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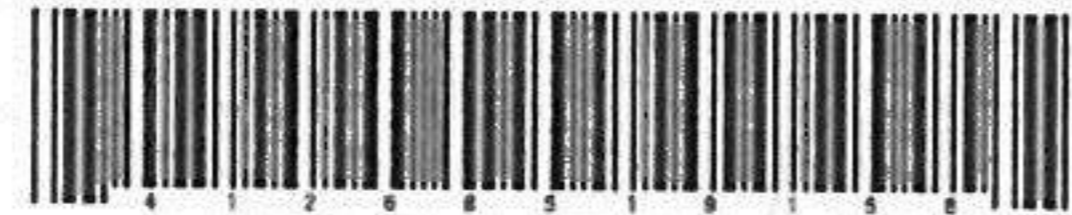
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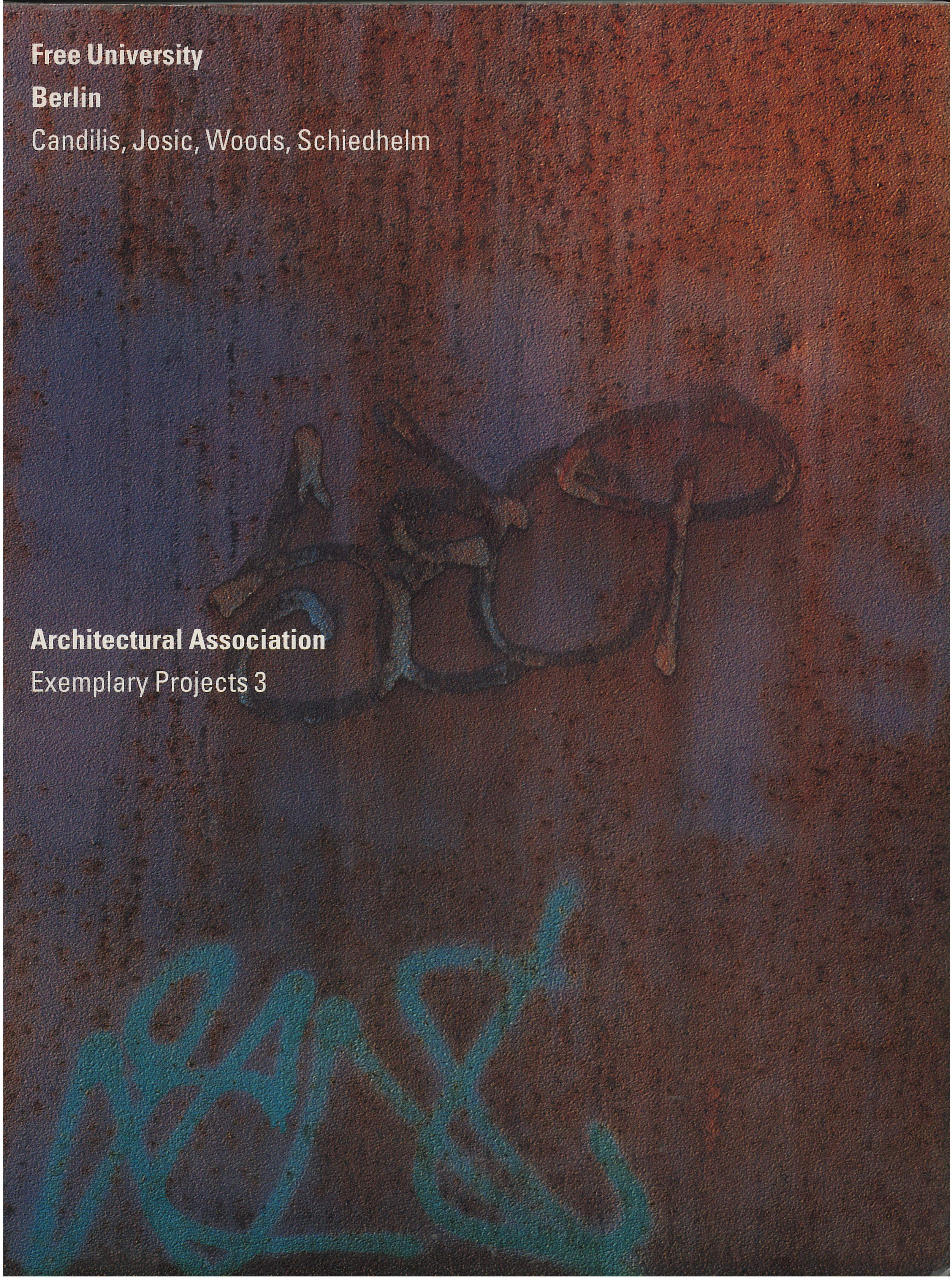
Free University

Berlin

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Exemplary Projects 3



**Beyond Monuments, Beyond Zip-a-tone, Into Space/Time:
Contextualizing Shadrach Woods's Berlin Free University,
A Humanist Architecture**

Alexander Tzonis and Liane Lefaivre

We are concerned, not with 'architecture' or 'town planning', but with the creation of environment at every scale... The problems which we face in making our world are entirely new, for our society is entirely new... The concept of society towards which we strive: that of a completely open, non-hierarchical co-operative in which we all share on a basis of total participation and complete confidence... We cannot think of planning in static terms, in three-dimensional space, when we live in a four-dimensional world. The realization, for instance, that the scene of action of reality is *not a three-dimensional Euclidean space but rather a four-dimensional world, in which space and time are linked together indissolubly, sets our civilization apart from any others.*

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Shadrach Woods, 1964¹

The above passage, in emphasizing the relation between architecture and the 'fourth dimension', time, provides the best introduction to our discussion of the Free University of Berlin. We will consider the building designed by Shadrach Woods and his associates, Georges Candilis and Alexis Josic, as part of the conceptual shift that occurred in architecture and urbanism following the Second World War. More specifically, we will look at how it sought to redefine a humanist architecture, an architecture of community, incorporating new design developments based on *space/time* and *movement* and the associated concepts of plasticity, mobility, flexibility and process.

Shadrach Woods did not have a formal architectural training. This is true of many innovators in the field: Leon Battista Alberti was a lawyer, Claude Perrault a doctor, Christopher Wren a mathematician, Laugier an abbot in the chapel of Versailles. Le Corbusier served an apprenticeship in watch-engraving and never went to a recognized school of architecture. Woods, a New Yorker, studied engineering, then philosophy, before joining Le Corbusier's office. Woods was an outsider in another sense, too. He spent most of his life uprooted, but in contrast to the architects of the 1930s European diaspora – among them Le Corbusier, Chermayeff, Mies and Breuer – his migration was voluntary. Though the economy of North America was booming, he preferred to live in Paris, the city of the avant-garde, where he set up his practice with two other expatriates: Candilis was Greek, and Josic, Yugoslavian.²

Being an outsider can be a major impediment to running a large practice, but it can also stimulate creative thinking, helping to reshape the conceptual systems of a discipline. This was precisely the case with Woods's architecture and urbanism, and the project for the Free University in particular.

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New ideas in design can emerge from changing social, cultural and political conditions or from a dialogue between people working on similar problems. Both of these factors played a role in constructing a new idea of space transformed by *movement*: in the words of Woods, 'space measured not by inches but by the speed of a moving pedestrian'.

For many people the designs of the late 1950s and 1960s are without much significance; they are held to be naive and banal, Utopian and ideological, confused and lacking in intellectual content. Contrary to this view, we will argue that the Free University and the spatial and cultural ideas linked to it are not only historically significant but also relevant today.

Plasticity

There was nothing new about the fascination with movement shared by many of Woods's generation: a precedent can be found as far back as the Bible, in the description, in Exodus, of a whirling column. Nor was this fascination unique to architecture: it triggered the developments in transport and the emerging media technologies of the 1960s – the forerunners of virtual reality and the Internet.

Artists, architects and urbanists have for a long time sought to capture movement within the spatial framework of design. One approach to achieving this has been to emphasize the expressive visual-spatial qualities of the design object, arranging its masses in controlled disequilibrium so as to anticipate a future state. (Elsewhere, in relation to the work of Santiago Calatrava, we have called this the 'aesthetics of the pregnant moment'.³) Prior to the Second World

War the word used to describe this strategy was 'plasticity', relating the iconic likeness of the artefact to an organism which moves or grows.

It has been argued that the twentieth century's renewed obsession with movement was a response to the perceived ability of robust models of science to capture 'time and space': a response to non-Euclidean geometry introducing the 'fourth dimension', to Einstein's theory of relativity, and to Henri Bergson's philosophy of duration, flux and movement. Material culture also played a part, as everyday life after the First World War was subjugated to the imperative of speed. Ilya Ehrenburg, in *The Life of the Automobile* (1929), described dances called 'Monsieur Simon's Automobile Gallop' and 'Monsieur Salabre's Automobile Polka'. The idea of fast food took hold; in 1932 the futurist Filippo Marinetti proclaimed that all prepared meals (with pasta 'top of the list') should be replaced by pills, in the interests of promoting the 'new beauty of speed'.⁴

Sigfried Giedion, the Swiss historian and main propagandist of the modern movement as embodied by Le Corbusier, Gropius and the CIAM group, maintained that Einstein's 'space/time conception' was as relevant to architecture as it was to physics: both disciplines, in his view, conceived 'of space as relative to a moving point of reference, not as an absolute and static entity'.⁵ This belief inspired his best-selling book, *Space, Time and Architecture* (1941). Giedion's writings could be both inaccurate and capricious. *Space, Time and Architecture* makes no mention of the works of Erich Mendelsohn – not even the buildings most relevant to the title, the Einstein Tower in Potsdam (1920) and Schocken Department Store in Chemnitz (1928) – a scandalously partisan omission. None the less it was Giedion who most effectively summarized architecture's engagement with movement, mapping its physical spatial/formal characteristics and encapsulating them as *plasticity* of form.

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Plasticity continued to play a central role in shaping the conceptual system of architecture after the Second World War, stimulated not only by advances in the sciences and transport technology but also by changing cultural politics. Plasticity was seen as the key to liberating architecture from the realm of functionalist design and engineering and reuniting it with art. As such, it was a principal component of New Monumentality, the movement championed by Giedion and Nikolaus Pevsner in the late 1940s.⁶

For Giedion, *plasticity* came to be synonymous with the rejection of strict orthogonality – the model that some of his contemporaries tended to call 'match-box architecture'.⁷ In the second edition of *Space, Time and Architecture* (1949) he used the concept to analyse the aesthetic qualities of his favourite projects at the time. The undulating riverside wall of the MIT Dormitory by Alvar Aalto (1947–9) was praised for its monumental qualities, with its 'culminating spiral... resembl[ing] some organic growth...' and 'its inherent movement', which seemed to echo earlier experiments by Borromini. Gropius's Graduate Center at Harvard University was singled out for the dynamic way its buildings 'spread informally' and its columns imparted 'movement'. Similarly the twenty-four buildings of Mies van der Rohe's Illinois Institute of Technology (1940) were so disposed that they created an 'all-embracing space... not visible at one glance – a space that can only be slowly perceived by including the dimension of time, that is, by movement'.⁸

Woods's projects are no less characterized by a search for plastic effects. His *nid d'abeilles* housing blocks of the mid 1950s, for example, are staggered white prismatic masses which appear to reverberate in the Mediterranean

light. Equally, the housing at Bagnols-sur-Cèze is a visual grouping of asymmetrical stepped units on an orthogonal grid, intended – as Woods explained at the anti-CIAM meeting in Otterlo in 1959 – to introduce ‘a fourth dimension into architecture’.⁹

Away from Plasticity

However, this hardly makes Woods a follower of Giedion or of the New Monumentality. On the contrary, the Otterlo text reveals a quite different approach. After describing how the Bagnols-sur-Cèze project had attempted ‘to avoid the deadly alignment of the straight line’, Woods stated that ‘the structure of the new town’ had been ‘directly determined’ by that of the old town. What Woods was describing was not the mimicking of local building styles, but a means by which the layout of the modern blocks of a new town could be derived from the elongated semi-enclosed layout of a traditional settlement: an early example of ‘critical regionalism’.¹⁰ These ideas were in all probability misconstrued by the other participants at the congress, who included the Smithsons and Aldo van Eyck. It was not immediately clear that Woods’s intention was to sustain social cohesion and identity in a manner consistent with what they called, and we may still call, a humanist architecture.

The First Steps Towards a New Framework: The Stem

122 The experiment at Bagnols-sur-Cèze marked the beginning of Woods’s most significant contribution to post-war architectural thinking. Its ideas were elaborated in articles published in *Architectural Design* (1960)¹¹ and in *Le Carré Bleu* (1961),¹² the influential architectural review founded by Andre Schimmerling. The latter article was divided into two parts: a critique of existing approaches, followed by a vision of a new architecture. Contemporary practice, Woods argued, was ‘static’ and ‘closed’, guided by the concept of *plan masse* – the assembling of mass-produced blocks to form dynamic-looking, abstract spatial compositions. Any composition of this kind was merely a:

plastic or aesthetic arrangement [that] does not work in our mobile civilization. These fleeting images are built to last fifty or a hundred years, and in one tenth of that time the image is already out of date.

Plasticity was no longer a concern. The *plan masse*, representing movement in a *plastic* way, did not overcome the static confines of traditional culture. It still led to monuments.

As an alternative to the obsolete formalism of monumental architecture, Woods proposed a new framework for design thinking. The ideas of a fourth dimension – time – and movement were retained, but were no longer related to any ‘ingenious plastic arrangement’: instead they became part of something new, which Woods named ‘Stem’.

Stem goes beyond the *plan masse* and the plastic architectural composition, prescribing a topological order, a way of linking locations that accommodates human activity and interaction. The Stem is a support system, very similar to the network of paths in a traditional town. In short, when Woods talked about the structure of the new town of Bagnols-sur-Cèze, he was referring to a *topological* structure rather than the visual–spatial structure associated with New Monumentality.

