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Geology in the inventories of the Museum of Natural History of Florence

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ABSTRACT
Selected inventories and catalogues hosted at the Museum of Natural History of the University of Florence are here presented to illustrate the changes in perspective over the natural world and Earth's history as seen from museum curators during the passage from late Renaissance to early Modern Age and through to the birth of modern geology, from eighteenth to nineteenth century. This study deals with the following documents: 1) the list of minerals and fossils brought by Nicolaus Steno from Pisa to Florence in 1672, to start a new museum for Grand Duke Cosimo III, of the Medici dynasty, 2) the first inventory of the museum inaugurated in 1775 by Peter Leopold of Lorraine, written in 1793, 3) a list of mineralogical specimens sent from Deodat de Dolomieu to the museum director Felice Fontana, around 1789, and 4) a page on new acquisitions of fossils registered in 1813 by the curator Filippo Nesti, first professor of geology in Florence.

Key words:
early Modern Age, Medicean collections, history of geology, museum catalogues, inventories.

RIASSUNTO
Geologia negli inventari del Museo di Storia Naturale di Firenze

Alcuni inventari e cataloghi del Museo di Storia Naturale dell'Università di Firenze rispecchiano i cambiamenti di prospettiva sul mondo naturale e sulla storia della Terra propri dei curatori museali durante il passaggio tra la fine del Rinascimento e l'inizio dell'età moderna, fino alla nascita della geologia moderna, tra Diciottesimo e Diciannovesimo secolo. Questo studio tratta i seguenti documenti: 1) la lista di minerali e fossili portati da Niccolò Stenone da Pisa a Firenze nel 1672, per principiare un nuovo museo per il Granduca Cosimo III de' Medici; 2) il primo inventario del museo inaugurato nel 1775 da Pietro Leopoldo di Lorena, scritto nel 1793; 3) una lista di campioni mineralogici mandati da Deodat de Dolomieu al direttore del museo Felice Fontana, intorno al 1789; 4) una pagina relativa a nuove acquisizioni di fossili registrate in ingresso nel 1813 dal curatore Filippo Nesti, primo professore di Geologia a Firenze.

Parole chiave:
prima età moderna, collezioni medicee, storia della geologia, cataloghi museali, inventari.

INTRODUCTION

The word "inventory" comes from the Latin word "inventarium", meaning a "list of what is found", through the French "inventaire". While inventories are very basic lists, by "catalogue" it is generally meant a series of longer descriptions of individual items of a given inventory. Inventories and catalogues disclose the way in which items are ordered, revealing something of the mind of the Ordinator in terms of the underlying taxonomy. This concept applies to museum collections more than anything else, as the arrangement imparted to collections guides museum activities, from new acquisitions to curatorship, and from research to outreach through exhibits and public events. In the history of museums, valuation is often the first reason for jotting down inventories of specimens hosted by an institution. At given times, curators are thus asked to write a list of items owned by their institution. As taxonomies and the market change, older museum inventories and catalogues become a precious primary source to reconstruct history. In strictly monetary terms, they are important to see how the value of the hosted collection has changed and the conservation state. For the historical mind, an inventory is a means to identify past taxonomies when the curator of a scientific museum approaches older inventories and catalogues, in interpreting their significance he becomes a historian of science. The older the hosting institution, the more this becomes a necessity. This is the case of

many Italian scientific museums that keep collections that have amassed through centuries of research. An example occurs at the Museum of Natural History of the Florence University (MSN-FI), in Tuscany, where inventories of mineralogical and paleontological collections reveal successive historical passages, starting from the natural philosophy professed during the early Modern Age, to the birth of modern geology and its diffusion in Italy in the first quarter of the nineteenth century, to the modern scientific approach. This paper presents four inventories of specimens hosted at MSN-FI, written at significantly different times. It attempts to show how these delineate four basic steps in the perspective with which learned men in Florence have looked at the natural world what today concerns the science of geology in the wide sense, including mineralogy and paleontology. Some given specimens listed in the inventories are still recognised among modern digitally-catalogued collections, underlining how past curatorship succeeded in preserving the objects of our changing taxonomies, for future generations to exercise their vision of Earth's history.

