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It is all about location: GIS, property records and the role of space in shaping late medieval urban life. The case of Antwerp around 1400

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Urban historians have come to regard space as a key dimension of their areas of inquiry. Yet few apply GIS in question-driven research on pre-industrial cities. This is mainly due to the scarcity of accurate maps and spatially referenced data. This essay illustrates that locating large sets of textual data, constructing parcel maps, and linking both, is feasible even for medieval cities. Thus, medievalists too can apply GIS at the household-level and reach a spatial definition high enough to expose the roles played by space in shaping medieval urban life.

Keywords: real property, digital parcel maps, occupational topography, GIS, Antwerp

Per gli studiosi della città lo spazio è un concetto chiave dell'indagine, e tuttavia ancora pochi utilizzano i GIS nelle loro ricerche sulle città preindustriali, a causa della scarsità di mappe accurate e di dati georeferenziati. Questo contributo si concentra sulla georeferenziazione di dati testuali e il loro collegamento con le mappe parcellari. Anche i medievisti possono così usare questo strumento per poter mettere in luce il ruolo dello spazio nella definizione della vita urbana medievale.

Parole chiave: proprietà, mappe delle parcelle, topografia occupazionale, GIS, Anversa

Over the last twenty years, many historians of both the modern and pre-modern city have come to regard space, physical space as well as social and cultural space, as an important dimension of their areas of inquiry. Inspired by the new cultural history or influenced by post-structural theory of space such as the work of social theorist Henri Lefebvre on the relationship of space to the capitalist process (Lefebvre 1974; 1991), urban historians have drifted away from the long-standing traditions of historiography that dealt with cities as mere containers of human activity. Their attention shifted from cities, and spaces of cities, as inert places lacking causal significance to spaces as socially produced

and socially productive entities. Space, historians came to see, was an agent in its own right, playing a role in shaping economic, cultural, political and social city life and having the same significance as time in the unfolding of human affairs. In consequence, the geographical dimension of historical facts and events became an essential key to understanding how and why things had happened¹.

In the course of the 1990s did not only fresh theoretical impulses spur a renewed interest in the influence of geographical space on past human behaviour, the improvement of spatial technologies did too. A re-development for PC, a growing user-friendliness, and cheaper or even free software brought geographic information systems or GIS originating in the earth sciences within reach of historians, geographers, archaeologists, and other scientists who seek to answer questions about the past. A GIS, in short, is a database management system built around two linked components: a spatial database and an attribute database. The spatial database describes the location and shape of a selection of both physical and non-physical entities that exist or occur on earth, such as census districts, flood depths, or buildings. Spatial datasets take the form of layers of pixels or of layers of points, lines and/or polygons that have spatial coordinates. These georeferenced layers are the chief constituents of digital maps. The attribute database on the other hand, holds non-spatial facts about these spatial entities, for example their material qualities, or the personal data of their users. Thus, a GIS makes possible not only the combination of attribute data from various unrelated (historical) sources based upon their geographical location, they also allow the integration of familiar database operations such as querying and statistical analysis with the unique visualisation and geographic analysis benefits offered by maps. Owing to these specific qualities, GIS has become a popular addition to academic research in a wide range of historical endeavours.

Over the last ten years, for instance dozens of historical GIS (HGIS) infrastructure projects have sprouted whereas the number of scholars who apply spatial technologies to historical questions has also grown².

Yet, the number of historians using GIS to study the pre-industrial city remains relatively small, even though GIS-technology makes space

¹ For historians dealing with these changed concepts of space in regard to the Medieval and/or Early Modern city, see, for example, MAIRE VIGEUR 1989; HANAWALT, KOBIALKA 2000; BOONE, STABEL 2001; HARDING 2002.

² Examples of application of GIS in history can be found, for instance, in KNOWLES 2002; KNOWLES, HILLIER 2008; BOONSTRA, SCHUURMAN 2010; and in special issues of "Social Science History" 24/3 (2000); "History and Computing" 13/1 (2001); "Historical Geography" 33 (2005); and "Social Science Computer Review" 27/3 (2009).

an explicit part of analysis. The lack of technical knowledge, the favouring of the word over the spatial image, and the historian's concern with 'time' rather than 'space' only partially account for this deficit. The limited temporal functionality of GIS software is an issue too; although by now solutions exist for effectively incorporating change over time in GIS (Gregory, Ell 2007, pp. 119-145; Goodchild 2008). The main obstacle in applying historical GIS to pre-industrial cities is the scarcity of ready-to-use maps and attribute information.

Very little historical information is available in a georeferenced or geocoded digital form, except for the often statistical and aggregated data already disclosed via infrastructure projects, such as the Great Britain Historical GIS. Urban historians eager to approach a particular historical problem by means of GIS usually face the laborious preparatory tasks of collating the required written texts into digital tables, of digitizing and georeferencing historical maps, and then somehow linking both. Most of the published GIS-based urban studies to date are therefore concerned with the modern city³.

Archives favour the historian of the twentieth and nineteenth century city with geometric accurate maps and with a rich variety of sources that contain unambiguous geographic references. Such spatially referenced sources include household surveys, business censuses, and cadastral records, sometimes accompanied by plans. Preparing archival data of this kind for use in a GIS is rather straightforward. Moreover, the level of detail of the records is often that of the city dweller or the building unit. This allows one to move away from aggregate analyses on parishes, quarters or streets as a whole and to study complex city life with the individual actors as a starting point. Presenting and analysing data on the household-level allows a more inclusive form of history and leads to a better understanding of historical phenomena (Bisschops 2007, p. 138). In contrast, the historian of the early modern or medieval city has to deal with a lack of detailed and accurate city maps, with fewer and more partial records, and with strategies for describing precise locations that were once common but that are now since long disused, with numerous geographically meaningless references as a result. Yet these are surmountable obstacles.

This essay aims to illustrate that it is possible to locate large sets of non-spatial medieval urban data, to construct precise parcel maps of medieval cities, and to link both. Thus, historians of the medieval city too can apply GIS at the plot or household-level and reach a spatial definition

³ Several successful case studies are discussed in DIAMOND, BODENHAMER 2001; BEVERIDGE 2002; HILLIER 2002; DE BATS 2008; LESGER, VAN LEEUWEN, BUZING 2010.

high enough to expose some of the various roles played by space and place in the shaping of late medieval urban life. The methods and preliminary findings discussed in this text are drawn from an ongoing study of the property market in Antwerp around 1400⁴.

