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volume 8/2017

CONTENTS PAGES

BEYOND THE THEME

PROJECT

REVIEWS

PCA 8 (2018) ISSN: 2039-7895 (pp. 73-89)
Post - Classical Archaeologies

research

Urban environmental archaeology in Brussels (Belgium): perspectives at the onset of the 21st century

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Over the last decades a specific research protocol aiming at optimizing the integration of environmental archaeology within the urban archaeological practice has been developed in Brussels. Its systematic application has enriched our knowledge on many aspects of urban development. Current research addresses three main topics: urban Dark Earth and the origins of Brussels, the evolution of the regional landscape and urban economy and personal life. Future research will further explore these themes, but also other themes such as the study of microlaminated house floors and the georeferencing of the environmental dataset open new perspectives in research in Brussels urban archaeology.
Keywords: Belgium, Early Middle Ages, Dark Earth, geoarchaeology

Nelle ultime decadi è stato studiato a Bruxelles uno specifico protocollo di ricerca teso a ottimizzare l'integrazione dell'archeologia ambientale nelle pratiche dell'archeologia urbana, la cui sistematica applicazione ha arricchito per molti aspetti la nostra conoscenza dello sviluppo storico urbano. Ad oggi le ricerche si rivolgono specialmente in tre direzioni: le terre nere e le origini di Bruxelles, l'evoluzione del paesaggio regionale e infine l'economia e la vita in ambito urbano. Gli studi futuri approfondiranno queste tematiche, ma si concentreranno anche su altri temi, come lo studio dei pavimenti microlaminati domestici e la georeferenziazione dei dataset *ambientali, che apriranno nuove linee di ricerca per l'archeologia urbana a Bruxelles.*
***Parole chiave**: Belgio, alto medioevo, terre nere, geoarcheologia*

1. Introduction

Since Belgium is a federal state, each Region (Flanders, Wallonia and the Brussels Capital Region) has its own organization concerning the archaeological heritage: inventory and protection of sites, excavations,

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storing of archaeological objects and samples and archiving of the various gathered data. In the Brussels Capital Region, preventive (development-led) archaeological research has been systematically organized since 2004, the year when archaeology was included in the Brussels' law for town planning. Before its systematization, projects were essentially chosen on the basis of scientific research questions in relation to the personnel available and the building permits destroying the archaeological heritage, e.g. building plots near the 13th century city wall.

Since 2004, every demand for a building permit or renovation/restoration permit is verified in relation to the known archaeological potential published in the Archaeological Atlas and integrated into the Regional Cartographic site BRUGis (www.mybrugis.irisnet.be). If the demand matches a known archaeological potential, the Department of Archaeological Heritage will include a compulsory clause into the permit obliging the developer to accept the organization of archaeological research, in function of the expected destruction of the archaeological heritage as described by the building/renovation works. Although archaeology is primarily development-led, the "polluter-pays-principle" is not applied. The Region pays all expenses linked to preventive archaeological research (subsoil archaeology and/or building archaeology) by tendering the research to licensed firms and institutions: this spans as well the field study as the reports and the study of the objects and samples.

Environmental studies in urban contexts, still rare in the beginning of the 1980s, have today become an integral part of the urban archaeological research within many towns in Europe (Devos *et al.* 2017c). The first archaeo-environmental studies in Brussels date back to the beginning of the 1990s. Punctual studies on a series of archaeological sites concentrated on the identification of animal (Dupont, Peuchot, Schuiten 1995; Gautier 1995a; 1995b; 1997; 2001a; 2001b; Pigière 1997; Van Neer 2001) and plant remains (Laurent 1995; 1997a; 1997b; 1997c; 2001a; 2001b; 2001c; 2001d; 2001e; 2001f), primarily focussing on food economy and artisanal activities in (post-)medieval times. Geoarchaeological interventions were limited to issues of site stratigraphy and the identification of particular layers (Fechner 1995; 1997a; 1997b; 2001a; 2001b; 2001c; Degryse, Fechner 2001). Interdisciplinary synthesis was still largely missing. Due to the punctual character, all these studies were very much focussed on individual sites and did not result in larger synthesis.

Things changed at the onset of the 21st century. The research focus shifted towards the study of (early) urban development and Dark Earth and hence an integrated approach became inevitable (Devos *et al.*

2007a; Devos *et al.* 2011; Vrydaghs *et al.* 2016). In a series of steps an interdisciplinary approach was introduced in all development-led excavations involving geoarchaeology (field study, micromorphology, physico-chemical analyses), archaeobotany (study of plant macro-remains, phytoliths and pollen) and archaeozoology (Devos 2015).

2. The need for an integrated approach

Understanding the emergence and evolution of the urban fabric is a complex issue as a result of centuries of successive activities in a densely populated area. For a long time this has been the exclusive ground of historians. Although many aspects of urban development and urban life are richly documented, others remain poorly known. This is particularly the case for the transition period between late Roman and early medieval times, and the emergence of towns of the second generation.

This is also true for the emergence of Brussels in the Duchy of Brabant. A lack of reliable documents has inevitable led to a ceaseless and sometimes heated debate on the dynamics involved in its formation (see for example Despy 1997). It is only in the early 1990s that Brussels' archaeology entered the debate as a result of a series of mostly rescue excavations in the centre of the town (Degraeve *et al.* 2010). These excavations improved our understanding of different aspects of town development. Examples are the large excavations of the site of Rue d'Une Personne detailing shoemaking practices in the 13th century AD town centre (Diekmann 1997), or the excavation in the Rue Sainte Catherine documenting the organisation of a brewery in the alluvial valley in the 16th-17th century AD (Degré 1995).