A GEOLOGICAL INVENTORY FROM THE EARLY MODERN AGE

The oldest MSN-FI inventory available is a list of specimens brought to Florence by Nicolas Steno in 1672 for Grand Duke Cosimo III (born in 1643, reigning 1670-1723), to form the nucleus of a new museum. Born in Copenhagen in 1638, Steno had studied there until 1659 and had completed his education in Amsterdam and Leiden in 1660-1661, becoming famous at an early age for his skill in animal and human dissections and for the anatomical discoveries that followed. At a public dissection in Paris, in 1665, Steno had proved René Descartes wrong on the nature of the brain and his notoriety reached. Shortly afterwards, he moved southward and settled in Florence, at the Medici court (Scherz, 1956; Cutler, 2003). In Tuscany Steno collected empirical evidence on the nature of minerals, fossils, sedimentary strata and mountains and, in the brief interval of three years, composed two influential essays, published under the tutelage of Grand Duke Ferdinand II (1601-1670): "Canis carchariae dissectum caput" (Stensen, 1667) and "De solido intra solidum naturaliter contento dissectionis prodromus" (succintly, the "Prodromus", Stensen, 1669). In the first essay he famously proved the marine origin of fossils, such as mollusc shells and so-called "tongue stones" (or *glossopetrae*), while in the second he illustrated the basic geometric principles he followed to reconstruct the history of the globe through the empirical study of sedimentary strata (Dominici, 2009). Based on solid mechanicistic and experimental grounds (Clericuzio, 2020), his work on natural history is regarded as one of the fundamental steps forward from the Aristotelian philosophy of the Late Renaissance into early modern natural philosophy, passing through Cartesianism. The science inaugurated by Steno, one based on observation and geometry and today called "geology", became known throughout Europe, also thanks to contemporaneous English translations (Rappaport, 1997; Rudwick, 2014). Steno's list of 1672, known as "Indice" from a copy transcribed in 1763 by Giovanni Targioni Tozzetti (Dominici & Cioppi, 2018), is thus an important means to understand if and how an analogous change had occurred in the taxonomy of geological specimens (Fig. 1). To understand this step, the content of the "Indice" can be compared to preceding taxonomies as revealed, again, by an inventory.

Steno's "Indice"

The Gran-Ducal collection of natural history, annex to the botanical garden in Pisa, had become famous already at the end of the sixteenth century "not only [for] its minerals and fossils, but also [for] animals, birds and fishes", in the words of a contemporary (Tongiorgi Tomasi, 1991). Greatly expanded by the Franciscan friar Francesco Malocchi (Tongiorgi Tomasi, 1991; Tchikine, 2020), visited by students of the Pisa University and by learned men not only for its curiosities, but also for its pedagogic value, the medicean collection of natural history basically occupied a single large room with two windows, one facing the Arno river, the other the Duomo of Pisa. When Malocchi died,

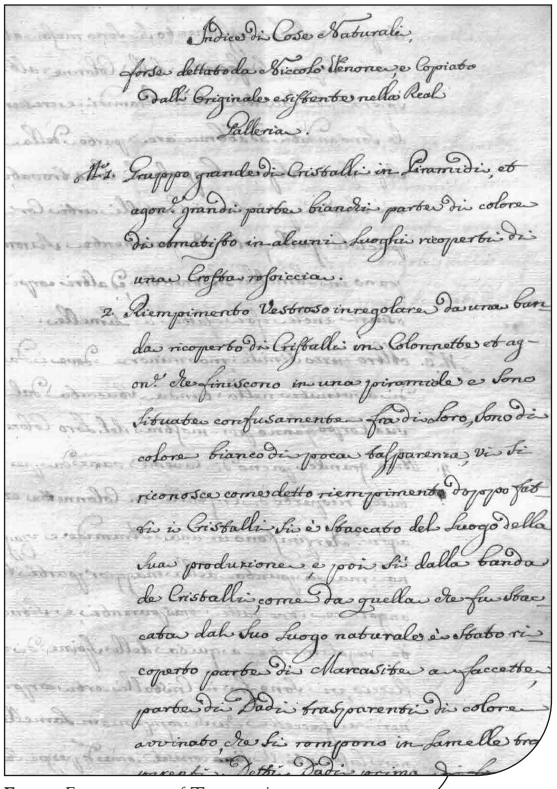
Indice di Cose Naturali,
forse dettato da Niccolò Veronese e Copiato
dalli Originali esistenti nella Real
Galleria.
N.1. Sasso grande di Cristalli in piramidi, et
agon.i grandi parte bianchi parte di colore
di ametisto in alcuni luoghi ricoperti di
una Crosta roficcia.
2. Riempimento Vetroso irregolare di sua cava
da ricoperto di Cristalli in colonnette et ag-
on.i Re finiscono in una piramide e sono
situate confusamente fra di loro, sono di
colore bianco di rocca trasparenza, ve si
riconosce come detto riempimento dopo fat-
to i Cristalli si è staccato dal luogo della
sua produzione e poi si dalla banda
de Cristalli come da quella de fu stac-
cata dal suo luogo naturale è stato ri-
coperto parte di Marcasite a faccette
parte di Dadi trasparenti di colore
avvinato, ne si rompono in lamelle tra

Fig. 1. Frontispice of Targioni's transcription of Steno's "Indice", with long descriptions of items 1-2 (groups of quartz crystals).