Antwerp at that time was a flourishing inland port city of about 20.000, sited on the right bank of the river Scheldt and located on the border of the County of Flanders and the Duchy of Brabant. The body of source material described is similar in character to that for most of the larger cities in the Southern Low Countries. To these cities at least, the principles of the presented methodologies are transferable.

1. Containing medieval location: records of property-ownership

Records concerning the holding and use of property hardly need promotion as one of the best starting points for GIS-based studies of the late medieval city, even if real property is not the researcher's actual concern. Real property, which includes all interests arising out of property such as life estate or usufruct, logically has a fixed location on the earth surface. If one can establish the location of an individual medieval property, it follows that all information about this property automatically receives geographical meaning. Attribute data are obtainable from sources directly related to property such as deeds or material remains, but also from sources indirectly related via the users of property. Guild membership registers or militia payrolls, for example, may not include spatial references yet they become spatially meaningful if we can link the listed individuals to the street or house where they lived. Secondly, the documentation regarding rights and interests in property is not only profuse; it also starts at an earlier date than most other written record series. Real property was a valuable commodity that served various purposes ranging from the humble securing of housing to the raise of capital or the promotion of social advancement. The alienation of real property, therefore, became formalized in deeds or charters and enforceable at law at already an early stage. Twelfth-century deeds are relatively common. Thirdly, in addition to its power to authenticate the transfer of real property a local authority could systematically register changes in property ownership for fiscal or probative use. Of such predecessors of modern land registers many have survived and they are fruitful sources

⁴ University of Antwerp (Belgium), Centre for Urban History, PhD study funded by the Flemish Research Foundation (FWO) for the period 10/2007-09/2012 under the working title "Broadening the spatial turn, Real Estate, annuities and the rise of the Antwerp market (ca 1390-1430)".

for tracing changes in for example the use of urban land or the distribution of wealth over the long term.

Antwerp was one of those cities that neatly kept track of its citizens' interests in land. Most of the land inside its walls was privately held and therefore transmittable, dividable, or chargeable at will. From around the middle of the fourteenth century any transfer of real property within the city's geographical jurisdiction had to be acknowledged by two local magistrates, known as *scabini* or aldermen, and entered in sum into official registers to be legally enforceable. A small fee was due for this service. Even in the sixteenth, seventeenth and eighteenth century when independent notaries controlled most of the writing of legal documents, the aldermen kept on recording an abstract of every change in interest in property. Only after the turn of the eighteenth century, the Napoleonic administration replaced the age-old land record system by the modern cadastre still in use today. Owing to its probative value, most of the old land register survived the French modernisations. Today the Antwerp City Archive preserves a series of aldermanic registers covering almost every year from 1394 to 1797 and containing the abstracts of more than half a million transfers of property. It follows that one can not only largely reconstruct Antwerp's property market at any given point in time since the Late Middle Ages; in theory one can also trace the succession of title ownership to a specific property from the present owner back to his medieval predecessor. The custom of legal registry by aldermen was widely spread in the Southern Low Countries and records series very similar to those in Antwerp survive for example in the cities of Ghent, Malines, and Louvain, starting 1339, 1345 and 1362, respectively (Dumon 1986).

The continuous series of aldermanic registers have already proven great value for the fields of economic and social history in the Low Countries. Seen as a perfect instrument to identify urban development trends in the pre-statistical era or to study social stratifications within pre-modern urban societies the series were very fashionable sources in the 1970s and 1980s⁵. Because of the strong scholarly emphasis on their value for quantitative analysis, the interest for the registers quickly faded when the cultural studies boosted in the 1990s. Nowadays urban historians consider the voluminous and non-indexed registers as rich yet highly unattractive research material. Nonetheless, their potential goes beyond the amassment of data to study urban economic trends or urban social geographies at ward or parish level.

⁵ For example SOLY 1974; BOONE, DUMON, REUSENS 1981; DEGREVE, SCHOUPS 1983; STABEL 1989.

Beside the price and occupational information so much appreciated two decades ago, the registers contain a rich variety of data. In the Antwerp records a precise date and the names of the two attestors are always given. These attestors did not only witness changes in title to property. Debts, payments, marriage settlements, and other legal arrangements were entered in the registers as well, albeit less frequent. The aldermanic registers, therefore, also reveal personal details of the parties to a contract, for instance their marital status, their kin and acquaintances, or their political or religious offices. Particularly interesting is that nearly every reference to a property comes with a detailed description of its location.

The Antwerp magistrates used a particular discourse of space for accurately locating a building or piece of land. After having defined its typology, the aldermen approximately situated the property in terms of a place name or a landmark. Next, they specified the location of a property in relation to its abutments by giving a brief description of the neighbouring plots and quoting of the names of their owners or occupants. Sometimes the magistrates wrote down a house name as well. They also regularly relied on communal memory by referring to former owners or former use. Accounts such as 'The small house named The Salmon previously owned by our good bailiff, located at the Fish Market between the smoke house of John Stevens the fishmonger and the corner house of Peter the cooper, stretching at the back to the garden of the same Peter' were commonly used for defining the fixed location of houses or land. Today this system is no longer practicable as nearly all the references to individual plots and persons have lost their spatial connotation. Yet there are two generic ways to make these descriptions understandable in their historical context and to locate medieval property once again.

2. Determining medieval location: the 'cross-section method'

The first way to identify medieval property is via the 'regressive method' for historical investigation, a technique generally applied in house history research. The method involves the accumulation of as much property records as possible for a particular modern address in order to construct a successive chain of title from the present owner back to his medieval predecessor at best. To such a history of title, a researcher then attaches other archival information about the property and its users. As every title search is carried out for a geographically well-defined property, it follows that all historical attribute information automatically becomes spatially referenced and suitable for processing in

a GIS. Established histories of property ownership and use provide valuable information for the conservation, the excavation, or the promotion of specific historic sites. For locating large numbers of medieval urban property, however, working backwards from modern records is not always possible or practical. Even when serial records are at hand, as is the case in Antwerp, and no parts are missing, tracking the five- or six-hundred-year-old-histories of hundreds of modern parcels within a medieval urban area would require immense resources.

