruolo attribuito ai singoli campioni di diamante dal Museo di Storia Naturale nel corso dei secoli, sia attraverso l'esame del posto occupato da questi esemplari storici nella speculazione scientifica contemporanea, in virtù dei legami che continuano a instaurare con curatori, studiosi e visitatori.

Parore chiave:
diamante, patrimonio geologico, collezione Liebmann, gemmologia, Università di Firenze.

INTRODUCTION

In the UNESCO 2015 Recommendation on Museums and Collections, museums and collections are described as "primary means by which tangible and intangible testimonies of nature and human cultures are safeguarded". The Recommendation then pointed out how museums "have great potential to raise public awareness of the value of cultural and natural heritage", for instance, thanks to the transmission of

scientific knowledge acquired through their primary functions as the preservation and valorization of naturalistic and cultural objects encompassing their collections. In this regard, among museums' primary functions there is "the study of collections" because "it is only through the knowledge obtained from such research that the full potential of museums can be realized and offered to the public". Moreover, museum research offers "opportunities to reflect in a contemporary context, as well as for the interpretation, representation and presentation of collections" (UNESCO, 2015). What has just been said can also be found in 2013 ICOM's Code of Ethics for Museums, which defined museums as the "responsible for the tangible and intangible natural and cultural heritage" (art. 1). Museums then "have the duty to acquire, preserve and promote their collections as a contribution to safeguarding the natural, cultural and scientific heritage" (art. 2) through "the interpretation of primary evidence collected and held in their collections" (art. 3) (ICOM, 2013). As stated in the Convention on the Value of Cultural Heritage for Society (Council of Europe, 2005) what is important about cultural heritage is not the objects in themselves, but the meanings and values that these objects represent for people. In this respect, Article 4 specified how "everyone [...] has the right to benefit from the cultural heritage and to contribute towards its enrichment" (Schofield, 2015; Montella et al., 2016). Museums have been described as free-choice learning environments (Falk & Dierking, 2000; Kelly, 2004) that promote meaning making and learning through their permanent and temporary exhibitions (Silverman, 1995; Hein, 1998; Weil, 2002; Carr, 2003; Bell et al., 2009; Wilson, 2018). Museums are not simple repositories of natural and cultural objects, but places of learning that play a pivotal role in attracting audiences from the community, locality or group they serve, thus encouraging interactions with a broad range of people through the promotion of their heritage as an integral part of the museum educational role (ICOM Code of Ethics for Museums, art. 4).

In this regard, the Italian Code of the Cultural and Landscape Heritage (Legislative Decree no. 42, 22 January 2004) defined the term "museum" as a "permanent facility which acquires, conserves, arranges and exhibits cultural property for the purposes of education and study" (article 101, paragraph 2). The Ministry of Cultural Heritage and Activities (MiBAC) then outlined "guidelines, technical regulations, criteria and models for the conservation of cultural properties, and in doing so may avail itself the participation of the Regions and the collaboration of universities and competent research institutes" (article 29, paragraph 5). As an example, "the Ministry and Regions, which may also avail themselves of the collaboration of universities, shall work together for the definition of programs concerning studies, research and scientific initiatives regarding cataloguing and inventory methodologies" (article 17, paragraph 3). Such was the case of the catalogue standards proposed by the Central Institute for the Catalogue and Documentation (ICCD) in early 2000s for the cataloguing of natural, cultural and scientific-technological heritage housed in Italian art and natural history museums (Calosso et al., 2008; Miniati, 2008; Corradini, 2013; Pratesi et al., 2014a; Tucci, 2018; Cignoni & Meloni, 2019). The Ministerial Decree of 10 May 2001 "Guideline on technical-scientific criteria and standards for the management and development of museums" (art. 150, paragraph 6, Legislative Decree no. 112 1998, G.U. 19 October 2001, no. 244, S.O. of the Ministry of Cultural Heritage and Activities) also underlined how museums, alongside the practices of object conservation, valorization projects and activities of public engagement, have a particular responsibility for making collections available for research purposes. In Scope VI, subchapter 5 "Research and study policies", ethical and academic practices as well as technical standards for the study of museum collections were defined as follows: "research is a museum primary aim, to which has to be assigned adequate human and financial resources to provide accessibility to the collections for research purposes as freely as possible. Data dissemination must be guaranteed to involve the largest number of people interested in them. In order to ensure a better understanding of the collections and improve the state of their knowledge, museums may establish relationships – permanently or temporarily – with other museums, scientific institutions, universities, experts and scholars". Collections and archival materials pertaining to them therefore represent the core and the raison d'être of museums, and their management plans have to guarantee their preventive preservation and restoration, cataloguing and public outreach, inalienability and full physical and intellectual accessibility to scholars for the purposes of research (Shaffer et al., 1998; Carter & Walker, 1999; Beolchini, 2002; Miller et al., 2004; Jacobson et al., 2006; Del Favero, 2007; Kapos et al., 2008; Hoeksema et al., 2011; Ballard et al., 2017; Dorfman, 2017). In this context, naturalistic collections were recognized in the International Accord on the Value of Natural Science Collections (Manchester, 1995) as "organized collections founded on biological specimens (living or dead) and geological specimens together with associated information and expertise. These natural science collections are held in museums and other institutions which are responsible for facilizing access to the use of such resources, and for their care and development for the benefit of society". Research on these kind of museum collections therefore emphasize their utility to scholars and general public, as well as provides data pertaining to the monetary cost associated with their conservation and management. It is not by chance that the issue of the economic value of naturalistic

