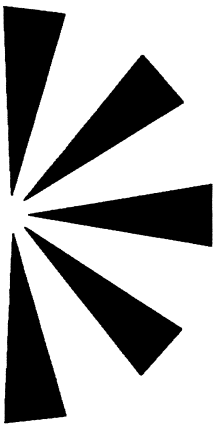

VIEWPOINTS

Discussion of topical issues
in urban morphology

Comparing metropolitan regions

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Making comparisons between metropolitan regions around the world is fashionable. Newman and Kenworthy's *Cities and automobile dependency* (1989) was one of the first attempts to collect data from cities around the world and make systematic comparisons (although highly criticized: see, for example, Gomez-Ibanez, 1991). Recent books (Simmond and Hack, 2000; Susteren, 2005) and even a summer 2007 exhibit at the Tate Modern continue the tradition. A further attempt, a poster prepared by Sorensen and me, has been sponsored by the Neptis Foundation, a Toronto based non-governmental organization (Sorensen and Hess, 2007). Its data and methods are described at www.neptis.org/atlas/show.cfm?id=60&cat_id=29. The aim was to promote discussion, showing simple comparisons (of regional form, density, and the use of private motorized vehicles) between the built-up area of Toronto and selected metropolitan areas in Canada, the United States, Europe and Australia (Figure 1).

In the course of the project major difficulties were encountered. Scheduled to take less than 2 months, the project ended up taking 2 years and required significant efforts and technical support by Zack Taylor and Marcy Burchfield of The Neptis Foundation and Byron Moldofsky and Jo Ashley of the Cartography Office at the Department of Geography at the University of Toronto. The greatest difficulties were locating comparable data and arriving at similar definitions for how the built-up areas were to be measured and defined. These issues were not fully resolved.

The transportation data, for example, came from *Millennium cities database* by Kenworthy and Laube (2001). This provides little information on sources or accuracy but yielded the best data that could be found for international comparisons. We had more control over the definition of built-up areas. In the United States and Australia we used the national census, which in each case defined the built-up or urbanized area of each metropolitan region based on a population density of about 4 persons per hectare for small census units (blocks in the United States) and provided rules on their contiguity. In Canada, national census data allowed us to develop a similar method. For European cities, comparable small census units were not available and the built-up area was defined using a combination of population density, based on administrative units, and land cover data for 'urban morphological zones' from the European Environmental Agency. This meant that some non-urban population was ascribed to built-up areas, thus raising density.

Despite the difficulties, we believe this is some of the most careful comparative work to date and allows for informative comparisons between the selected metropolitan regions. Differences in patterns of development at the edges of the metropolitan regions are striking. The urban 'islands' around the European cities may partly reflect definitions of built-up areas, but in some cases they are indicative of growth around historical villages and towns. In Toronto, the relatively smooth edges are explained by a strong planning regime that only releases fairly large blocks of land for urban development at the urban edge. The feathery patterns around American cities reflect strong land rights, weak planning regimes,