The second technique, the 'cross-section method', allows one to tackle the accurate spatial referencing of property over an entire medieval urban area without the construction of hundreds of property histories. The strategy of describing the location of a property by referring to its abutments was widespread in pre-industrial Western Europe. Particularly in the UK historians, archaeologists and historical geographers have drawn on abutment relationships to identify medieval and early modern urban property in order to reconstruct ancient plot or tenement patterns. Influential studies are those on late medieval Winchester and London by Derek Keen and Vanessa Harding⁶. The cross-section method is rather straightforward (fig. 1). Yet putting the procedure in effect can be quite a challenge.

The method requires a set of more or less consistent medieval records of property holding that geographically covers the entire area under examination. Preferably, the records also cover a substantial stretch of time. Several consecutive years are taken out of the available sources, and for every recorded property within this cross-section a (digital) filing card or abstract is made. Such an abstract contains at least the abutment clauses about the building or piece of land involved. Next, all filing cards are grouped according to the properties they refer to and according to the toponyms mentioned in relation to the properties (a street, square, landmark ...). For each toponym are then traced as much 'reference properties' as possible. Most of the medieval street names and landmarks are still identifiable today, but this information alone does not allow one to locate individual plots or buildings accurately. Reference properties are locatable even today, for example because they adjoined a key medieval building, because they occupied a street corner, or because their medieval house name has survived. One can also try to create references using the regressive method. These locatable properties then serve as key stones for positioning numerous strings of properties with overlapping abutment relationships. If a sequence of properties includes at least one reference property then the block or

⁶ KEENE 1985; HARDING 1985; KEENE, HARDING 1987.

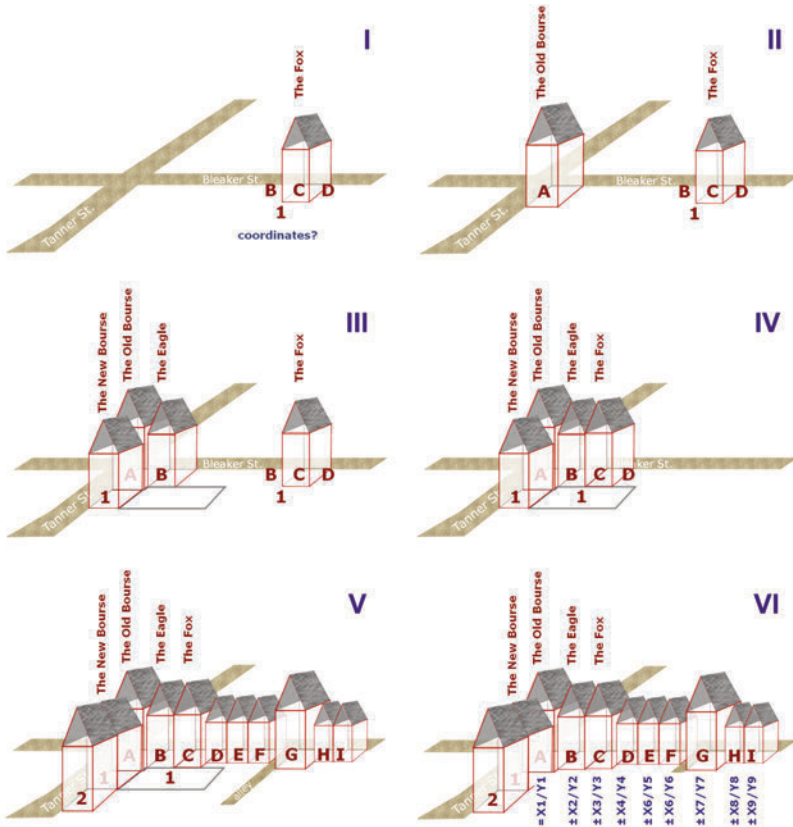


Fig. 1. Diagram of the 'cross-section method'.

street front along which the properties are located and the order of their progression along it can be determined with reasonable accuracy. Series without a reference property remain 'floating' inside a block or along a street until additional evidence makes it possible to establish the precise location of one of the string components⁷.

The series of aldermanic registers that are available in a number of cities in the southern parts of the Low Countries evidently lend themselves for determining the location of large numbers of late medieval properties and their attribute data via the cross-section method. Despite their wealth of historical information the registers have been tested only once on a scale comparable to the Winchester and London sur-

⁷ For a full discussion of the method see, for example KEENE 1985, pp. 37-41; ASAERT 1967-1968, pp. 5-12; BISSCHOPS 2009.

Form Properties

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ParcelID: 63

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Mutations:

Place: AN TW/PE/N

Street: 80A

Block: 41A

Parcel: 101 [Select]

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People involved in transactions

Property values

People involved in transactions related to this property:

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44	89	4/07/1994	AMBT						heerlijk	Jan / Johan	van de	Pulte	Pulte / Penysaone (?)		
44	487	4/07/1994	DERD	A - 1	7	1.000				Ohereng	van	Pulte			
44	487	4/07/1994	DERD	B - 1	1.000					Ohereng	van	Pulte			
44	487	4/07/1994	DERD	A - 1						Ohereng	van	Pulte			
44	250	4/07/1994	ODOR	B - 4	0.500					Jan / Johan	van	Cant	Janzz		
44	89	4/07/1994	ODOR	B - 1	0.500				heerlijk	Jan / Johan	van de	Pulte	Pulte / Penysaone (?)		
44	488	4/07/1994	ODOR	A - 1	0.500					Lysoeth	van	Dooyfaats	de haer		
44	489	4/07/1994	OVVR	A - 1	0.500				weduwe	Lysoeth		Dooyfaats	van	Zerkzee	
44	490	4/07/1994	DERD						wijlen	Dederick		Willemaone			
159	78	1/09/1994	AMBT						heerlijk	Claus / Nichola	van den	Werve	Jansone		
159	79	1/09/1994	AMBT						heerlijk	Claus / Nichola	van	Oyrygaen	Artesone		
159	489	1/09/1994	DERD	A - 1	1.000	weduwe				Lysoeth	van	Dooyfaats	van	Zerkzee	
159	490	1/09/1994	ODOR	A - 1	1.000	wijlen				Dederick		Willemaone			
159	148	1/09/1994	OVVR	B - 1	1.000					Bayrene / Rein	van den	Lare			

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 Zoeken

[Go to ID's](#)

[Go to transactions](#)

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data capturing received an ID too. With the ID-numbers acting as a key, a relational join can link together the two GIS-components: a multisource relational database of property and people, and a spatial database that stores the constituting parts of a large-scale base map. This enables the mapping and quantitative spatial analysis of data from various medieval written sources.

