arq (2018), **22.2**, 100–103. ©Cambridge University Press 2018
doi: 10.1017/S1359135518000362

Lionel March: 1934–2018

Philip Steadman

Lionel March, who has died aged 84, was an architect who brought mathematical and scientific rigour to the study of buildings and cities. He had a profound influence with colleagues and collaborators on the discipline and theory of architecture, some of which is only now being recognised. He was active in the foundation of computer-aided design in architecture and the computer modelling of cities. He was also an artist whose calm and dignified digital works had their basis in geometrical structure.

Lionel March's mathematical talents were evident as a schoolboy, when his work on complex numbers reached the attention of Alan Turing. One of March's most treasured possessions was a letter from the great cryptographer. As an undergraduate at Cambridge, March started out reading mathematics and then switched to architecture. Meanwhile he was designing sets for opera at the Cambridge Arts Theatre and for productions by the New Opera Company at Sadler's Wells.

In 1960, March married the anthropologist Lindsey Miller. In 1961 he was awarded a Harkness Fellowship to study the works of Frank Lloyd Wright, the start of a lifelong attachment to North America. The couple travelled around the States and lived for a time on a Hopi reservation in Arizona. March published papers on Wright's low-density 'Broadacre City' plan, identifying the influence on Wright of the pragmatists John Dewey and William James and the land reformer Henry George. Much later he edited a volume with Judith Sheine on Wright's collaborator Rudolph Schindler, architect of the Lovell Beach House in California. In the 1980s March was able to buy and restore Schindler's How House in Los Angeles.

1 Lionel March

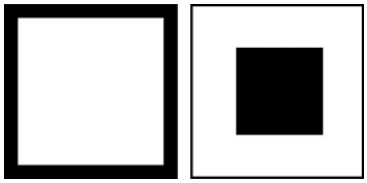
Land use and built forms

Sir Leslie Martin became the Professor of Architecture at Cambridge in 1956. In the mid-1960s, March joined Martin's practice to work on proposals for the redevelopment of government offices in Whitehall. The scheme was never built, but March and Martin's preparatory work involved theoretical studies of the relationship of building form to density, which were to prove of fundamental importance. They compared three simple schematic 'built forms': freestanding 'pavilions' which when tall would be towers; parallel 'streets'; and inward looking 'courts'. They held a series of variables constant – plan depth, storey height, and the spacing apart of the forms by reference to a 'cut-off angle' – and varied the number of storeys. The results showed that, to achieve a given level of density, the 'streets' had to be twice the height of the 'courts', and the 'towers' had to be three times the height of the courts. Put simply, this proved the

https://doi.org/10.1017/S1359135518000362 Published online by Cambridge University Press

fallacy of the popular wisdom – still to be found in some parts of the construction world today – that high-rise towers are essential to achieving high densities where land is in short supply.