the curatorial role was undertaken by another friar, Matteo Pandolfini, who wrote a complete inventory in 1626. The collection remained largely unaltered in the following decades, so that Pandolfini's list is a precious document to understand what Steno found in Pisa at his arrival in 1666 and what was still there when Cosimo III appointed him to select and bring to Florence the best specimens. As it was customary in late Renaissance Wunderkammer (Findlen, 1994), specimens in the Pisa gallery filled every available space, from the ceiling to the walls and the floor. Walls and the ceiling were largely occupied by hanged zoological and botanical specimens, while shelves hosted also minerals and fossils. Zoological, anthropological and ethnographic specimens were on the floor. Curiosities were interspersed, confirming that the disorder of the Wunderkammer coexisted with pedagogic purposes as annex to the Pisa University (Tongiorgi Tomasi, 1988). Locked in shelves and chests drawers, leaning on the walls, were the most precious among minerals and fossils, together with marine shells and corals. Around the winter 1671 and in the following spring 1672 Steno worked at an inventory in Pisa, briefly listing what was on the locked shelves. At the end of the list (one closely matching that of the 1626 inventory), dated 7 May 1672, he briefly informed that he had selected about 250 specimens of minerals, fossils, shells and corals to bring to Florence, promising he would write there a "detailed catalogue of taken things" ("particulare catalogo delle cose levate", De Rosa, 1986). Some of the chosen specimens came from locked shelves (the "silver mines" for example), but others he surely took from unlocked spaces, such as "islebian fishes", corresponding to one only element in Pandolfini's inventory ("black stone with a fishbone", Tongiorgi Tomasi, 1991: 300).

In the list preserved at Florence Steno gave a detailed description of each specimen, as he had promised. Firs, he listed 38 quartz specimens, then 76 groups of minerals including marcasite and pyrite, 24 shells, 51 stones with fossil shells, 5 fossil bones, 31 heterogeneous objects and 40 corals (Scherz, 1956; Dominici & Cioppi, 2018). The list of the "Indice" follows the same organisation that, in the "Prodromus", he had imparted to Earth's solid bodies: after discussing "strata of the Earth" and "mountains", he had presented "angular bodies", starting from quartz, following with pyrite, haematite and diamond (Stensen, 1669: 36-53), then shells of marine organisms (Stensen, 1669: 53-57), then the same in the fossil state (Stensen, 1669: 57-61), then plants and remains of terrestrial animals, also in the fossil state (Stensen, 1669: 62-63).

Since Steno, with few exceptions, took to Florence mainly minerals and fossils, and among zoological specimens he selected only mineralised ones (molluscan shells and corals), the museum to be started in Florence plausibly concerned a gallery of minerals, rocks and fossils. A new form of Metallotheca, in the sense given to

Fig. 2. Engraving by A. Donati and A. Lamberti, showing the Royal Museum during the late eighteenth century, shortly after its opening to the public.

it by Michele Mercati in the last two decades of the sixteenth century, when he displayed in Rome at the Vatican his collection of "metallic things" (Accordi, 1980), or a modern "Musaeum Metallicum", like the one illustrated in paper by Ulisse Aldrovandi in Bologna. These late Renaissance museums were not mere cabinets of curiosities, aiming to be places where to philosophize about nature (Findlen, 1994). Underlying taxonomies still suffered however from the necessity to compare the natural world with the lessons learned from classic philosophers, while the museum that Steno wanted to assemble was one guided by geometric relationships among "solids contained in other solids", conforming to the paradigms of post-Galilean philosophy.

THE CHAIN OF BEING

The Florentine Museum of Physics and Natural History – at first named Laboratory (Gabinetto) of Physics and Natural History to underline its experimental mission for the advancement of knowledge – opened to the public on 22 February 1775. Built in Palazzo Torrigiani, near Palazzo Pitti where the court lived, the new museum was born under the auspices of Prince Peter Leopold of Lorraine. Born in Vienna and young successor of his father Francis Stephen of Lorraine, first Grand Duke of Tuscany after the end of the Medici dynasty in 1737, Pietro Leopoldo brought to Florence the spirit of the Enlightenment. Through new forms of scientific collections and a tight connection with the territory, the museum aimed at the dissemination of knowledge for the public good. The exhibition offered an overview of all scientific disciplines and all aspects of nature, the building allowing to the museum to develop vertically as much as horizontally (Fig. 2). From the ground floor, hosting minerals and fossils, the exhibition continued on the first floor with plants and animals, then with waxes finely reproducing parts of the human body in natural size, until reaching the astronomical observatory on the top of the building. The museum was the manifestation of the "chain of being" as presented by the authors of the "Encyclopedie" in 1754: "Everything in nature is linked together" since "beings are connected one with another by a chain of which we perceive some parts as continuous, though in the greater number of points the continuity escapes us," and the "art of the philosopher consists in adding new links to the separated parts" ("Encyclopédie ou dictionnaire raisonné des sciences, des arts et des métiers", 4, p. 294, article "Cosmologie", in Lovejoy, 1936: 232). The museum, which included laboratories where experiments in physics and chemistry were carried out, was a creation of the Prince, with a director overseeing its realisation and administration. For this role Peter Leopold had chosen Felice Fontana (1730-1805), born in Trento, known for his studies on physiology and Professor of Physics at the Pisa University since 1766. This choice he made at the expenses of the other candidate, the Florentine Giovanni Targioni Tozzetti (1712-1783). Authors of six volumes of travels, Tozzetti had a profound knowledge of the history and physical geography of his region and had inherited Steno's lesson on the historical meaning of strata and landforms (Dominici, 2009). He had stronger connections with the Florentine cultural environment and had worked for years to bring order to the collections of natural history hosted at the Uffizi, authoring the "Catalogue of natural productions hosted at the Royal Gallery" (Cioppi & Dominici, 2011; Cipriani et al., 2011; Dominici & Cioppi, 2018). In the end, however, he had lost the competition against Fontana, who was younger and active, more modern and better connected with the Austrian court (Contardi, 2002).