Documenting the earliest town development, however, proved far more challenging, as the remains from this period typically are hidden within the ubiquitous urban Dark Earth (fig. 1). These Dark Earths are thick, dark coloured, homogeneous units covering large surfaces. They are often rich in anthropogenic remains (ceramics, bricks, bone, charcoal, etc.) and typically lack a clear internal stratigraphy (Nicosia, Devos 2014) (fig. 2). While most of the units composing the complex urban stratigraphy can be readily identified by experienced archaeologists during fieldwork, interpreting Dark Earth turned out to be a difficult, if not impossible task. It needed a change of perspective and scale from the field to the microscope, to enable the understanding of the formation of such units. Geoarchaeology, and more specifically micromorphology, demonstrated to be particularly well armed to tackle these matters (see

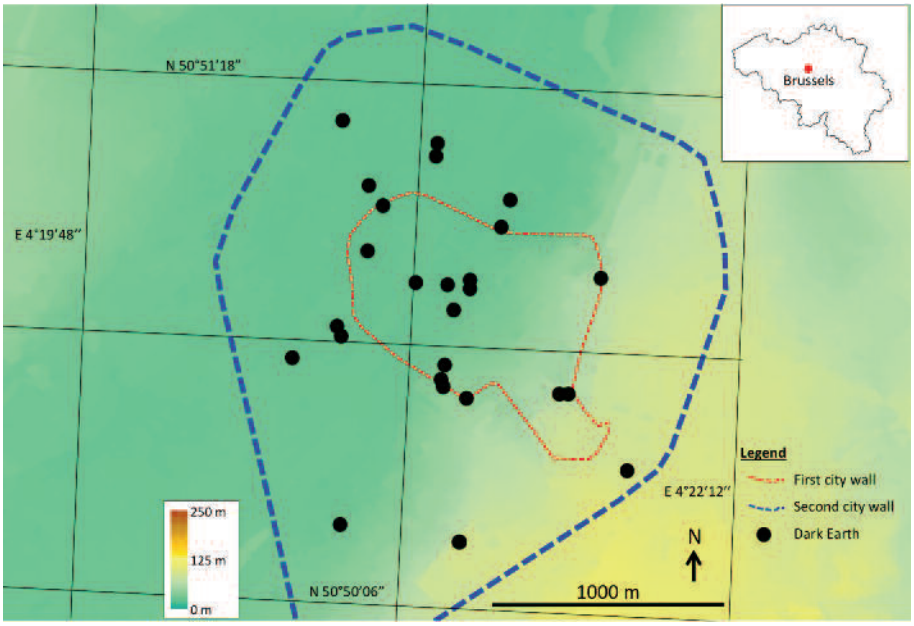

Fig. 1. Map of the centre of Brussels showing the locations where Dark Earth has been discovered.

for example: Nicosia, Devos, Borderie 2013; Nicosia, Devos, Macphail 2017). The study of soil and sediment thin sections enables not only to observe all of the components (e.g. minerals, artefacts and ecofacts) at a microscopic scale, to detail their relation and distribution, but also to observe limits that were not visible with the naked eye. Over the last decades this approach has successfully been incorporated in the study of the Brussels' urban stratigraphy (see for example Devos *et al.* 2007; 2009; 2011; 2013; 2017a). The geoarchaeological study of these Dark Earth units did not only allow to readdress the issue of the formation of the urban soils and sediments, but also to identify a series of activities such as construction with earth-based building materials, crop growing and pasture that were previously not recognised. The systematic study of Dark Earth from the 10th-13th century AD allowed not only to detail the succession of activities at different studied locations, it also contributed to understand the bigger picture. For instance, the observation of colluvium in toeslope position could be related to agriculture upslope (see Devos *et al.* 2017a).

Combining all the data also allows to obtain an idea on what happened at a larger scale. Hence, a whole new picture for 10th-13th century AD Brussels started to emerge (see Devos 2015). The area that is now the centre of town was still strongly occupied by pasture and crop fields; other parts were devoted to soil extraction and open air quarries (fig. 3). Needless to say that these identifications gave fuel to a series of new and exciting hypotheses on the origins of Brussels (see for example Degraeve *et al.* 2010; Vannieuwenhuyze *et al.* 2012).

Another aspect is that the geoarchaeological study permits the understanding of the formation history and thus also on the taphonomy of

