1. Research activity

The main aim of this project is the valorisation of the “hidden heritage” of the collections stored in the MUST (Museo Universitario di Scienze della Terra, Sapienza), finally granting public access to the whole archive and materials.
This will be achieved by the draft of a specific preservation protocol for the fossils, rock and minerals specimen, the compilation of a digital and interactive inventory of the museum’s contents, extending and updating the existing database of fossils, minerals and rocks, and the planning of data sharing and dissemination to different levels of knowledge (e.g., scientific, high school, middle school and general audience).

The MUST arises from the merger of the three historical museums of Geology, Mineralogy and Palaeontology of Sapienza University of Rome, which preserve over 34,000 mineralogical, 6,000 geological and 500,000 palaeontological estimated samples or specimens [1]; the assets of the Museum also consist of books, maps and tools of historical and scientific significance.

The initial research work will be devoted to analysing the Museum collections in order to plan an adequate preservation and storing protocol. During this period an intensive literature analysis about preservation, storing and valorisation will be carried out; at the same time, a network with specialists in the sector of other museums, universities and agencies will be established.

Then the focus will be on the compilation of an inventory of the scientifically most relevant invertebrate fossils, such as the holotypes, syntypes, topotypic specimens, and some historical collections. This part of the Ph.D. is aimed at type specimen conservation, fulfilling the first mission of a scientific museum, thus contributing to the prestige of the Museum.
To achieve this objective the Tellini collection, consisting of more than 5,000 specimens, 25 holotypes and 50 figured specimens of invertebrate fossils, was analysed and catalogued.

The update and management of the database will be performed in collaboration with the Polo Museale Sapienza, which has already developed a specific database that will be then uploaded to the departmental cloud infrastructure to provide web access to the entire museum catalogue.

Another pivotal topic in my research will be improving and comparing techniques and equipment used for 3D digitisation and virtualisation in museums, such as blue-light scanners, structured lights scanners, multi-spectral photogrammetry and focus-stacking photogrammetry.
These techniques will be tested to digitise historical geo-palaeontological collections (e.g., the Portis collection of vertebrate fossils), specific specimens that are too vulnerable to be properly studied and for documenting the restoration of some specimens in the Vetebrate Hall.

The project will focus on a census of type mineral specimens [2], historical collections (e.g., the Dactyliotheca, donated by Pope Leo XII in 1824) and igneous and metamorphic rocks, most relevant meteorites, sedimentary rocks and uncategorized samples preserved in the museum (e.g., the Marmi Antichi T. Belli, Dodwell, Spada collections).
The historical analysis of the oldest collections stored in the Museum will also be carried out during the three years. This aim will be complemented by literature analysis, to better understand the history of the Museum and its collections.
During the whole Ph.D. program selected events for the community will be periodically scheduled. Those events will make aware the lay public of the role played by the Museum, through scientific dissemination, seminars and practical activities aimed at involving students and community into museum work. Collaboration and coordination with trainees and fellow researchers will be crucial, not only for the individual tasks mentioned above but also for the medium-term planning of targeted activities; professors and researchers of the Earth Science department will be involved in specific decisions relating to their areas of expertise.

With the progressive cataloguing of the material and its reorganization, guides of the museum will be developed, targeted on the different types of visitors from primary schools up to university level. In order to support the use of specialised guides, particularly those dedicated to primary schools, it is considered useful to design kits for geological practicals to be supplied to the teachers.
In addition, tours will be designed and provided within the museum, with the adoption of the most modern technologies such as augmented reality (e.g., applications for smart devices with multiple levels of information on interactive objects).
Within this framework, I started to collaborate with Dr. Conti of the Polo Museale Sapienza for the realization of a virtual tour of the Atrium of the MUST, to be shown at the event "La notte dei ricercatori 2020”. The collaboration was further pursued during the “Maggio Museale 2021” event, with the improvement of the virtual tour of the MUST and the addition of a 3D model of Elephas falconeri and a tridimensional model of the dinosaur footprints from Sezze trampled surface. In addition, I made a short video preview using as a case study one of the dinoturbated surfaces of the Petrianni Quarry near Sezze (a cast of this is located in the Atrium of the MUST), showing the 3D potential for both scientific and dissemination applications. This is the first step towards the realisation of a virtual tour of the entire ichnosite.

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2. Research products

Publications (ISI journals)

Petti F. M., Avanzini M., Antonelli M., Bernardi M., Leonardi G., Manni R., Mietto P., Pignatti J., Piubelli D., **Sacco E.**, Wagensommer A. (2020a). Jurassic tetrapod tracks from Italy: a training ground for generations of researchers. In: Romano M., Citton P. (Eds.), Tetrapod ichnology in Italy: the state of the art. Journal of Mediterranean Earth Sciences 12.

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Abstracts

Petti F. M., Petruzzelli M., Conti J., Spalluto L., Wagensommer A., Bernardi M., Tomasoni R., Antonelli M., **Sacco E.,** Pignatti J., Sabato L. & Tropeano M. (2018) - The use of aerial and close-range photogrammetry to study dinosaur tracksites both at the meso- and macro-scale: the cases of the Lavini di Marco (Lower Jurassic, Hettangian - Trentino-Alto Adige) and Molfetta (Lower Cretaceous, Aptian-Albian - Apulia) tracksites. Session S37 Congresso SGI-SIMP: "Geosciences for the environment, natural hazard and cultural heritage", Catania (Italia), 2018.

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