'Only connect!' Despite the proliferation of interactivity technologies for domestic spaces, current commercial models for the smart house remain focused on the supply of gizmos and multimedia flatscreens. What is the design potential for connectivity in the home? Mike Weinstock asks how interactive technologies might achieve a new level of topographical and environmental change and enhance the spaces in which we live.
The coupling of space, technology and domesticity is part of our architectural legacy, an unregarded inheritance that extends beyond the *machine à habiter* of Le Corbusier. It includes the spatial differentiation of the *Raumplan* of Loos, the continuous connectivity of space of Mies, the transformable space of Rietveld’s Schröder House, and the source of Modernist theory, the traditional Japanese House. These concepts are persistent, but rarely considered to be relevant today, and the slow reduction of the phenomenal complexity of the Modernist spatial agenda in favour of a simplified goal of efficiency of means and functions has brought us to a condition in which the union of interactivity and the idea of a home are seen as unlikely collaborators.

Space and time are inextricably entwined in the idea of a home. The anthropologist Mary Douglas argued in ‘The Idea of a Home’ that a home cannot be defined by its functions, but is a ‘pattern of regular doings’, and ‘neither the space nor its appurtenances have to be fixed, but there is something regular about the appearance and reappearance of its furnishings’. People come and go, flowing through a home; however, there are some regularities or patterns that give it a structure in time. A home is an organisation of space that has some structure in time, in which people interact in a pattern of events and phenomena that integrate space and perceptions.

In the domestic realm, interactivity now tends to mean a multitude of media connections and applications, resulting in spaces that are mediated yet somehow remote from our senses, in which phenomenal qualities are muted and in which time is ‘real’ yet never realised as experience. The ‘real time’ of media connectivity is a paradox, muting our phenomenal presence in the physical world but extending our connection to the constantly unfolding data image of the world, in which each second has the capacity to carry an infinitely extended array of data and images. In real time we are alone, though always reachable and accountable. Ways of working and living have grown up around mediated interactivity so that personal physical space is increasingly unmarked by the daily and seasonal changes of light and temperature in the physical world. Real time is unlocated, and tends to induce a corresponding perceptual dislocation from the physical space in which we are present.

The space in which we live has become a *terrain vague*, and our fascination with its dislocation is a measure of its availability for the contemporary imagination, part of the exploratory engagement, both topographical and theoretical, with spaces ‘in between’, with vectors of ambiguity and with fluid boundary conditions. At its most extreme, the space of the home is a space of transit, between the digital and physical worlds, between the infinite extension of data connectivity and the compression of phenomenally mute and depersonalised physical space.

Marc Auge’s anthropological analysis, set out in *Non Places*, deals with urban spaces and programmes, but it can be extended to current modes of interactivity and to current built domestic space. The materiality of the boundaries between interior and exterior, between public and private, is no longer solid and opaque. Excess individualisation has destabilised the reference points of collective identity, a paradoxical counterpart to the acceleration of global culture. Supermodernity produces ‘urban’ spaces that are not places. Non-places have programmes that typically have a structured time of occupation, and are related to networks of information or movement. They are transit zones to which the individual purchases rights for measured units of time. In Auge’s argument, places are related to dwelling, social interchange and spoken language; nonplaces are related to transit, assemblies of solitude, and communication by codes and images. Auge understood nonplaces to be airports and stations,
but the description is now alarmingly close to many contemporary forms of housing.

The separation of the architectural discourses of technology, personal space and domesticity from the everyday experience of life is an equally persistent theme in other cultural areas. The global ‘information society’, and the anxieties that surround it, have been prefigured in films and literature throughout the last century. EM Forster presented a disquiet about the implications for personal relationships and the loss of personal contact resulting from remote communication technology. In a short story, The Machine Stops (1909), a worldwide machine supplies all the essentials of life. People live alone in underground cells; they seldom meet anyone face to face, but communicate by means of a globally networked system of ‘optic plates’ and telephones. The protagonist of the story becomes obsessed with the phrase ‘Only connect!’: he escapes to the unoccupied surface, and comes to realise that there is a difference between mediated experience and direct perception:

‘I see something like you in this plate but I do not see you. I hear something like you through this telephone, but I do not hear you.’