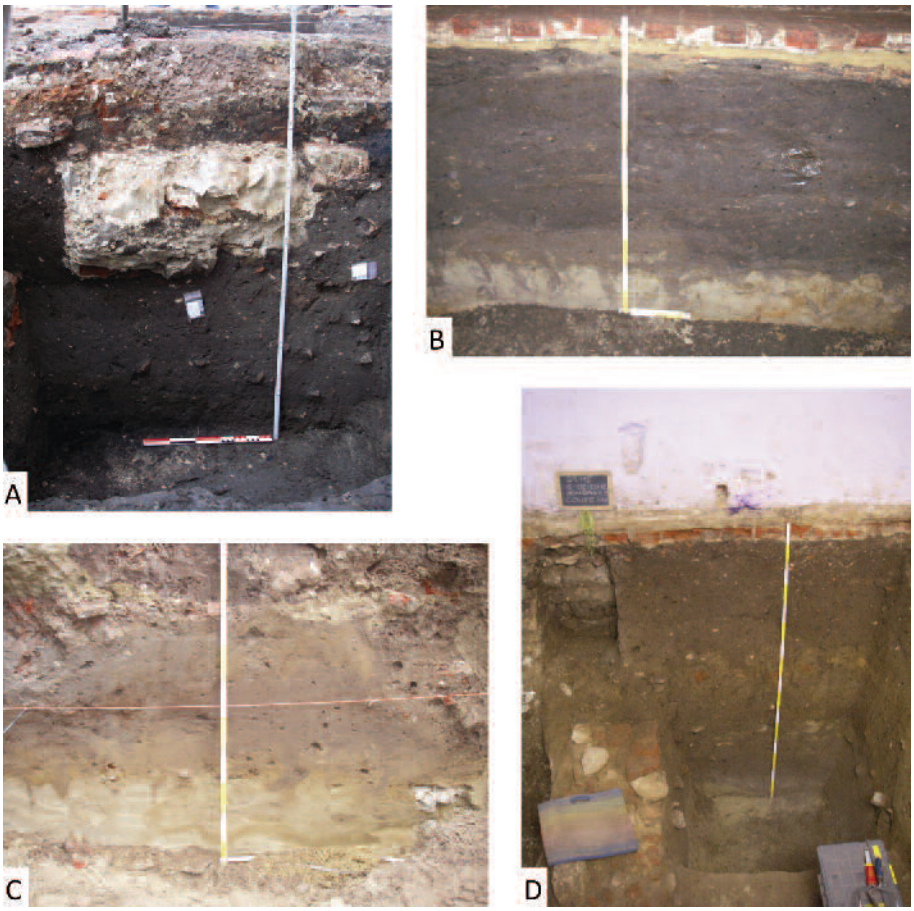

Fig. 2. Examples of Brussels' urban Dark Earth: A: site of Place Fontainas; B: site of Rue d'Une Personne; C: site of Rue Brederode; D: site of Rue du Chevreuil.

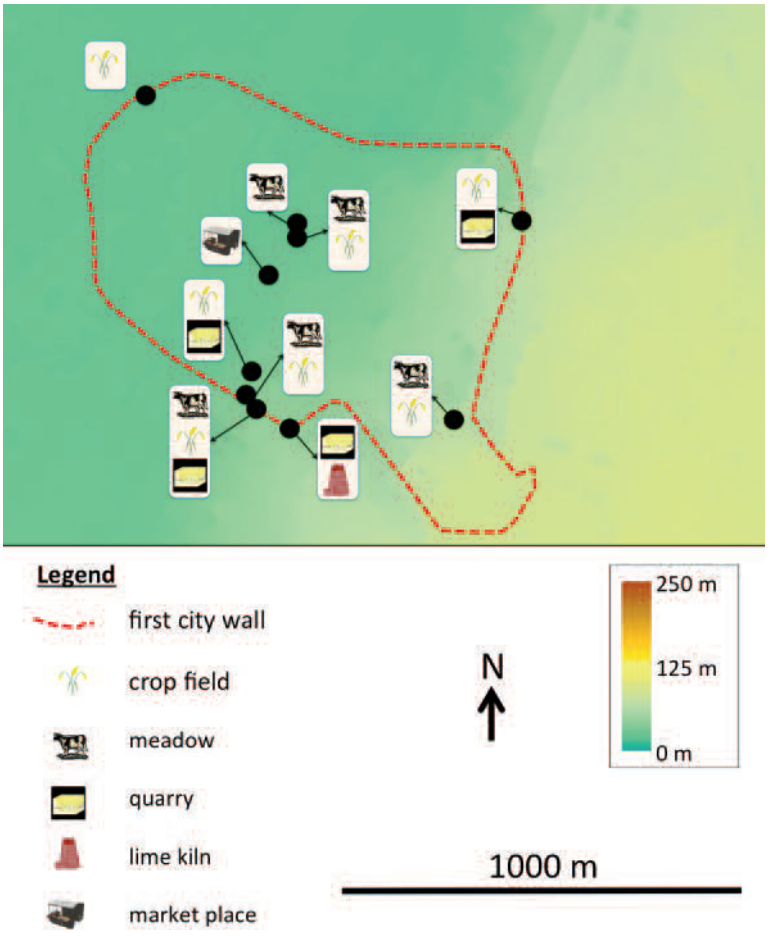

Fig. 3. Map showing the different activity areas in the 10th-13th century AD that have been identified through the study of Dark Earth.

the different components observed within Dark Earth. This is of fundamental importance for the study of plant and animal remains, where previously their study was often hampered by a poor knowledge of the taphonomical history of the remains (see for example Gautier 1995). One example is the identification of crops that were grown on the medieval fields in Brussels, a delicate task as the origin of the botanical remains found within them can be multiple. For instance, they can be part of the excremental and household waste applied as manure, or they can be grown *in situ*. To complicate further, preservation of organic remains

is generally poor in these well-aerated contexts. The study of phytoliths in thin sections enables to overcome these issues. As phytoliths are (microscopic) mineral bodies of plant origin they can be preserved in contexts where other botanical remains (fruits, seeds, pollen, etc.) do not preserve. Unfortunately traditional sampling and laboratory procedures result in a systematic mixing of the sample content thus involving a loss of the depositional history of the phytoliths, thus rendering the identification of their origin hazardous (see Vrydaghs, Ball, Devos 2016). This is not the case when the phytolith study is performed on soil and sediment thin sections (e.g. integrated with the micromorphological study). Here not only the original distribution patterns of the phytoliths are preserved, but also their relation to other elements. It is thus possible to verify whether they are for example incorporated within coprolitic remains or whether they are part of ashes (fig. 4). By establishing the origin of the individual phytoliths it becomes possible to isolate the ones that are part of the plants that have been grown *in situ* (Devos, Vrydaghs 2009; Vrydaghs *et al.* 2016). This thus allows for a secure identification of the crops that have been grown on the medieval fields in Brussels. As such, oats, barley and wheat have been identified (Devos *et al.* 2011). Also for Dark Earth of more recent periods, this integrated approach has shown to be a useful contributor in detecting for example the presence of privy alleys and gardens (see Devos *et al.* 2017a). Although initially specifically developed for the study of urban Dark Earth it also proved useful in other urban contexts (e.g. latrines, stables, floors, etc.) (see for example Devos *et al.* 2012).