finds is the subject of a lively debate in the scientific community (Fromm, 2000; Dalton, 2003; Froelich, 2003; Suarez & Tsutsui, 2004; Bradley et al., 2014; Pratesi et al., 2014b; Moggi Cecchi et al., 2017; Camacho et al., 2018). However, it should be remembered that all public law bodies, with the transition from the financial report to the economic-patrimonial report, have a duty to estimate the economic value of their assets (Manetti & Valeri, 2012; Landriani & Pozzoli, 2014; Imperiale & Vecco, 2017).

This study investigates the role that geo-mineralogical collections preserved in natural history museums can play as repositories of knowledge on geodiversity and as permanent record of a natural heritage of certain scientific, historical and cultural significance (D'Amico & De Angelis, 2009; D'Amico et al., 2013; Borghi et al., 2015; Carpino, 2015; Petti et al., 2015; Carpino & Morelli, 2016; Cita, 2016; Pereira & Marker, 2016; Carpino et al., 2017, 2019; Migaszewski & Mader, 2019; Borghi et al., 2020; De Lima & De Souza Carvalho, 2020). Beside playing an active role in the preservation of movable geological heritage, research carried out in natural history museums using archival documents, catalogues and inventories can lead scientists and historians to the potential discovery of geo-mineralogical specimens previously unknown to the scholar community, thus highlighting the importance of historical-scientific research in the context of museum studies (Petti et al., 2010; Trevisani, 2011; Garcia-Guinea et al., 2013; Ghiara et al., 2014; Moggi Cecchi et al., 2015, 2019; Franza et al., 2019; Llorca et al., 2020). On this basis, we agree with Lourenço and Wilson (2013) when they defined geological and mineralogical specimens preserved in natural history museums not only as a natural and cultural heritage, but also as a scientific heritage (or heritage of science), i.e. the expression of what the scientific community has perceived over the centuries as representative of its identity and worth of being preserved and explained to future generations of scientists and the general public alike. However, in this vibrant multidisciplinary context, few studies have focused on the investigation of gemstones kept in geo-mineralogical collections, and most of this research has been descriptive in nature or has focused on the scientific characterization of the samples (e.g. Boscardin, 1999; Kagan, 2010; Evans et al., 2011; Bedini et al., 2012; Petrova et al. 2012; Dmitrieva, 2013; Re et al., 2015; Barone et al., 2016; Mazzoleni et al., 2016; Patrizi et al., 2016; Robinson, 2016; Lo Giudice et al., 2017; Rossi et al., 2017; Mercurio et al., 2018; Rossi & Ghiara, 2019; Megaw, 2020).

Starting from the methodological approaches proposed by Alberti (2005), Hill (2012), Monti and Keene (2016) on objects' biographies in museum contexts, we present the diamond collection preserved at the Natural History Museum of the University of Firenze, analyzing the theoretical trajectories that the specimens have traced since their entry into the museum, along with the relationships with the people who have recovered and studied them in the past.