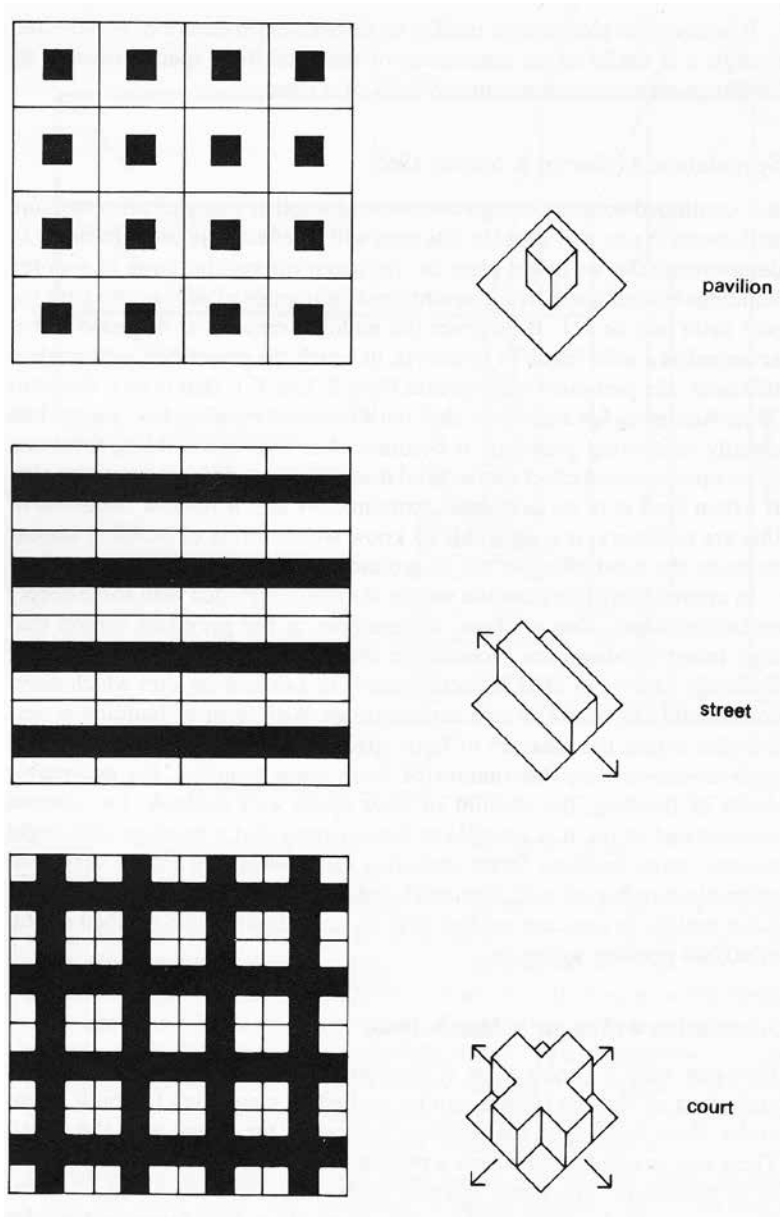
Some aspects of the calculations have since been questioned by building scientists, but the basic findings stand. Meta Berghauser Pont and Per Haupt have provided empirical confirmation by measuring the densities of large numbers of Dutch housing developments. The ideas were influential on architectural practice in the 1970s, in Martin's own work and the housing schemes of Richard MacCormac. They were then largely forgotten, to be revived in the 1990s by Richard Rogers and his Urban Task Force. Indeed, their significance has come to be increasingly appreciated in the last decade as high-rise buildings have proliferated. March would joke later in life that there is a major but invisible monument to him and Martin in Whitehall, where there are still no high-rise towers.



2 The logo of the Centre for Land Use and Built Form Studies, based on the insight that the perimeter on the left is the same area as the square on the right – a lesson applicable to site planning.

Martin and March also compared plans with the same total floor area placed either at the centre or around the perimeter of a site, showing how the latter could free up land in the interior of a block or larger urban development for parks or school playgrounds. This work was inspired by the geometry of the optical device known as a Fresnel lens, whose shape is divided into a series of rings of equal area.

These studies of density and plan geometry provided the unwieldy name and logo for the research centre that March and Martin founded in 1967, the Centre for Land Use and Built Form Studies, of which March became the first Director. One of March's great gifts was for assembling, inspiring, and enthusing research groups, of which the Cambridge centre was just the first. Later he did the same thing at the University of Waterloo in Canada, the Open University, and the University of California in Los Angeles.



3 Three generic built forms compared by Lionel March and Leslie Martin: 'pavilions', 'streets', and 'courts'

Mathematical and computer modelling

From 'land use and built forms' the work in Cambridge spread out into many areas of architecture and planning research, with the emphasis on mathematical and computer modelling. The centre expanded quickly and by 1973 had over thirty research staff. Much of the work was supported by grants from government departments – the Ministry of Housing, the Ministry of Public Building and Works, the University Grants Committee – and involved cooperation with architects working in those departments.