The 1793 inventory

On 21 February 1775, the Grand Duke ordered the inventory of what was hosted in the museum. This followed a precise arrangement indicating for each entry the generic nature, its location (room and shelf) and the number of specimens. Officers involved were Giuseppe Pigri and Giuseppe Panzanini, Minister of the Office of Revision and Syndicates, who compiled the inventory, and Alessandro Cerchi and Bartolomeo Coppini, who materially wrote down in calligraphy a good copy. The result was a topographic inventory offering an idea of the amount of specimens both hosted and exhibited, but not allowing to reconstruct the history of the specimens, with few exceptions. Ten years passed by before a true catalogue was laid down, the consequence of the order of the Grand Duke, on 19 November 1789. This was aimed not just to list what was in the deposits and what was exhibited, but also at bringing to light what missing links of the "chain of being" needed to be integrated with new acquisitions. Officially starting in May-June 1793, the task to organise the exhibition and the relative catalogue was given to Attilio Zuccagni (1754-1807), prefect of the botanical garden and the museum. The inventory of the

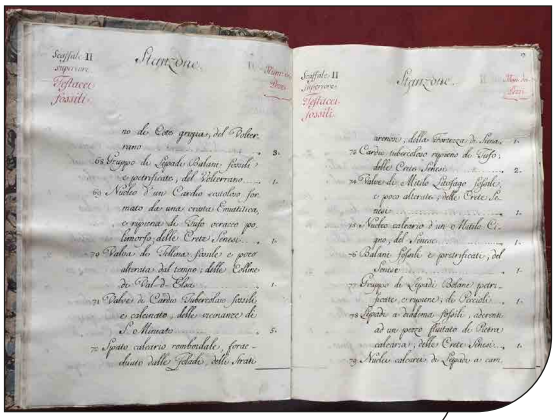

Fig. 3. Pages of the 1793 inventory with short descriptions of fossil bivalves without reference to Linnean taxonomy.

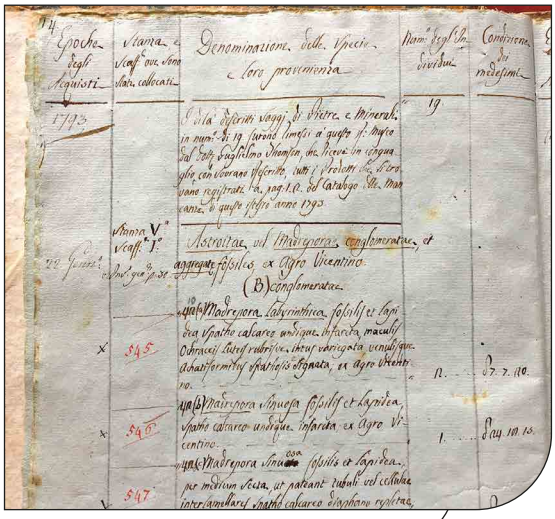

Fig. 4. Page from a volume of new acquisitions, dated 1793. Descriptions of fossils are slightly improved with respect to inventories of older collections.

animal and vegetal kingdoms was written by the botanist and younger keeper Giuseppe Raddi (1770-1829), while anatomical and mineralogical specimens were inventoried by Giovacchino Frosini, an employee also charged of labelling the specimens. Short descriptions of paleontological and mineralogical objects occupied eight volumes, one for each room of the exhibition, only seldom referred to classificatory systems used at the time, such as those of Wallerius, Kirwan and Born. Between one volume and another, as new specimens were acquired, additional catalogues called "Appendices" or "Augments" were written. Descriptions of fossils were very superficial and never adopted the binomial system of Linneaus (what Zuccagni did instead with botanical specimens, Nepi, 2017). Localities of provenance were seldom detailed, and only wider sedimentary basins were mentioned, like for example "Casentino", "Senese" or "Valdarno" (Fig. 3). The situation improved only slightly with new acquisitions, with specimens sometimes bearing a Latin binomial attribute, but again lacking a precise geographical location of provenance (Fig. 4). These descriptions were sufficient for the scopes of the "chain of being" outlined in the "Encyclopedie", written at a time when geological matters were included ini the field of "Cosmology" but were unfit for the new forms of human knowledge that had emerged from the ashes of the French Revolution (Rudwick, 2005).