This multidisciplinary approach, as remarked by Kopytoff (1986), allows to ask museum objects questions like those asked when writing a person's biography: e.g., what are the scientific phases that characterize the finding? How has its scientific and cultural status changed over time? What makes it different from other similar specimens? Quoting the metaphor proposed by Byrne et al. (2011), this study "unpacked" the aforementioned diamond collection, considering the specimens included in it as material, scientific and social representations. This approach is made possible through the analysis of the role attributed to the diamond samples by the Florentine natural history museum over the centuries, along with the investigation of their function in contemporary scientific speculation, thanks to the study of the connections they continue to have with curators, scholars and visitors. The reconstruction of the diamonds' scientific biographies returns to the academic community the figures of scientists and collectors who would otherwise have stuck in a "space of invisibility". This intriguing expression was created by Monti and Ratcliff (2004) to define scholars who: 1) were known at their times and later forgotten, 2) although brilliant, remained unknown to the chronicles of their time, 3) after a brief and shining scientific career, have undertaken other life paths. According to Monti and Ratcliff (2004), the "space of invisibility" describes a conceptual category that does not intend to re-locate "obscure" scholars at "their place" in the history of science, but rather to provide a critical review of the complex social and intellectual developments that underline the advancement of empirical science. The analysis of the diamond specimens preserved at the Natural History Museum of the University of Firenze together with the relative archival materials (i.e., ancient museum catalogues and inventories, correspondence, documents relating to the administrative and scientific management of museum collections) has therefore highlighted the figures of naturalists, collectors, and gem merchants that otherwise would have been impossible to know.

Furthermore, this study pointed out the importance of what Brocx and Semeniuk (2010) named as "the geoheritage significance of gemstone crystals" in a museum context. Although the concept of geoheritage relative to crystals is a well-established topic in the management planning of protecting areas (e.g. Cairncross, 2011; Errami et al., 2015; Brocx & Semeniuk, 2019; Cai et al., 2019; Hatipoğlu, 2019), gemstone crystals as features of geoheritage significance in geological collections is still an unstudied topic. On the contrary, as stated by Van Geert (2019), the multidisciplinary analysis of gemstone collections in natural history museums can lead to interesting op-

portunities to communicate a wider range of geological knowledge to scholars and non-expert audiences alike. In fact, going beyond the undoubted aesthetic value of certain samples, storytelling and narratives resulting from the critical study of gemstones in geological collections, i.e. the museological study of the single specimen along with the analysis of the relevant archival material, can improve the level of interpretation of the gemological heritage in museology. Furthermore the study of gemstone collections can be of potential interest not only in promoting geodiversity, but also in popularizing university museums to the general public through temporary and/or permanent exhibitions, which tell the history of these particular and fascinating collections as well as the story of the men who passed them on to the future generations of scientists and amateurs.

THE DIAMOND COLLECTION PRESERVED AT THE NATURAL HISTORY MUSEUM OF THE UNIVERSITY OF FIRENZE

The diamond collection that is the topic of this paper is currently preserved at the Mineralogical and Lithological Section of the Natural History Museum of the University of Firenze. This work focuses exclusively on the analysis of the diamond samples acquired by the museum over the centuries, leaving in the background the diamonds present in other historical collections such as those of the Medici family.

Founded in 1775 at the behest of the Grand Duke of Tuscany Peter Leopold (1747-1792), the Imperial and Royal Museum of Physics and Natural History was an expression of its founder's scientific interests (Masoner et al., 2002; Knieling, 2016; Franza et al., 2019) as well as an institution for the promotion of science and the technical elaboration of knowledge, on the basis of the core ideas of the Age of the Enlightenment (Barsanti et al., 1996; Baldacci, 2000; Sloan & Burnett, 2004; Tazzara et al., 2020). Even if a complete survey of the bibliography relevant to the Florentine Natural History Museum is beyond the scope of this paper (e.g. Bertucci, 2006; Barbagli & Pratesi, 2009; Barsanti & Chelazzi, 2009; Raffelli, 2009; Monechi & Rook, 2010; Maeker, 2011; Pratesi, 2012; Moggi Cecchi & Stanyon, 2014; Dominici & Cioppi, 2018), it is worth reminding that in his major study Contardi (2002) pointed out how the naturalistic collections housed in the Imperial and Royal Natural History Museum were a tool for independent learning since the establishment of the institution in the late 18th century. Indeed, although the collections remained a Grand Duke's private property, they were available to anyone wishing to study and visit them. The Imperial and Royal Natural History Museum was the first naturalistic museum to be open to the general public in Europe and its collections – originally located on the second floor of Palazzo Torrigiani – were accessible to visitors "from morning to evening in the same way of public libraries" (see archive 1). The latter rule had been arranged by the museum's first director, Felice Fontana (1730-1805), for the collec-

Fig. 1. Diamond Sample No. 826. Starting from the top left: paper label relative to the Mineralogical Museum of the Regio Istituto di Studi Superiori; leaflet with handwritten notes; glass jar in which the diamond specimen is preserved; back of the display tag; paper label compiled during the 1925 museum inventory.

