For example, a flint knife is an implement, whereas a dam is a facility. Whatever else made towns possible, there is no doubt that they were usually marked by a radical increase in facilities, most especially irrigation systems and food storage facilities.

What made towns possible socially was an invention we are so familiar with that we tend to take it for granted and forget it is there: the urban grid. The urban grid is the organization of groups of contiguous buildings in outward-facing, fairly regular clumps, amongst which is defined a continuous system of space in the form of intersecting rings, with a greater or lesser degree of overall regularity. Urban grids were never inevitable. In fact, the archaeological record reveals many proto-towns with quite different morphologies.

The urban grid was, however, the first powerful theorem of urban spatial engineering. Its crucial characteristic is that it is itself a facility – one that takes the potential movement of the system and makes it as efficient and useful as possible. The grid is the means by which the town becomes a 'mechanism for generating contact', and it does this by ensuring that origin–destination trips take one past outward-facing building blocks *en route.* That is, they allow the by-product effect to maximize contact over and above that for which trips are originally intended.

In the nineteenth century, however, under the impact of industrialization and rapid urban expansion, two things happened. First, to cope with sheer scale, the urban spatial grid was thought of as more of an implement than a facility. That is, it was seen as a means to accelerate movement in order to overcome size. Alongside this it was envisaged as a set of point-to-point origins and destinations, rather than as an 'all points to all points' grid, which is the product of an urban movement economy.

Second, the city began to be seen not as a grid-based civilization, but as the overheated epicentre of focal movement into and out of the city, and as such the most undesirable of locations. A social problem was seen in the disorderly accumulation, in and around city centres, of people brought in to serve the new forms of production. Big became synonymous with bad, and density became synonymous with moral depravity and political disorder. It was this that gave rise to much of the value system of nineteenth-century urban planning, as well as the more extreme proposals for the dispersion and ruralization of the city and its population.

Unfortunately, much of this nineteenth-century value system survived into the twentieth century, not so much in the form of consciously expressed beliefs and policy objectives as in assumptions as to what constituted the good city. For much of the twentieth century, nineteenth-century anti-urbanism provided the paradigm for urban design and planning. It would be good to believe that this may have now changed, and that cities are again being taken seriously. But this is not the nature of human beliefs when they become embedded in institutional forms and structures. Many aspects of the nineteenth-century urban paradigm have not yet been dismantled, and are still to be found enshrined in everyday policies towards density, in novel ways of breaking up urban continuity into well-defined and specialized enclaves, in continuing to reduce spatial scale, and in separating and restricting different forms of movement. These relics of an outdated paradigm do not derive from an understanding of cities. On the contrary, they threaten the natural functioning and sustainability of the city.

Notes

1. The best recent review of these issues is Owens, S. (1992) Land-use planning for energy efficiency, *Applied Energy,* 43, 1–3, Special issue on the rational use of energy in urban regeneration, R. Hackett and J. Bindon (eds), Elsevier Applied Science. An important source on settlement forms on which she draws is P. Rickaby (1987) Six settlement patterns compared, *Environment & Planning B: Planning & Design*, **14**, 193–223. Significant recent contributions include Banister, D. (1992) Energy use, transport and settlement patterns, in M. Breheny (ed.) *Sustainable Development and Urban Form*, Pion; also Hall, P. (1994) Squaring the circle; can we resolve the Clarkian paradox? *Environment & Planning B: Planning & Design*, **21**, s79–s94.
2. For a discussion see Batty, M. (1989) Urban modelling and planning: reflections, retrodictions and prescriptions, in B. Macmillan (ed.) *Remodelling Geography*, Basil Blackwell, Oxford, pp. 147–169. See also Batty, M. and Longley, P. (1994) *Fractal Cities*, Academic Press, London.
3. Hillier, B. *et al.* (1993) Natural movement: or configuration and attraction in urban pedestrian movement, *Environment & Planning B: Planning & Design*, **20**; and Penn, A. and Dalton, N. (1994) The architecture of society: stochastic simulation of urban movement, in N. Gilbert and J. Doran (eds) *Simulating Societies: The Computer Simulation of Social Phenomena*, UCL Press, London, pp. 85–125.
4. In this sense, it is an instance of what Ian Hacking calls 'the creation of phenomena', which then leads to the evolution of theory: Hacking, I. (1983) *Representing and Intervening*, Cambridge University Press, pp. 220–32.
5. The figures are taken from a case study carried out by Marios Pelekanos while a student on the MSc in Advanced Architectural Studies at the Bartlett School of Graduate Studies, UCL, in 1989.