Cities, Trees, and Cucumber Sandwiches: Team 10 and Christopher Alexander at Royaumont

1 Abbaye de Royaumont Postcard 1962

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Intro

In September 1962, Team 10 (a.k.a. TEAM X) convened for one of their famous meetings at the Abbaye de Royaumont, just north of Paris. Four days of presentations and characteristically intense discussion followed. One of the invitees was a young Christopher Alexander, who presented his study of an Indian village and participated in the discourse at various points. Both Alexander and Team 10 went on to make important contributions to architectural history and theory. Yet little research has been done into their influences on one another, or to compare and contrast their respective ideas. I would argue that this is unusual, given that their paths are known to have directly crossed at Royaumont and that both Alexander and Team 10 were motivated by a critical appraisal of CIAM high modernism to search for new solutions. The following essay endeavours to throw light on this topic.

2 Team 10 at Abbaye de Royaumont 1962. Photograph by George Kasabov.

Stage-setting

Following the meeting in Royaumont, Christopher Alexander went on to become a widely influential, if sometimes controversial, architect and design theorist. His (co-authored) book *A Pattern Language* (1977)[1] became one of the best-selling books on architecture of all time. He was the first- ever recipient of an American Institute of Architects (AIA) Medal for research (Bryant, 2014)[2], amongst many other awards. In 1967 Alexander set up a non-profit corporation, the "Center for Environmental Structure", while a professor at the University of California, Berkeley. Together with this organisation Alexander published several books, conducted research into building techniques and materials, and built more than 200 buildings on five continents[3] (though he remains relatively little known for his built works). His ideas also influenced the New Urbanism movement.

Alexander's outspoken criticism of modernism, postmodernism and contemporary architectural theory and practice have perhaps served to marginalise his influence among architects. In an infamous debate with Peter Eisenman in 1982, Alexander

accused him of "f***ing up the world" (to a round of applause) (Steil et al., 2004)[4]. Despite Alexander seeming to win over his Harvard audience at the time, Eisenman went on to starchitect levels of commercial and professional success, with deconstructivism also rising to prominence as a movement. On the other hand, as Eisenman himself quipped years later ''I think Chris unfortunately fell off the radar screen some time ago" (Eakin, 2003)[5]. This may be true within the architectural profession, yet a simple Internet search (at the time of writing) reveals many times more results on both Google Search and Google Scholar for "Christopher Alexander" than "Peter Eisenman". This suggests that there is at least more to the story than Alexander simply fading into obscurity. Indeed it has been argued by Steil et al. (2004) that it is rather a sign of the *profession* falling off the radar of the wider culture.

That the architectural profession may have marginalised Alexander is indicated by the fact that, to date, his ideas have had more influence in other fields, most notably software engineering and computer science. In computer science, *A Pattern Language* influenced information management, human-computer interface design, systems architecture and related fields. In software engineering, the impact of the "design patterns" movement has been ubiquitous, leading to the technology behind Wikipedia, simulation games such as Sims and Spore, the Cocoa programming language used by Apple, as well as Agile software development, Extreme Programming and more. Pattern language related scholarship can also be found in sociology, organisation theory, economics, education, ecology, molecular biology and still other fields. For instance, in molecular biology, a notable paper by Newman and Bhat of the New York Medical College proposed a "pattern language" model for the development and evolution of multi-cellular form, which would help to explain the rapid diversification of organisms that occurred in periods such as the "Cambrian explosion" (Newman & Bhat, 2009)[6], something that if true would be a major breakthrough. Despite this apparent imbalance of influence in architecture compared to other professions, all the more mysterious since Alexander was writing about architecture first and foremost, he remains a widely influential figure in the field of architecture.