tions to serve both as a research tool for scholars and as an exhibit meant to provide visual evidence of the laws of nature, thus encouraging the process of a visitor's self-instruction (Contardi, 2000; Cipriani, 2006; Contardi, 2006; Mazzolini, 2006; Schockore, 2009; Fontanelli, 2019). Contardi (2002) then pointed out how the artifacts and the natural specimens preserved at the Imperial and Royal Museum of Natural History were also the subjects of study and research by local and foreign scholars. In this regard, the "Relazione sugli studi del Museo" highlighted how a part of the collections kept in the Paleontological and Geological Cabinet were studied by a group of German geologists in April 1868. The document also reported the list of the scientific publications, among them the essay entitled "Studi Geologici e Paleontologici sulla Valle del Santerno", resulting from the analysis of the specimens kept in the Cabinet. The "Relazione" then stated, while discussing the publication scientific quality, how "the State can be greatly rewarded by a Cabinet that realized such a work" (see archive 2). Since then, the paleontological and geo-mineralogical collections preserved at the Natural History Museum of the University of Firenze have been the core topics of extensive research of high international relevance thus showing, as stated by Gippoliti et al. (2014), the relevance of historical collections as a valuable, long-term source of data in several fields of research.

Among the 50,000 samples that encompass the Mineralogical and Lithological Section, this work analyzed the diamond specimens here preserved. The decision to focus on this particular mineralogical species derived not only from the scientific and cultural role traditionally attributed to diamonds in the history of collecting (Lenzen, 1970; Yogev, 1978; Tillander, 1995; Harlow, 1998; Klein, 2005; Vanneste, 2011; Haas et al., 2012; Diemer et al., 2014; Post & Farges, 2014; Dalrymple & Anand, 2017; Ogden, 2018), but also from the pivotal role that the diamond specimens have played in the establishment and enrichment of the mineralogical and gemological collections at the Florentine Natural History Museums throughout the centuries (Aloisi, 1932; Cipriani et al., 2001, 2002, 2004, 2005; Cipriani, 2007; Fantoni & Poggi, 2012). In this regard, a part from the use of diamonds as engraving tools (see archive 3), the collecting importance of this mineralogical species was confirmed by the letter that Alexandre Petiet (1782-1835), who was the intendant of the crown estate in Tuscany, sent to the naturalist Girolamo Bardi (1777-1829) (Vadalà, 2017), as director of the Imperial and Royal Museum of Natural History, on 24 February 1810. In his letter, Petiet asked Bardi for an inventory of the "precious objects" (diamonds and pearls, in particular) kept in the museum's collections because they were property of the French Crown since the Senate Decree of the 30 January 1810, article n. 8 (see archive 4). Furthermore, Cipriani and Poggi (2008) reported that under the scientific direction of the naturalist Filippo Parlatore (1816-1877) (Barbagli, 201 5), a wooden case containing 15 Bohemian glass models of famous diamonds (i.e. Hope, Kohinoor, Regent and Orloff) in natural scale was purchased in 1872. As pointed out by Insley (2018) the acquisition of crystal sets of renowned gemstones was a common praxis in the 19th-century museum collecting for keeping exhibitions with reproductions of unique specimens always up to date, as well as for using the vitreous models in scientific and didactic activities. Poggi et al. (2012) noted that the purchase of diamond glass models continued at the beginning of the 20th century when the Natural History Museum acquired the mineralogical collection belonging to the Regio Istituto Superiore di Magistero, which encompassed more than 465 mineralogical samples (Di Bello, 2006; Cipriani et al., 2011; Poggi et al., 2012). Among the 39 crystal models, there were sets of vitreous gemstones stored in four boxes. The first case contained a large model of a rough diamond, slightly yellowish with a vaguely octahedral habit. The second box conserved 10 glass

Inventory 1943-48	Catalogue 1793	Catalogue 1820	Catalogue 1824	Catalogue 1843-1845	No. Museum labels	Catalogue description
825	-	-	-	8807	-	Colourless binary shaped diamond with rough material inside it
826	536	3683	-	8805	4	Diamond of sextuplate spheroidal shape
827	-	-	532	8806	3	Diamond of sextuplate spheroidal shape from Brazil
828	-	-	537	8803	5	Very small and shattered diamond of primitive shape from Brazil
829	-	-	531	8804	5	Diamond of primitive shape, just a bit deformed, from Brazil
13097	-	3685	-	8808	4	Faceted yellowish diamond

Tab. 1. This table shows the inventory numbers along with the catalogue description of the oldest diamond specimens preserved in the mineralogical collections of the Natural History Museum of the University of Firenze.