Alas, visualising and analysing medieval data with georeferenced modern large-scale city maps as a spatial basis is not an option. Modern maps, both in raster and vector geometry, include centuries of alterations of the medieval plan and are laden with non-relevant map elements. Using them as a backdrop for visualising medieval data addles research results. Moreover, the linkage of medieval attribute data to modern spatial units such as parcels and streets of which the shape, location and quantity is very likely to have changed over the past six hundred years is both problematic and pointless. On the other hand, in Antwerp no pre-modern cadastral maps or land register maps exist. Thus, it was necessary to construct a new, layered base map that consists of the fundamental features of Antwerp's medieval plan: plots, blocks, streets, waterways, key buildings...

3. Mapping medieval location: the legacy of 'town plan analysis'

The methodological principles of 'town-plan analysis' put to test by Michael Conzen in the 1960s and elaborated more recently by, for instance, Keith Lilley, underlie the creation of a detailed and reliable cartographic representation of late fourteenth-century Antwerp⁸. This methodology to analyse the process of physical change in an historical urban environment, especially a medieval urban environment, trusts in the fact that the form of streets and the property boundaries that define urban plots are extremely conservative. Hence, it is possible to trace medieval plan elements such as streets, plots and buildings on modern large-scale maps. In their *Mapping the Medieval Urban Landscape Project*, completed in 2005, Keith Lilley, Chris Lloyd, and Steve Trick proved that accurate and detailed medieval town plans can be constructed in a GIS-environment by combining plan elements with evidence from field-surveys, and historical and cartographic sources (Lilley, Lloyd, Trick 2007).

⁸ LILLEY 1998, 2000 provides and discusses a step-by-step methodology for performing town-plan analysis. On the original town-plan analysis techniques: CONZEN 1960, 1968, evaluated in for instance BAKER, SLATER 1992.



Fig. 3. Vectorised and coded medieval streets with two 1823-1824 1:500 cadastral map sheets as a backdrop.

Digitally reconstructing Antwerp's medieval topography started with scanning at high resolution all 1:500 scale sheets of the 1823-1824 *Plan Primitif* which is the city's oldest, most accurately surveyed and detailed parcel plan. Through georeferencing and georectifying the digitized maps were then converted to raster layers fit for processing in a GIS. This was a procedure done visually by lining up features on the scanned historical maps with current GIS layers. A particular advantage of these 1823-1824 maps over more recent large-scale maps is that they show Antwerp's plot pattern before disruption by a range of major nineteenth century urban renewal projects. Once geocorrected the high-resolution scanned cadastre maps are usable for plucking off information to create new GIS vector layers.

With the cadastre maps displayed as a backdrop for visual reference, first the axes of all medieval streets were vectorised, uniquely coded, and stored as a new map layer (fig. 3). The previously created street-name gazetteer proved a valuable support. It provided an instant spatial overview of the now sometimes lost streets and squares that existed around 1400. Additional evidence from cartographic, iconographic, material and documentary sources assisted the refining or reconstruction of the shape and size of the medieval streets. Possibly some back lanes were omitted, but it is quite certain that no more than a tiny fraction of the city's fourteenth-century street pattern has been left out. After having constructed the medieval street plan, the outlines of most medieval house-blocks also became clear. The block contours were vectorised, corrected, coded and stored in the same way as the street-axes (fig. 4).

At the end of this first stage of mapping, 98 blocks and 111 streets, alleys and squares had been transformed into spatial objects linkable to attribute data.

The second stage of mapping involved the tracing of the medieval plots, a task more demanding than tracing and reconstructing the streets and blocks. At the end of the fourteenth century, extensive common fields and large pieces of non-built-up private land still represented a substantial part of all the land inside Antwerp's walls. It would take another two centuries and an additional 80.000 citizens to parcel out and

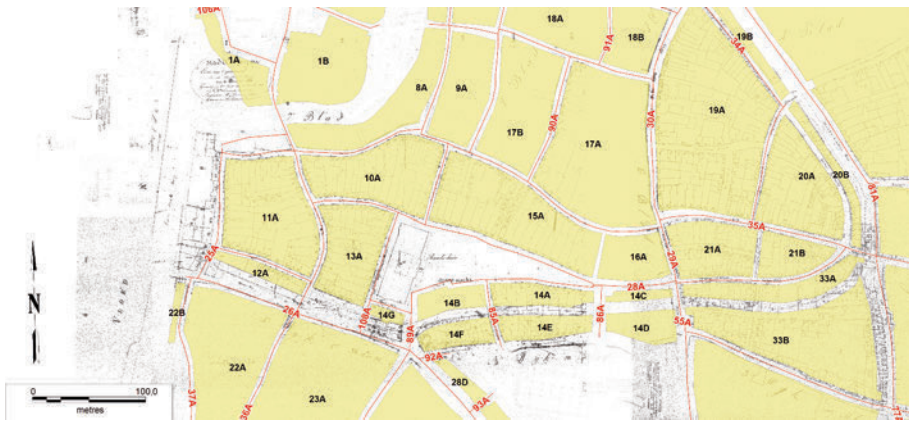


Fig. 4. Vectorised, corrected and coded medieval blocks with two 1823-1824 1:500 cadastral map sheets as a backdrop.