Team 10, both as a group and through its individual members, would also have a profound impact on the architectural world. The group played a pivotal, if at times ambivalent, role in architectural history, both presiding over the dissolution of CIAM, and later serving as the last defenders of the modernist project, particularly against the more radical ideas of postmodernism. The influence on architectural theory was undoubtedly immense, though not always clear or linear. Both the New Brutalist and Structuralist movements emerged from Team 10, through the English members Peter and Alison Smithson and the Dutch members Aldo van Eyck and Jacob Bakema respectively. Concepts and movements such as Regionalism, megastructure, participatory urbanism, Metabolism and Mat-building all have origins in, or important links to, Team 10. Team 10 can be credited with fundamentally rethinking our relationship to the city and the role of modern transportation in our lives. George Baird noted a return to the urban idea of the street as a key development of Team 10, an idea which Le Corbusier had forcefully rejected. Team 10 challenged the strict separation of functions as conceived by CIAM modernists, particularly the four functions of the 1933 Athens Charter: dwelling, work, recreation and transportation. They questioned the "one-sided rationalism" (as cited in Deyong, 2014, p.227)[7] of CIAM and its "Western rationalistic bias" (as cited in Mumford, 2001, p.52)[8] and began to look more frequently to the non-Western world for solutions and to grapple with its problems.

The influence of Team 10 on architectural history and theory is undoubtedly immense. However, for the purposes of this essay, it is also important to note some caveats: this history and theory is often difficult to trace or sum up and is sometimes ambivalent, if not outright contradictory. For one thing, there was an overt effort to produce a looser and more informal grouping than had existed in CIAM. There was no formal mechanism of 'membership', with the composition of the group varying greatly over the years. There is also little by way of joint statements or official consensus that

could be considered canonical of the views of Team 10. During debates, individual group members often passionately defended their own individual positions, so it is not clear when they were speaking for themselves or for the group as a whole. There was only one manifesto produced, the Doorn Manifesto of 1954, but this was written from within CIAM before Team 10 officially existed or even had a name. Furthermore, the manifesto was a subject of dispute between the Dutch and English younger members of CIAM (Vollaard & van den Heuvel, n.d.)[9]. Two statements were produced in 1961 following the dissolution of CIAM, the "Paris Statement" and "The Aim of Team 10", but neither lays out any comprehensive set of positions. It is hard even to trace a clear starting point for the group because Team 10 gradually emerged from within CIAM. Members of a younger generation were originally brought in to rejuvenate CIAM, but a generational spilt gradually manifested, and a process of handing over control to the younger members began. At some point after the tenth congress, which had been organised by members of the younger generation (nicknamed 'Team 10'), a tipping point was reached, where the desire to continue the organisation evaporated. The following congress in Otterlo in 1959 was to be CIAM's last. Given these complexities, much of the following essay will focus on the views of individual Team 10 members and try to infer, where possible, the more general attitudes of the group.

3 Christopher Alexander with Ralph Erskine at Royaumont

A Tree is a Large Leaf

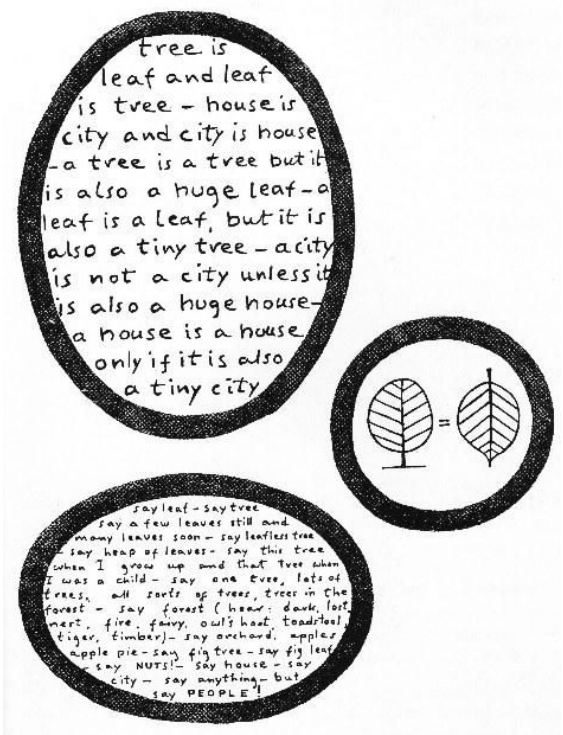
To return now to the meeting in Royaumont, it is perhaps instructive to begin, not with Christopher Alexander's presentation, but with Aldo van Eyck's. Not only did this presentation spark one of the most heated debates of the meeting, dividing loyalties within the group, but it proved to touch upon several themes central to both Team 10 and Alexandrian thinking.