ECHOES OF REVOLUTIONS

Deodat de Dolomieu was no ordinary man. Born in 1750 in the Dauphiné from a noble family, he was sent to Malta at the age of two, to be raised and educated as a Knight of Malta. At the age of 18, following the killing of a comrade in a duel, he was sent to prison and had lost his grades. Freed and rehabilitated thanks to the royal and papal protection, he spent his early twenties in France, where he studied chemistry and physics, waiting to become Knight Commander. In Paris he became friend with Louis-Jean-Marie Daubenton (1716-1800), collaborator of Luis Buffon for the many instalments of the "Histoire Naturelle" (Buffon, 1749-1789), and the Duke Alexandre de La Rochefocauld (1743-1792), nobleman traveller and patron of some of the leading figures of the science of physical geography, such as Horace-Bénédict de Saussure (1740-1799) and Nicole Desmarest (1742-1815), both familiar with Italian geology (Rudwick, 2005; Dominici, 2009). Daubenton and Rochefocauld helped Dolomieu to organise a trip to Sicily to learn about extinct and active volcanoes. Dolomieu was in Sicily in 1781 and in the French Pyrenees in 1782, studying the structure of the mountain chain. Once back in Italy, in 1784 he visited the museum in Florence, where he returned a second time in 1786, expressing an enthusiastic opinion on the institution, its director and the exhibition, from the point of view of a learned contemporary, one of the few modern geologists who could judge: "The most beautiful natural history cabinet that has ever been formed, and the most magnificent collection of physical machines attract the naturalist there and make his stay infinitely interesting (7 September, 1786). […] Fontana is the most deeply educated man existing in Italy. From what he knowns in the different sciences, there would be enough to make four famous men. […] It is thanks to him that the finest anatomical models that exist anywhere have been achieved. 22 large rooms are full of these wax preparations, which, by color, freshness and accuracy, compete with nature itself. […] There are thirty chambers intended for other parts of natural history; only one is neglected, the collection of rocks, and it is precisely the one that I pursue with the most ardor (25 September, 1786)" (translated from Lacroix, 1921: 166, 168-169).

In 1786 Dolomieu was not yet referring to his scientific interests as "geological", but his approach to the mineral world was not simply that of the chemist and the crystallographer, even less that of a collector. This was clear as early as 1782, when in a few lines on the geology of Sicily his attitude to make conjectures on the history of globe had emerged: "Etna is not yet known to physicists, chemists or naturalists. […] Me, Monsieur, whose trip to Sicily was mainly aimed at observing this volcano, to travel which takes more than a month, on the flanks that make the outline of its vast base. Hammer in hand, I have tried all the lava currents that I have encountered, [but] I have collected only particular, isolated facts, and I could only hazard glimpses and conjectures. What confidence can be inspired in the relations of travelers who have confined themselves to climbing the mountain and enjoying the spectacle of an immense and superb view on its summit? Sicily has extinct volcanoes accompanied by singular circumstances; sulfur mines which are not the product of

volcanoes; mines of rock salt which are not formed by lakes of salt water abandoned by the sea; petroleum oil and pissasphalt fountains; a large quantity of cold and thermal mineral waters, none of which have been analyzed; mines of alum and green vitriol, mines of silver, copper, lead, mercury and antimony of which there is not a single one now in operation; a lot of dry bitumens of different kinds; jaspers and agates in immense quantities and in blocks bigger than anywhere else" (letter written on 9 June 1782; original text in Lacroix, 1921: 94-95).

The need for a new science named "geology", the terrestrial analogue of "cosmology", had been first expressed in "Letters on mountains" of 1778 by the Swiss natural philosopher Jean André De Luc (1727-1817). First denoting the field of the Theory of the Earth, the meaning of "geology" at the end of the century moved away from describing the speculative attitude of "world makers" (pioneered by Steno, Rappaport, 1997) to indicate a historical science in the hands of physical geographers such as Desmarest, Saussure and Dolomieu. Author of important treatises on the geology of Sicily and southern Italy, Dolomieu had amassed in Malta an imponent collection of mineralogical and geological specimens. His support of the French Revolution in 1789 met with the adversity of his family and superiors, impairing his career. In 1790 he planned to send his cabinet to the United States, in exchange for an equivalent mineralogical collection instructive of the geology of the new continent, in his plan to be sent only at the condition that France "maintain its freedom" (Lacroix, 1921; Rudwick, 2005). The following year he expressed his opinion on mineral collecting in the attitude of a fully-fledged geologist, travelling the world in search for geohistorical evidence, both mineralogical and paleontological, comparing the fossil record with modern analogues: "The Mineralogist who travels through countries that are almost uninhabited should not hope to find there those pieces that make the ornament of cabinets. […] In mineralogy, the existence of each stone is linked to the history of the globe; if by itself it is only of poor interest, it can lead through its relationships to the discovery of the most extraordinary phenomena, it can reveal to us the most unexpected truths. […] Limestone, for example, covers more than a third of our continents: it is the abundance of this stone, the almost always horizontal position of its beds, it is the fossils it contains, which have taught us about the long stay of the sea on our continents: they indicated that this submersion lasted for many ages [siècles], that it was not the effect of a violent cause, but that it was a habitual state, since its deposits accumulated regularly & successively until they formed mountains of more than a thousand toises of elevation [more than 2000 m]; they told us that the climates were not the same then, because the sea fed animals whose analogues are only found in the seas of India" (Dolomieu, 1791).