models showing different brilliant-type cuts, while the third comprised 4 reproductions in finer crystal of the Hope, Kohinoor, Regent and Orloff diamonds. The last case encompassed 40 vitreous models of various precious and semi-precious gemstones. As noted by Peixe et al. (2019), the historical and scientific analysis of mineralogical glass models in naturalistic collections emphasized not only their role as primary sources, thus highlighting the importance of material cultures in museum studies (e.g. Alberti, 2005, 2008; Knell, 2007; Dudley, 2012, 2013; Weidenhammer & Gross, 2013; Hentschel, 2014; MacDonald, 2020), but also their use as visual and didactic tools (Laudan, 1987; Saeijs, 2004; Touret, 2004; López-Acevedo Cornejo, 2006; Curtis, 2007; Maitte, 2013; Brenna et al., 2018; Alvis, 2020). Furthermore, the study of glass crystal models in historical collections stressed the importance of improving appropriate conservation and restoration methodologies.

This paper analyzes the 61 diamond samples kept in the Mineralogical and Lithological Section of the Natural History Museum of the University of Firenze. These samples are small in size, mostly raw and rough, and some of them have inclusions. All the diamond specimens are documented in the Historical Archive of the Natural History Museum (i.e. inventories and catalogues from the 18th century to the second part of the 20th century, letters of donation, purchasing documents, original exhibition labels). By analyzing the aforementioned archival materials, it was possible to date the entry of the first samples into the mineralogical collections at the end of the 18th century. The most recently acquired specimens date back to the 1990s.

The inventory numbers with which the 18th- and 19th-century diamonds are indicated today referred to the museum catalogue compiled between 1943 and 1948. Here, the mineralogical specimens were registered according to the Strunz-Nickel classification and were given an economic value for the first time. These inventories also report a brief description of the samples along with their previous catalogue numbers. The oldest collecting group is represented by the specimens showed in table 1, which are rough diamonds currently kept in the museum storerooms except for sample No. 13097. Within this group it is interesting to focus on the analysis of sample No. 826, which is preserved in its original glass jar (whose lid

Collection	Sample No.	Location	Containers	Museum Tags	Sample Notes
Magistero	834	storerooms	glass jar (not openable)	2	rough specimens
	835			1	
Capacci	13098	storerooms	storage box	1	rough specimen
	13100		glass jar (not openable)	1	8 very small rough specimens in a glass jar
Ciampi	830	storerooms	glass jar (not openable)	2	rough specimens
	831			2	
	832			2	
	833			2	
Magistretti	16842	gemstones cabinet	display stand	-	cut specimens
Giazotto	42884	storerooms	storage box	-	rough specimens
	42885				
	42886				
	42887				
	42888				
	42889				
	42890				
	42934				
	42935				
Koekkoek	43372	storerooms	plexiglass box 2,5 cm	3	micromounts
	44911			3	
Scuola della Moda	1969	storerooms	storage box	-	20 very small rough specimens
Mineralientage München	47629	storerooms	storage box	-	rough specimen

Tab. 2. Overview of the Natural History Museum's mineralogical collections including diamond specimens.

is not openable) along with two exhibition labels, one paper tag, and a small leaflet with handwritten notes (fig. 1). These records highlighted how this sample was part of the museum collections long before the 20th century. In fact, it had already been catalogued in the fourth volume of the 19th-century "Catalogo della Mineralogia e della Orittologia" (1845, No. 8805). In this catalogue the specimen was described as a "diamante di f. sferoidale sestuplata", which was on display on shelf No. 57. The description then reported a further inventory number (No. 3683) referring to a previous museum register compiled in 1820. Here, the diamond specimen was defined using the same words that can be read in the 1845 catalogue. Visitors could observe this sample on the top of shelf No. 4. It is interesting to note the presence of a third catalogue number (No. 536) that referred to the museum inventory made in 1793. In this volume, the specimen we are analyzing was defined as a raw diamond, which had the shape of a rectangular octahedron. Its facets were divided into three small triangular and somewhat convex planes that formed a solid of twenty-four curved faces. The 18th-century catalogue reported as the diamond specimen was included in a lotto of 19 minerals that William Thomson (1761-1806) sent to the Imperial and Royal Natural History Museum, on the occasion of one of the many mineralogical exchanges that the English naturalist had with the Florentine institution in the last decade of the 1700s (see archive 5). The analysis of the archival documents relative to the diamond specimen No. 826 clearly illustrates how the biography of a museum object gathered meanings that would otherwise remain unknown, through the investigations of the relationships that the latter formed with people during its collecting process. This multidisciplinary approach therefore links not only a particular museum object to the history of the collections in which it is preserved, but also to a broader historical and scientific culture.

Fig. 2. Diamond sample No. 16842, Magistretti Collection.