Beyond Zip-a-tone

In the same *Le Carré Bleu* article Woods attacked another aspect of New Monumentality inherited from the pre-war CIAM: functional zoning. This required an urban plan or a building programme to be analysed in terms of elementary functions and then visualized in terms of spatial 'zones', to produce a 'zoning plan'. The dogma of functional zoning was embodied by a new means of representation: Zip-a-tone, a patterned plastic adhesive material which denoted a general-purpose use rather than a particular volume or shape. Le Corbusier himself helped to popularize Zip-a-tone, but he was also one of the first to react against it. His *Modulor 2* (1955) contains a surrealist visual poem which playfully attempts to subvert the narrow-minded thinking the material promoted.¹³

Woods's defence against the 'zoning mentality' was to use the Stem as an alternative means of viewing function: an approach based not on space alone, but on human mobility in space. As Günter Nitschke wrote:

... some of the latest explorations for New Towns made by Candilis and Woods, with... the system STEM... originated in considerations of mobility, in other words in form/energy interrelations... [which] are no longer given in measures of length (Renaissance Principle of Planning) but of speed (measure of energy): 2.5 miles per hour, 60 miles per hour... [and] measures of validity (5 years, 25 years).¹⁴

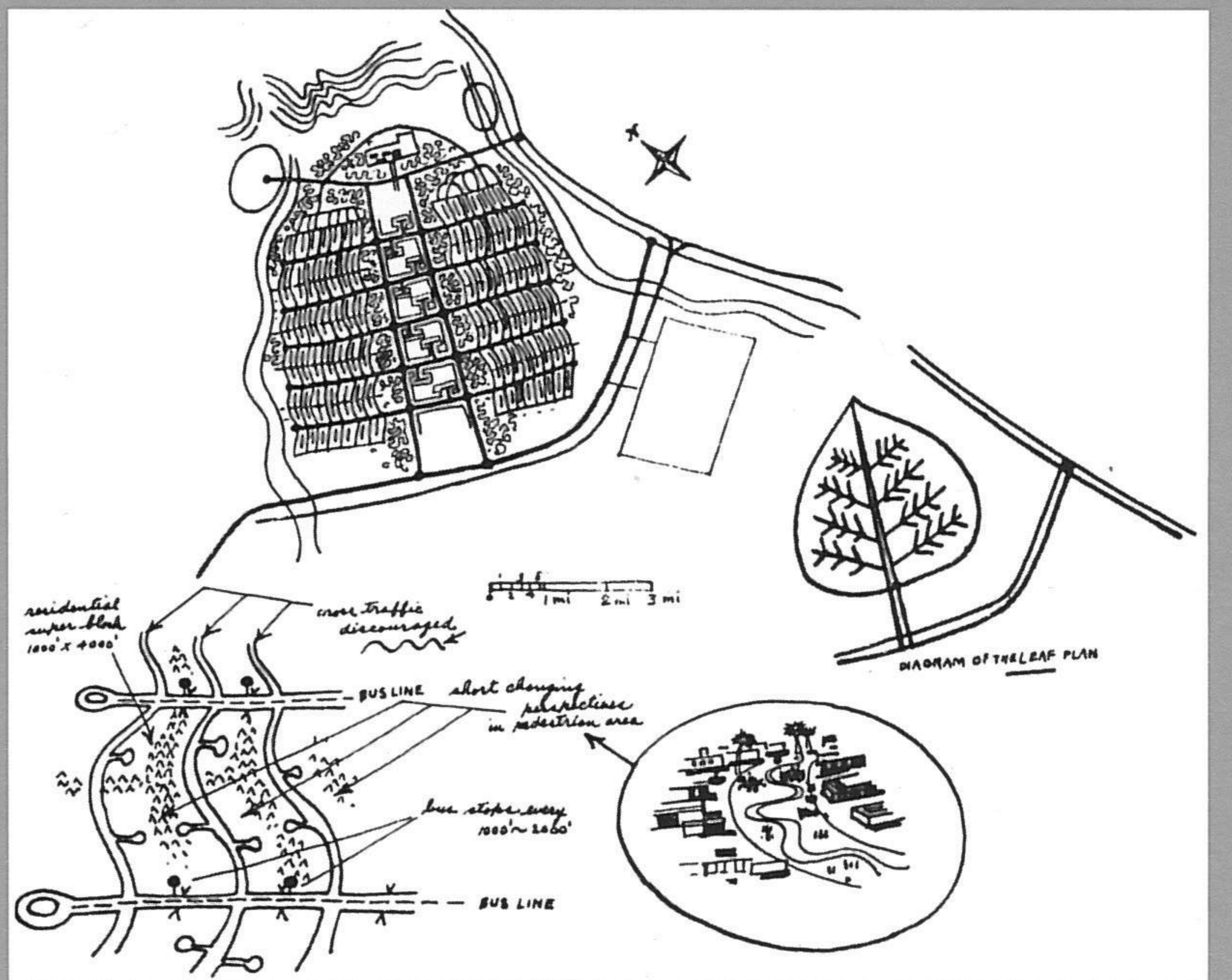
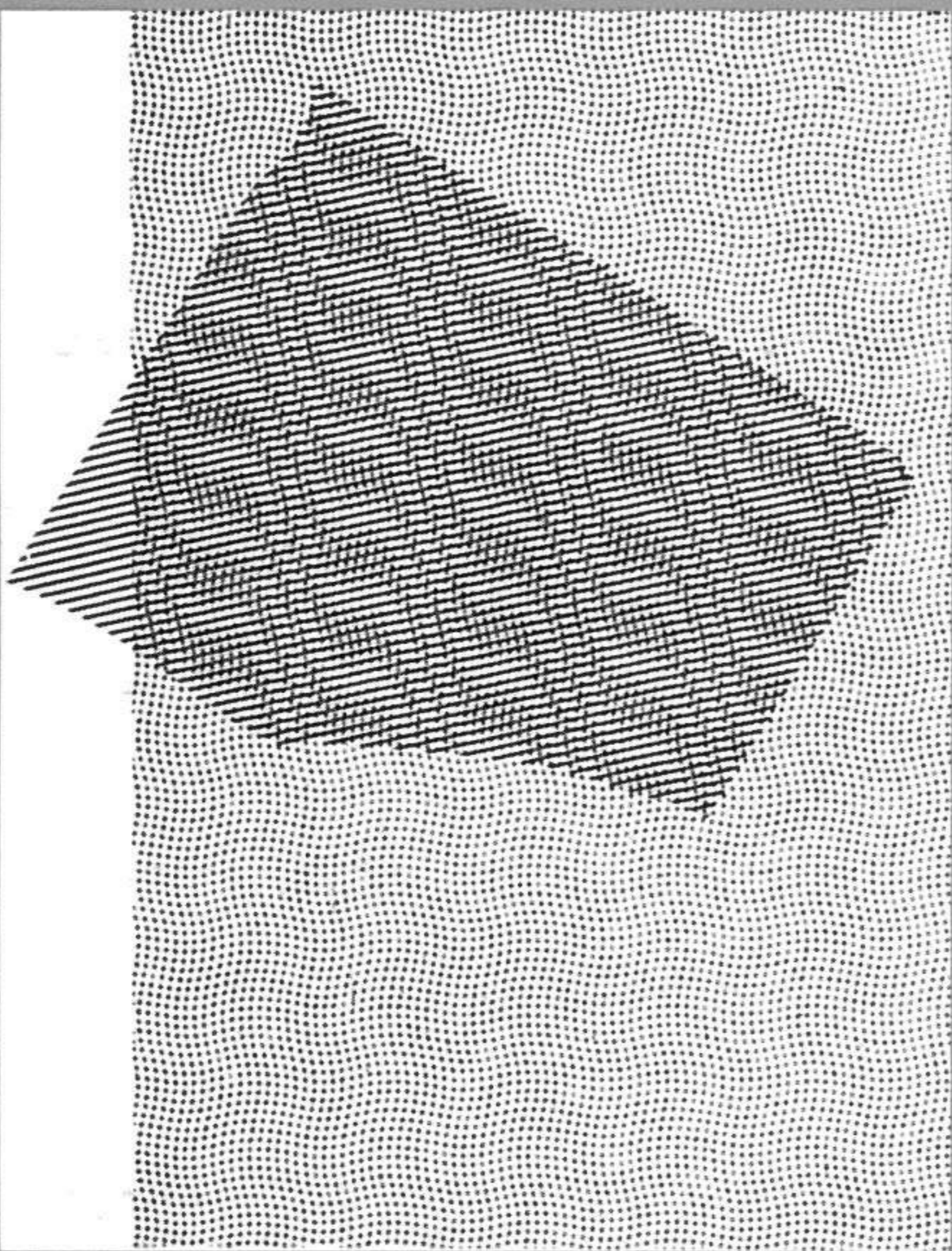
Woods framed the idea of the 'Web' in a short essay in *Le Carré Bleu* (1962), in which he described his practice's scheme for a new housing quarter in Bilbao for 100,000 people. This project incorporated 'more than the usual three dimensions... a time dimension' within its arrangement of paths. But it was not just a circulation system; it was an environmental system, 'a way to establish a large-scale order' which by its existence made possible 'an individual expression at the smaller scale'. More than a technical device, the Web was 'a true poetic discovery of architecture'.¹⁵

Stripping away the aesthetic implications of the dimension of time revealed more clearly its social connotations, which related to a society evolving away from 'the limits of perceptible human groupings (villages and towns, classes, castes and sects)'. For this new society 'the approach' of architecture could 'no longer be only visual, we call upon the whole range of sense, intellect and emotion to elaborate an architecture consonant with our aspirations'. The Web emerged, not unlike the Stem, as a kind of framework within which function could be 'articulate'. Without imposing any repressive order, it excluded 'the chaos of disparate elements in pointless competition'.¹⁶

A later text in *World Architecture 1* (1964) attacked functionalist zoning and 'plastic monumentality' with equal force. Architecture could not 'result from a zoning plan', which did not *associate* functions but only laid them out. Nor could it be made 'from a composition of solids and voids'; no matter how dynamically these were shaped, they were still 'static and therefore the least adapted to the change and growth of life'.

A year later, in a more polemical tone, Woods challenged New Monumentality on historical grounds:

It appears evident that, unlike Michelangelo, we cannot deal with our environmental problems in terms of perfect Euclidean space since we are aware that we live in a space-time 4D world. In fact we might say that the most perfect composition would also be the least interesting, since its very



Le Corbusier, exercises with Zip-a-tone.

From *Modulor 2*, 1955.

perfection would conceal an imperfect, unstable state of becoming. To add to, or take away from, the Campidoglio is to destroy it. We are unwilling to sacrifice to change, with its unknown visage, this perfection. So we will keep it – as long as we can – not entirely useless but finally less satisfactory to the spirit than Hoyle's and Narliker's work on the nature of the universe. The Campidoglio is its own universe, statically balanced and perfectly exclusive.¹⁷

Concluding his critique, Woods dismissed the architecture of the past as being not 'human' but 'super-human'.¹⁸

In introducing a humanist critical dimension, Woods was typical of his generation. His ideas were developed in opposition to those of pre-war architects, who were seen as being rigidly attached to old beliefs and incapable of confronting new problems. The sharpening divide between the generations arose from the devastation caused not only by the war but also, paradoxically, by the unexpected economic miracle which succeeded it. The products of the New Monumentality and the functionalist zoning favoured before the war – the cultural and commercial complexes of North America, the *cités-dortoirs* and 'new towns' of Europe – never found favour with the general populace. The world had changed since 1928, when the Charter of Athens was conceived; both society and technology had become more complex. Yet CIAM VIII in 1951 continued to think in terms of 'master plans', 'centres' and 'cultural monuments'.¹⁹

Though Woods challenged modernism, he did not break with it in a radical way. He adopted the pre-war objectives of movement, change and the 'fourth dimension', but gave them a different meaning – that of mobility. Woods saw himself as an inheritor of modernism's humanist tradition at a time when that tradition appeared to be disappearing. He rethought basic concepts of modernism, adapting them to post-war needs and aspirations.

Dimitris Pikonis, road and footpath study for the landscaping of the area immediately below the Acropolis, 1951–7.

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Post-War Circulation Rigorism, Mobility, the Stem and the Web

Technically the Stem and its variant, the Web, defined mobility as a new conceptual framework for design. In developing these concepts, Woods drew both on pre-war precedents and on the ideas of contemporaries who, like him, were attempting to respond to the dynamic realities of the post-war world.

A significant precedent was Le Corbusier's concept of the *promenade architecturale*, developed before the war but given its most logical expression in the original plan for the Carpenter Center for the Visual Arts at Harvard University, designed in 1960. The *promenade architecturale* was in many respects a formalist device intended to give people in motion a greater aesthetic appreciation of volumetric compositions, but it was also a means of facilitating social interaction between different groups, as was the Stem.

The writings of Lewis Mumford, in particular *The Culture of Cities*, were also important. Mumford popularized the Radburn plan, which was generated out of a system of movement separating pedestrian and vehicular traffic.²⁰ This plan was the basis of many garden communities of the 1920s and 1930s. A variant of it may also be seen in a proposal (1950) by the Polish architect Matthew Nowicki for Chandigarh, called the 'city as a leaf'. Nowicki's successor at Chandigarh, Le Corbusier, took up the idea of differentiated traffic in his own plan for the city (1951–4). A further influence was Jane Jacobs, whose journalism of the late 1950s (pre-dating her best-seller, *The Life and Death of Great American Cities*) discussed movement in cities, streets and buildings as a mechanism for social interaction.

Matthew Nowicki, 'leaf plan' for Chandigarh, 1950.