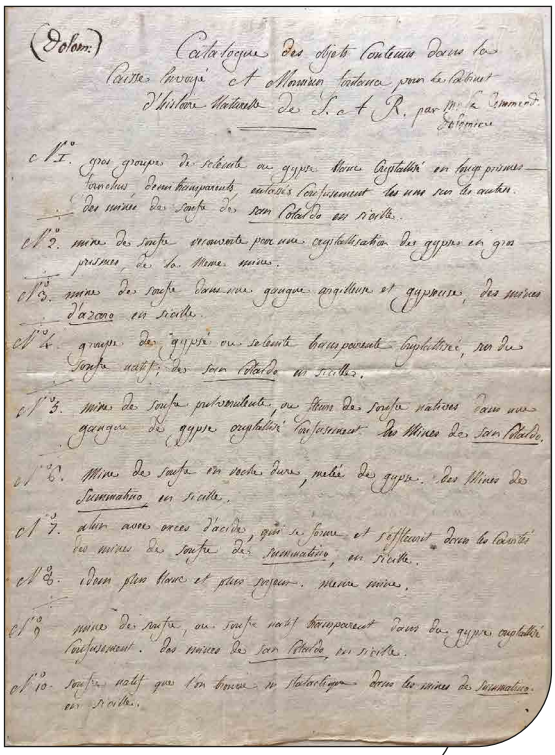

Fig. 5. Frontispice of catalogue of mineralogical specimens collected by Deodat de Dolomieu around 1782 and sent to Felice Fontana in 1788.

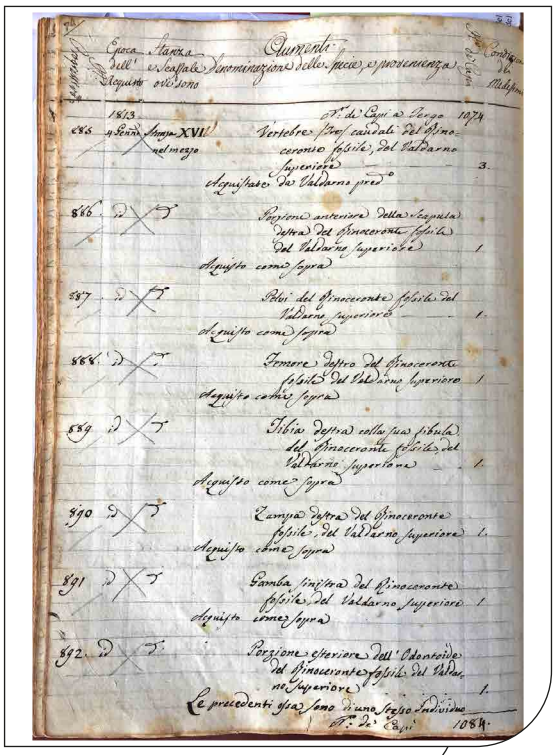

Fig. 6. Page from the volume of new acquisitions of 1813, with descriptions of bones of a fossil rhino found articulated in upper Valdarno.

Dolomieu's catalogue

Around 1788 Dolomieu provided a small collection of mineralogical specimens to the Florence museum. This is testified by a "Catalogue of objects sent to Mr. Fontana for the Cabinet of natural history of H.R.H. by Mr. Knight Commander Dolomieu", including 38 entries, some comprising more than one specimen (Fig. 5). The specimens came from the mines he had personally visited in Sicily (entries 1-23, including selenite, gypsum, alum and bituminous limestones), Calabria (32-33: mica and tourmalines), French Pyrenees (24-30, 32, 34: haematite and manganese), Dauphiné (31, 33-38: mica and tourmalines). Expressing a change in attitude with respect to the natural philosophers who aimed at simply filling the voids in the great "chain of being", in the catalogue Dolomieu detailed which locality each specimen came from, indicating the enclosing rock whenever necessary. As for the classificatory system, the French suggested looking at the "Crystallography of Romé de l'Isle" (entry 15). Knowing the inclination for experimental science impressed by Fontana to the Florentine institution, he sent several additional samples of "bituminous stone from Ragusa" so as "to make experiments" (entry 23), while a "calcareous-argillaceous geode" with small crystals in its inner part would have "indicated how crystals can be artificially made" (entry 30). A new and revolutionary science, directed at "bursting the limits of all historical times, and scorning as it were the brevity of epochs relative to the human species" (Dolomieu, 1796, in Rudwick, 2005), was discreetly making its entrance in the history of the museum, bound to change the way in which fossils would have to be treated.