Excluding the samples listed in table 1, all the other diamond specimens kept in the Mineralogical and Lithological Section of the Natural History Museum of the University of Firenze are part of different collections as shown in table 2. For instance, two samples – i.e. a carbonado from Brazil (No. 834) and a specimen from Cape of Good Hope (No. 835) – belong to the aforementioned Magistero Collection. These raw and rough diamonds are currently kept in the museum's storerooms and are preserved in their original glass containers whose cork lids cannot be opened.

Other diamonds specimens are then part of the Capacci Collection, which is a heterogeneous collection encompassing various scientific books and 1221 mineralogical specimens donated by the heirs of the engineer Celso Capacci (1854-1929) to the Natural History Museum in 1933 (Cipriani et al., 2011; Poggi et al., 2012; Fagioli, 2018). Within Capacci's mineralogical collection, we note the presence of a raw diamond specimen (No. 13098), which is an octahedron isolated crystal, along with a glass jar containing diverse small and colored diamonds (No. 13100). Both the sample and the jar have maintained their original labels bearing the words "Donazione Eredi Capacci" and a brief description of the displayed specimen. As an example, the tag No. 13098 defined the sample as a "raw diamond", and then provided data about its weight ("gr. 0,204"). It can also be noticed that the paper label No. 13100 described the sample as composed by "three very small diamonds". However the jar in which these specimens should have been stored, contains 8 tiny diamond specimens. At the current state of research, there is no further archival documentation relative to Capacci's mineralogical collection that could ascertain the correct number of diamonds associated with sample No. 13100.

In 1938, after long negotiations, the Natural History Museum acquired the mineralogical collection belonging to the engineer Adolfo Ciampi (1876-1934), who was the former director of the Ribolla and Castelnuovo mining sites and a technical inspector for the Società Alti Forni in Piombino and the Società Toscana di Industrie Agricole e Minerarie (Pelloux, 1935; Ridge, 2013; Ranieri, 2016). Ciampi's collection encompassed 1000 fossils and more than 5200 mineral specimens. Most of them were extracted from the Sardinian mines of Monteponi and Calabona, while others were carved out from the Tuscan mines of Amiata, Gavorrano as well as from the mining deposits on Elba Island. Ciampi described his mineralogical collection in a typewritten catalogue, which was accompanied by a register cataloguing the mineralogical specimens according to their species and varieties in alphabetic order. The samples were then ordered in accordance with the classification for

19 classes established by Giovanni D'Achiardi (1872-1944), who was Ciampi's professor of mineralogy at the University of Pisa (Sartori, 1985). Ciampi's mineralogical catalogue (CC) briefly described the samples, reporting their name and geographic provenance. Mineral sizes and the monetary value of the single specimens were penciled on the margins. Four diamonds were listed in the carbon mineralogical section of the catalogue (7th Group, Carbon). Sample No. 830 (CC No. 140) was described as a transparent diamond from South West Africa, while sample No. 831 (CC No. 500) as a black bort diamond. The last two samples were catalogued as a twinned and transparent diamond from New Rush (South Africa, No. 832-CC. 5047), and as a carbonado from Minas Gerais (Brazil, No. 833-CC. 499). The original museum labels, which are still preserved in the Historical Archive of the Mineralogical and Lithological Section, reported the aforementioned catalogue descriptions. Cipriani et al. (2011) rightly pointed out how the exchange of minerals between natural history museums was a well-established practice in the 20th century to acquire specimens from other national or international areas. In this regard, the naturalist Guido Carobbi (1900-1983) (Cipriani, 1988), as director of the Natural History Museum, began in the postwar period the negotiations for a mineral swap between the Florentine institution and Luigi Magistretti (1886-1958), who was an engineer, collector and a founding member of the Italian Mineralogical Society (Bianchi, 1959). The negotiates between Carobbi and Magistretti lasted one year (June 1945-1946) due to the lack of agreement on the economic value of the minerals involved that in the exchange. The final agreement provided that Magistretti would have received from the Natural History Museum 13 mineralogical specimens for a total amount of L. 1805, while Carobbi would have acquired 46 minerals whose value exceed L. 113.170. Among them, there were 17 cut stones and a diamond specimen (No. 16842), which is now on display in the collections of the Mineralogicaland Lithological Section (Poggi et al., 2012) (fig. 2).