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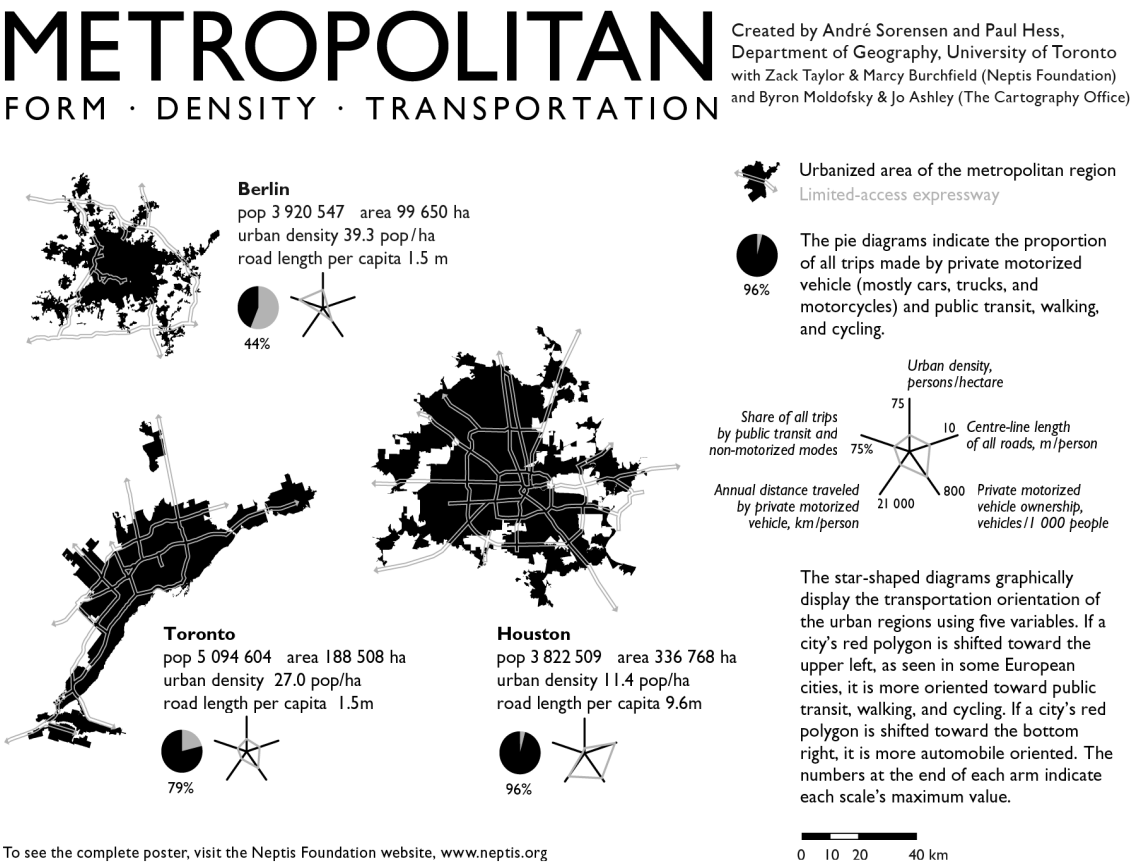

Figure 1. Examples of the data included in the poster.

and a continuous process of leapfrog development and infill.

The differences in the density of the metropolitan regions within and between Europe, the United States, Canada, and Australia are remarkable, with Madrid's density being more than 10 times that of Atlanta's. Generally, the European cities are the most dense, although the Canadian cities of Montreal and Toronto are as dense as the Scandinavian cities of Copenhagen and Stockholm. Similarly, the Australian cities are less dense than the Canadian cities, and the American cities are clearly, as a group, the least dense of all. It is tempting to make causal links between transport and density, but even with such highly aggregated data, this set of cities shows the relationships are complex. Certainly, all the low density cities are heavily automobile dependent and the highest density ones much less so, but in between the relationships are not so clear, with Montreal and Toronto much more reliant on automobiles than Copenhagen or Stockholm, a difference not explained by density alone. In addition to helping to answer such questions, the city comparisons are useful in posing them. For example, why do the cities largely cluster geographically based on density? How do such variables as differences in the culture, planning regimes, periods of rapid growth and other factors interact? Why are Canadian cities so much denser than their American counterparts even though, in many respects, they share similar histories of growth?

In light of the speed and potential consequences (environmental and otherwise) of urbanization across the world, posing and answering such questions is critical to making better cities. Researchers interested in urban and regional form need to continue to work on methods that allow meaningful, systematic comparisons at a variety of scales, from the individual street block to the entire city. Part of this effort must be to develop datasets that are more comparable across national boundaries.

References

Gomez-Ibanez, J. A. (1991) 'A global view of automobile dependence', *Journal of the American Planning Association* 57, 376-9.

Kenworthy, J. and Laube, F. (2001) *Millennium cities database* (International Union of Public Transport, Brussels).
Newman, P. W. and Kenworthy, J. R. (1989) *Cities and automobile dependence: a source book* (Gower Technical, Aldershot).
Simmonds, R. and Hack, G. (eds) (2000) *Global city regions: their emerging forms* (Spon, London).
Sorensen, A. and Hess, P. (2007) *Metropolitan form, density, transportation*(Neptis Foundation, Toronto).
Susteren, A. von (2005) *Metropolitan world atlas* (010 Publishers, Rotterdam).

GPS and historical maps on hand-held computers: potential use in urban morphology

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High grade global positioning systems (GPS) have a number of urban morphological applications; for example in surveying and analysing the built form of medieval settlements.[1] There is, however, potentially interesting work that can be undertaken using the considerably cheaper, though less accurate, forms of GPS which are now starting to become common in everyday life, particularly through satellite navigation systems. The range of maps on proprietary satellite navigation systems is quite limited, but the new generation of personal digital assistants (PDAs) has moved from being little more than electronic diaries, to full blown mini-computers, and many come with navigation-grade GPS, or can have this facility added via an inexpensive expansion card. ESRI, the makers of one of the most widely used geographical information systems (GIS), have produced ArcPad, a stripped down version of their main mapping software, specially for use on small hand-held computers.