MODERN GEOLOGY

In 1796, after a stroke that ended his hope for further active fieldwork, Saussure had proclaimed in the "agenda" of a new science that "the life of the "géologue" is divided between tiring and perilous journeys, on which one is deprived of almost all the conveniences of life and varied and profound studies in the cabinet". He also had urged that this new type of naturalist should "compare fossil bones, shells, and plants with their living analogues" to reconstruct "the relative ages and epochs of appearances of new species" (Saussure, 1796; quotes from Rudwick, 2005: 345). Besides Dolomieu, to the younger generation to which Saussure directed his agenda belonged in Paris Jean-Guillaume Bruguière (1750-1798), perhaps the most gifted to carry out the search for modern analogues of invertebrate fossils. Dolomieu and Bruguière, on the different fronts of mineralogy and the study of organic fossils (not yet called paleontology),

Fig. 7. "Islebian fish" described by Steno in 1672, retraced in late Renaissance Medicean collections inventoried in 1626, and in 1793 catalogues.

set out to travel distant continents, both ending their lives from the consequences of their "tiring and perilous" travels (Dominici, 2015). An even younger naturalist with a modern geological mindset had chosen instead the safer life of indoor studies at the newly born Muséum national d'histoire naturelle in Paris. This was Georges Cuvier (1769-1832), another follower of De Luc's lead in the study of mountains, soon diverting his focus on the anatomy of animals, both vertebrates and invertebrates (Dominici, 2017). With the early disappearance of Bruguière and Dolomieu from the scene, Cuvier proved to be very intelligent and swift in taking center stage on the debate on the history of the earth. Starting from 1796, based on his studies of comparative anatomy of fossil elephants (genus *Mammuthus*) and sloths (*Megatherium*), he publicly demonstrated that all fossil quadrupeds belonged to extinct species (Rudwick, 2005, 2014). Instead of travelling to Italy and Africa with Napoleon's army, as done by Dolomieu, he climbed the social and scientific ladder by remaining in Paris and building a network of informants, who brought him knowledge of the paleontological heritage of far-away regions by sending drawing of specimens for a "paper museum". In Florence, his connection was first with Giovanni Fabbroni (1752-1822) (Rudwick, 2005), Fontana's young collaborator (Contardi, 2002). Under a Napoleonic rule, through Queen Maria Luisa of Etruria (the name given to Tuscany in 1801), the Florence museum in 1807 became a school where teachings included Astronomy, Physics, Chemistry, and the chairs of "Botany and Comparate Anatomy" and "Mineralogy and Zoology". The last was given to the young Filippo Nesti (1780-1849), who would adopt classificatory systems following the school of Johann Friedrich Blumenbach (1752-1840) and Georges Cuvier. In 1808, the museum launched a new journal titled "Annals of the Imperial Royal Museum of Physics and Natural History", where Nesti published an inaugural discourse on "Mineralogy" where he criticised the tradition to include the study of "fossil animal remains" under this discipline. He praised instead Cuvierian comparative anatomy, taking a clear stand for the new science of geology, one to be practiced in the field: "The explanation of geological facts is actually an intricate problem that won't be possibly ever untangled. It is however important that the history of fossils is reconstructed in every province where these are buried, and that this history is, as much as possible, described in all the details concerning position, height above sea level, direction of strata, quality and position of surrounding terrains and mountains" (Nesti, 1808).

Nesti was also keeper of the growing geological collections and the principal investigator on the systematics of fossil vertebrates from Tuscany, soon substituting Fabbroni as Cuvier's correspondent. In 1809 the Parisian naturalist came to see the collection with his own eyes, as part of his visit to the newly appointed Grand Duchess of Tuscany, Napoleon's sister Elisa Bonaparte Baciocchi. Nesti guided Cuvier in the field, in particular in the Upper Valdarno area, where most of the "fossil quadrupeds" came from, and on the occasion the two visited he geological collections hosted at the Accademia del Poggio, at the time in Figline Valdarno. Nesti studied the Valdarno fossil megafuna and published his findings in a few papers, connecting his name to the "southern" mammoth, *Elephas meridionalis* which he definitely described in 1825 (Lister, 2011; Dominici & Cioppi, 2018). In 1822, "paleontology" had started as a field of study distinct from geology, and in 1833 Lyell's three volumes of the "Principles" gained geology a wide readership (Rudwick, 2014). In Tuscany, the end of the Napoleonic era coincided with a stop in teaching until 1833, when Nesti was finally assigned the chair of "Mineralogy and Geology", testifying to social embodiment of the discipline.

Nesti's entries in the inventory

Nesti took care of new acquisitions, showing a change in the way in which new fossil specimens were registered in the inventories. An example is on a page dated 4 January 1813, where bones belonging to a fossil rhino coming from the upper Valdarno were described separately (Fig. 6). Eight entries, numbered 885-892, included three vertebrae, one element of an anterior limb (scapula), elements of the right posterior limb (pelvi, femor, tibia+fibula, metatarsal), one element for the whole left posterior limb (entry 891) and a dental. The bottom line made explicit that "the above bones belong to the same individual", testifying to a careful excavation of this fossil. The above closely match the descriptions he had published two years before on "the fossil bones of a rhino" (Nesti, 1811: 13-23). In that paper he stated that it is difficult to extract articulated bones from the enclosing sediment, if the excavation

Fig. 8. Specimen of siderite described in the Dolomieu 1789 catalogue.

is led by inexperienced people, for "they would not know how to direct their shovels without damaging the bones" (Nesti, 1811: 11-12).