Van Eyck's presentation revolved around the work of two favoured students, one in particular, Piet Blom. He began by saying that these students "have tried to confront themselves with the enigma of quantity, not in the analytic, urbanistic sense, but purely as human beings who cannot understand, who fail to understand what it all means" (Woods, 1964, p.218)[10]. This set the tone for van Eyck's presentation. Van Eyck sought to question the purely analytical approach to architecture. He spoke in a playfully enigmatic manner, invoking several metaphors and questioning the meaning of terms such as 'quantity', 'large', 'small', 'city' and 'house'. He also criticised compartmentalised thinking and the construction of "construed polarities" (Woods, 1964, p.220).

It has been suggested (van den Heuvel, 2006, p.93)[11] that this presentation can be

understood in the 'ludic tradition' as defined by the Dutch historian Johan Huizinga in *Homo Ludens* (1938) (Huizinga, 1971)[12]. More specifically, in this case, as "formulating poetic riddles, that can only be solved and surpassed by equally poetic formulations" (van den Heuvel, 2006, p.98). Van Eyck introduced the image of the house as a small city, and the city as a large house, a metaphor which can be traced back hundreds of years to Leon Battista Alberti (Rykwert et al., 1988, p.23)[13] (and still further). Van Eyck says that this "image provides scope for multi-meaning" (Woods, 1964, p.218) and emphasizes its ambiguity. He is thus inviting a poetic understanding, where multiple meanings can be present simultaneously. His positions here can be understood not only in the 'ludic tradition' but also in terms of a theoretical framework, in part inherited from Sigfried Giedion, which rejected the notion of binary opposites (e.g. inside/outside, large/small, many/few) existing in isolation from one another. Rather their meaning springs from the relationship between them, which may be subject to flux, though remaining ever-present (Deyong, 2014, p.235). This view also explains van Eyck's interest in the liminal spaces of the built world, since he saw the strict opposition of inside/outside as a spurious dichotomy.

We will return to these themes later, but for now it will serve us simply to note this context to the presentation and to jump to the next image invoked: that of the tree. Van Eyck relates this image to the previous one and links the house/city relationship to that of tree/leaf. He identifies the idea of ascending dimension as the main subject of the congress (Woods, 1964, p.222) and notes that the tree is sometimes used as an analogy to the city, "[i]n order to illustrate the idea of ascending dimensions and degree of complexity from house to city" (Woods, 1964, p.222-223). However, he is careful to stress that he is not intending to make an analogy since all analogies are "not only misleading but false" (Woods, 1964, p.223) and "analogies compare directly instead of identifying indirectly" (Woods, 1964, p.223). He is rather intending a "poetic association" (Woods, 1964, p.224). There follows a playful sequence of associations, among them: "If only you regard a leaf as a small tree and a tree you see as a large leaf, which [sic] you would be capable of seeing a leaf as a feather and a sign of a fish, too." (Woods, 1964, p.226) Van Eyck also accompanied this part of the presentation with his 'tree-leaf, house-city' diagrams (see below).