The new fascination with motion was explored in Japan by the metabolists. Kenzo Tange was among the first to investigate the implications of increased mobility in his plan for Tokyo (1960). In *Kenchiku Bunka* in 1963,²¹ Noriaki Kurokawa wrote about the path up to the Acropolis designed by the Greek architect, Dimitris Pikionis, comparing it with roads in Japan based on similar ideas of movement, with the new town of Toulouse-Le Mirail by Candilis, Josic and Woods, with the idea of the Stem and, finally, with his own projects. In an issue of *Bauwelt* in 1964 Kurokawa elaborated:

The present – an experience of hell... which includes ideas of CIAM, of futurism, and generally of the established heroes in Japan, is juxtaposed to a new philosophy of action, from which may eventually arise the 'Beauty of Metabolism'. Life is movement – road is architecture.²²

Another metabolist, Kiyonori Kikutake, wrote:

... contemporary architecture must be metabolic. With the static theory of unsophisticated functionalism, it is impossible to discover functional changes. In order to reflect dynamic reality ... we must stop thinking about function and form, and think instead in terms of space and changeable function... unity of human space and of service functions... to serve free human living.²³

In London around the same time, the Archigram group was developing radical ideas about architecture and urbanism which were to a large extent based on mobility. In 'City Synthesis' (1964) Dennis Crompton wrote: 'The city is a living organism, it divides and multiplies. The complex functioning of the city is integrated by its natural computer mechanism.

126 Optimal responsiveness is achieved...' This Archigram project in fact came closer to anticipating today's 'information city'²⁴ than the Free University did, as we will see.

Precedents and Parallels: Team 10

The design of the Free University should, however, be placed in another context, more intimately associated with Woods than the above spectrum of projects and publications: namely, the circle of young European architects known as Team 10. The exchange of ideas among the members of this small group holds the key to understanding many of the original intentions and beliefs behind the university scheme.

The discussions of Team 10 were often informal, and it is hard to specify the role each member played in initiating ideas linked to the Free University. Moreover, the very idea of searching for the initiator of an idea ignores the special character of the group – or 'family', as they liked to call themselves. They were a creative 'think-tank', exchanging ideas freely, striving towards common enrichment and common social goals. A characteristic statement of the group's aims, published in the *Team 10 Primer*,²⁵ reads:

Team 10... have sought each other out because each has found the help of the others necessary to the development and understanding of their own individual work... because of mutual realization of the inadequacies of... architectural thought which they had inherited from the modern movement... each sensed that the other had already found some way towards a new beginning.

Work by other Team 10 members had strong affinities with Woods's ideas about movement in architecture as a

mechanism for enhancing and sustaining community and democracy, *social interaction* and *maximization of choice*.

We will attempt to outline their intellectual contributions below.

Jacob Bakema: 'The New is Always Social'

A significant precedent for the development of the Free University and the idea of the Stem was the Lijnbaan project in Rotterdam (1951–3), designed by Jacob Bakema and J. H. van den Broek.²⁶

Bakema, like Woods and Candilis, was a member of CIAM. Whereas Woods served in the US Navy, Bakema spent the war years either imprisoned by the Germans or active in the underground resistance. After the war he became an outspoken champion of the campaign to redefine modern architecture and equip it for a changed world. He spelled out his architectural position, which was influenced by his activities in the resistance, in the first issue of *Vrije Katheder* in 1946:

A society can only find its cohesion belonging together, by... the way we express in housing how to live together... architects must know that the culture pattern of tomorrow can only be a great-number-participation culture... the modern architect must be able to communicate with people... beauty has to express openness in human relationships...

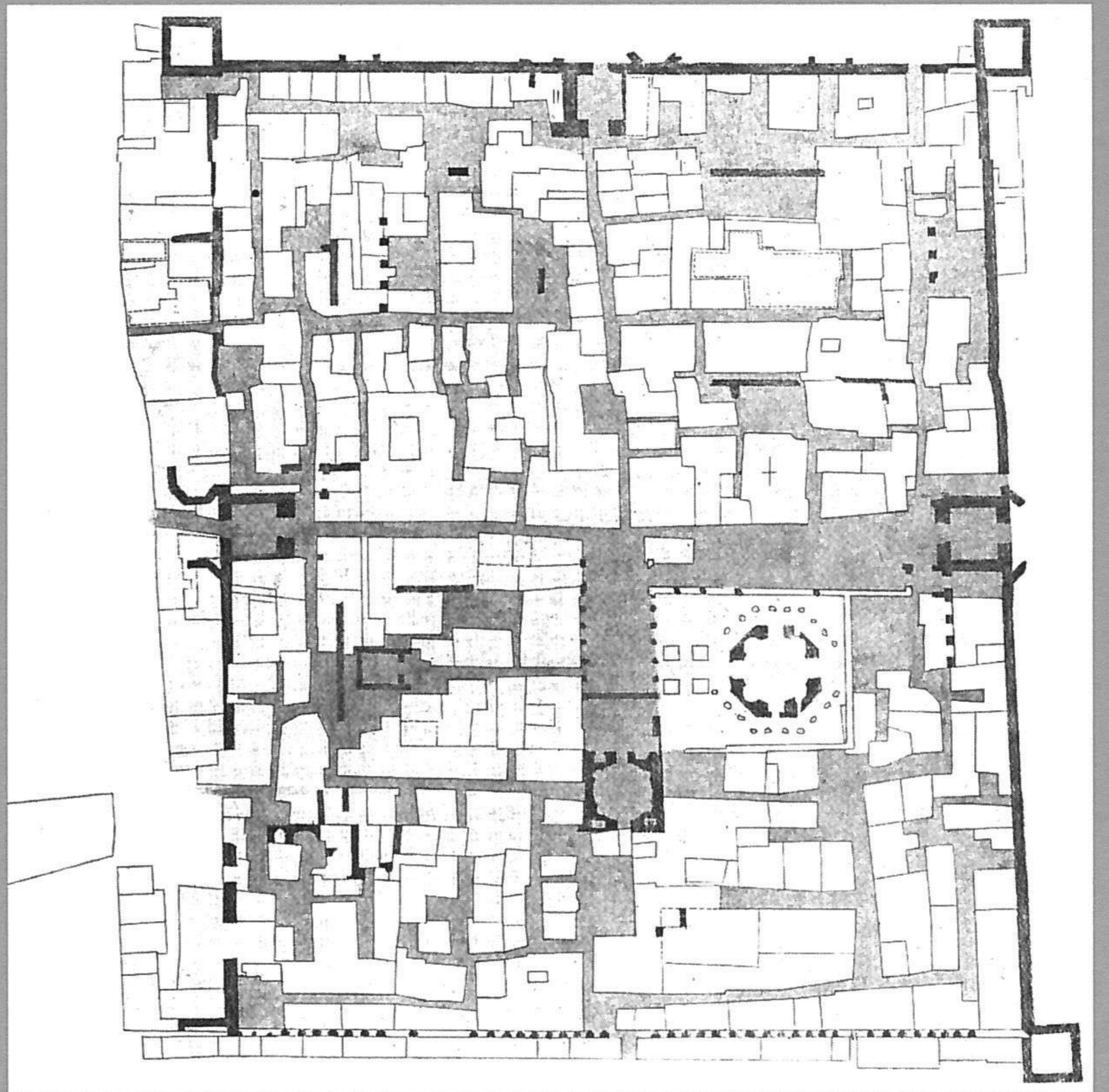
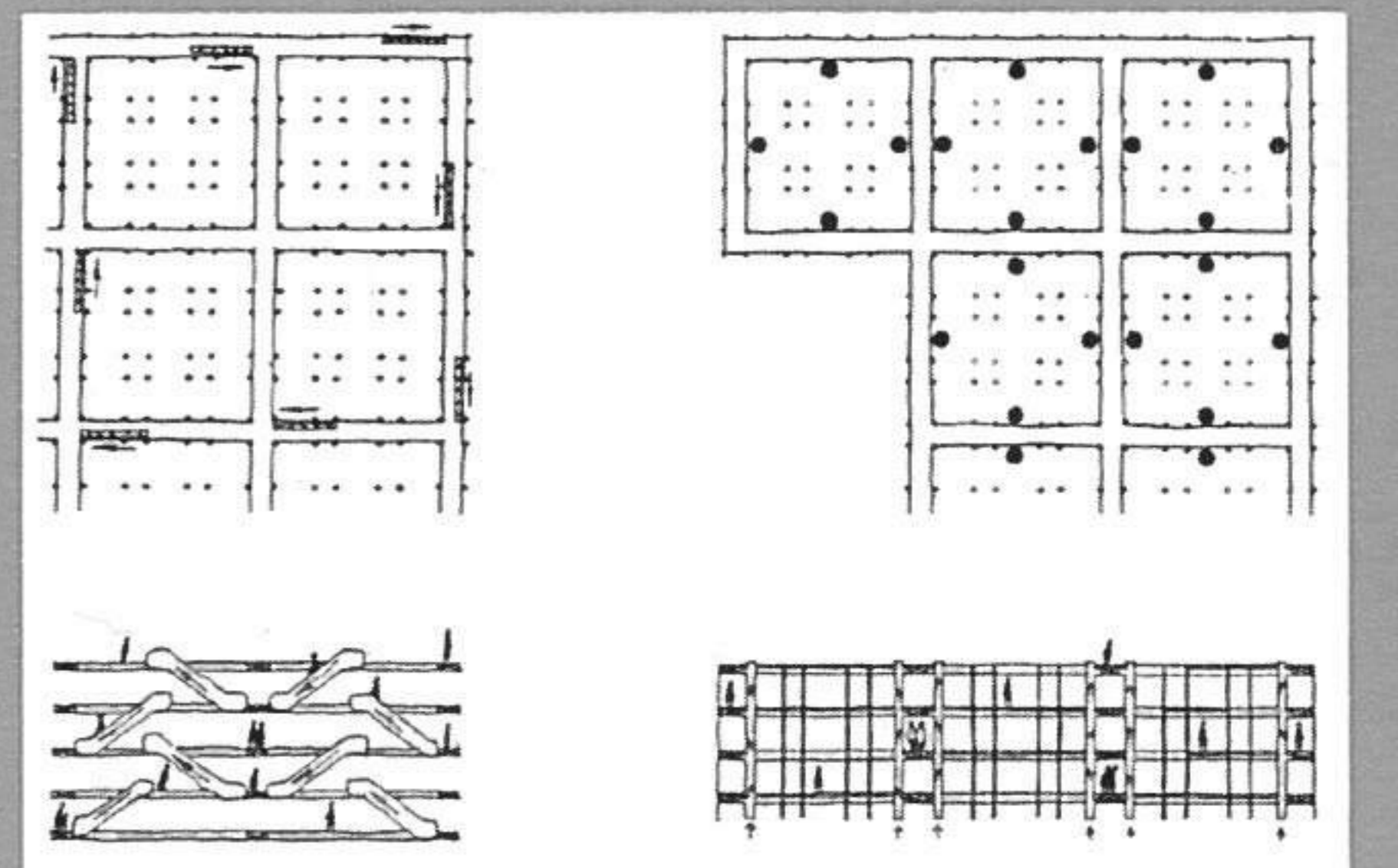
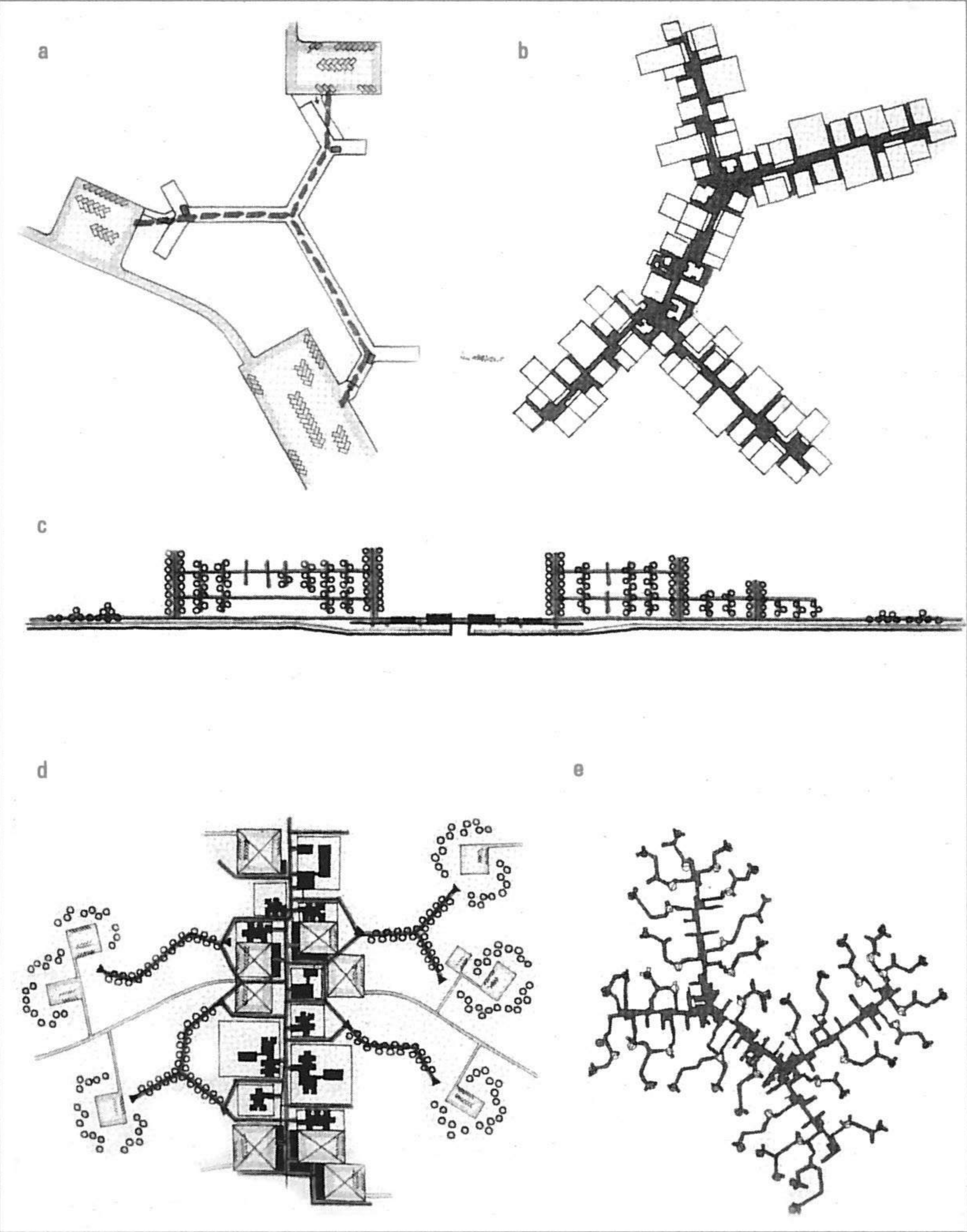
In an article entitled 'The New is Always Social', published in *Forum* in 1949, Bakema again emphasized the special role of architecture. He wrote of the need to restore a human dimension to the abstract space-based conceptual framework of pre-war modernism:

The period of 'to possess' is being replaced by the period of 'to be'; we measure space by means of 'house' as we measure time by means of hour and day.²⁷

These passages underline how Bakema and Woods shared similar values, defined in explicit opposition to pre-war ideas.