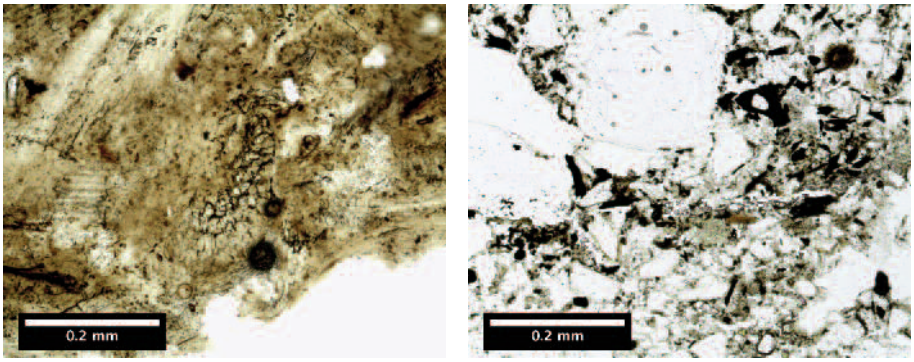

Fig. 4. A: microphotograph of phytoliths within a coprolite (site of Petite Rue des Bouchers); B: microphotograph of phytoliths within ash remains (site of the Court of Hoogstraeten).

3. A protocol for an integrated approach

The protocol evolved over time as new questions were raised and new techniques were adopted. Today it involves a series of steps integrating the archaeo-environmental expertise at different levels (fig. 5):

- A desktop study. All existing documentation is collected: the archaeological atlas, historical maps and pictures, geotechnical and quaternary geological maps, etc. to permit a preliminary evaluation of the potential of the site and to understand its position within the urban tissue.
- Fieldwork and sampling. During the fieldwork geoarchaeologists are permanently on standby for taphonomical and stratigraphical issues. Sampling is also performed by the geoarchaeologists (fig. 6).
- Based on the results of the field study and the questions raised, a series of laboratory analyses are executed parallel to the traditional archaeological study. These involve the sieving and study of the large bulk samples for macrobotanical and zoological remains, the preparation and study of palynological samples, the study of soil and sediment

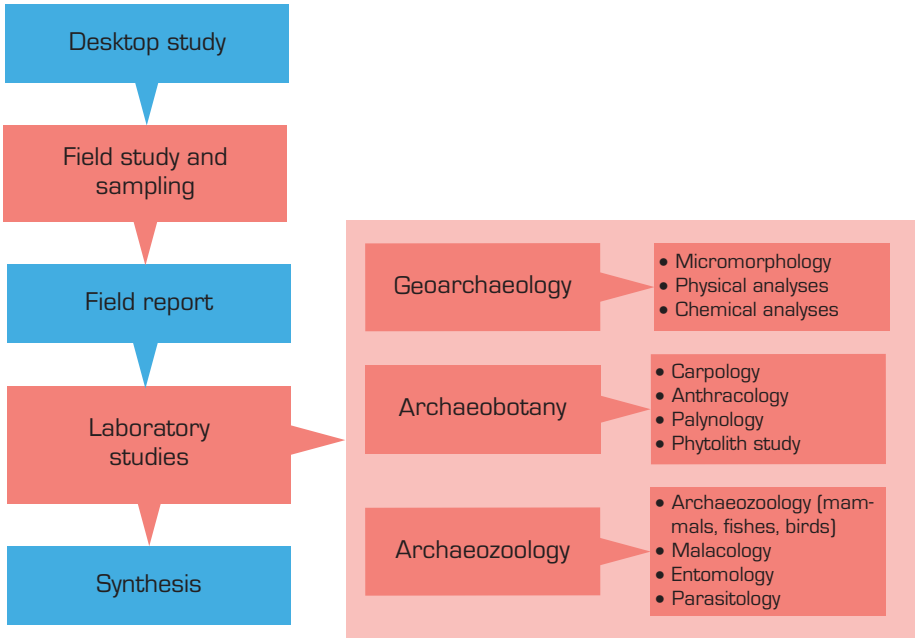

Fig. 5. Simplified working scheme for archaeo-environmental studies in Brussels.

thin sections for micromorphology and phytolith studies, as well as a series of standard physico-chemical analyses on soil and sediment bulk samples. When necessary additional analyses are performed (parasites, diatoms, ^{14}C dating, etc.).

- Synthesis. The first results and interpretations of the different specialists are presented in a series of reports. These serve as a basis for further interdisciplinary discussion and the realisation of synthesis on site, as well as on higher levels (e.g. neighbourhoods, town, regional).

Importantly, during all these steps, there is permanent discussion among the specialists (historians, archaeologists, archaeo-environmental specialists) to ensure an optimal integration of the data.

4. Widening the perspective

Starting from the successful study of the urban Dark Earth on the origins of the town, the horizons of our research have progressively broadened. Two more main axes of research are currently addressed: the evolution of the regional landscape and aspects of urban economy and personal life.

Fig. 6. Sampling of block samples for micromorphology (site of Place Fontainas).

4.1. The evolution of the regional landscape

Understanding town development passes necessarily through a thorough understanding of the environment in which the town develops. It involves a multi-scalar interdisciplinary approach starting from detailed geographical mapping based on actual LiDAR-data at a regional scale, and involving historical, archaeological, geoarchaeological, archaeobotanical and archaeozoological studies.

A first key feature in this research is the Senne river, indirect tributary of the Scheldt river. This river, passing through the centre of town until it got covered and finally derived in the 19th century, served a series of important roles in the urban development of Brussels (see e.g. Deligne 2003). The oldest written sources already pointed to its economic importance for traffic. It also provided water for its inhabitants, their livestock but also for their activities (milling, brewing, tanning, for fishing ponds, etc.). In later periods it also became a sewer, causing permanent nuisance. Beyond its economic importance the river and its surrounding valley also represented an ecological niche that evolved over time partly as a result of the town development. Whereas the Holocene vegetation history of the main basin of the Scheldt river is rather well documented, until recently no attention has been paid to the evolution of the vegetation in the Senne valley. Over the last fifteen years, a couple of well preserved, and often several meters thick peat deposits have been discovered and systematically sampled (fig. 7). Interdisciplinary studies involving geoarchaeology, palynology, the study of plant macro-remains, phytoliths, etc. start showing a detailed picture of the evolution of the vegetation at a regional and local level throughout the Holocene (Devos *et al.* 2017b; Marinova *et al.* in prep.).