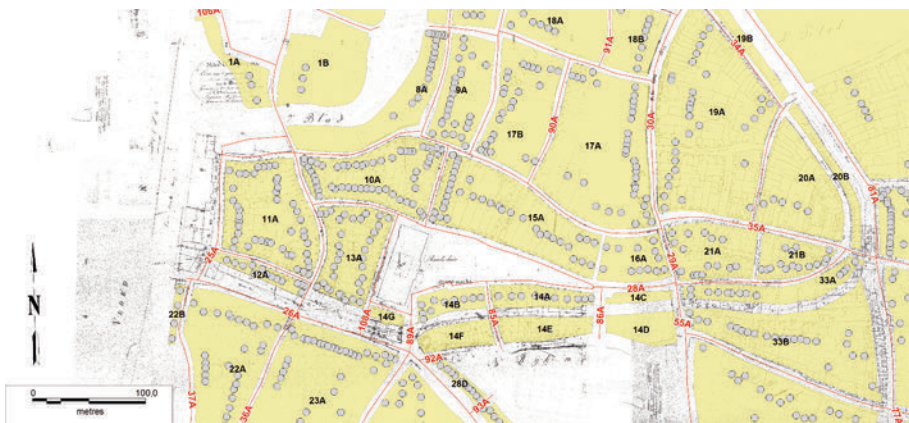


Fig. 5. Digitised 'property strings' from the Asaert survey; after their repositioning within the medieval blocks based on established primary plot boundaries.

consume these unoccupied lands as well. Filtering out these hundreds of post-medieval parcels inside the late medieval city walls would have been extremely time-consuming. Yet, again, the topographical survey already at hand proved its value. Instead of meticulously vectorising every parcel boundary on the cadastral maps and next deleting all fifteenth and sixteenth-century boundaries to create a map layer of exclusively medieval parcels, it sufficed to plot the property strings from the survey over the block-layer with the cadastre maps displayed as a backdrop (fig. 5). Then, of every the block or block front that held a sequence of medieval properties, the primary plot boundaries were traced in a temporary layer. While plots could be subdivided, amalgamated, or developed otherwise through time, their primary outer boundaries were unlikely to alter before the nineteenth century. This boundary stability is mainly due to the legal and practical difficulties of physically moving boundaries in densely built-up areas. As follows, a framework of principal boundaries was established to which the points of the property sequences could be repositioned with the reference properties from the survey serving as anchor points. Usually the strings matched the number of boundaries. If they did not, the problem could often be solved by re-evaluating those preliminary traced parcels of which the size exceeded the common medieval plot widths of 14 ft or 21 ft, ca 4,2 m and 6,3 m respectively. A parcel 28 ft wide for instance, may actually represent two parcels 14 ft wide. Most of the time such a missing boundary indeed stood out on the cadastral map as an anomaly in the shape of a building or parcel. After having defined the most likely location of every property, the prospective

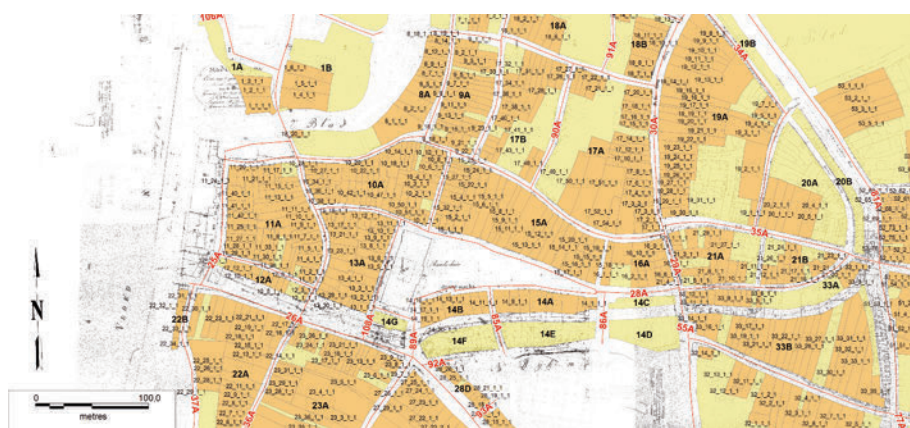


Fig. 6. Located, vectorised, and coded medieval plots with two 1823-1824 1:500 cadastral map sheets as a backdrop.

plot outlines were vectorised in a new layer and each of the 1.688 plots was given its unique ID-code (fig. 6). In a final stage, spatial datasets were created for other features of the medieval plan: waterways, defences, ecclesiastical precincts and religious medieval buildings again by mapping them against historical evidence (fig. 7). The resulting digital parcel map of the medieval city (fig. 8) then made possible the visualisation, spatial querying and spatial analysis of a variety of data on urban land and urban land use on several levels of geographical detail.

It is evident that many of the mapped features do not fully correspond with medieval reality. Unavoidably assumptions had to be made while mapping, not in the least because the project resources only allowed the integration of a limited amount of historical evidence. However, distortions caused by adherence of these assumptions in the plotting of attribute data are relatively small. Wrongly assuming that the plot of a small house was only 14 ft wide, changes nothing to the fact that the house

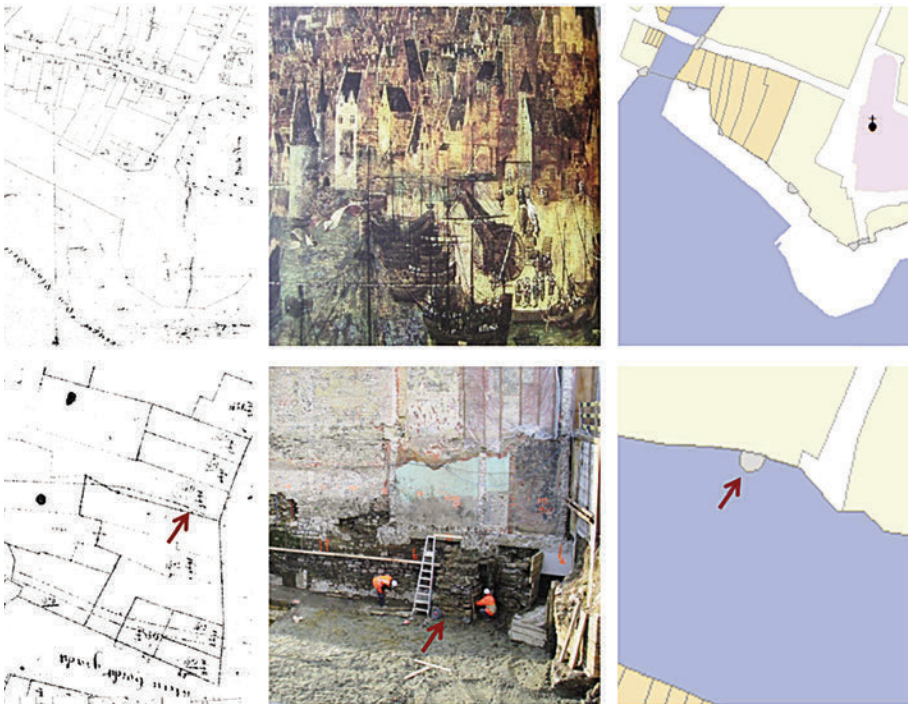


Fig. 7. Combining cartographic, iconographic, and archaeological evidence to locate and map medieval plan elements.