Bakema's values were given material expression in his Lijnbaan project. This was an atypical solution to a common task in post-war Europe, involving the reconstruction of the historic centre of Rotterdam and of part of the residential quarter of Kralingen, devastated by German bombing on 14 May 1940. The architects appeared to have a unique opportunity: instead of being obliged to follow the pre-war property parcelling and circulation system, they were free to apply their design ideas as they saw fit. The result was a new layout based on a movement structure which responded to Bakema's call for architecture to 'express openness in human relationships' rather than plastic, compositional prerogatives.

In this scheme, individual property lines and traffic routes were redistributed to fit within a mobility system; access points and services were organized in a linear pattern separating vehicular and pedestrian conduits, in the manner of the Radburn plan. An attempt was made to modernize commercial activities by 'Americanizing' them. The old shopping street patterns were recast into a 'shopping mall' – an idea then just emerging in the United States – but in contrast to American planning, which segregated uses, the project mixed together retail and commercial activities, offices and residential areas.



Shadrach Woods, Stem development at

Caen-Hérouville, 1961.

- a The synthesis of parking lots, pedestrian ways and lift points becomes the generator of the urban element.
- b The linear centre is exclusive to pedestrians and re-establishes the street as the primary function of urbanism.
- c and d Schemes showing the linear organization of activities and the grouping of cells around the linear centre.
- e From the parking lot, one moves onto a multi-level independent pedestrian network.

Candilis-Josic-Woods, Frankfurt centre competition, 1963. Schematic indication of the circulation grid and mechanical system grid.

The town of Split, as presented by Bakema. The walls of the old palace serve as foundations for the current town, while the ancient circulation system is preserved.

At Lijnbaan, Bakema and his collaborators rejected both plasticism and the mono-functional zoning principles that were popular at the time. By incorporating utilitarian, social and recreational activities within a linear pedestrian movement system, they created the earliest example of a new conceptual design framework promoting *social interaction* and the *maximization of choice*. In this respect Lijnbaan was the immediate predecessor of the Free University of Berlin.

In 1961 Woods employed in his schemes for Caen-Hérouville and Toulouse-Le Mirail some of the basic principles first seen a decade earlier in Bakema's project. The Stem acquired a multi-level organization, a hierarchical, bifurcal branching structure; Lijnbaan was creatively redesigned and reborn in the Stem.

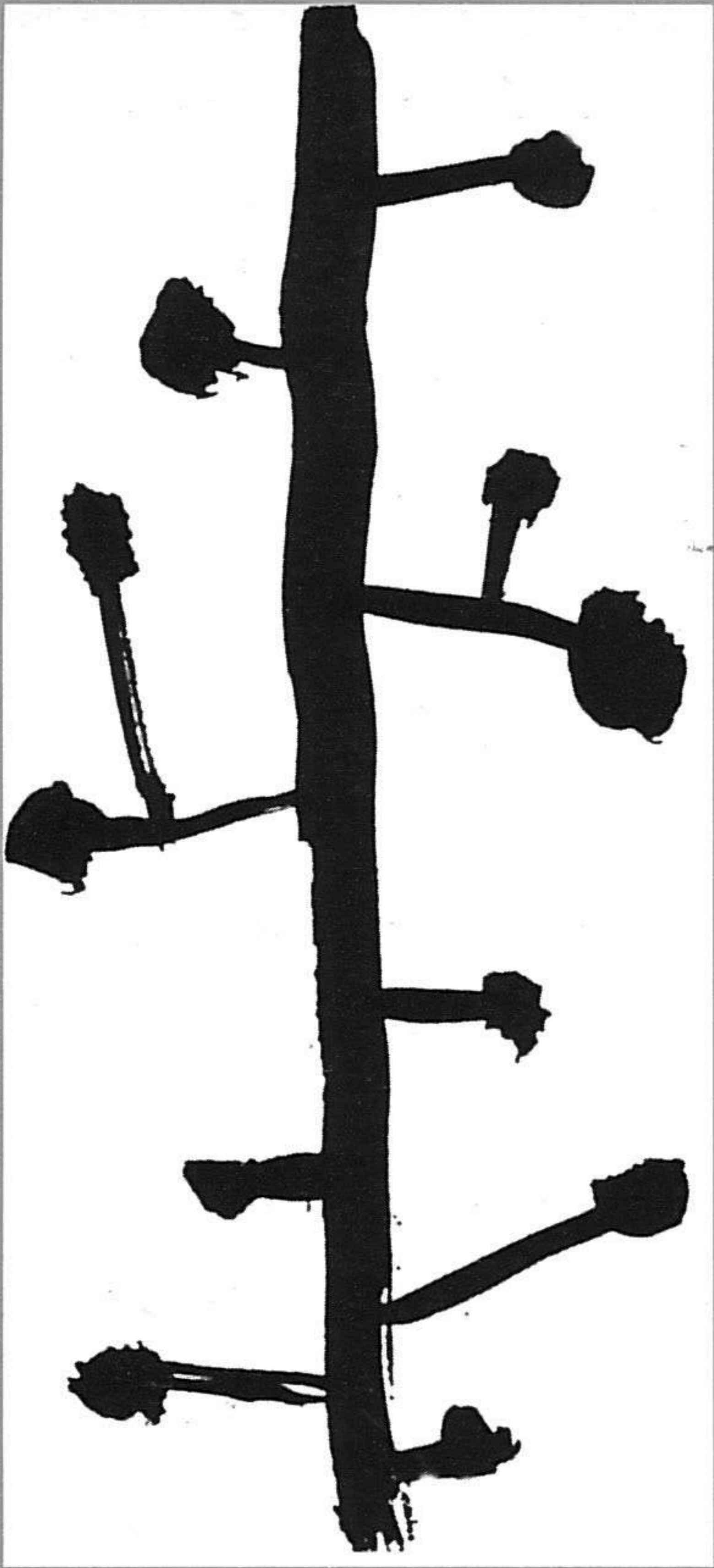
The Minimal Open Structure

Another significant precedent for the development of the Stem and of the Free University was Bakema's article of 1962 about Split, a town that had grown out of a palace built by Diocletian c. 300 BC.²⁹ Bakema used historical documentation to put forward design ideas unrelated to conservation or historical context. He showed the town quartered by the movement structure of the Roman *cardo* and *decumanus*. Within these two axes, old ruins (columns, architraves, gates, walls) were entwined in a close embrace with newer constructions: settlements, houses, shops and small workshops. The article included photographs of busy streets flanked by Corinthian colonnades from the original palace, demonstrating how the old was perfectly adaptable to new uses. Bakema was particularly concerned to show how a long-term structure, as exemplified by the skeleton of the palace-town complex, could co-exist with short-term elements, and how this minimal structure, sustained over centuries, could respond to changing ways of life.

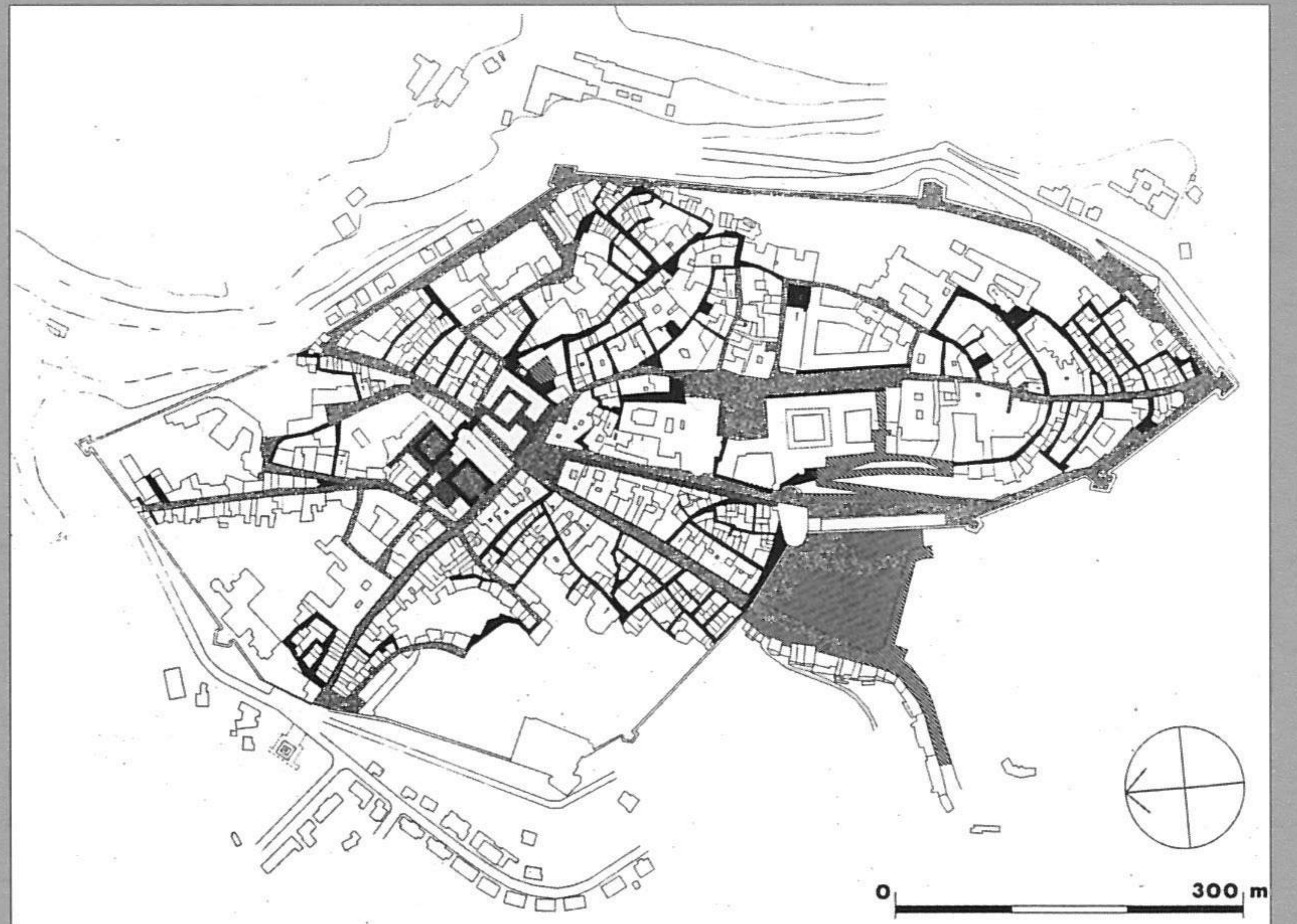
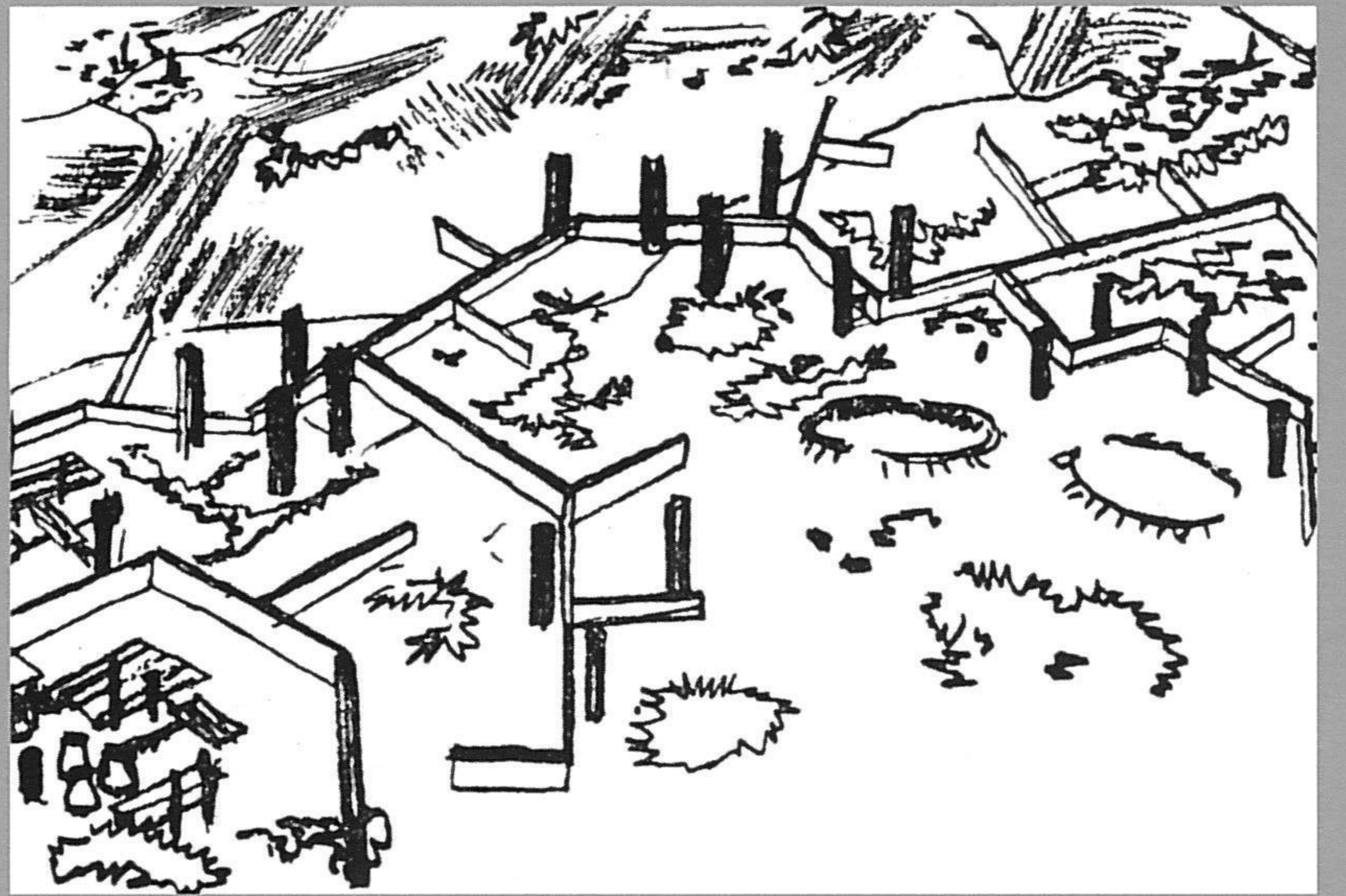
Bakema admired Split because it provided freedom of choice through flexibility, a path he believed post-war architecture had to take. A 'minimal open structure' – or what John Habraken called a 'support system' – replaced the traditional concept of the complete and static project.²⁹ The modernist principle of bringing together time and space was implemented, not by formalist, plastic means, as Giedion and the old CIAM had advocated, but by organizing space in a new procedural manner.