Furthermore, right outside the historic town centre, an unknown ancient branch of the river has been uncovered (fig. 8). The discovery of Roman embankments during the excavations demonstrated that already during Roman times attempts were made to control the water flow (Van Bellingen, Modrie 2015). Although the first results focused primarily on the Roman period (De Cupere *et al.* 2017), further geoarchaeological, archaeobotanical, archaeozoological (e.g. malacological) studies and diatom analysis will provide us with detailed information about the long-term evolution of this river branch.

Reconstructing the evolution of the relief is a second main topic. The many archaeological interventions in the historical centre provide us with a rich dataset on ancient occupation surfaces, which will be integrated in the actual regional LiDAR-data to model the evolution of the relief

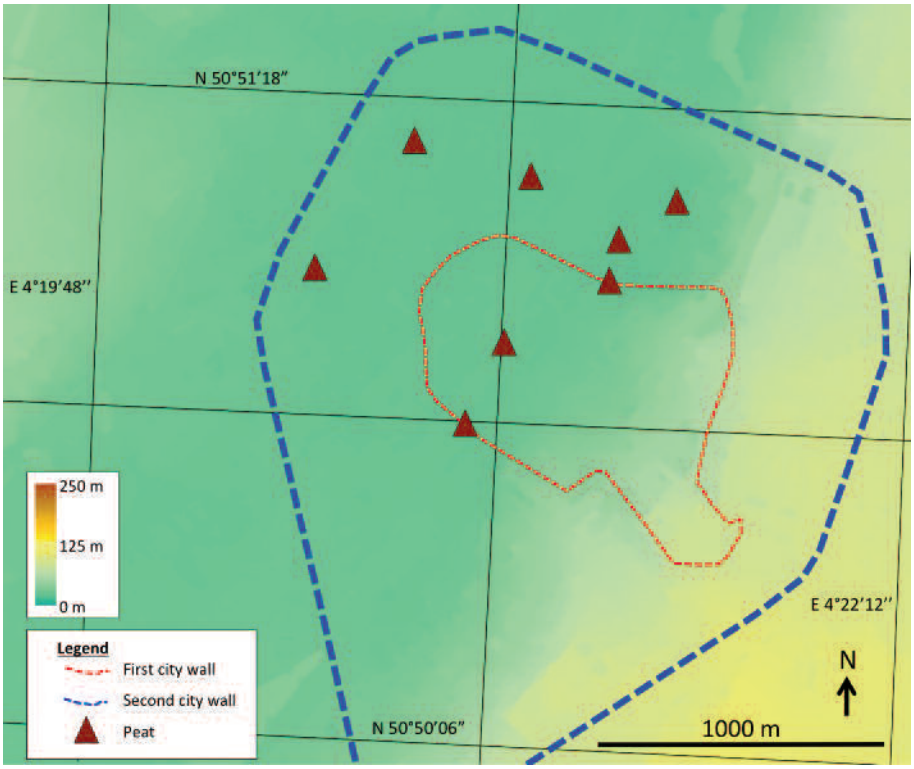

Fig. 7. Map showing the location of the archaeological sites where peat has been observed.

Fig. 8. Overview of the site of Tours & Taxis where an ancient branch of the Senne river has been discovered.

within the developing town. On a more regional scale the integration of the LiDAR-data with the detailed soil maps and geoarchaeological data equally helps to understand the impact of human activities on the physical environment (see for example Langohr, Nicosia, Devos 2015).

4.2. Urban economy and personal life

Systematic geoarchaeological studies on the urban fabric improved our understanding of the formation history of the different archaeological deposits and structures, thus overcoming problems related to taphonomy of the archaeozoological and archaeobotanical remains that were often hampering the earliest studies conducted in Brussels. The numerous archaeobotanical and archaeozoological studies conducted on cess- and waste pits, stables, dark earth, etc. have provided a wealth of data. As a result, Brussels has now become the most sampled and documented town in Belgium (see Speleers, van der Valk 2017; Ervynck, Van Neer 2017, appendix A). This rich and diverse dataset allows to address a series of topics related to the urban economy and the personal life of the town inhabitants. The study of a cesspit, for instance, informs about the diet of the individual household, and indirectly on its socio-economic status. The study of ancient stables informs about livestock diet.

The first diachronic syntheses on the vegetal and animal consumption on a town level have thus been realised (Thys, Van Neer 2010; Charruadas *et al.* 2017; Speleers, van der Valk 2017). Whereas no major changes in cereal consumption patterns were observed, other plant categories such as fruits, herbs and spices become more diverse during the late medieval and post-medieval periods (Speleers, van der Valk 2017). As for what concerns the animal consumption the main meat providers are beef, porc and mutton. Despite the large dataset no general trend in their relative frequencies has been observed. The pig/sheep ratio however, revealed rather high ratios dropping around 1500 AD (Ervynck, Van Neer 2017). The remains of birds usually represent 10% or less, decreasing from Late Medieval to Early Modern times (Thys, Van Neer 2010). Among the consumed fishes, a clear predominance of marine fishes is attested (Charruadas *et al.* 2017).

The study of a series of sites within the neighbourhood of the Petite Rue de Bouchers and Rue d'Une Personne richly illustrate butchery practices performed on cows and muttons and their use by artisans (e.g. shoemaking).

Diet is only one element within these studies. They also provide information about the status of the inhabitants and ancient trade patterns.