It should be appreciated that through the 1950s and 1960s there was only *one* computer in the whole of the University of Cambridge, the experimental EDSAC and subsequently the TITAN machine. It was clear nevertheless to March and colleagues that computers offered rich and exciting potential applications in an emerging architectural and urban science, in particular the simulation of complex systems such as the physical performance of buildings, and patterns of movement in and between buildings. In 1971 March and I published together *The Geometry of Environment*, a book devoted to applications of discrete mathematics in architecture, in which we explored some of the

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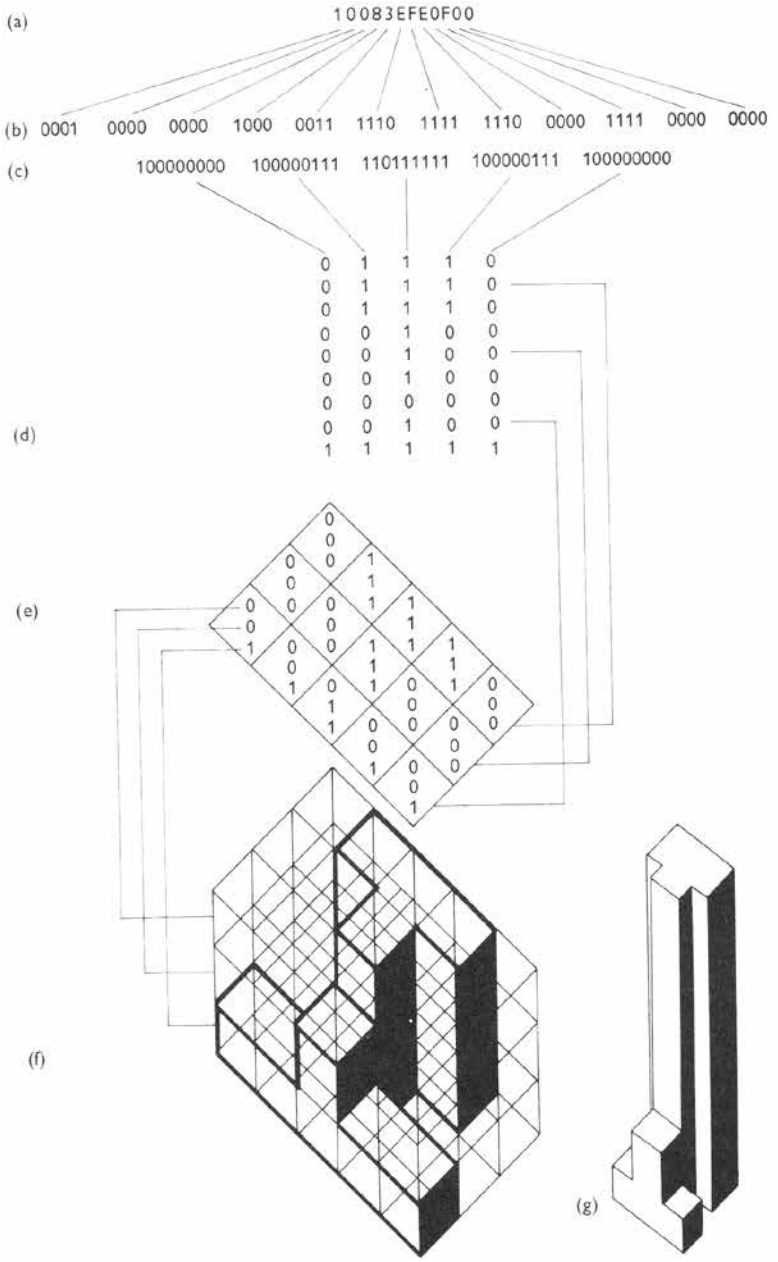
methods of representation that would prove central to computer graphics. *The Architecture of Form* (1976), edited by March, was a collection of papers from Land Use and Built Form Studies, again focused on representation and modelling, to which March contributed a key essay on 'The Logic of Design and the Question of Value'.