The influence of Split is evident in Woods's entry to a 1963 competition to re-plan the centre of Frankfurt. In this scheme the Stem is no longer bifurcated, as it had been in the 1961 Caen-Hérouville and Toulouse-Le Mirail competitions, but has a square configuration. The advantages for the Frankfurt site were obvious: whereas the earlier projects had been located on open sites where the blocks could branch out freely, following the bifurcation rule, this development had to fit within the gaps opened up by war bombing in an existing dense urban fabric.

Conversely one has to note that, by this time, Woods had begun to think that even a square grid, generating implicit centres at its cross intersections, was perhaps just one more relic of the formalism inherited from the pre-war generation.³⁰ The issue of flexibility – movement expressed in terms of the capacity of a project to change its form over time – became increasingly important to him. The Split model resurfaced in the design for the Free University, but its purpose was changed. It now served to show how the idea of movement could be translated into two complementary design strategies: *mobility* and *flexibility*, both environmental means of enhancing and sustaining social interaction and



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Alison Smithson, ideogram of infill completing the structure of an old village in order to make it serve contemporary needs, 1959.

maximization of choice. Design as movement meant not just mobile people and objects circulating in space – the whole project was conceived as an object in flux, transforming itself in relation to people's changing needs and aspirations.

Woods acknowledged the importance of Bakema's article in his book *The Man in the Street*, which was published after his death. An aerial photograph of Split, with the caption 'a city... may be thought of as a building', accompanies a text on treating problems of change, decay, maintenance and replacement common to both cities and buildings.³¹

The Smithsons: Ordinarity versus Order

Designing for the 'man in the street' was a primary concern of Team 10. The scheme of the Free University, the idea of the Stem – the reinterpretation of movement not as a formal, plastic ideal but as mobility and flexibility for ordinary people in everyday life – emerged largely out of Team 10's search for ordinarity, as opposed to order. The group's democratic empiricism – in contrast to the imperiously normative preoccupations of CIAM – was particularly evident in the writings of Alison and Peter Smithson from the early 1950s onwards.

As was the case with Bakema, the link between Woods and the Smithsons passed through CIAM. The Smithsons were elected members of CIAM in May 1953, as part of the English MARS group. In the same year they published in the *Architect's Year Book* 'an urban project' – Golden Lane – in which some of the origins of the Stem can be found. In their commentary they alleged that:

'...the idea of 'street' has been forgotten [by the CIAM architects]. It is the idea of street not the reality of street that is important – the creation of effective group-spaces fulfilling the vital function of identification and enclosure making the socially vital life... possible.'³²

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The idea was taken up by others in their generation. Two years later, in August 1955, a CIAM study programme entitled 'Mobility' included themes such as 'man as a traveller – man going to work in the morning – what he sees... the enjoyment of points of interest' and 'the approach to the house... the corridor... as a social element'. In September 1955, at a gathering of CIAM members in La Sarraz, the Smithsons stated:

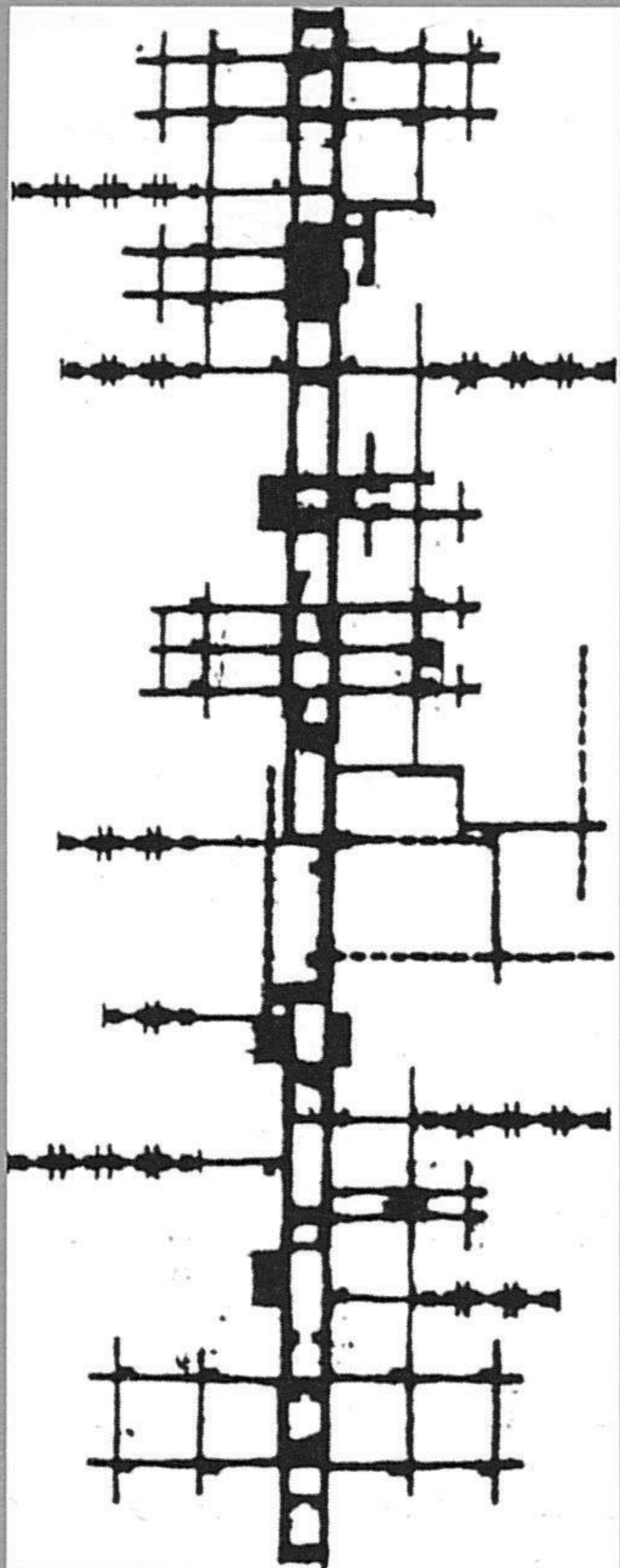
If, thirty years ago, the use in a creative way of new techniques was an urgent problem for CIAM, today... [the problem] is to create the forms of habitat which can stimulate the development of human relations.'³³

This statement was followed by a detailed list of 'relationships' which specified connections between buildings and external public spaces as a person moved from one location to another, with no mention of the visual-plastic qualities of the designed space.

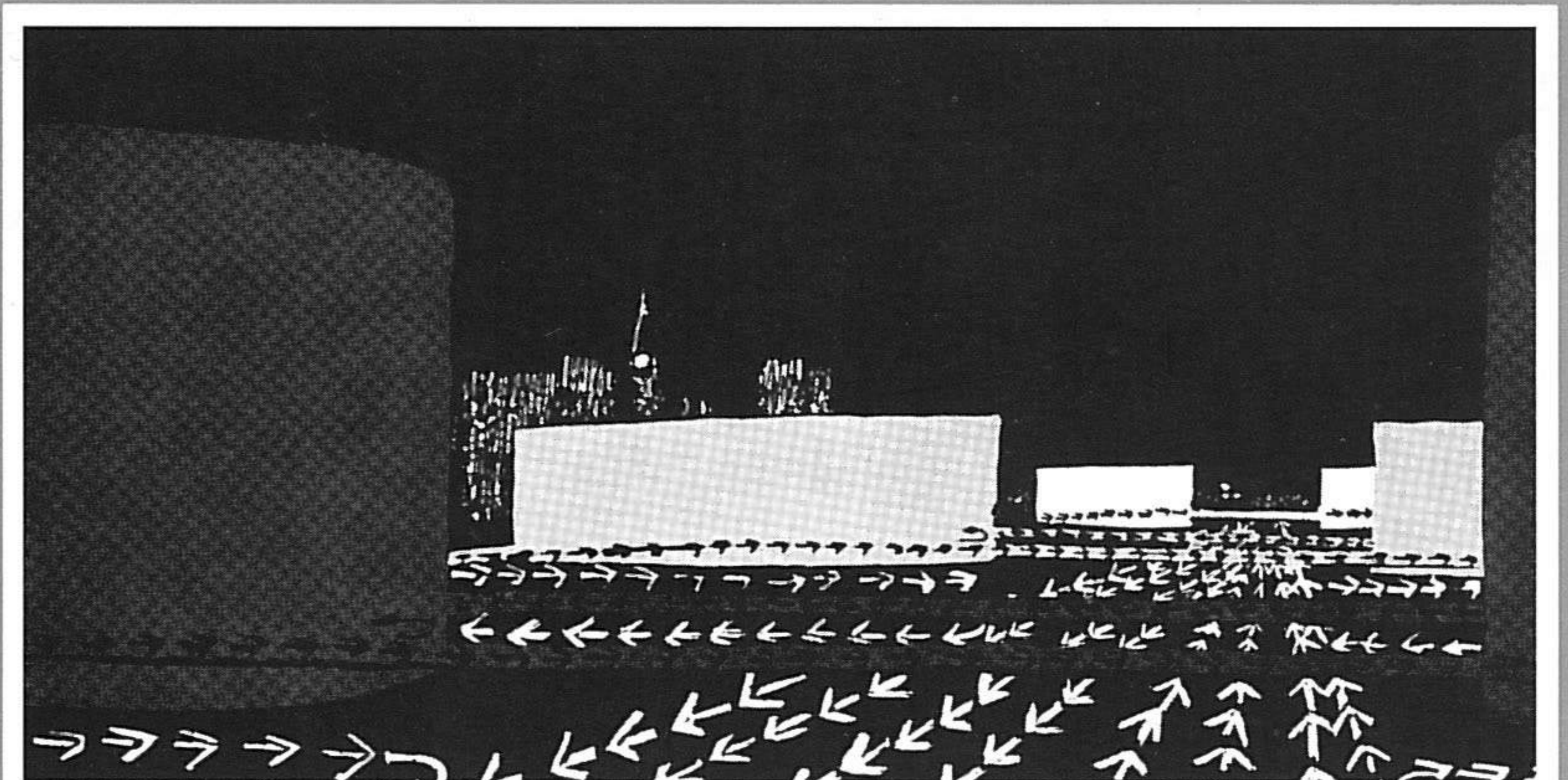
At CIAM X in Dubrovnik in August 1956 the Smithsons presented a condensed diagram that showed a causal link between 'social order' and 'environment'. The diagram projected the aspirations of the new generation, pointing out new avenues of design. At the same time, it was more the expression of the young architects' wishful thinking than of truly empirically founded principles.³⁴

Alison and Peter Smithson, Golden Lane housing, 1953. The street mesh slots into the vertical circulation of the street deck complex.