The study of the urban Dark Earth has the potential to address another aspect of town life: the management of waste. Written sources often mention the huge problems medieval cities had to manage their rubbish (see e.g. Keene 1982; van Oosten 2015). They tell us about citizens complaining about the nuisances caused by the artisanal activities in the centre of the city, the disgusting smell of tanning, the throwing of cadavers of animals in the river, the refuse from kitchens thrown onto the streets, and of course the management of the immense mass of excreta from men and animals, in cities where sewers did not exist. Were medieval towns indeed filthy places where organic remains accumulated everywhere, as often suggested in popular media, or is there a more nuanced story to tell? The study of urban Dark Earth, a feature so omnipresent in towns can be of great help to gain some new ideas about the management of waste within towns and its evolution through time. An important point in this respect has been made by Rathje, Murphy (2001, p. 19): it is not the individual garbage cans that are of interest but rather the broad patterns. As such urban Dark Earths building up over relatively long time spans and involving a variety of actions and events are particularly interesting. One striking example is the identification of a post-medieval privy alley (see Devos *et al.* 2017a).

5. Conclusions and perspectives

Studying the development of a town is an arduous task requiring a multiscalar approach, involving not only manifold smaller and bigger excavations but also the integration of many different disciplines. The integration of environmental studies within the urban archaeological practice and its systematic application for the numerous development-led archaeological operations have enriched our knowledge on many aspects of the urban evolution.

The study of urban Dark Earth has not only enlightened our understanding of the early town development, it is providing an extremely rich data set on a whole series of aspects dealing with town development and urban life. Current research on the regional environment helps us to better understand the interaction between the town and its hinterland, but also on the impact of the urban development on its environment.

The many archaeobotanical and archaeozoological studies inform us not only about the evolution of the environment but also different aspects of the daily life within town. As such, they permit to document the diet, the healthiness and – indirectly – the socio-economic status of the

individual households, to detail a series of artisanal practices, and to detect trade networks. Further extension of our database to fill in the existing chronological and spatial gaps and comparison with other towns should provide more detailed patterns. In this regard we refer to a recent study on the consumption of meat in Flanders and Brussels (Ervynck, Van Neer 2017).

Future perspectives include the integration of the environmental data within the georeferenced archaeological dataset of the Brussels Capital Region's official cartographic website BRUGis (www.mybrugis.irisnet.be) and the study of microlaminated floors. These are, especially for the earliest periods, often the only remains of houses that have been preserved, as most buildings were built with perishable earthen-based materials and wood. Field study cannot help to decipher their history but micromorphology can (see for example Milek 2012; Banerjea *et al.* 2013; Crabtree *et al.* 2017; Macphail, Goldberg 2018). The identification of fuel resources is another topic that merits more attention. Abundant charcoal samples have been collected from a series of hearths and within the urban Dark Earth. A recent study of such remains from a Dark Earth in the centre of Ghent demonstrates its potential to identify the essences used for fuel within town (Deforce 2017).

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References

R.Y. Banerjea, M. Bell, W. Matthews, A. Brown 2013, *Applications of micromorphology to understanding activity areas and site formation processes in experimental hut floors*, "Archaeological and Anthropological Sciences", 7, pp. 89-112.

P. Blanquart, S. Demeter, A. De Poorter, C. Massart, S. Modrie, I. Nachtergael, M. Siebrand 2001 (eds), *Autour de la première enceinte*, Bruxelles.

P. Charruadas, Y. Devos, L. Speleers, C. Boffin, L. Vrydaghs, J.M.A. van der Valk, Q. Goffette, C. Nicosia 2017, *Des champs et des bêtes à Bruxelles (10e-15e siècles). Approche interdisciplinaire des pratiques agricoles et alimentaires*, in B. Larioux (ed), *L'acquisition des aliments: de la nature à la table au Moyen Âge*, Paris, pp. 11-27.

P. Crabtree, E. Reilly, B. Wouters, Y. Devos, T. Bellens, A. Schryvers 2017, *Environmental evidence from early urban Antwerp: new data from archaeology, micromorphology, macrofauna and insect remains*, "Quaternary International", 460, pp. 108-123.

B. De Cupere, Y. Devos, E. Marinova, L. Speleers, C. Nicosia, S. Modrie, S. Van Bellingen 2017, *De opgravingen van Thurn en Taxis: een inkijk op het Romeinse landschap en voedseleconomie (Brussel)*, "Signa", 6, pp. 23-26.

K. Deforce 2017, *Wood use in a growing medieval city. The overexploitation of woody resources in Ghent (Belgium) between the 10th and 12th century AD*, "Quaternary International", 458, pp. 123-133.

A. Degraeve, S. Demeter, Y. Devos, S. Modrie, S. Van Bellingen 2010, *Brussel voor 1200: een archeologische bijdrage*, in M. Dewilde, A. Ervynck, F. Bécuwe (eds), *Cenulae Recens Factae, Een huldeboek voor John De Meulemeester, Novi Monasterii 10,* Gent, pp. 141-157.

S. Degré 1995, *Brouwerijen in de Sint-Katelijnewijk*, Brussel.

H. Degryse, K. Fechner 2001, *Etude archéopédologique dans l'impasse du Papier*, in Blanquart *et al.* 2001, pp. 300-311.

C. Deligne 2003, *Bruxelles et sa rivière. Genèse d'un territoire urbain (12e-18e siècle)*, Turnhout.

G. Despy 1997, *Un dossier mystérieux: les origines de Bruxelles*, "Bulletin de l'ARB (Classe des Lettres)", 8, pp. 241-303.

Y. Devos 2015, *Archeomilieuspecialisten. Het onderzoek van archeologische 'crime scenes' in Brussel*, "Erfgoed Brussel", 17, pp. 92-99.