In the late 1980s, the Natural History Museum purchased 416 mineralogical specimens from the physicist Adalberto Giazotto (1940-2017). This collection is one of the most important mineralogical acquisitions made in the museum's history because it encompasses minerals of great scientific and aesthetic value, which have been the core of an exhibition that opened in 2009 and lasted more than ten years (Pratesi & Pezzotta, 2008; Cipriani et al., 2011; Poggi et al., 2012). Giazotto's collection included seven diamond specimens coming from South Africa (Nos. 42884-42890) and two samples from Namibia (Nos. 42934-42935). These diamonds are currently stored in the museum's deposits.

In 1990, the mineralogical collection belonging to the Dutch collector Nicholas Koekkoek (dates uncertain) was acquired. It encompassed more than 3500 micromount minerals (i.e. specimens of very small size that are best seen using a microscope) for a total of 2500 different species that have been studied and characterized over the years (Poggi et al., 2012; Steinhardt, 2013; Bindi, 2020). Among these unique specimens, there were two diamond samples: an isolated crystal coming from Zaire (No. 43372) and a diamond crystal on kimberlitic matrix from the Russian Republic of Sakha (No. 44911) (fig. 3). These samples are not on display and are currently preserved in their original plastic boxes on which the paper labels in Dutch are still visible. Other twenty diamond specimens (No. 1969), very small

Fig. 3. Diamond sample No. 44911, Koekkoek Collection.

in size and coming from the same geographical area, were purchased through the mineral trader Soboleva (dates uncertain). Before to be acquired by the Natural History Museum, these specimens were part of a naturalistic collection housed at the European Institute of Design (IED) in Firenze.
The most recent acquisition is represented by a cubic diamond from Zaire (Bakwanga, No. 47629) purchased in 1996 at the Mineralientage München, an international trade fair for minerals, gems, and fossils. The purchase of samples on the occasion of fairs and exhibitions plays a pivotal role in the enrichment of naturalistic collections with new specimens recognized, also by the market, of certain collecting and scientific interest. In this regard, since 1984, the Natural History Museum of the University of Firenze have acquired more than 600 new specimens during international trade shows.

Sample No.	Location	Containers	Sample Notes
13101	storerooms	storage boxes	rough specimen
13102			cut specimen
13103			rough specimen
13104	gemstones cabinet		cut specimen
13105	polymorphism cabinet		rough specimen
13106			cut specimen
13107			rough specimen
13108			
13109	storerooms		
13110	polymorphism cabinet		cut specimen
13111			rough specimen
13112			
13113			
13114			
13115	storerooms		
13116			
13117			
13118	Mohs hardness cabinet		
13119	storerooms		
13120			
13121			
13122			
13123			
13124			
13125			
13126			
13127	polymorphism cabinet		
13128	storerooms		
13129			
13130			
13131			
13132			bort
13133			carbonado

Tab. 3. The Liebmann diamond collection preserved at the Natural History Museum of the University of Firenze.

The Liebmann collection

The largest diamond collections preserved at the Natural History Museum of the University of Firenze was acquired in the late 1860s. It comprises 33 samples (Nos 13101-13133), some of which are currently on display, while others are kept in the museum storerooms (tab. 3; fig. 4). This collection was inventoried for the first time in the second volume of the museum catalogue compiled between 1860 and 1874. The catalogue description reported that in "Aprile 1869. Una collezione di diamanti montati su un mobilino foderato di velluto e sostenuti da spilli a grappa di metallo composta nel modo qui appresso, dono del Sig Aug. Liebemann". The catalogue then listed and briefly described 28 diamond specimens, indicating their color and whether they were cut or rough stones. These data were collected from a letter that the donator sent to the museum's director Igino Cocchi (1828-1913) (Tarantini, 2000; Bruno & Sassi, 2011) on 22 February 1869. Cocchi was informed that the diamonds would have been delivered in Firenze without the presence of any chaperone. Exhibition tags, a velvet case, a stand and a glass bell would have been sent in a box that had to be opened by customs only in the presence of Cocchi. The diamonds would have been shipped via 9 letters of cargo. In this way the letters' contents would not have been subject to customs inspection, arriving thus undamaged in Firenze. After having warned Cocchi to open the letters with extreme caution, Liebmann expleined how to reassemble the display case: every diamond had to be mounted on a pin, removable by a small spring, and each pin was assigned a number and an exhibition tag. The pin had then to be positioned on the case through a small hole in the velvet and in front of it had to be placed the corresponding paper label. The case contained three rows of pins and each one was set to display 11 diamonds. Liebmann then recommended Cocchi to brush the velvet that would probably have been dusty because of the packaging, and to clean the glass bell as well. He also reminds Cocchi to inform the customs in Firenze to open the box only in his presence to avoid losing the labels. At the end of his letter, Liebmann enclosed a sketch to make it easier to reassemble the diamond display case (see archive 6). Apart from the diamond specimens, no other items sent by Liebmann to Cocchi have been preserved.