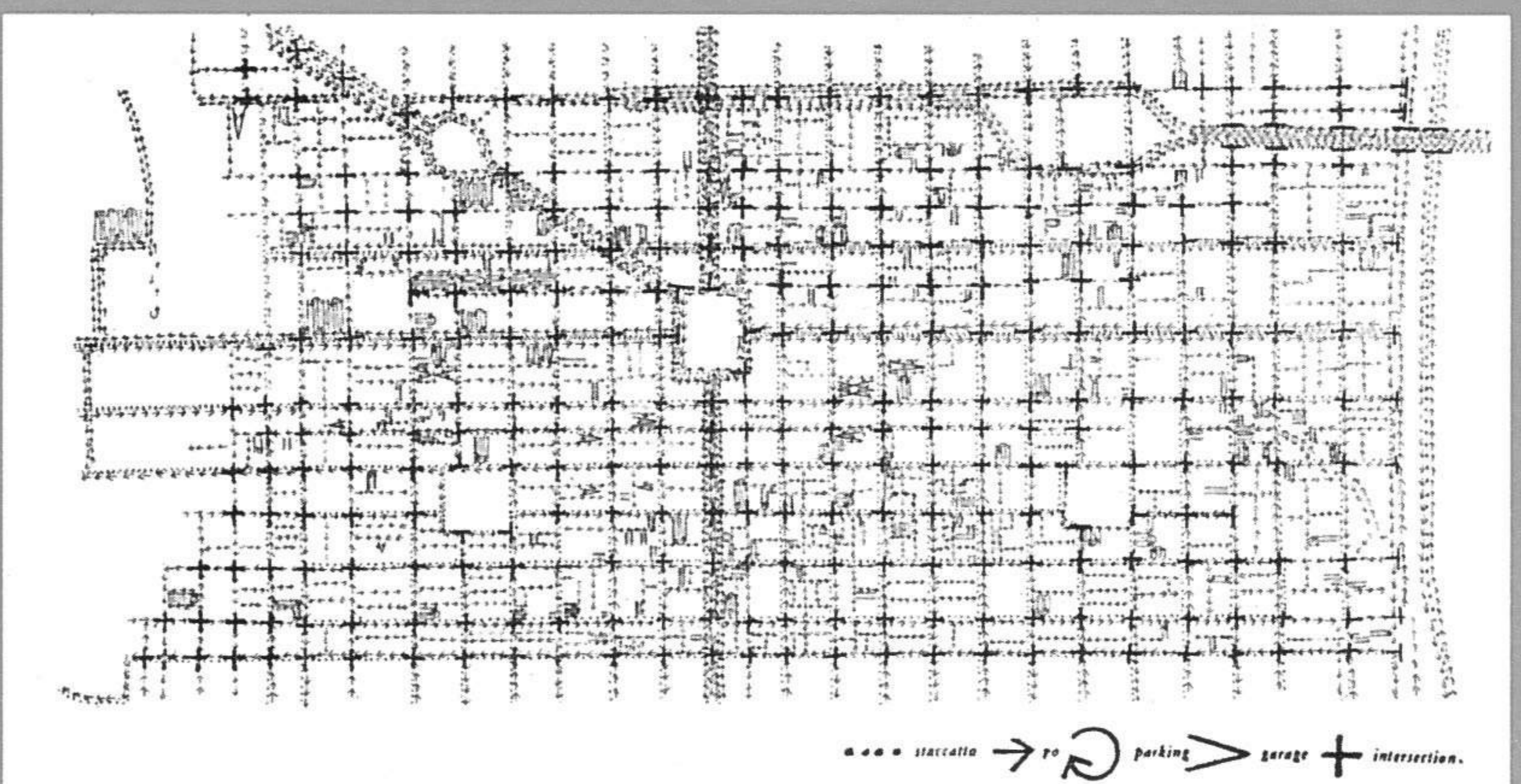
Giancarlo De Carlo, documentation of materials and hierarchies of pedestrian paths in Urbino.



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Expressways are like **RIVERS**
 These **RIVERS** frame the area to be served
RIVERS have **HARBORS**
HARBORS are the municipal parking towers
 from the **HARBORS** branch a system of **CANALS** that serve the interior
 the **CANALS** are the go streets
 from the **CANALS** branch cul-de-sac **DOCKS**
 the **DOCKS** serve as entrance halls to the buildings



Giancarlo De Carlo, proposal for the University of
Dublin, 1963. Campus plan showing pedestrian paths.

Aldo van Eyck: Place and Occasion

A study of the evolution of the Stem and the design of the Free University must also take into account another member of Team 10, Aldo van Eyck, who was one of the most aggressive opponents of the ailing dogmas of CIAM. Van Eyck expressed his approach to movement in poetic prose:

Whatever space and time mean, place and occasion mean more.

Space and time must be opened—interiorized, so that they can be entered... place acquires temporal meaning and occasion spatial meaning.³⁵

Van Eyck took Giedion's framework of 'space/time/plastic architecture', as interpreted by mainstream practice after the Second World War – and turned it on its head. He re-humanized it, introducing what he called the 'image of man'.

There was a deep affinity between Van Eyck's powerful poetic statements and Woods's vision of the Web, expressed in more prosaic language.

The 'Web' intends to find ways for man on foot to associate... It seeks to re-establish the human scale... In relation to speed, the measure of which is distance, the human scale is the pedestrian who moves at about 4 kms/h... If the human scale is to survive, it must subjugate all the other scales... It is clear that the measure of speed is distance and the measure of distance is time.³⁶

In all his writings Woods emphasized that the Stem could be applied irrespective of scale. It was a conceptual schema, suited to both large environmental projects and smaller designs; it did not distinguish between building, built complex or urban conglomerate. In a similar vein Van Eyck, echoing the Renaissance humanist architect Alberti, said:

A house is a tiny city, a city a huge house... the time has come to conceive of architecture urbanistically and urbanism architecturally.³⁷

Woods reiterated the same idea when he said that, rather than being concerned with the distinct categories of 'architecture' or 'town planning', architects should address the 'creation of environment at every scale' because, irrespective of scale, what mattered was 'human association'³⁸ – the actions of people – rather than abstract configurations of space.

These principles guided the design of both Woods's Free University and Van Eyck's Children's Home in Amsterdam (1960), though the outcome in each case was quite different. Whereas Van Eyck chose to specify each prop, each piece of building furniture, in order to sustain a welcome activity, Woods opted for a 'minimal structure' maximizing the choice of alternative uses in an unknowable future.

Giancarlo De Carlo: Sustainability

The Italian architect Giancarlo De Carlo was another member of Team 10 who contributed to the development of Woods's thinking. At the beginning of the 1960s De Carlo devised a master plan for the city of Urbino which used a 'structuralist' approach, as opposed to visual–aesthetic categories, as the basis of analysis. This method focused on the material properties and geometric configurations of the fabric of the city, revealing a structure pared down to a movement system, very close to the sense of Woods's Stem. The whole hierarchical fabric of the historical city –

Louis Kahn's movement-based model of an architecture
of community, from this plan for Philadelphia, 1953.

Louis Kahn, ideogram of existing traffic movement in
Philadelphia, 1953.

individual apartment, building, block – was analysed in terms of access, both controlled and potential, taking into account the dynamics of the urban fabric and its ability to change. This diagnostic analysis in turn generated a series of guidelines for the future development of Urbino as a 'sustainable' project, as it had been in the past. The study was pioneering in that it brought together for the first time two different aspects: the analytical apparatus of the new conceptual structure of movement, and the historical data supplied by an important European town.³⁹

In 1963, the same year the Free University was begun, Giancarlo De Carlo designed a competition project for University College, Dublin. His campus plan made use of many of the analytical tools applied to the historical example of Urbino, and also appeared to adopt the principles outlined by Woods in his 'Stem' article of 1961. It was neither a plastic composition nor a zoning proposal, but a movement system 'serving the requirements of... flexibility and social contact at all levels'. No distinction was made between individual building and urban fabric. The system provided 'the structure... the space and social organization... based on a time-distance factor'. More concretely, the proposal consisted of a 'main spine' and, branching out of it, a series of 'routes' – interlinked pedestrian and service/mechanical paths – which defined communal versus private areas, general versus specialized use.

Woods did not refer explicitly to any of the above work by Team 10 members which ran in parallel with his own, quite possibly because he took it for granted that the ideas of the group were freely shared. But there was at least one other major debt which he acknowledged without hesitation: this was to Louis Kahn.

134 Louis Kahn: Rivers and Docks

Many of Woods's ideas about movement and the Stem were prefigured in Kahn's 'Toward a Plan for Philadelphia' (1953):

Architecture is also the street... the design of the street is design for movement... not for speed but for order and convenience.

In this essay Kahn put forward his movement-based model of an architecture of community, using an 'aquatic' analogy whose components – rivers, harbours, canals, docks – specified different qualities and levels in a hierarchy of flow. Embedded in this model were the concepts of vehicular 'serving' and social 'served', applied to urban 'areas' and 'buildings'.⁴⁰ These ideas were reinforced by the illustrations to the article, which introduced a new system of representation: a notational system of hierarchies and qualities of mobility replacing the traditional Euclidean volumetric description of buildings and outdoor spaces.

In the early 1950s the prevalence of Mies's idea of 'universal space' often resulted in the suppression of the component of circulation on the level of buildings. Like Kahn, Woods reacted against this underdifferentiation of aspects of movement and interaction in space. Again like Kahn, he was not so much concerned to develop a new kind of architecture that facilitated circulation or bureaucratic efficiency, as he was to preserve, sustain and ultimately privilege human association: community. They both sought a new conceptual framework for design, the 'servant and served' being Kahn's basic concepts, the Stem and (less frequently) the 'Cell' being Woods's.

A 1961 description of the Candilis-Josic-Woods housing at Toulouse-Le Mirail underlined the importance of the scheme's linearity and the relation between linear pattern and movement. The presentation of the same project in

World Architecture in 1964 extolled the idea of the Stem and the merits of its linearity. Woods stated: 'a line is open ended; it has no dimension. It can change direction at will.' With reference to the Web and its rejection of a central point, he said:

When we predetermine points of maximum intensity – centers – we are fixing a present or projected state of activities and relationships... we compromise the future, closing doors....

In verse form (prefiguring Louis Kahn's poem 'Architecture' of 1972) he added:

A point of static, fixed.

A line is a measure of liberty.

A non-centric 'Web' is a fuller measure.⁴¹

But whereas Kahn's topology of servant and served was implemented three-dimensionally, in terms of vertical elements and point towers, Woods used horizontal elements – linear paths – because he preferred the activities of life to be centred on the ground.