CONCLUSIONS

Thanks to museum inventories, some of the specimens presented in this paper are today recognised among collections that were gathered in centuries of history. Examples are the "islebian fish" listed by Pandolfini in 1626, described by Steno in 1672, and retraced in the 1793 inventory (Dominici & Cioppi, 2018) (Fig. 7) and a beautiful aggregate of crystals of siderite collected in Sicily by Dolomieu and sent to Fontana around 1789 (Fig. 8), and the partial skeleton of the Pleistocene rhino inventoried by Nesti in 1813, today part of the exhibition open to the public (Napoleone et al., 2001) (Fig. 9). The manuscripts presented in this paper were selected among the many that are hosted in the museum and other public archives in Florence. They outline cultural changes in the daily activity of the museum keeper, as a reflection of the passage from disordered cabinets of curiosities, to exhibition of naturalia for both learned men and the public good, into the birth of the new sciences of geology, mineralogy, crystallography and paleontology, when minerals and fossils became instrumental to reconstruct Earth's history. Museum inventories and catalogues, with their underlying taxonomies, testify across the centuries how human perspective over the natural world has changed. Too often neglected as a means to reconstruct history, they are part of the cultural heritage hosted at museums of natural history, inseparable from the collections they describe.

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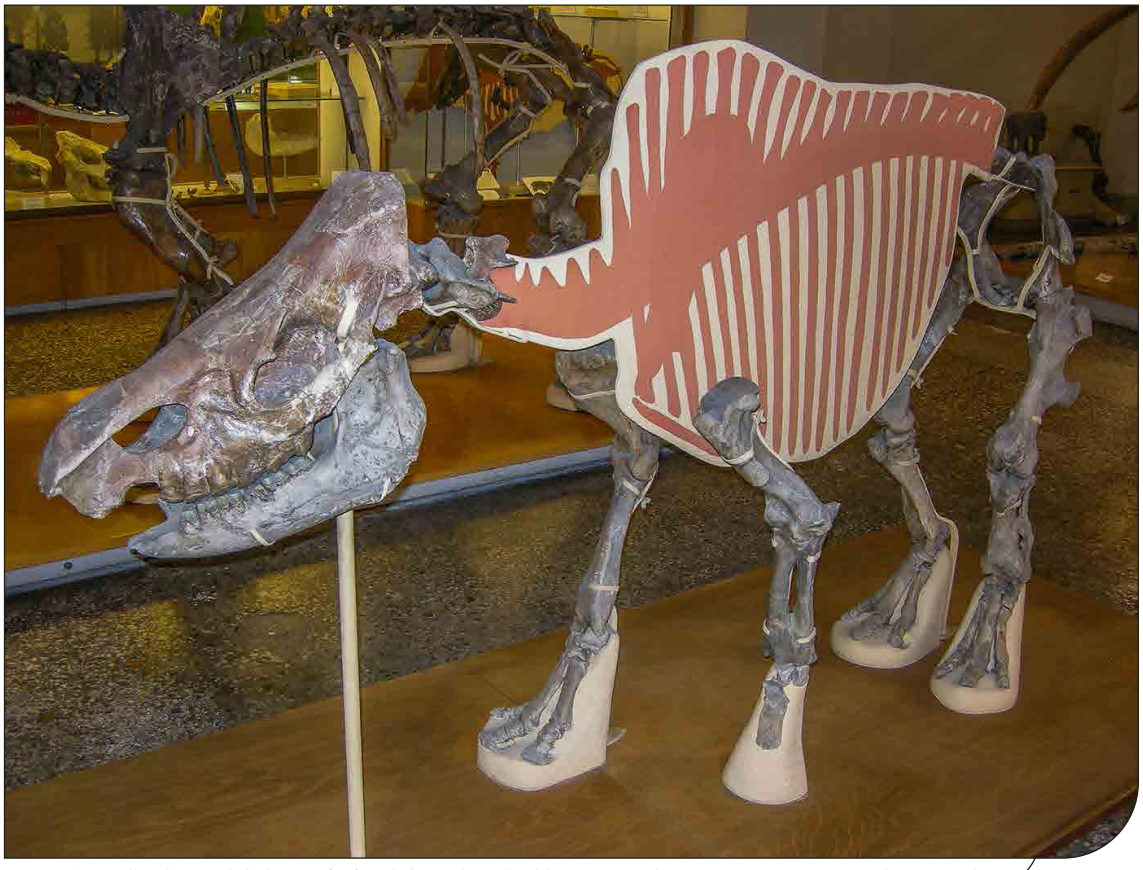

Fig. 9. Articulated partial skeleton of a fossil rhino described by Nesti in the 1813 inventory, currently exposed to the museum public in Via La Pira 4.

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