March was also involved with planning issues, and in the computer modelling of land use patterns and traffic flows in cities. This work was covered in another collection of papers, *Urban Space and Structures* (1972). March argued the merits of linear cities organised along transport routes: what he termed 'think-line', as opposed to the conventional 'think-blob' of centralised towns and cities. He was thus an early prophet of the planning principle later promoted by the American New Urbanists as 'transit-oriented development'.

The collaboration in the Cambridge research with government departments led to requests for applications of the computer models to programmes of public sector construction, in particular hospital building. In response, a group from Land Use and Built Form Studies established Applied Research of Cambridge Ltd, a 'tech start-up' *avant la lettre* spun out from the academic research in 1969. March was the founder chairman. This was the world's first company devoted to computer-aided design systems for architecture. It grew rapidly into an international enterprise with a multi-million pound turnover.

The Cambridge group had a festive social life. March enjoyed dressing up in the naval uniform of his National Service years, and hosted a series of inventive fancy dress parties. He was obsessed for a time with the geometry of 'rational' clothing, building suits made from rectangular pieces only, whose results proved why men's tailoring has not generally followed this path.



4 Method for representing the form of Mies van der Rohe's Seagram Building using binary encoding

Configuration, proportion, and serial art

In 1974 March went to the University of Waterloo to work with an interdisciplinary group on applications of combinatorial mathematics in design and engineering. In 1976 he was appointed Professor of Design at the Open University, bringing some of his Waterloo colleagues with him. Here he established the Centre for Configurational Studies. This group developed systematic methods for counting and cataloguing possible rectangular plans for buildings, with applications in housing design and policy.

George Stiny came from the Massachusetts Institute of Technology to collaborate with March in applying 'shape grammars' to the analysis of composition and style in architecture. A shape grammar is analogous to a Chomskyan grammar for natural language, but instead of words, its basic units are simple shapes, assembled by means of 'shape rules' to produce languages of designs in two or three dimensions. Stiny and March, along with Bill Mitchell and others, produced shape grammars for Palladian villas and the prairie houses of Wright, which not only recreated those architects' actual corpuses of work, but generated other 'theoretically possible' designs in the same styles.

In 1981 March was made Rector of the Royal College of Art at a time of turmoil for the College, and stayed just two years before moving to the School of Architecture and Urban Planning at UCLA, where he spent the remainder of his career, becoming Professor of Design and Computation in 1995. During his years in California, March turned his attention to the

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mathematics of proportion in Renaissance architecture. He joined the University's Center for Medieval and Renaissance Studies, and in 1988 published the definitive *Architectonics of Humanism: Essays on Number in Architecture.* This was conceived as a companion volume to Rudolf Wittkower's *Architectural Principles in the Age of Humanism* (1949). March's book offered a new interpretation of the use by Alberti and Palladio of principles of symmetry and proportion, and followed the legacy of this Renaissance geometrical tradition into twentieth-century modernism.

In his student days, March made 'serial art' in the tradition of De Stijl and Continental geometric abstraction. He had an exhibition of this work at the Institute of Contemporary Art in London in 1966. In retirement he returned to this activity, using digital techniques. The mathematical organisation of these beautiful compositions draws in many cases on the proportional theories of Palladio and Alberti.

March's second wife Maureen Vidler died in 2013. He is survived by Lindsey and their children Candida, Talitha, and Ben.

Philip Steadman is Emeritus Professor of Urban and Built Form Studies at the Bartlett School of Architecture, UCL, and a Senior Research Associate at the UCL Energy Institute. He has published several books: The Geometry of Environment *(with Lionel March, 1971)*; Architectural Morphology *(1983)*; The Evolution of Designs: Biological Analogy in Architecture and the Applied Arts *(1979, 2008)*; *and* Vermeer's Camera *(2001). His most recent book is about building types, considered from both historical and geometrical points of view, with the title* Building Types and Built Forms *(2014).*

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