Study of Zsolnay building ceramics in aspect of deterioration by environmental factors

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The Zsolnay products are the one of the most famous Hungarian ceramics. The glazed building ceramics produced by the Zsolnay Factory were often applied to decorate the buildings, mainly around the turn of the 19th-20th century and since their outplacements the ceramics have suffered numerous environmental and human influences. Our purpose is to observe the alterations by environmental factors considering that these ceramics have never been studied in this aspect before. The studied objects were used on two buildings in Budapest. We have examined the major characteristics of the glaze and the ceramic body on two buildings in Budapest, the depositions on the surface of the glazed and the unglazed sides of some selected ceramics. Several types of Zsolnay ceramics were used as building materials on these buildings. We distinguished different kinds of damage, black deposition layer and alterations. Natural and artificial particles (e.g. carbonaceous and Fe-rich), spherules and a characteristic gypsum layer frequently cover the studied objects. Traces of biological activity (hyphaes) were also found and connected to these organic residues calcium-oxalate (weddellite) was identified. On some samples the glaze has started to weather and the lead leached from the thin surface layer of glaze by rainfall and, if this phenomenon continues for a long period, it will result in the deterioration of the whole glaze.

Trends in urban biogeochemistry at the Anthropocene

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As socio-natural sites [1], cities *create* a specific biogeochemistry [2], mainly because they attract huge amounts of materials concentrated in very small areas. This *urban metabolism* is the result of two intertwinned phenomema: the natural processes on one hand, the technical ones on the other. Its study calls for an interdisciplinary approach as illustrated in [3]. In order to better characterise urban metabolism, we chose Paris urban area as a case study. By crossing historical methods and material/substance flow analysis, we were able to describe long term trends and changes. These results, together with other ones for other cities, allow to give a general insight into urban key issues in terms of biogeochemistry.

The very characteristic of cities is the externalisation of a great (and up to now growing) part of their metabolism. Cities were borne from a specialisation that made possible for some people to not produce their food and then to develop other activities in specific places – cities. This externalisation peacks with industrial revolution(s) with, for instance the partial externalisation of water cycle, the one of urban by-products transformation, etc. The shift of cities from sink (up to the end of the 19th century) to source of emission to air and water for substances like N or P is another characteristic of cities metabolism. This is due to changes in waste management and to the devalorisation of urban fertilisers (especially human manure) that occurred at the beginning of the 20th century together with the increase in fossil fuel consumption (for N).

As a result, urban metabolism goes far beyond the urban limits and cities can be considered as one of the main drivers of biogeochemical cycles, considering both their direct and indirect impacts on them. Today, one of the great challenges faced by urban managers and biogeochemists is the improvement of urban metabolism (its *re-internalisation*?), its transformation from a constraint to an asset – for the provision of nutrients, the reduction of urban heat island, etc.

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