A humorous commentary is presented in the films of Jacques Tati, in which Monsieur Hulot’s bemused confrontations with a technology that he fails to interact with strikes a particular resonance with us. In Mon Oncle, Hulot is lonely and unemployed, and goes to live with his sister and her husband in a fully automated home that is impersonal, uncomfortable, unreliable and, ultimately, alienating. The theme here is not so much dystopian, but more how technology makes us do ridiculous things. Dystopian anxieties are strongly marked in literature and films, as if a measure of the anticipated effectiveness of any new technology is the peculiar mixture of dread and excitement it engenders; there is a narcotic dimension to society’s dreams of interacting with technology.

Two interesting built experiments reveal different aspects of interactivity, and both utilise continuous computational comparisons between digital models and events in the physical world. Although quite different in their aims, and indeed in their
computational processes, in combination they demonstrate a potential means of achieving a more spatial and temporal interactivity. The Aegis Hypo-Surface of dECO is a programmable wall or surface, which can be deformed by pneumatic pistons and springs. The ability to reconfigure the surface of the wall is achieved by a complex mechanical system of linked pistons and springs that move the metal strips of the wall. The wall requires a static structural frame behind the movable surface, to carry all of the dynamic structural load, and the springs attached to it ensure that the activated pistons are returned to their neutral condition. A central computer analyses the acoustical changes in the environment, and responds to these stimuli by sending signals to each individual piston to produce complex patterns on the surface. The wall interacts spatially with the environment.

Three different modes of interactivity operate together in the interior of the Freshwater Pavilion by NOX. Together these produce an interior environment that is constantly modified by lighting, sound, and by image projection. The space does not change topographically or in dimension, but in a limited sense it is programmable. In this case, rather than responding to sound by a single computer driving hundreds of activators, the Freshwater systems respond to the movement of people within the space. An array of sensors and trackers is coupled to multiple distributed processors, which produce interference in the continuous processing of a virtual real-time model of water. Sensed changes in the environment produce changes in the virtual water system, images from which are projected into the interior space of the pavilion.

There are interesting innovations here, not least in the distributed intelligence of multiple processors, but what is significant is not the qualities of the interior environment, nor even the real-time immediacy and content of the images projected, but the conceptual schema of interactivity. Firstly, the continuous process of calculating the parameters and performance of the digital model of an active body of water is modified by information from the physical world and, secondly, the physical environment is directly modified by those changes to the digital model.

The means of achieving topographical and environmental change to architectural space exist, albeit in experimental form. The question that must be asked is to what agenda can these technologies be coupled to enhance the quality of the spaces in which we live? If we are to replace the terrain vague of the contemporary home with a more explicit cartography, we must start with an examination of the models of home that are part of our architectural legacy.

The traditional Japanese house provided a model for Modernist architects and theoreticians. In particular they valued the way in which the material construction suggested a continuity of interior and exterior. It was not just a single unit subdivided according to programme, and although some Modernist accounts refer mainly to the plan, the section was the principal ordering device. The section was spatially and materially differentiated, by a ‘high’ area for dwelling and sleeping and a ‘lower’ part – the working space and kitchen. The floor of the higher part was covered with boards or tatami; the lower part formerly had a floor of stamped earth and is still often known as a niwa (garden or courtyard). Space was structured around social practices, and was related to traditional ideas of land use and demarcation in agriculture. It was an arrangement of separate but related spaces that together constructed a ‘housescape’.

The relationship of the spatial organisation to material construction was manifested by the flexibility of division in the principal interior space, and by the continuity of material construction between interior and exterior. The horizontal was emphasised by the way in which material is carried through from one space to another, from interior to exterior. The main spatial divisions were part of this arrangement, but there were also movable partitions of paper on wooden frames (shoji), which slid along grooved sills and lintels. Interior floors were often extended through to the exterior to form a veranda, which was considered to be both interior and exterior space.