At the School of Geography, Earth and Environmental Sciences at the University of Birmingham we have recently acquired a number of Fujitsu-Siemens PDAs as part of a teaching project developing course materials using mobile GIS.[2] A series of campus maps has been uploaded to these machines, spatially referenced such that when the GPS units are activated, students are placed 'in' the correct location on the maps. This has a number of potential applications. It allows data collected in the field to be entered directly into a GIS. This can then be easily processed when back in the office.

A major element in urban morphological fieldwork, particularly among Conzenians, is to enter the spaces under consideration, armed with a series of historical plans, to gain an understanding of the changing plan form.[3] While this is a highly effective technique, in the field it can be quite awkward switching between large paper plans and locating oneself in certain areas where landmarks have changed. This can be a particular problem for less experienced fieldworkers.

Spatially referenced historical maps and plans can be put into the ArcPad system as easily as contemporary maps and this offers very interesting possibilities to urban morphologists. The user can be placed 'in' an historical landscape on the screen while walking around the contemporary city. With a series of historical maps loaded into the PDA it is possible to walk to a particular part of a site tracked by the GPS. This allows the user to very quickly orientate and then switch between a series of different historical 'layers' to examine the changes to an area over time. The effect of walking around a site whilst watching your position move within a historical map[4] on the PDA screen can be a little eerie, in part because it helps to generate something akin to an embodied understanding of a space that does not now exist.

As experienced urban morphologists we sometimes take for granted the ability to look at a series of maps and work out how the different spaces fit together with the currently existing landscape. Some people do, however, find it difficult to orientate themselves spatially within two-dimensional maps of the contemporary landscape,[5] let alone historical maps. The use of a GPS enabled GIS in the field therefore offers a tremendous teaching tool to urban morphologists, removing one of the barriers to people making the connection between a map space and a physical space. Of course there are technical limitations. The screen size of PDAs is too small to see larger

urban areas at a detailed resolution. Clearly this can be overcome through the use of larger tablet-type PCs although these can be quite expensive, as well as being somewhat unwieldy (and indiscreet) in an urban context. Navigation-grade GPS is only accurate to a few metres, which is acceptable for most uses, but patchy reception when standing close to buildings can reduce this. Maps scanned or downloaded[6] need to be geo-referenced to the correct spatial co-ordinates to work with the GPS. This can be a fiddly process, as can be setting up the PDAs with the appropriate layers of data. The technology is, however, becoming more accessible year-on-year and a little patience setting up the PDA back in the office means that the experience for the user in the field is quite straightforward. Ultimately this combination of GPS and historical maps has great potential for helping to foster the deeply personal engagement with past urban forms that is such a critical part of urban morphology.

Acknowledgements

The PDA technology described here was acquired as part of a teaching project with Warren Eastwood, David Hannah and Dan Kingston of the School of Geography, Earth and Environmental Sciences at the University of Birmingham. This project was funded through the E-learning and Flexible Learning programmes of the University Learning Development Unit.

Notes

1. Lilley, K., Lloyd, C., Trick, S., and Graham, C. (2005) 'Mapping and analysing medieval built form using GPS and GIS', *Urban Morphology* 9, 5-15.
2. Kingston, D. (2007) 'Integrating flexible e-learning and mobile technologies in geography', unpublished paper presented to The University of Birmingham Annual Learning and Teaching Conference, 28 February.
3. Lilley notes the importance of walking through urban spaces, as well as tracing them on maps, as part of an iterative process, developing the necessary subjective engagement with an area to undertake an effective town-plan analysis. See Lilley, K. (2000) 'Mapping the medieval city: plan analysis and urban history', *Urban History* 27, 5-30.
4. Or, for that matter, an unbuilt development plan.
5. A problem explored by Presson, C., Delange, N. and Hazelrigg, M. (1989) 'Orientation specificity in spatial memory: what makes a path different from a map of the path', *Journal of Experimental Psychology – Learning Memory and Cognition* 15, 887-97.
6. Subscribers in the UK can download historical geo-referenced Ordnance Survey maps from an extensive collection held by the Edina data archive. Unfortunately before these can be used within ArcPad in combination with GPS, additional processing within ArcGIS has to be undertaken to define the geographical projection and resolve issues of colour depth.