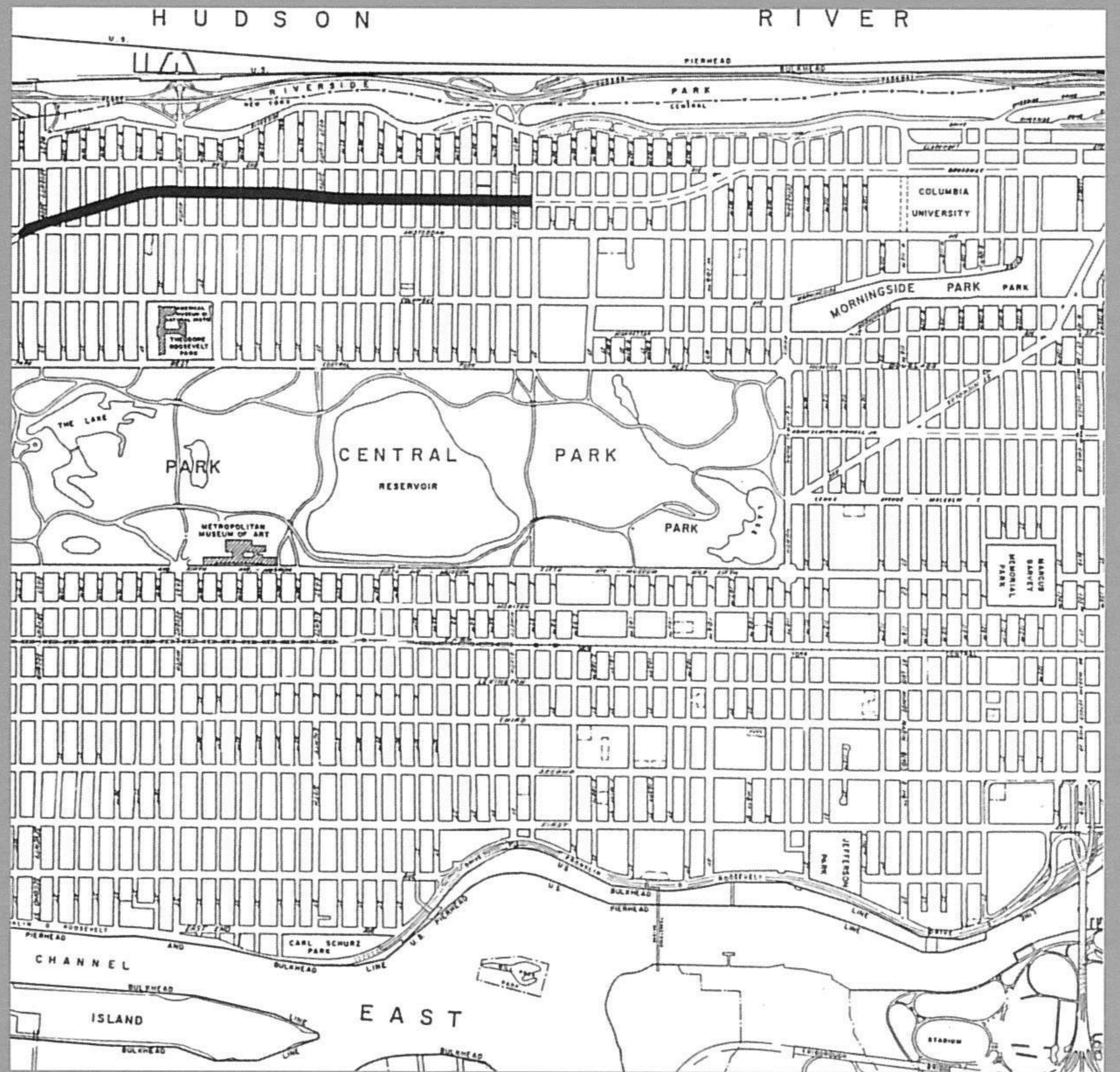
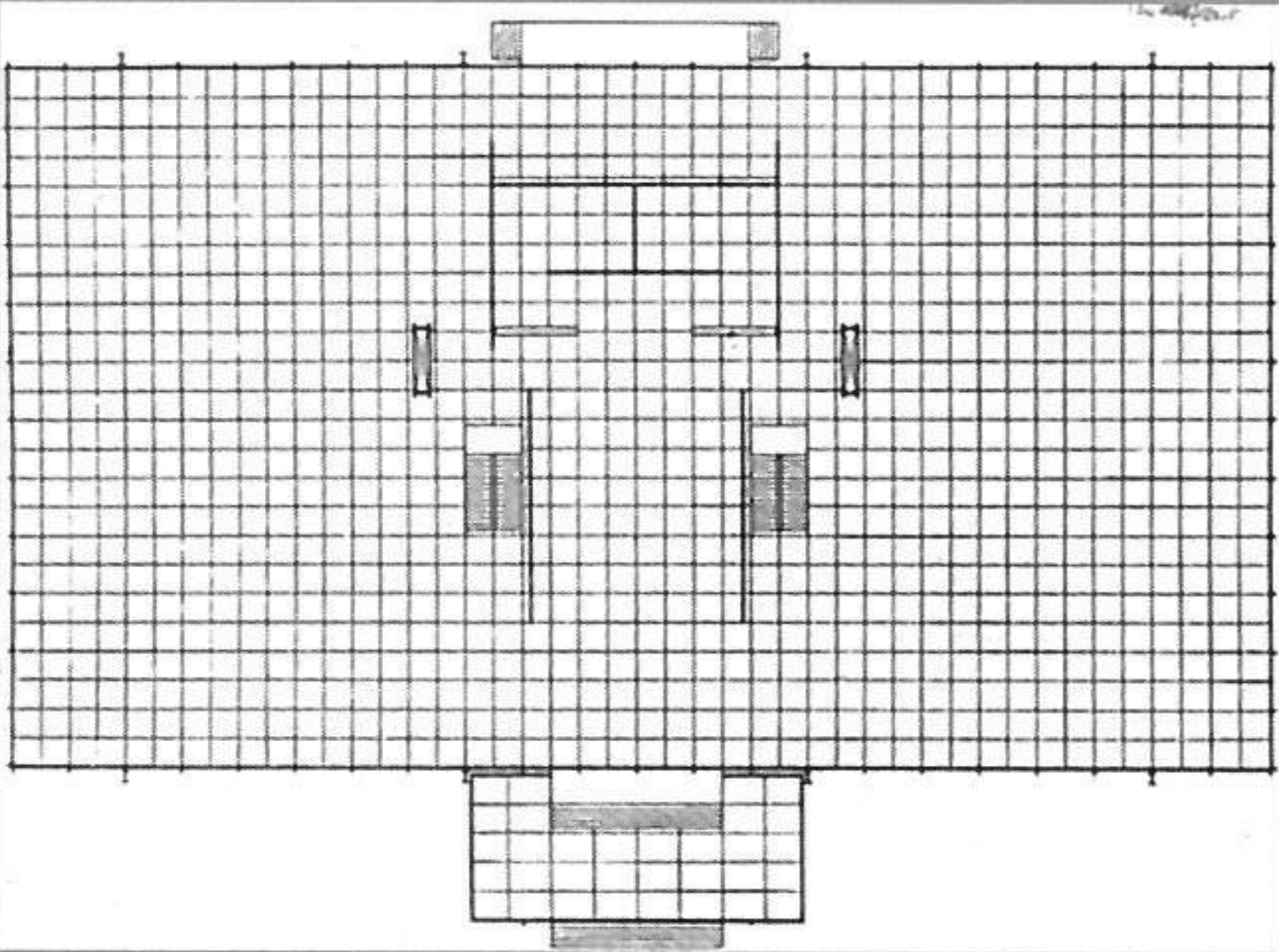
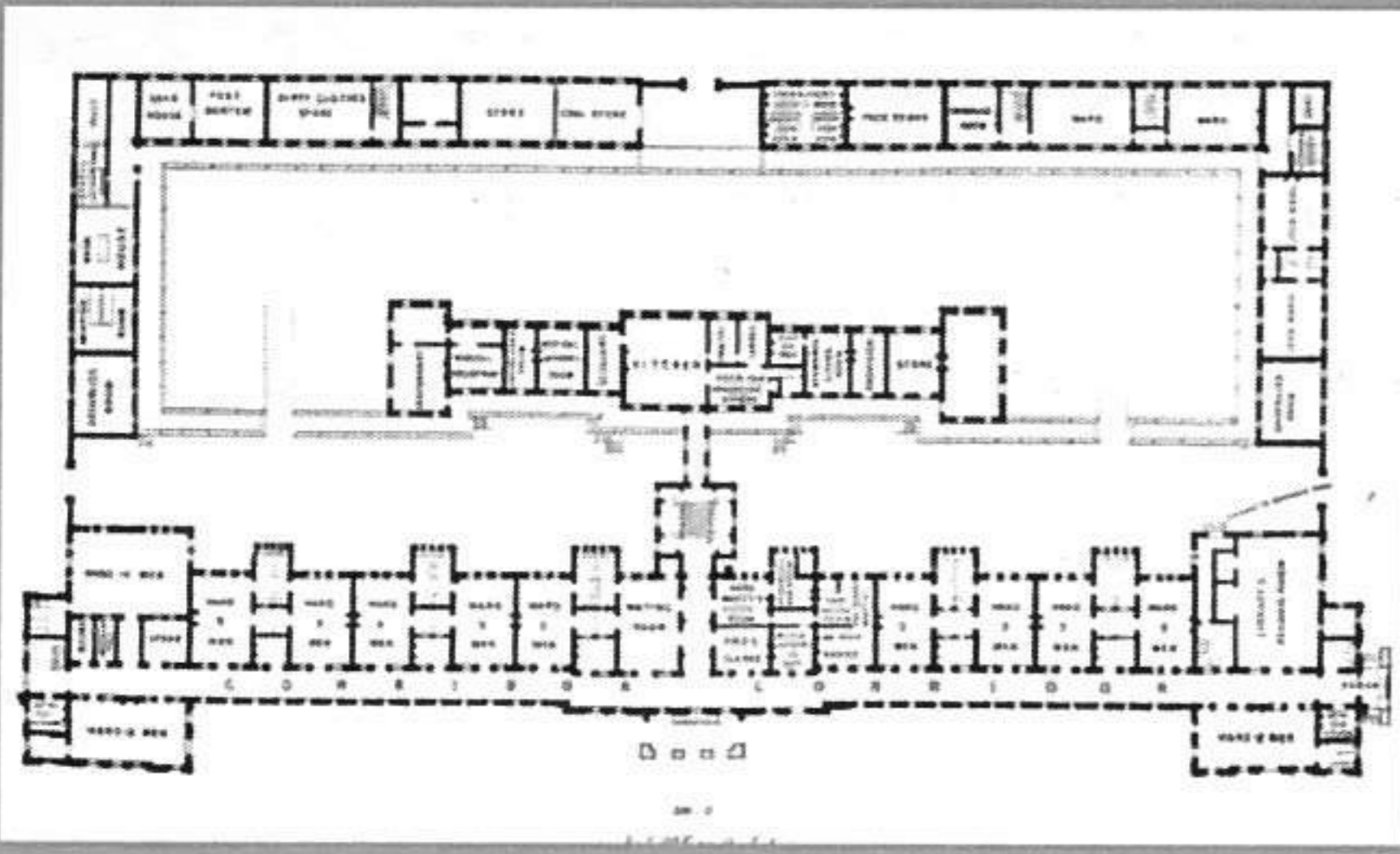
Streets and Corridors: Yona Friedman's 'Spatial Urbanism' and Constant's New Babylon

Though Kahn and Woods disliked corridors as such, they defined 'rooms' and 'corridors' as the two distinct components of the built environment, an idea contemporary architecture had abandoned, as we have said, in favour of undifferentiated *universal space*.⁴² With both Kahn and Woods one can observe a kind of return to the mid-eighteenth-century French concept of 'distribution' which split buildings into *salles* and *corridors* – a concept originally intended to protect the upper classes from noise and intrusion but applied, in their work, to bring people together while shielding them from disruptive technology. Like the Stem, Kahn's device of 'servant/served' resolved conflict in the environment. It provided a new set of architectural categories – alongside the traditional spatial-visual 'solid and void', or the structural-functional 'support and supported' – which might be called *movement* categories. Both the Stem and the elaborated idea of the Web were 'intended to find ways of circulation by which man on foot can exist and associate without inflicting hardship on other men in machines'.⁴³

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Toulouse-Le Mirail still bears the hallmarks of a traditional modernist project. Alongside the linear Stem pattern, there is a detached 'centre' or 'head' (an agora or acropolis) very much like the centres one finds in the plans of Chandigarh or even Brasília. In the later scheme for Frankfurt, however, the agora-acropolis centre has disappeared completely. The Stem is implemented in the plan as a square grid rather than a bifurcating tree pattern.⁴⁴ The grid is divided into economically manageable areas whose dimensions were determined by the optimum span achievable without expansion joints. Distances of between 35 and 45 metres were examined; the final dimension was set at 36.47 metres. Pedestrian paths are 3.66 metres wide and a grid of free spaces, each 32.81 metres square, is left open for development.

Berlin Free University is a rare example of an advanced architectural idea being translated into building without undergoing major modifications. It is the most mature of a series of projects in which Woods used an architecture based on the idea of movement as a physical medium to enhance social interaction and maximization of choice. It took



Halls and corridors, ground plan of the south-eastern wing of the Royal Victoria Hospital, Netley, 1858–9.

Universal space. Ludwig Mies van der Rohe, Crown Hall, IIT, Chicago, 1956.

Plan of Manhattan. From R. B. Shannon, *The City that Never Was*, 1988.

three years for the initial bifurcating Stem pattern of Caen-Hérouville (1961) to become the rectilinear frame of the Free University of Berlin, via the square grid structure of the Frankfurt competition scheme. If Frankfurt refers to the precedent of Diocletian's palace at Split, the rectilinear weft and warp of Berlin evokes the structure of Manhattan. (Woods, we recall, often proclaimed his 'Manhattanism' in relation to this project.) The rectilinear variant of the grid restored informality as well as versatility, allowing greater choice and social interaction than did the dogmatically square pattern of the Frankfurt scheme. By differentiating the two directions of the Free University grid into 'avenue' and 'street', and by spacing the 'streets' of the grid irregularly, Woods came closer than in any of his previous projects to translating the diagram of the Stem into a real building. In this shift another precedent was important for Woods: namely, the so-called 'spatial urbanism' that Yona Friedman had developed in the late 1950s, around the time Constant was elaborating, in a much more studied visual way, his dada-Utopian plans for New Babylon.

Flexibility

We have already mentioned that *mobility* and *flexibility* were two complementary strategies for achieving community and democracy through design. In almost all of the projects by Woods examined up to now, mobility was given priority in the conception of the project. In the Free University, however, flexibility was equally important.

As shown above, Bakema acknowledged the significance of flexibility in his article on Split, and developed a new design method for making two scales of permanence coincide in the same scheme – a method applicable both to buildings and to urban projects.⁴⁵ This basic idea had been sketched out by Le Corbusier in his 1930 urban plan 'A' for Algiers. Other pre-war projects broach the same theme: for example, El Lissitzky's experiments of the 1920s, or the Maison du Peuple at Clichy (1937–9) by Beaudoin and Lods, with Bodiansky and Prouvé.⁴⁶

The design of the Free University was not determined by plastic, compositional considerations. But this does not mean that Woods was oblivious to its potential visual impact. The intention from the start was to make the building appeal to the senses. In particular the smooth cladding, made up of the lightweight panels designed by Jean Prouvé, offered a deliberate contrast to the rough, almost pachyderm exteriors typical of 1960s brutalism.

An Urban Arcadia for Community and Participation

Many of the technophilic projects of the early 1960s appeared to treat movement as a narcissistic sensory experience. In critical opposition to these projects, Woods emphasized movement as a social experience related to the goal of uniting a community. Similarly, in defending place-based human interaction, he confronted 'end-of-place' anti-urban schemes such as Melvin Webber's proposal for achieving community without the physical proximity of place, or Marshall McLuhan's Global Village (a community with no human contact), or Karl Deutsch's 'city as switchboard'.⁴⁷

Woods's ideal – his urban arcadia – was Manhattan. Although he espoused the ideas of the promenade and the arcade, both attributes of Paris, he recognized that Paris was a city of monuments, of fixed facades and ordered vistas; it reflected the values of the *ancien régime gentilhomme*, not those of a modern democracy. He undoubtedly also found the anarchy of Manhattan appealing, as a demonstration of unconstrained vitality and freedom. Thus, although his

ideas were very much inspired by the nineteenth-century concept of the street and the corridor, they are entirely unrelated to the postmodern revivalism or neo-Manhattanism of the 1980s.

For Woods, flexibility was not about an efficient interchangeability of building parts to satisfy technocratic or bureaucratic demands. Its aim, rather, was to open up a creative, festive discovery of the possibilities of social life, 'even today a revolutionary notion. The butcher, the baker, the candlestick maker... no one is condemned'. Woods was committed to community, participation and exchange.

In this context the political meaning of the Free University is clear. In a divided city, the building presented a humanist alternative to both mainstream western New Monumentality and official eastern block architecture. The implications of its 'maximization of choice' become even more significant, when one considers that the university attracted many people who, having fled the persecution of the East German police state, pursued extreme left-wing agendas in the west.

Critique

138 In the years following the publication of the initial plans, the Free University had an enormous impact around the world. We may even conjecture that it helped Le Corbusier, in late projects such as the Olivetti Centre (1963) or Venice Hospital (1964), to redirect the course of his work and reassess his ideas about desirable building typology – a typology removed from the dogmas of *plan masse*, plasticity and New Monumentality which he himself had promoted. In recent years the guiding ideas of the Free University have been renewed in the designs of a younger generation of architects, including Labfac and J. Ferrier. This, more than any theoretical argument, indicates that the Free University is still a prototype for our time. And yet the question remains: How successful was the Free University? Did it accomplish an 'integration of a physical, social and temporal milieu into one habitat', Woods's ultimate goal?

Given its highly innovative character, we might say that the fact that the scheme was built at all was a major achievement. Very often, however, there is a price to be paid for implementing a novel architectural idea. The building can become problematic if people have difficulties understanding its original meaning and consequently utilizing it effectively. In the case of the Free University, there were difficulties both in interpreting Woods's plan and in constructing Prouvé's cladding panels, to achieve an industrial yet 'seasoned' look.

Woods knew from the outset that the siting of such a high-density machinistic structure next to Dahlem, one of the wealthiest suburbs in pre-war Europe, would be contentious. In contrast to his Frankfurt scheme, which is integrated into the existing built environment, the university confronts a suburb with a piece of urban structure. The unhurried grand avenues of Dahlem are juxtaposed with the university's busy street-corridors; the sparsely populated garden settlement yields to high-density living and close contact settings, full of frequent chance encounters and human vitality.