Above right
Angelo Invernizzi, Casa Girasole, Verona, Italy, 1935
Each wheel is a metre high, and sits between the upper part of the house and the roof level of the lower part. The house has two levels, one fixed and the other rotating to follow the arc of the sun, maximising the light in the interior. The top level contains the main living space.
Two other models provide the instruments for a more detailed mapping of the operating concepts of the ‘housescape’: the Müller Villa by Loos, and the Schröder House by Rietveld. The Müller Villa is a simple cube with a complex interior set of spaces, each of which has differing dimensions according to what Loos considered to be the hierarchy of programmatic importance. The Raumplan was a spatial structure that used sectional differentiation as the main ordering device, so that storeys merge into one another to produce continuous space. The largest is the main living space, which Loos called the ‘residential hall’, and its two-storey volume is linked to all the other spaces – the dining room, boudoir and study, and at the higher level to bedrooms and terraces.

Programme subdivisions such as ‘boudoir’ may have limited relevance today, but topographical differentiation coupled with continuity is still important. The upper floor of the Schröder House has a system of sliding partitions that allow the reconfiguration of the space according to need, and although there are severe limitations to the character and functionality of the variety of available spaces produced by manual reconfiguration, there is a capacity to produce daily or even more frequent spatial changes.

The pattern of living is a little different today, and the integration of work and domesticity occurs in varying degrees, across all professions. Families split and recombine, people come and go, and the desire for private space within families is matched by the increasing number of single people living in shared homes. An extra bedroom, or space for a work project, may be necessary for a few days or weeks, whilst other domestic shared spaces may need to be more permanent. Internet, telecommunications and media activity may be private or shared, or cycle between these modes. Far from negating the need for structures in time, the new housescape needs the pattern of phenomena of light and dark, of daily and seasonal changes, to maintain its identity and its continuity.

The Möbius House, built by UN Studio, uses an interesting new mode of topographical differentiation, and recognises one of the new patterns of living and working that have emerged. The organising principle is a mathematical model that has one single continuous surface: the Möbius strip. The twisting figure of eight is used to provide space in which two people can work apart, yet meet together at certain times in what become shared spaces. The husband and wife, both of whom work at home, have separate work areas, and the shared domestic spaces of family and social life are enfolded by the continuous surface structure. The house is orientated east to west, and the phenomenal character of the surrounding forest and garden infiltrates it through a long glass wall on the south side. Interaction with the environment is passive in Möbius, although well integrated with programmatic deployment of special characteristics.

In the Casa Girasole built by Angelo Invernizzi in Verona, Italy, in 1935, there is a more positive interactivity with the environment. The house has two levels, one fixed and the other rotating to follow the arc of the sun, maximising the light in the interior. ‘Il Girasole’ has a simple programme, built as a holiday home, but the rotating top level contains the main living space. The plan is interesting, not occupying the full circle that a rotating device suggests, but rather a chevron-like arrangement of two rectangular wings, leaving three-quarters of the circle as a garden over which the two-storey top rotates.

The union of these ideas sets out the spatial and phenomenal parameters for the contemporary housescape. Spatial organisation needs to be flexible to adapt to changing patterns of life and work. The coupling of interactive surface technology to topographical differentiation would provide a means of activating subtle changes to the physical dimensions and varying degrees of separation and privacy that are demanded by fluctuating programmatic needs. The cycling between public or private media interactivity lies between spatial and environmental patterns, needing to be linked to both. The interactivity of the internal phenomenal character to the external environment can be orchestrated in complex patterns that are active, and may enable a new agenda of environmental adaptability aligned to another spatial flexibility, providing spaces that get taller, lighter and more open in the summer, cosier and warmer, or smaller in the winter. Housescapes will require distributed intelligence and active material systems, programmable virtual representations of themselves (digital models) that are capable of changing their internal parameters and performances in relation to the life of their inhabitants and events in the external world. ☞

Notes
4 Michael Weinstock is an architect. He was born in Germany, and lived as a child in the Far East and then West Africa, where he attended an English public school. At the age of 17 he ran away to sea after reading Conrad. During his years at sea in traditional sailing ships he gained experience in shipyards and shipbuilding. He studied architecture at the Architectural Association and has taught at the AA School of Architecture since 1989. He is co-founder and co-director, with Michael Hansell, of the Emergent Technologies and Design Masters programme, and co-founder of the research practice Emergence and Design Group. He has organised symposia, curated exhibitions, lectured and published widely on architectural, urban and technical issues.