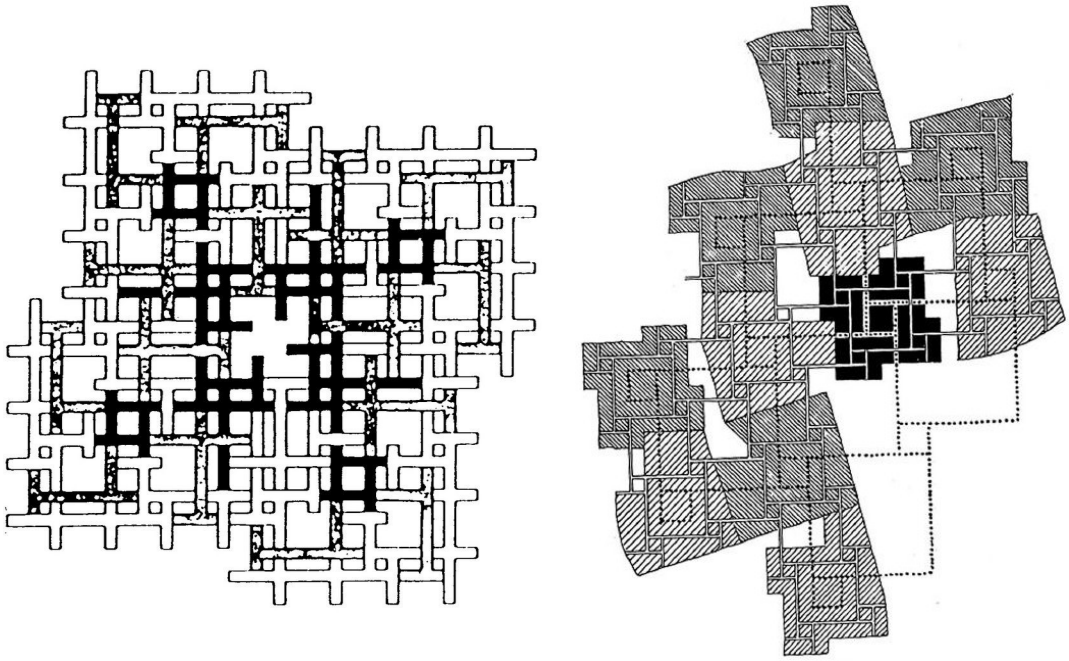


4 *Identification of leaf with tree* by Aldo van Eyck

Christopher Alexander joined in the discussion of the presentation and is noted for saying: "You know damn well that a tree is not a big leaf – that it is useless in that respect to bring the parallel image" (Woods, 1964, p.237). Three years later, in 1965, Alexander published an essay titled "A City is Not a Tree". It is highly plausible that this essay was (at least in part) a response to Aldo van Eyck's presentation and the discussions at Royaumont. This has been taken as self-evident by several commentators (Unwin, 2019, p.48[14]; Kehl, n.d.[15]; Clarke, 1985, p.202[16]; Deyong, 2014, p.246) not least of whom was van Eyck himself who rejected the essay in the following terms: "I brought forward the leaf-tree, house-city identification at the Team X Royaumont meeting in 1964 [sic]. Christopher Alexander was present at the meeting as a guest and joined the discussion. His subsequently published thesis that a city is not a tree but a semilattice is, in my opinion, neither a valid negation nor a valuable affirmation of the truth in mathematical terms" (as cited in Clarke, 1985, p.203). He issued another more elaborate statement in his defence, reiterating that the common analogy, seeing both tree and city as a "kind of system of ascending dimension and ascending degree of complexity" (as cited in van den Heuvel, 2006, p.103), is well-intentioned but false, that it is unpoetic, as it misses the real meaning of both city and tree, and that his own identification was more ambiguous than this. Through this ambiguity, van Eyck maintained that his position acknowledged the nature of the city as a semi-lattice. And, finally, he quipped: "Anyway, a city is no more a tree than it is not a tree. That goes without saying, hence also without Alexander's mathematics" (as cited in van den Heuvel, 2006, p.103-104).

A cursory view makes Alexander's response to van Eyck's presentation appear uncharitable and ignorant of the context (of poetic association) in which van Eyck was hoping to be understood. The oft-quoted retort that "a tree is not a big leaf" flatly disregards van Eyck's call to avoid making direct and analytical comparisons. Van Eyck himself replied that: "As long as he doesn't know that he won't be able to make a house – he won't even be able to make a chair, and he won't know how to sit on it. I'm sorry for you. The poetic reality that you do [sic] is discarded if you think a tree is not a leaf" (Woods, 1964, p.237). Simon Unwin spotted the disagreement between van Eyck and Alexander and wrote: "Considering his other writings, which suggest subtlety and complexity in the human use of space, it seems likely that van Eyck never intended his tree metaphor to be interpreted so strictly as it was by Alexander" (Unwin, 2019, p.48).

Yet a closer reading of the disagreement shows that this was more than a misunderstanding, neither was it a stubborn refusal by Alexander to engage in van Eyck's poetic games, but instead, perhaps, something more inevitable: a clash based on outlook. Before his vehement rejection of the tree image, Alexander had criticized van Eyck's presentation of Piet Blom's "Noah's Ark" plan in the following manner: "In your opinion it's not complicated enough to look at a tree as a grouping of small elements into large elements and these large elements into larger elements and so on. Now, I don't understand why you think that is a bad way to look at a tree. But never mind about that. Why is this something else, because that is exactly what this is – a grouping of small elements into slightly larger elements and a regrouping of these and so on. You began by saying that this was going to be something slightly more complex" (Woods, 1964, p.234).