Liebmann's letter included a list in which the diamonds were numbered and described (see archive 7). This list offers interesting insights into the 19th-century diamond collecting. For example, no data were provided about the weight, size and carat of the specimens. But their cut and color were described in detail. In this regard, it is worth noting the use of the term "klivé" (Nos. 23-26 of Liebmann's list corresponding to Nos. 13128-13131) to indicate the diamond cleavage, and the expression "seconde eau" (Nos. 3, 3 bis and 24 of Liebmann's list corresponding to Nos. 13103, 1304 and 13129) to define the diamond quality. As stated by Tondi (1827) and Castellani (1870), the quality of a diamond depended on its color, purity, and transparency. The best-quality specimens ("première eau") were perfectly colorless, pure, transparent and without stains or inclusions. If the diamonds showed some slight defects and imperfections, they were defined as "seconde eau" as in the case of Liebmann's specimens. The expression "troisième eau" finally indicated the poorest diamond quality, i.e. a specimen full of inclusions or a dyed stone. The lack of information on the economic evaluation of the diamonds, which was carried out ex post in the 1943 museum catalogue, revealed how the samples sent by Liebmann to the Natural History Museum had only a scientific collecting interest. Cocchi wished to enrich the mineralogical collection with new specimens that could display to scholars as well as to the general public diamond types, cuts, and quality.

As stated in the Introduction, one of the goals of this paper was to bring the figures of less known or unknown scholars, collectors and traders out of a "space of invisibility", thanks to the reconstruction of the diamond specimens' biographies preserved at the Natural History Museum of the University of Firenze. For example, since the acquisition of his diamond collection in April 1869, Liebmann's biography seemed to be shrouded in mystery because it was impossible to retrieve any information about his life (Cipriani et al., 2011; Poggi et al., 2012). In this regard, the recent analysis of the original handwritten documents has revealed a transcription error of Liebmann's name (i.e., Liebemann instead of Liebmann) that has been reported from the first 18th-century description of his diamond collection to the 20th-century museum inventories. The same typo has occurred on the diamonds' display labels. The correct transcription of Liebmann's name allowed us to retrieve some fragmentary but relevant information about his profession (he was a diamond cutter), and the place where he worked (his atelier was located in Paris, in Rue des Petites-Ecuries 31). Liebmann was also one of the exhibitors at the Universal Exposition held in Paris in 1867 (AA.VV., 1867), where he exposed his diamond cutting machine. The acquisition of Liebmann's diamond collection can therefore be considered as an important event in the history of the mineralogical collections preserved at the Florentine Natural History Museum. It was in fact discussed in the annual museum director's report to the local Superintendence and Liebmann was awarded of a medal with the portrait of Galileo Galilei (see archive 8).

Fig. 4. Part of the diamond specimens belonging to the Liebmann collection.

CONCLUSIONS

The historical-scientific investigation of the diamond specimens preserved at the Mineralogical and Lithological Section of the Natural History Museum of the University of Firenze, and in particular the analysis of the Liebmann collection, has pointed out how object biographies in museum contexts can improve the management of poorly documented mineralogical collections, thus avoiding what in the museological literature is often defined as "curation crisis". This expression, which is mainly used in American archeological museums, defines the issues in preservation and valorization of artifacts supplied with insufficient information or unorganized archival material (e.g. Tinkcom, 2019). As rightly pointed out by Friberg and Huvila (2019), writing collection biographies provides a better understanding of the scientific and collection history behind the single object.

As showed in this study, objects biographies can provide interesting and useful insights to avoid potential "curation crises" also in diverse museum contexts, such as the historical collections kept in natural history museums. This multidisciplinary approach shows new opportunities for involving hardly used mineralogical or gemological collections in innovative research projects or exhibitions as the diamond exhibitions organized by the Parisian Muséum National d'Histoire Naturelle and the Scuderie del Quirinale in Rome in early 2000s (Bari, 2001; Bari et al., 2002).

Future research on the diamond samples preserved at the Natural History Museum of the University of Firenze will focus on their characterization with FT-IR spectroscopy. As stated by Artioli (2013) diffraction-based techniques are fundamental tools for the characterization and correct understanding of various materials, including those relevant for the heritage field as geological, mineralogical and gemological assets. These techniques, as rightly pointed out by Cayla (2014), Balletti and Guerra (2015) have gradually entered different phases of geoheritage management, playing a pivotal role in compiling catalogues and museum inventories, planning and developing research activities, and promoting geo-mineralogical collections through permanent, temporary and touring exhibitions.

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