Devos *et al.* 2007a = Y. Devos, L. Vrydaghs, A. Degraeve, C. Laurent, S. Modrie 2007a, *L'anthropisation du paysage bruxellois au 10e-13e siècle. Résultats d'une approche interdisciplinaire*, in *On the Road Again. L'Europe en mouvement. 4e Congrès International d'Archéologie Médiévale et Moderne*, Paris.

Devos *et al.* 2007b = Y. Devos, K. Fechner, L. Vrydaghs, A. Degraeve 2007b, *Contribution of archaeopedology to the palaeoenvironmental reconstruction of (pre-)urban sites at Brussels (Belgium). The example of the Treurenberg site*, in G. Bosschian (ed), *Proceedings Second International Conference on Soils and Archaeology* (Pisa, 12th-15th May 2003), Pisa, pp. 145-151.

Devos *et al.* 2009 = Y. Devos, L. Vrydaghs, A. Degraeve, K. Fechner 2009, *An archaeopedological and phytolitarian study of the "Dark Earth" on the site of Rue de Dinant (Brussels, Belgium)*, "Catena", 78, pp. 270-284.

Devos *et al.* 2011 = Y. Devos, L. Vrydaghs, A. Degraeve, S. Modrie 2011, *Unravelling Urban Stratigraphy; The Study of Brussels' (Belgium) Dark Earth: An Archaeopedological Perspective*, "Medieval and Modern Matters", 2, pp. 51-76.

Devos *et al.* 2012 = Y. Devos, J. van der Valk, Q. Goffette, M. Court-Picon, H. Doutrelepont, L. Vrydaghs, B. Claes 2012, *Interdisciplinair onderzoek van een enigmatische structuur op het site van de Korte Beenhouwerstraat nr. 29 (Br.)*, "Archaeologia Medievalis Kroniek/Chronique", 35, pp. 134-136.

Devos *et al.* 2013 = Y. Devos, C. Nicosia, L. Vrydaghs, S. Modrie 2013, *Studying urban stratigraphy: Dark Earth and a microstratified sequence on the site of the Court of Hoogstraeten (Brussels, Belgium). Integrating archaeopedology and phytolith analysis*, "Quaternary International", 315, pp. 147-166.

Devos *et al.* 2017a = Y. Devos, C. Nicosia, L. Vrydaghs, L. Speleers, J. van der Valk, E. Marinova, B. Claes, R.M. Albert, I. Esteban, T.B. Ball, M. Court-Picon, A. Degraeve 2017a, *An integrated study of Dark Earth from the alluvial valley of the Senne river (Brussels, Belgium)*, "Quaternary International", 460, pp. 175-197.

Devos *et al.* 2017b = Y. Devos, C. Nicosia, L. Vrydaghs, R. Langohr, E. Marinova 2017b, *De evolutie van het Brusselse landschap, een archeologische kijk*, "Erfgoed Brussel", 23-24, pp. 8-17.

Devos *et al.* 2017c = Y. Devos, W. Van Neer, E. Marinova, A. Degraeve 2017c, *Editorial: Proceedings of the Conference on the Environmental Archaeology of European Cities (CEAEC)*, "Quaternary International", 460, pp. 1-2.

Y. Devos, L. Vrydaghs 2009, *Micromorphology and opal Phytolith Studies on Thin Sections on Medieval Sites in Brussels (Belgium)*, "Frankfurter Geowissenschaftliche Arbeiten, Serie D", 30, pp. 25-33.

A. Diekmann (ed) 1997, *Artisanat médiéval et habitat urbain, rue d'Une Personne et place de la Vieille-Halle-aux-Blés*, Bruxelles.

T. Dupont, R. Peuchot, M. Schuiten 1995, Archeozoölogisch onderzoek, in S. Degré (ed), *Brouwerijen in de Sint-Katelijnewijk*, Brussel, pp. 159-165.

A. Ervynck, W. Van Neer 2017, *Beef, pork and mutton: An archaeological survey of meat consumption in medieval and postmedieval towns in the southern Low Countries (Flanders & Brussels, Belgium)*, "Quaternary International", 460, pp. 65-73.

K. Fechner 1995, *Archeopedologie*, in S. Degré (ed), *Brouwerijen in de Sint-Katelijnewijk*, Brussel, pp. 171-185.

K. Fechner 1997a, *Etude archéo-pédologique du site de la rue d'Une Personne*, in Diekmann 1997, pp. 91-100.

K. Fechner 1997b, *Etude archéo-pédologique du site de la Place de la Vieille-Halle-aux-Blés*, in Diekmann 1997, pp. 135-139.

K. Fechner 2001a, *Etude pédologique*, in Blanquart *et al.* 2001, pp. 61-64.

K. Fechner 2001b, *Etude pédologique*, in Blanquart *et al.* 2001, pp. 43-47.

K. Fechner 2001c, *Etude archéopédologique*, in Blanquart *et al.* 2001, pp. 93-104.

A. Gautier 1995a, *Restes d'animaux*, in A. De Poorter (ed), *Au quartier des Riches-Claires : de la Priemspoort au Couvent*, Bruxelles, pp. 181-198.

A. Gautier 1995b, *Dierlijke resten*, in S. Degré (ed), *Brouwerijen in de Sint-Katelijnewijk*, Brussel, pp. 189-202.

A. Gautier 1997, *Restes d'animaux de la rue des Chandeliers à Bruxelles*, in I. Nachtergael (ed), *Sauvetage archéologique dans le quartier des Marolles à Bruxelles rue des Chandeliers, Nos 12-16*, (Supplément a "Vie Archéologique", 47), Bruxelles, pp. 51-60.

A. Gautier 2001a, *Laat- en postmiddeleeuwse dierresten uit de Zuidstraat te Brussel*, in Blanquart *et al.* 2001, pp. 105-109.