Fig. 8. Detail of the reconstructed parcel plan of Antwerp around 1400. The map-objects 'street' and 'parcel' are labelled with their unique ID-code.

was once named 'The Salmon'; located at the Fish Market; owned by 'the good Antwerp bailiff'; and abutted by the smoke house of John Stevens the fishmonger and the corner house of Peter the cooper. Moreover, spatial data are flexible and easily extendible in both space and time. Whenever new historical evidence or new research questions require it, one can resize, reshape, relocate, or add spatial objects. Spatial data-layers are also easily copied, making possible, for instance, the mapping year after year of changes in the layout of properties that can be constructed from the evidence of the abutment clauses. The unique match keys guarantee that the plots, streets and other objects remain linked to their attribute data.

4. It is all about location: Antwerp's medieval occupational topography

The ability to locate and map a wide range of documentary information regarding medieval urban land and its users at the plot or household level yet with the geographical scope of an entire city offers new perspectives for studying the attitude of medieval city-dwellers to real property and, accordingly, to urban space. This way for example we reach a spatial definition high enough and a spatial context large enough to gain original insights into the location decision processes of medieval urban land users, whether they be business, produce, or residential. The factors that made someone decide to live, work, trade, or invest in a particular property on a particular location were various. It is evident that considering each of



Fig. 9. Thematic map of a data query for land bought in Antwerp by butchers (◆), money-changers (●), stonecutters (▼), and dyers (▲) in the year 1399.

them is not feasible in the context of a medieval city simply for lack of data. Yet with GIS, one can capitalize the evidence available.

At present, composing the attribute database regarding medieval Antwerp real property is a work in progress. Numerical datasets especially are still lacking. For that reason, the following brief discussion of preliminary results is based upon visual representations of rather simple data queries. The small set of thematic maps gives only an impression of the research potential. Among the attributes already usable are the occupations of about 60% of the ca 5.400 property-holders referred to in the registers covering the years 1391-1404. This sample, which comprises seventy different occupations and trades, is large enough to test if considerations about economies of agglomeration weighed on the location decision-making process of buyers of property and to what extent. The Antwerp GIS permits the isolation of a single occupational group out of the attribute dataset and the mapping of its activities on the property market within definite geographical and chronological boundaries.

A query for property *intra muros* acquired in the year 1399 by four non-related occupational groups, being butchers, moneychangers, stone-



Fig. 10. Four examples of discrete occupational clusters exposed via diachronic aggregation of a single attribute on the parcel level. Properties bought by butchers (◆), moneychangers (●), stonecutters (▼), and dyers (▲) between 1395 and 1404.

cutters and dyers, makes no trade concentration particularly noticeable when plotted on the base map (fig. 9). The query results are simply not sizeable enough. The picture changes drastically if the chronological scope of the same query is enlarged to the years 1395-1404. This diachronic aggregation of a single attribute on the parcel level brings to light four discrete occupational clusters (fig. 10). Even though the local land market was relatively fluid and no government regulations forced them to do so, most of the Antwerp butchers, moneychangers, stonecutters and dyers who were engaged in acquiring real property limited their investments to a small area of the city. In the case of the butchers, the proximity of the meat hall on the southeast bank of the castle moat played a key role in their spatial location process. On the other hand, as both slaughter and sale were restricted to the premises of the meat hall, there were few economic benefits for butchers to obtain by congregating close to the hall in a narrow street characterised by relatively small dwellings liable to flooding. The large number of conveyances of houses and land from one butcher to another through several gener-



Fig. 11. Occupational integration exposed via diachronic aggregation of a single attribute on the parcel level. Properties bought by cartwrights (◆), loggers (▼) and sawyers (▲) between 1395 and 1404.

ations, although not necessarily from the same family suggests that social ties, and territorial delineation of geographic space outweighed environmental inconveniences and limited economic benefits when butchers accounted for their residential needs and preferences.

A query similar to the previous one but now for the related occupational groups of loggers, sawyers and cartwrights reveals a different marked pattern of localisation: one of geographical occupational integration instead of spatial distinction (fig. 11). The Antwerp loggers or *houtbrekers* controlled the harvest, transportation, and local store and sale of inland wood. In an appropriate juxtaposition, sawyers and cartwrights lived alongside the loggers who brought them most of their trade. The location of these three occupations on both sides of the 'Meere' correlates with the exceptional width of the public space they lined. Sized trunks, especially those for the building industry, could still measure up to 15 m in length and were heavy to handle. A street-width of 20 to 40 m instead of the usual 6 to 8 permitted an easier storing and processing of trunks in front of the houses instead of behind them. It is very like-



Fig. 12. The navigability of waterways as a structuring element in the clustering and spatial distribution of occupational groups. Properties bought by fishmongers (●), skippers (◆), stonecutters (▲), tanners (■), and dyers (▼) between 1395 and 1404.

ly that loggers and sawyers themselves are accountable for the rather uncommon dimensions of the 'Meere' by first occupying the higher north side of the place and later building up the lower marshy south side at sufficient distance from the on-street lumber yards.

Location-specific advantages were also a steering element in the investments of occupational groups contingent on access to water. In fourteenth century Antwerp, the navigability of local waterways appears to have been a structuring element in the spatial distribution of fishmongers, shippers, stonecutters, tanners, and dyers among others (fig. 12). Trades depending on transport by sea-going vessels controlled most of the riverfront. The fishmongers clustered north and south of the castle. In the north, on the downwind side of the city and between two deep river inlets the fishmongers held nearly all herring smokehouses that could be located (fig. 13). In the south, they occupied most of the properties surrounding the fish market. The skippers of cargo-vessels congregated around the mouth of the canal that connected the river to the 'Markt', the city's commercial heart. Shipwrights and fishermen are not



Fig. 13. A visualisation of spatial correlations within and between attribute-categories: clustering of smokehouses (highlighted in orange) and clustering of properties bought by fishmongers (●) and skippers (◆) between 1395 and 1404.

mapped but they too occupied a distinct part of the river bench, mainly the excentric river inlets in the north and south. For their supply of raw materials, especially limestone from the Tournai region upstream, the Antwerp stonecutters depended on the river as well. The fishmongers and skippers, however, outnumbered the stonecutters. As they needed less frequent access to navigable water, the stonecutters were therefore located somewhat inland on the south bank of an old moat that was navigable by vessels of limited draft only. Further inland along a non-navigable part of the same moat could be found the tanners and dyers who needed access to water solely for produce. Whereas other cities tended to relegate the noxious tanning and dyeing activities to the periphery, the Antwerp tanners and dyers concentrated close to the centre of the urban area. Customary activity, fixed industrial equipment, and most importantly, the fact that the brackish water of the river and moats was not suited for consumption anyway, probably made allowable the central location of these environmentally demanding trades.