5 Diagrams of a neighbourhood (left) and city (right) according to Piet Blom's Noah's Ark plan

This shows that Alexander *was* prepared to engage with the poetic approach, but he wanted to know how this would produce a better outcome. If van Eyck's method of comparison by 'poetic association' opens up new avenues of meaning, how is this evident in the resulting architecture? Alexander's focus here is characteristic of his early career: he displays an intense desire to uncover a practical and empirical basis for design. His views clashed with van Eyck's, not because he necessarily rejected or misunderstood the poetic approach, but because he remained concerned with the empirical results and the practical applicability thereof.

A City is not a Tree

Christopher Alexander's 1965 widely cited essay[17] "A City is not a Tree" (later published as a book)[18], has often been considered a landmark text[19] and was first published in the American journal *Architectural Forum.* As already shown, the thinking behind the essay is likely to have origins in the discussions at Royaumont. However, the essay itself makes no reference to Team 10. At only 7500 words, it focuses primarily on making a technical argument: Alexander delves into set theory and distinguishes between two mathematically defined types (or structures) of sets known as a 'tree' and a 'semi-lattice'. He shows that a semi-lattice is a better representation of the complex reality of the city than a tree. He goes on to show that many modern cities and districts that have been created by designers and planners have the structure of a tree. This makes them less successful, from a human perspective, than "cities which have arisen more or less spontaneously over many, many years" (Alexander, 2015/1965, p.9), which he calls "natural cities". These natural cities almost invariably have a semi-lattice structure.

The central argument of the essay and key points will be explored here as they can be shown to have strong parallels to Team 10 thinking. To summarise this central argument: a set can be defined as any "collection of elements which for some reason we think of as belonging together" (Alexander, 2015/1965, p.11). "When the elements of a set belong together because they co-operate or work together somehow, we call the set of elements a system" (Alexander, 2015/1965, p.11). The difference between a tree and a semi-lattice is that a semi-lattice can contain overlapping subsets but a tree cannot. Every tree is therefore a trivially simple semi-lattice, but not every semi-lattice is a tree.

In a tree, two subsets must either be wholly separate or one must be contained within the other. The systems that make up the city, from the smallest to the largest, are rarely simple trees. To give a basic illustration, a traffic light could be considered an element (i.e. a subset) of both the 'road' and the 'pavement', because it affects both traffic and pedestrians. Both of these are subsets (or subsystems) of the city and both contain the traffic light, but neither is contained by the other, so the structure we are dealing with here is a semi-lattice. What is particularly important about the difference between trees and semi-lattices is not just the presence of overlap, but the fact that a semi-lattice is "potentially a much more complex and subtle structure than a tree"(Alexander, 2015/1965, p.15). The potential difference in complexity is clear from the following fact: "a tree with 20 elements can contain at most 19 further subsets of the 20, while a semi-lattice based on the same 20 elements can contain more than 1,000,000 different subsets" (Alexander, 2015/1965, p.15).

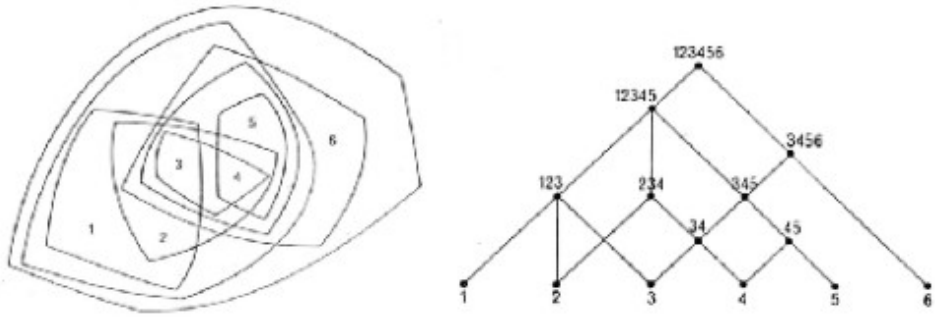


Diagram A (left), diagram B (right)