The potential for Chinese urban morphology

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The article by Whitehand and Gu (2007) on the plan analysis of Chinese urban form prompted me to consider the broader possibilities for the application of urban morphology to Chinese cities. As Whitehand and Gu have so aptly observed (see also Whitehand and Gu, 2006), the shortage of 'true plans' in the Chinese historical record makes a Conzenian approach difficult in the Chinese context. Their admirable effort, and the fact that in their own research, they had to switch from their first-choice city to a second choice that had better ground plans, illustrate these difficulties. Yet there is a particularly rich historical record available for the analysis of Chinese cities within their own context. With both Whitehand and Gu's efforts and the recent Viewpoint published in this journal on 'Stepping outside the comfortable confines of the West' (Sobti, 2007) in mind, I would like to offer some thoughts on the potential for Chinese urban morphology.

As Whitehand and Gu note, one of the primary challenges presented by the application of the Conzenian approach in cross-cultural contexts is that Conzen's method is most effective in conjunction with certain types of data and historical records – particularly historical ground plans which indicate plot boundaries and the block plans of buildings. The limitations in the source material for Conzenian analyses of Chinese cities have been explicated by Whitehand and Gu (2006, 2007), by

Zhang (2005) and to some extent by Xu (2000). But what of the possibilities for approaches to Chinese urban morphology that take advantage of the extraordinary source material that *is* available on historical Chinese urban development and change?

These materials are summarized, to some extent, in an overview of the state of the field of Chinese urban history published by Liu Haiyan and Kristin Stapleton (2006). As Liu and Stapleton observe, the documentary sources for work on historical urban transformation in China include, in particular, references in general authoritative histories (such as the *Ming Shi* (Ming History)), provincial and city gazetteers (Chinese gazetteers are wide-ranging encyclopedic accounts), and a growing body of specialized gazetteers on either particular topics or particular neighbourhoods. Although much original source material in China is still very difficult to obtain, not only are increasing numbers of localities compiling and printing secondary sources based on such materials, but even the original source material is becoming easier (if not yet easy) to obtain. In addition, there are valuable photographic archives, ranging from the photograph collections of numerous Westerners who passed through China in the nineteenth and early-twentieth centuries, such as Frederic Wulsin or Owen Lattimore, to aerial photographs taken during the Second World War by the American military. The visual record is further increased by the stylized urban maps published in gazetteers (though these must be read with an understanding of contextual hyperbole and/or omissions) and landscape paintings commissioned, for example, by the Qing Kangxi emperor on his journeys. Numerous aspects of urban form can be traced through these variant sources in such a way that a very effective, if not Conzenian, analysis might be achieved.

Continuity without change?

What is important for those not versed in Chinese urban morphology to understand is that any analysis of Chinese urban form needs to engage with the interesting, but at times rather loose, relationship between the official design and portrayal of cities and their actual on-the-ground layout. There is a long-running discourse – extending back, by legendary inference, to the Zhou period (1046 - 256 BC) – which defines the 'official' Chinese urban form. This ideal is based on Chinese beliefs in *fengshui* (geomancy), in astrology and numerology, in Confucian ideals concerning the expression of power within society, and ancient building principles. In this ideologically-defined conceptualization of the Chinese city, Chinese urban form is mythologized as having changed relatively little over centuries of urban construction and reconstruction (see, for example, Steinhardt, 1999). Here is a real challenge for urban morphologists: can urban form in a given area remain unchanged for millennia?

Because of the particular ideological definition of Chinese urban form, form was in fact critical in the construction of Chinese cities over the centuries. As the realities of site and situation often limited the ability of city builders to achieve the ideal, the achievement of this ideal came to have a particularly limited set of practical requirements. That is, if the city wall followed a rectangular, or square, path, the city was perceived as having achieved the ideal shape – regardless of the 'true' shape of the settled area within and beyond those walls. What mattered in the Chinese cosmology and world-view was this initial, ceremonial aspect of city founding. In this there are perhaps parallels with the Roman establishment of the *cardo, decumanus* and *pomerium* as a ritual establishment of pre-eminent urban form. Once an ideal form was achieved, there seemed to have been a reluctance on the part of subsequent chroniclers of the city to allow the realities of actual urban growth and change to intrude upon the representation of the city in its ideal state. Non-conforming aspects of urban form were often minimized or obscured in cartographic and artistic representations of the cities over the centuries (see Gaubatz, 1996; Steinhardt, 1999). Thus there is both a discursive urban form and an 'actual' urban form to be researched for most Chinese cities (although this is true for all cities, it is particularly relevant in the Chinese case).