Antwerp's late medieval occupational topography does not only provide

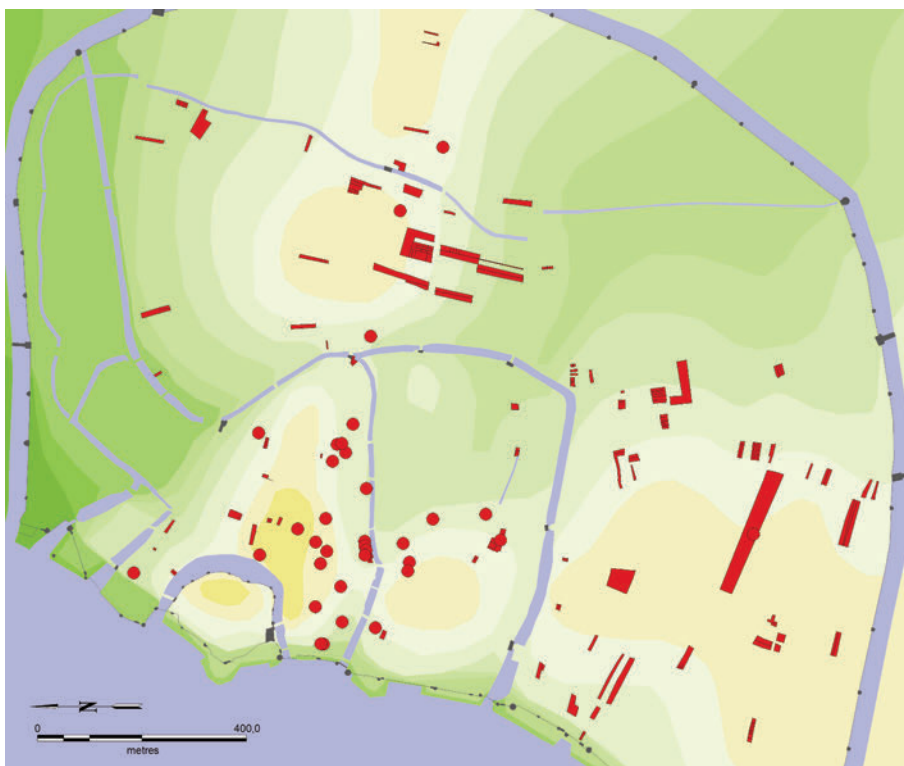


Fig. 14. An example of the complementarity of attribute-categories. One-room housing units (plots highlighted in red) were typical rental properties yet high turnover-rate and low prices made registering the rental agreements too costly. Valuable lease contracts on the other hand were frequently registered (●). When mapped together for the period 1395-1404 the attributes present an improved image of the topographies of Antwerp's medieval rental market.

examples of concentration. There certainly were trades with representatives scattered through the city such as shoemakers, tailors, blacksmiths and bakers. Still, the evidence suggests that while no individual occupation predominated to the exclusion of all the others in a specific area, most of the Antwerp trades did have a characteristic pattern of distribution. The thematic maps previously discussed are no doubt incomplete. They do not depict properties that tradesmen held but did not sell. Furthermore, records of property ownership do not always indicate where a citizen lived, so this is primarily a study ownership, not of property occupation, although it is possible to bring to light part of the hidden population of tenants by harvesting information from other datasets in the Antwerp GIS (fig. 14). In any case it is clear that thematic mapping of investments by members of the same trade can provide a relatively full pic-

ture of the medieval urban occupational topography when the sources traditionally used for this type of research, such as censuses or assessment rolls, are lacking.

5. Conclusion

It could be argued that this text has said little about the role of space in shaping medieval economic, cultural, political and social city life; except for a short discussion on the localisation of Antwerp trades that aimed to illustrate the potential of parcel-based GIS for recasting our understanding of urban life during the late medieval period. Rather this text has concentrated on demonstrating how historians can accurately locate large sets of non-spatial medieval textual data and how they can construct detailed and rather reliable digital maps of medieval cities using mainly archival sources. Using GIS for studying historical phenomena at the household level clearly does not have to be the prerogative of the historian of the modern city. Yet, even when able to conduct question-driven and fine scale GIS-based research to explore medieval urban life one cannot omit certain issues inherent to GIS and mapping. Maps often look more convincing than is justified by the ambiguity or incompleteness of the historical sources. Also, the ability to draw together distinct historical datasets by geographical location does not automatically imply a causal spatial relationship between the datasets. For such matters basic source criticism can and should be the treatment. The real issue with historical GIS is its cost. Although a historical GIS can have distinct cost advantages in terms of automation once created, actually building the GIS requires substantial investments in terms of time and money. The first question to ask when willing to use GIS for studying medieval city life, should therefore not be 'Can it be done?', but 'Will it be worth the effort?'