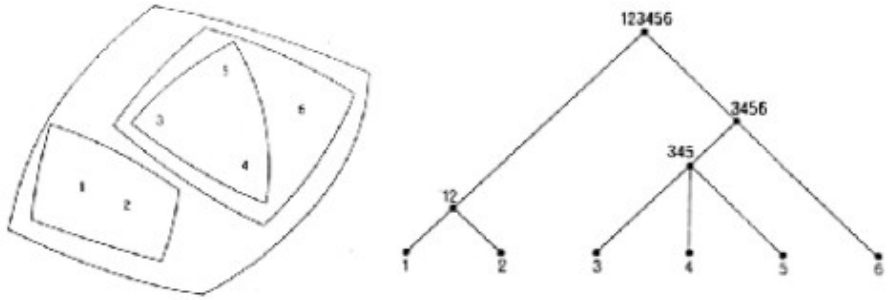


Diagram C (left), diagram D (right)

6 Diagrams showing the difference between a semi-lattice (A,B) and a tree (C,D)

The essay explores several modern city designs – both built and unbuilt – and shows that they are all essentially trees (at least in their general organisation). Alexander gives demonstrations of how these tree structures fail to grasp the true nature of the city. For instance, he points out that in modern society it is much less common to have closed groups of friends, all living in the same area. By contrast, in a traditional village, it is likely that if you ask "a man to name his best friends and then ask each of these in turn to name their best friends, they will all name each other so that they form a closed group" (Alexander, 2015/1965, p.26). And the group will likely all live in the same village. By contrast, in most of contemporary society: "If we ask a man to name his friends and then ask them in turn to name their friends, they will all name different

people, very likely unknown to the first person; these people would again name others, and so on outwards" (Alexander, 2015/1965, p.26). Why then do many modern city designs emphasise individual housing clusters, physically separate from one another, when it is so likely that people living in those clusters will have as many, if not more, friends outside of their cluster? Alexander suggests that the street is a better grouping of houses to acknowledge this fact (since it is open-ended and connected into a wider network) (Alexander, 2015/1965, p.27). Parallel to this, Team 10 itself gradually challenged the CIAM rejection of the street, with concepts such as the 'street in the sky', the 'Stem' and later the 'Web/Matrix'. For instance, Shadrach Woods in his essay introducing the 'Stem' concept writes "[t]he street, which was destroyed by the combined assaults of the automobile and the Charte d'Athènes, may be revalidated if it is considered as a place as well as a way from one place to another" (Woods, 1960, p.181)[20]. Thus Team 10 too argues that the street can serve as a place, a meaningful grouping of dwellings, which reflects social realities. Alison and Peter Smithson wrote in the *Team 10 Primer*: "In most cases the grouping of dwellings does not reflect any reality of social organisation; rather they are the result of political, technical and mechanical expediency" (Smithson, 1968/1962, p.48)[21].

Another example of tree-like thinking that Alexander brings comes from an attempt to separate out the city of Middlesbrough, England, into 29 neighbourhoods for planning and redevelopment purposes. This separation was done on the basis of building type, job type and income. As research for the redevelopment plan, various social systems were examined, to see if they actually corresponded to one and the same spatial neighbourhood. These included schools, secondary schools, youth clubs, adult clubs, post offices and greengrocer's shops. When these were mapped together with their catchment areas, it was clear that the different systems did not fit neatly within the prescribed neighbourhood boundaries, nor did they coincide with one another, nor were they completely separate, but instead they overlapped. While it may be useful in some cases to view Middlesbrough in terms of these 29 neighbourhoods, there is no reason why it should determine the placement of a school, or a post office, or a greengrocer. These systems are all very different, so why should their catchment areas all be the same? We can see this thinking reflected in Team 10's challenge to CIAM's strict separation of the four functions in its Athens Charter. Team 10 replaced the 'dwelling' function of the charter with the idea of 'habitat' which was understood as the entire life-world of the dweller rather than just the housing unit (as cited in Mumford, 2001, p.50). The opening statement of the Doorn Manifesto reads: "It is useless to consider the house except as part of a community owing to the inter-action of these on each other" (Vollaard & van den Heuvel, n.d.)[22]. Thus the practice of strict zoning is called into question by both Alexander and Team 10.