A. Gautier 2001b, *Middeleeuwse en post-middeleeuwse dierresten van de opgravingen langs de Villers- en Dinantstraat*, in Blanquart *et al.* 2001, pp. 249-256.

D.J. Keene 1982, *Rubbish in medieval towns*, in A.R. Hall, H.K. Kenward (eds), *Environmental archaeology in the urban context*, London, pp. 26-30.

R. Langohr, C. Nicosia, Y. Devos 2015, *Reading the soilscape and the anthropic impact in its evolution*, in A. Chavarría Arnau, A. Reynolds, *Detecting and understanding historic landscapes*, Mantova, pp. 273-296.

C. Laurent 1995, *Etude archéobotanique: carpologie*, in S. Degré (ed), *Brasseries au quartier Sainte-Catherine*, Bruxelles, pp. 165-171.

C. Laurent 1997a, *Etude micro-archéologique et archéo-botanique de sédiments prélevés sur le site archéologique de la rue des Chandeliers à Bruxelles*, in I. Nachtergael (ed), *Sauvetage archéologique dans le quartier des Marolles à Bruxelles rue des Chandeliers, Nos 12-16*, (Supplément a "Vie Archéologique", 47), Bruxelles, pp. 62-66.

C. Laurent 1997b, *Etude micro-archéologique et archéobotanique du site de la rue d'Une Personne*, in Diekmann 1997, pp. 79-90.

C. Laurent 1997c, *Etude micro-archéologique et archéopédologique du site de la place de la Vieille-Halle-aux-Blés*, in Diekmann 1997, pp. 131-134.

C. Laurent 2001a, *Etude microarchéologique et archéo-botanique*, in Blanquart *et al.* 2001, pp. 65-68.

C. Laurent 2001b, *Etude microarchéologique et archéo-botanique*, in Blanquart *et al.* 2001, pp. 48-50.

C. Laurent 2001c, *Etude microarchéologique et archéo-botanique*, in Blanquart *et al.* 2001, pp. 111-115.

C. Laurent 2001d, *Etude microarchéologique et archéo-botanique*, in Blanquart *et al.* 2001, pp. 173-174.

C. Laurent 2001e, *Etude microarchéologique et archéo-botanique*, in Blanquart *et al.* 2001, pp. 246-249.

C. Laurent 2001f, *Etudes microarchéologique et carpologique*, in Blanquart *et al.* 2001, pp. 311-315.

R.I. Macphail, P. Goldberg 2018, *Applied Soils and Micromorphology in Archaeology*, Cambridge.

E. Marinova, Y. Devos, L. Speleers, S. Modrie in preparation, *Contributions to the European pollen database: the peat profile of rue des Boîteux-rue d'Argent, Senne valley, Brussels (Belgium)*, "Grana".

K.B. Milek 2012, *Floor formation processes and the interpretation of site activity areas: an ethnoarchaeological study of tuf buildings at Thvera, northeast Iceland*, "Journal of Arnthropological Archaeology", 31, pp. 119-137.

C. Nicosia, Y. Devos 2014, *Urban Dark Earth*, in C. Smith (ed), *Encyclopedia of Global Archaeology*, New York, pp. 7532-7540.

C. Nicosia, Y. Devos, Q. Borderie 2013, *The contribution of geosciences to the study of European Dark Earths: a review*, "European Journal of Post-Classical Archaeologies", 3, pp. 145-170.

C. Nicosia, Y. Devos, R.I. Macphail 2017, *European "Dark Earth"*, in C. Nicosia, G. Stoops (eds), *Archaeological Soil and Sediments Micromorphology*, Oxford, pp. 331-343.

F. Pigière 1997, *Restes d'animaux provenant du site de la rue d'Une Personne*, in Diekmann 1997, pp. 63-77.

W.L. Rathje, C. Murphy 2001, *Rubbish: The Archaeology of Garbage*, Tucson.

L. Speleers, J.M.A. van der Valk 2017, *Economic plants from medieval and post-medieval Brussels (Belgium), an overview of the archaeobotanical records*, "Quaternary International", 436, pp. 96-109.

S. Thys, W. Van Neer 2010, *Bird remains from Late medieval and Postmedieval sites in Brussels, Belgium*, in W. Prummel, J. Zeiler, D. Brinkhuizen (eds), *Birds in Archaeology*, Groningen, pp. 71-86.

S. Van Bellingen, S. Modrie 2015, *Présence gallo-romaine sur le site de Tour & Taxis à Bruxelles*, "Bruxelles Patrimoines", 17, pp. 22-25.

W. Van Neer 2001, *Restes de poissons provenant de contextes médiévaux et post-médiévaux dans l'îlot Villers-Dinant*, in Blanquart *et al.* 2001, pp. 316-323.

B. Vannieuwenhuyze, P. Charruadas, Y. Devos, L. Vrydaghs 2012, *The medieval territory of Brussels: A dynamic landscape of urbanisation*, in S.J. Kluiving, E.B. Guttmann-Bond (eds), *Landscape Archaeology between Art and Science: From a Multi- to an Interdisciplinary Approach*, Amsterdam, pp. 223-238.

R. van Oosten 2015, *De stad, het vuil en de beerput*, Leiden.

L. Vrydaghs, T.B. Ball, Y. Devos 2016, *Beyond redundancy and multiplicity. Integrating phytolith analysis and micromorphology to the study of Brussels Dark Earth*, "Journal of Archaeological Science", 68, pp. 79-88.

L. Vrydaghs, Y. Devos, P. Charruadas, L. Scott Cummings, A. Degraeve 2016, *Agricultural Activities in the 10th-13th Century CE in Brussels (Belgium): An Interdisciplinary Approach*, in F. Retamero, I. Schjellerup, A. Davies (eds), *Agricultural and Pastoral Landscapes in Pre-Industrial Society: Choices, Stability and Change*, Oxford, pp. 221-234.