As for the 'actual' transformations of urban form over time, in the absence of both the 'true plans' which would lend themselves to a Conzenian approach, and, in many cases, the detailed architectural records which would lend themselves to an analysis of process typology, the most feasible analytical method is probably one that integrates the element-by-element approach favoured by theorists such as Spiro Kostof or Kevin Lynch with the explanatory approach taken by James Vance. That is, one can use the textual information in the encyclopedic gazetteers both to catalogue changes in each major element of Chinese urban form – wall, temples, administrative complexes, markets, canals, etc. – and to correlate

these changes with fundamental shifts in the political, economic, social, cultural and ecological contexts within which they occur. The scale at which such investigations can take place is primarily that of the city as a whole: the question is, how do the changing configurations and reconfigurations of these elements in relation to each other represent changes in urban form? There is an initial attempt to outline such an approach in 'Understanding Chinese urban form: contexts for interpreting continuity and change' (Gaubatz, 1999).

References

Gaubatz, P. (1996) *Beyond the Great Wall: urban form and transformation on the Chinese frontiers* (Stanford University Press, Stanford, CA).

Gaubatz, P. (1999) 'Understanding Chinese urban form: contexts for interpreting continuity and change', *Built Environment* 24, 251-70.

Liu, H. and Stapleton, K. (2006) 'Chinese urban history: state of the field', *China Information* 20, 391-427.

Sobti, M. P. (2007) 'Stepping outside the comfortable confines of the West', *Urban Morphology* 11, 65-6.

Steinhardt, N. S. (1999) *Chinese imperial city planning* (University of Hawaii Press, Honolulu).

Whitehand, J. W. R. and Gu, K. (2006) 'Research on Chinese urban form: retrospect and prospect', *Progress in Human Geography* 30, 337-55.

Whitehand, J. W. R. and Gu, K. (2007) 'Extending the compass of plan analysis: a Chinese exploration', *Urban Morphology* 11, 91-109.

Xu, Y. (2000) *The Chinese city in space and time: the development of urban form in Suzhou* (University of Hawaii Press, Honolulu).

Zhang, J. (2005) 'Diverse values on China's conservation areas – a synthesized urban morphology of historic urban environment', unpublished paper presented at the Eighth International Conference of the Asian Planning Schools Association.

Ville Recherche Diffusion

A number of publications of interest to urban morphologists are available from Ville Recherche Diffusion, Ecole D'Architecture de Versailles, 2 avenue de Paris, 78000 Versailles, France (internet site: www.versailles.archi.fr/VRD). Among the publications recently advertised are:

Bowie, K., Texier, S. and Bonnefoy, l. (2003) *Paris et ses chemins de fer.*

Bruant, C., Blain, C., Genaille, G. and Sellali, A. (2003) *Architecture et formes urbaines en villes nouvelles: enquête bibliographique sur les sources écrites.*

Doutre, M. (2003) *Modalités de transformation de la ville au début du XIX^{e} siècle en Auvergne l'édifice public et son espace urbain – pouvoirs et conflits.*

Ducos, L. (2005) *L'aménagement des terrasses de Saint-Julien et des Carmélites à tours au XIX^{e} siècle: un projet urbanistique et architectural en décalage.*

Gauthiez, B. (2003) *Recueil de texts.*

Gauthiez, B., Zadora-Rio, E. and Galinié, H. (2003) *Village et ville au moyen age: les dynamiques morphologiques.*

Jacquand, C. (2003) *Le grand Berlin et l'anticipation américaine: infrastructure, paysage et forme urbaine du 11^{e} au 111^{e} Reich.*

Nasr, J. and Volait, M. (eds) (2003) *Urbanism: imported or exported.*

Navarina, G, (2003) *Plan et projet: l'urbanisme en France et en Italie.*

Petiteau, J.-Y. and Chérel, E. (2004) *L'émergence du récit comme révélateur du processus de renouvellement urbain: ou l'urbanisme contemporain se réinvente-t-il à partir de l'art?*

Robert, S. (2003) *L'analyse morphologique des paysages entre archéologie, urbanisme et aménagement du territoire: exemples d'études de formes urbaines et rurales dans le Val-d'Oise.*

Soppelsa, C. (2005) *L'action publique en matière de voirie en France au XIX^{e} siècle: l'example de Tours à travers le plan général d'alignement de le section de Saint-Etienne (1865).*

Texier-Rideau, G. and Darin, M. (2003) *Places de Paris: X1X^{e} - XX^{e} siècle.*