Woods said that the university's 'galleries', as he called its passageways, were intended to draw in the residents of Dahlem, to make them rethink their views, shed their suburban identity, and ultimately be converted to a more humanistic way of life.⁴⁸ This never happened. Woods had succumbed to what we might call 'environmental

determinism', the architectural profession's optimistic tendency to assume that environmental conditions can effectively change human behaviour and even belief systems. Woods, like other members of Team 10, was convinced that the circulation system of buildings could bring about social change. This is evident in his 1965 plan for Fort Lamy in Chad, which attempted to weave together the existing urban fabrics of the European colonial quarter and the dense African casbah in order to unite the two populations – a goal which was never achieved.

The Free University encountered other problems which Woods found disturbing. The first phase of the building was completed at a time of student unrest and was not well received. When Woods confronted the students and suggested that if they did not like the building they might as well dismantle it, they responded that they were not interested in doing that. What they objected to was not the plan or the look of the university, but rather the fact that they had not been consulted during the development of the design. It was impossible, they said, to make a democratic product by means of an autocratic process. They saw the Free University, at best as an unfinished project, at worst as a failed experiment.⁴⁹

The students' objection was evidently one which Woods understood. He himself had written that 'the "man in the street" is the real town builder, and the job of the town planner is to interpret his ideas', but this two-way process was difficult to implement in the 1960s. We cannot say how Woods's work would have developed if he had lived longer. It is possible that he would have shifted the focus of his architecture from the form of the product to a search for higher social ends, involving all the interested parties in the design process. But, equally, he might have continued to experiment with new ways of bringing together buildings and the larger-scale urban structure to serve the community – a practice that has atrophied since the 1960s. The issue is clearly academic. One thing, however, is unquestionable: Woods's commitment to a humanist architecture. In *The Man in the Street* he wrote:

The fault of course lies not in the plan but in ourselves... We do not practise democracy nor do we live in an open society... we hold these up as ideals to be revered, while going about the sordid business of getting and spending.⁵⁰

This quotation represents for us the most lucid and concise expression of Woods's credo of architecture.

Coda: Recovering the Free University

Amidst the relativism and doctrine of the 1960s, the minimal structure of the Free University contained an implicit set of rules (proscriptive rather than prescriptive) for generating activities and alternative uses. The scheme might be considered to have failed in innumerable details – an aspect that matters enormously today, in an age dominated by programmed tediousness. However, it succeeds in presenting a vision, a rare commodity we should attempt to recover.

The Free University's mobile, flexible, minimal structure offers a 'direction for design', to paraphrase Descartes' 'direction de l'esprit'.⁵¹ Rather than controlling spatio-stylistic characteristics, it links programme and form. This minimal method offers a 'minimal rationality', supplied in this instance by spatial rather than conceptual rules. It chooses a possible organization of the places and plan of the building in preference to the improbable persuasiveness expressed in the rhetoric of loud volumetric images. Dividing issues between known and unknown, simple and difficult, certain and

uncertain, determinable and indeterminable, intractable and innumerable, well defined and unexplored, it offers the best model we have today for maximizing choice and increasing responsiveness to new ideas.

Descartes wrote during a time of great upheaval – a time of wars and catastrophes, of geographical exploration, of scientific discovery – a time very similar to our own. He provided a humanist system which was able to cope with conflicts and contradictions, which protected against oppression while supporting evolution and creativity. In many respects, Shadrach Woods's Free University does the same.

1 Shadrach Woods, 'Urban Environment: The Search for System' in J. Donat, ed., *World Architecture*, 1 (London: Studio Vista, 1964) p. 151. The emphasis in the quotation is ours.

2 It was only in the early 1960s that Woods began to turn back towards the United States. He taught first at Yale, and later became an endowed professor at Harvard and a registered architect in the State of New York.

3 Alexander Tzonis and Liane Lefaivre, *Movement, Structure and the Work of Santiago Calatrava* (Zurich: Birkhäuser, 1996).

4 Ilya Ehrenburg, *The Life of the Automobile* (reprinted London: Pluto, 1976) and Marinetti, *The Futurist Cookbook*, trans., S. Brill (San Francisco: Bedford Arts, 1989) p. 73.

5 Sigfried Giedion, *Space, Time and Architecture* (Cambridge: Harvard University Press, 1941).

6 Giedion (1941) and Nikolaus Pevsner, *Outline of European Architecture* (Harmondsworth: Pelican, 1943).

7 This is how Jerzy Soltan referred to the modernist architecture of the time.

8 Giedion (1941).

9 Jürgen Joedicke and Oscar Newman, *New Frontiers in Architecture* (New York, 1960) p. 126.

10 See Alexander Tzonis and Liane Lefaivre, 'Critical Regionalism' in A. Graafland, ed., *Critical Landscape* (Rotterdam: 010, 1996; first published 1991).

11 Woods, 'Stem', *Architectural Design*, 5, 1960, p. 181. See also *Architectural Design*, 12, 1962, pp. 594–6.

12 Woods, 'Stem', *Le Carré Bleu*, 2, 1961. Despite its small circulation, this magazine played an important role in promoting the ideas of Woods and of Team 10 in general.

13 Le Corbusier, *Modulor 2*, French edition, 1955 (London: Faber & Faber, 1958) pp. 148–52.

14 Günter Nitschke, 'Cities. Stasis or Process', *Architect's Year Book*, 11, 1965, pp. 165–81.

15 Woods, 'Web', *Le Carré Bleu*, 3, 1962.

16 *ibid.*

17 Woods, *World Architecture*, 1 (1964) p. 151.

18 Woods, 'Free University, Berlin' in J. Donat, ed., *World Architecture*, 2 (London: Studio Vista, 1965) p. 113.

19 The proceedings of the conference were published in E. N. Rogers, Josep Lluís Sert, Jacqueline Tyrwhitt, eds., *The Heart of the City* (London: Lund Humphries, 1952).

20 Lewis Mumford's writings, particularly *The Culture of Cities* (New York: Harcourt, Brace, 1938), were an important influence on the post-war generation.

21 Noriaki Kurokawa, 'Architecture of Roads', *Kenchiku Bunka*, January 1963.

22 Kurokawa, 'The Architecture of Action', *Bauwelt*, December 1964.

23 Kiyonori Kikutake, 'The Great Shrine of Izumo', in *World Architecture*, 2 (1965) p. 13.

24 Dennis Crompton, 'City Synthesis', *Archigram*, 1964.

25 Alison and Peter Smithson, *Team 10 Primer*, special issue of *Architectural Design*, December 1962. Reprinted in book form by Studio Vista, London, in 1968.

26 The Lijnbaan complex has suffered from both negligence and ill-considered 'improvements', and now gives a poor impression of the original scheme.

27 See D. Lasdun, 'Mars Group 1953–7', *Architect's Year Book* 8, 1957, pp. 56–61. In 1954 Bakema was a member of a group preparing for the 1956 CIAM congress in Dubrovnik.

who met members of the English MARS group at Doorn. The results of the meeting were summarized in an article by Denys Lasdun. One of the major commitments of the new generation, he reported, was to 'make creative use of the forces of human association' which in the view of Team 10 the Charter of Athens had ignored. The construction of the Lijnbaan project had demonstrated that for Bakema this was not a theoretical declaration but a practical issue.

28 Jacob Bakema, 'An Emperor's House at Split became a Town for 3000 People', *Forum*, 2, 1962, pp. 45–78.

29 John Habraken, *Supports: An Alternative to Mass Housing* (London: Architectural Press, 1972)

30 Based on discussions between Woods and Alexander Tzonis.

31 Woods, *The Man in the Street* (Harmondsworth: Penguin, 1972)

32 Alison and Peter Smithson, 'An Urban Project' in *Architect's Year Book* 5, 1953.

33 Lasdun (1957) p. 59.

34 Note by the Smithsons, Bakema Archive, Netherlands Architectural Institute.

35 Aldo van Eyck, 'Labyrinthine Clarity' in J. Donat, ed., *World Architecture*, 3 (London: Studio Vista, 1966) pp. 120-9.

36 Woods, *Le Carré Bleu*, 3, 1962.

37 Van Eyck (1966) p. 120.

38 Woods, *Le Carré Bleu*, 3, 1962.

39 Giancarlo De Carlo, *Urbino. La storia di una città e il piano della sua evoluzione urbanistica* (Padua: Marsilio, 1966).

40 Louis Kahn, 'Toward a Plan for Midtown Philadelphia', *Perspecta*, 2, 1953, pp. 10–27.

41 Woods, 'Urban Environment: The Search for System' in *World Architecture*, 1 (1964) pp. 152–5.

42 Woods, *Le Carré Bleu*, 3, 1962.

43 Mies's invention of universal space is usually associated with Crown Hall. Lefaivre has argued that it was developed in an earlier project: Cantor's Drive, Iowa. See her 'On the Road with Mies van der Rohe' in Arie Graafland, ed., *Cultural Landscape* (Rotterdam: 010, 1997) pp. 126–47.

44 According to a private communication from Woods to Alexander Tzonis, it appears that Woods was no longer afraid of the possibility of a 'centre' appearing in the intersections. The idea of the non-centric 'Web' was exemplified in the bifurcation of the linear pattern because such a configuration, which was not geometrical but only topological, rejected or overcame the idea of a point.

45 Bakema (1962) p. 52.

46 *Jean Prouvé Constructeur* (Delft: Delft University Press, 1981) pp. 62–3.

47 For further discussion of Marshall McLuhan, Karl Deutsch and the Switchboard City, see our 'The Emergence of Communication Space', *Cultures*, 4, 1978, pp. 114–25.

48 Woods, in a private communication to Alexander Tzonis who, as academic editor for the Penguin 'Man-Made Environment' series, had commissioned him to write *The Man in the Street*.

49 Again in a private communication to Tzonis. See Tzonis and Lefaivre, 'Planning and Tomatoes', *Casabella*, January/February 1992, pp. 146–9.

50 Woods, *The Man in the Street*, p. 11.

51 René Descartes, *Discours de la méthode*, 1637.

- Le Carré Bleu**, 1, 1963.
- Bauwelt**, 6, 1964, pp. 164–7.
- L'Architecture d'aujourd'hui**, 112, 1964, pp. xlv–xlvii, 'Concours pour l'université libre de Berlin'. Includes other prize-winning schemes in the Free University competition.
- L'Architecture d'aujourd'hui**, 115, 1964, pp. 14–17. Part of a larger article, 'Candilis, Josic et Woods, recherches d'architecture', which includes the projects for Bilbao, Belleville, Bochum and Frankfurt.
- Techniques et Architecture**, 5, 1964, p. 120.
- Architectural Design**, 8, 1964, pp. 380–83, 'Project for the Free University of Berlin'.
- John Donat, ed., **World Architecture**, 2 (London: Studio Vista, 1965) pp. 112–21.
- Art in America**, 6, 1966, p. 38.
- Bauen und Wohnen**, 7, 1966, p. 275.
- Manfred Schiedhelm, **Bauwelt**, 47, 1968, pp. 1499–507, 'Institutsbauten der Freien Universität Berlin. Bebauung des Obstbaugeländes in Berlin-Dahlem. Ein Zwischenbericht'.
- Alison Smithson, ed., **Team 10 Primer** (London: Studio Vista, 1968) p. 62.
- Shadrach Woods, **Candilis–Josic–Woods: Building for People** (New York: F. A. Praeger, 1968), pp. 208–12.
- 142 Shadrach Woods, **Harvard Educational Review**, 4, 1969, pp. 116–25, 'The Education Bazaar'.
- La Construction Moderne**, 4, 1969, pp. 28–33, 'L'Université Libre de Berlin'.
- Techniques et Architecture**, November 1973, 'Berlin Free University'.
- Alison and Peter Smithson, **Without Rhetoric: An Architectural Aesthetic 1955–1972** (London: Latimer New Dimensions, 1973) pp. 85–7 and 94.
- Architecture Plus**, January/February 1974, pp. 32–51, 'BFU: The most radical architectural departure of the 1960s is finally built'. Introduction by Stanley Abercrombie, critical assessments by O. M. Ungers, A. & P. Smithson, Günther Kühne, Brian Richards, Serge Chermayeff, Jerzy Soltan, Werner Düttmann, Jacob Bakema and Giancarlo De Carlo.
- Domus**, May 1974, pp. 1–8, 'The Free University and the Language of Modern Architecture'. Includes introduction by A. & P. Smithson and the architects' report on the first phase of construction.
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Biographies of the Architects

Georges Candilis was born of Greek parents in Baku, Azerbaijan in 1913. He studied architecture at the Technological Institute in Athens and met Le Corbusier at the fourth CIAM congress which took place there in 1933. After the war he went to France, working first with André Lurçat and from 1946 with Le Corbusier; they were joined by Shadrach Woods in 1948. Candilis worked in partnership with Woods and Alexis Josic from 1955 to 1963, with Woods until 1967, and in private practice in Paris from 1963 until his death in 1995.

Alexis Josic was born in Stari Becej, Yugoslavia in 1921. He studied painting in Belgrade at the National Fine Art School and Josic Fine Art School (founded by his father), and architecture at Grate Technical School, Faculty of Architecture. From 1953 to 1955 he worked with ATBAT (Atelier des Bâisseurs) Afrique in Paris, where he met Georges Candilis and Shadrach Woods. From 1963 to 1973 he taught at the Ecole des Beaux-Arts in Paris. In 1965 he founded Atelier Josic Architectes in Sèvres, France, a practice he now runs with his two sons. The Senate of Berlin has retained him as consultant for the renovations of the Free University, which are being undertaken by Foster and Partners.

Shadrach Woods was born in Yonkers, New York in 1923. He studied engineering at New York University and literature and philosophy at Trinity College, Dublin. He worked with Georges Candilis in Le Corbusier's Paris office and for ATBAT, forming a partnership with Candilis and Josic which lasted from 1955 to 1963. He continued to work with Candilis in Paris until 1967 when he moved back to the USA. He died in New York in 1973.

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Manfred Schiedhelm was a leading collaborator for the Berlin Free University competition, and was later in charge of the construction phase. He has his own practice in Berlin.