References

- G. ASAERT 1967-1968, *Huizen en gronden te Antwerpen omstreeks 1400. Proeve van topografische reconstructie*, "Bijdragen tot de geschiedenis", 19-20, pp. 5-166, 171-236.
- A.A. BEVERIDGE 2002, *Immigration, ethnicity and race in metropolitan New Yorks, 1900-2000*, in A.K. KNOWLES (ed), *Past time, past place: GIS for history*, Redlands, pp. 65-78.
- N.J. BAKER, T.R. SLATER 1992, *Morphological regions in English medieval towns*, in J.W.R. WHITEHAND, P.J. LARKHAM (eds), *Urban landscapes. International perspectives*, London, pp. 43-68.
- T. BISSCHOPS 2007, *Ruimtelijke vermogensverhoudingen in Leiden (1438-1561). Een pleidooi voor een perceelsgewijze analyse van steden en stedelijke samenlevingen in de Lage Landen*, "Stadsgeschiedenis", 2.2, pp. 121-138.
- T. BISSCHOPS 2009, *De methodes van het historisch huizenonderzoek; sleutels tot de ontwikkeling van stedelijke GIS voor de pre-kadastrale periode. Cases: laatmiddeleeuws Antwerpen en vroegmodern Leiden*, in J. D'HONDT (ed), *Huizenonderzoek en stadsgeschiedenis*, Bruges, pp. 25-40.
- M. BOONE, M. DUMON, B. REUSENS 1981, *Immobilienmarkt, fiscaliteit en sociale ongelijkheid te Gent, 1483-1503*, Kortrijk-Heule.
- M. BOONE, P. STABEL (eds) 2001, *Shaping Urban Identity in Late-Medieval Europe: The Uses of Space and Images*, Louvain-la-Neuve.
- O. BOONSTRA, A. SCHUURMAN (eds) 2010, *Tijd en ruimte. Nieuwe toepassingen van GIS in de alfawetenschappen*, Utrecht.
- D.A. DE BATS 2008, *Tale of Two Cities: Using Tax Records to Develop GIS Files for Mapping and Understanding Nineteenth-Century U.S. Cities*, "Historical Methods", 41, pp. 17-38.
- M.R.G. CONZEN 1960, *Alnwick, Northumberland: a Study in Town Plan Analysis*, London.
- M.R.G. CONZEN 1968, *The Use of Town Plan Analysis in the Study of Urban History*, in H.J. DYOS (ed), *The Study of Urban History*, London, pp. 113-130.
- H. DEGREVE, I. SCHOUPS 1983, *Vijf jaar aanvulling op de Gentse immobiliënmarkt in 1483-1503: 1478-1483*, in J. DE BELDER, W. PREVENIER, C. VANDENBROECKE (eds), *Sociale mobiliteit en sociale structuren in Vlaanderen en Brabant in de late middeleeuwen tot de 20e eeuw*, Ghent, pp. 23-40.
- E. DIAMOND, D. BODENHAMER 2001, *Investigating white-flight in Indianapolis: A GIS-approach*, "History and Computing", 13, pp. 25-44.
- M. DUMON 1986, *The registers of the magistrates of Ghent and Antwerp, a source of social and economic history (ca. 1490-1507)*, in W. PREVENIER, R. VAN UYTEN, F. VAN CAUWENBERGHE (eds), *Sociale structuren en topografie van armoede en rijkdom in de 14de en 15de eeuw. Methodologische aspecten en resultaten van recent onderzoek*, Ghent, pp. 89-97.
- M.F. GOODCHILD 2008, *Combining space and time: new potential for temporal GIS*, in A.K. KNOWLES, A. HILLIER (eds), *Placing History. How maps, spatial data, and GIS are changing historical scholarship*, Redlands, pp. 179-197.
- I.N. GREGORY, P.S. ELL 2007, *Historical GIS: Technologies, Methodologies and Scholarship*, Cambridge.
- B.A. HANAWALT, M. KOBIALKA (eds) 2000, *Medieval Practices of Space*, Minneapolis.
- V. HARDING 1985, *Reconstructing medieval London*, "London Topographical Record", 25, pp. 1-12.
- V. HARDING 2002, *Space, Property, and Propriety in Urban England*, "Journal of Interdisciplinary History", 32/4, pp. 549-569.
- A.E. HILLIER 2002, *Redlining in Philadelphia*, in KNOWLES 2002, pp. 79-93.
- D. KEENE 1985, *Survey of Medieval Winchester*, 2 vols, Oxford.
- D. KEENE, V. HARDING 1987, *Historical gazetteer of London before the Great Fire: Cheap-side; parishes of All Hallows Honey Lane, St Martin Pomary, St Mary le Bow, St Mary Colechurch and St Pancras Soper Lane*, Chadwyck-Healey, 57 microfiches, available online URL: <http://www.british-history.ac.uk/source.aspx?pubid=8> (accessed 15 August 2011).

- A.K. KNOWLES (ed) 2002, *Past time, past place: GIS for history*, Redlands.
- A.K. KNOWLES, A. HILLIER (eds) 2008, *Placing History. How maps, spatial data, and GIS are changing historical scholarship*, Redlands.
- H. LEFEBVRE 1974, *La production de l'espace*, Paris.
- H. LEFEBVRE 1991, *The production of Space*, trans. D. Nicholson-Smith, Oxford.
- C. LESGER, M.H.D VAN LEEUWEN, G. BUZING 2010, *Residentiële segregatie in Delft. Een verkenning van ruimtelijke patronen in 1832*, in O. BOONSTRA, A. SCHUURMAN (eds), *Tijd en ruimte. Nieuwe toepassingen van GIS in de alwetenschappen*, Utrecht, pp. 52-61.
- K.D. LILLEY 1998, *Urban design in medieval Coventry: the planning of Much and Little Park Street within the Earl of Chester's fee*, "Midland History", 23, pp. 1-20.
- K.D. LILLEY 2000, *Mapping the medieval city: plan analysis and urban history*, "Urban History", 27, pp. 5-30.
- K.D. LILLEY, C.D. LLOYD, S. TRICK 2007, *Mapping medieval townscapes: GIS applications in landscape history and settlement study*, in M. GARDINER, S. RIPPON (eds), *Medieval Landscapes: Landscape History after Hoskins*, II, Macclesfield, pp. 27-42.
- J.-C. MAIRE VIGUEUR 1989, *D'une ville à l'autre: structures matérielles et organisation de l'espace dans les villes européennes (XIII^e-XV^e siècle)*, Actes du Colloque (Rome, 1er-4 décembre 1986), Rome.
- H. SOLY 1974, *De schepenregisters als bron voor de conjunctuurgeschiedenis van Zuid- en Noordnederlandse steden in het Ancien Régime. Een concreet voorbeeld: de Antwerpse immobiliënmarkt in de 16de eeuw*, "Tijdschrift voor geschiedenis", 87, pp. 521-544.
- P. STABEL 1989, *Conjunctuur en immobiliënmarkt in Oudenaarde: einde 15e-16e eeuw*, "Handelingen van de Geschied en Oudheidkundige Kring van Oudenaarde", 26, pp. 3-23.