Alexander also criticises the idea of strict separation of vehicles and pedestrians, often favoured by CIAM. As he points out, while it makes sense at a basic level not to mix fast-moving vehicles with pedestrians, there are times when the interaction of these two systems is necessary and even crucial, for instance being able to get a taxi anywhere and anytime in a dense urban environment can be a lifesaver for the exhausted shopper, or the late night party goer. Team 10 showed some similar thinking. They emphasised "Urban infra-structure" as one of the three key themes of the *Team 10 Primer*. Not only was there a return to the idea of the street, as mentioned, but they remained deeply preoccupied with the concept of mobility. The road system was regarded as a unifying force that could help to order the urban fabric. Its total separation from the rest of the city was no longer a key idea. In fact, Aldo van Eyck, quoted in the *Team 10 Primer*, says: "As long as cities exclude particular kinds of motion that belong inseparably to urban life, their human validity – they have no other – will remain partial" (Smithson, 1968/1962, p.51) and that "[a] city, if it is really a city, has a very compound rhythm based on many kinds of movement, human, mechanical and natural" (Smithson, 1968/1962, p.53).

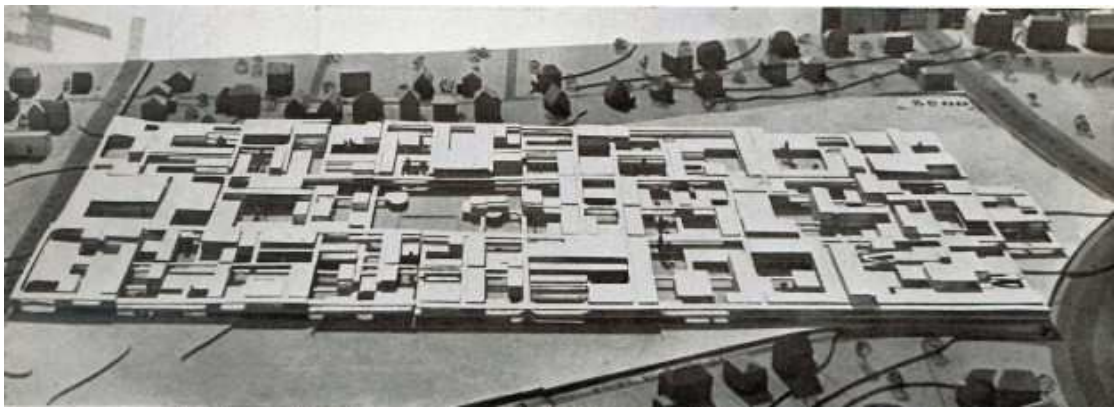
A further tree-like idea Alexander highlights is the separation of recreation from

everything else, described as "[a]nother favourite concept of the CIAM theorists" (Alexander, 2015/1965, p.30). This is expressed particularly in the playground, "asphalted and fenced in" (Alexander, 2015/1965, p.30). But, Alexander contends, "[f]ew self-respecting children will even play in a playground" (Alexander, 2015/1965, p.31). In reality, the play takes place in all sorts of different contexts and places throughout the city. This has a strong parallel in Team 10 with the work of Aldo van Eyck. Van Eyck maintained in the *Team 10 Primer*: "A city which overlooks the child's presence is a poor place. Its movement will be incomplete and oppressive. The child cannot rediscover the city unless the city rediscovers the child" (Smithson, 1968/1962, p.53). Van Eyck worked on a network of playgrounds throughout Amsterdam, which had grown to number 650 by the mid-1970s (as cited in Deyong, 2014, p.240). This was considered a crowing achievement of Team 10 urbanism by the Smithsons in later years (Deyong, 2014, p.240). Importantly, van Eyck's playgrounds were never fenced off, which went against common practice in Amsterdam in the '50s and '60s (it was not uncommon that children had to pay a small fee or have a membership to enter playgrounds) (Withagen & Caljouw, 2017, p.1130)[23]. Van Eyck also used materials common to the urban environment, mainly metal and concrete, to emphasise the non-separateness of the playground from the urban fabric (Withagen & Caljouw, 2017, p.1130). He also used simple, geometric forms that were ambiguous in their function. These helped to stimulate more creative play (through multi-meaning) and likely emboldened children to go out into the city and identify play elements of their own. Thus Team 10, at least in the work of van Eyck, also developed the idea that play is inextricably linked with the city.

7 Buskenblaserstraat playground in Amsterdam (1956) by van Eyck, not fenced off and using urban materials

Next, we have the idea of separating the university from the rest of the city, as expressed in the isolated campus. In reality, the life of the city and that of the university overlap in many ways: "pub-crawling, coffee-drinking, the movies, walking from place to place. In some cases whole departments may be actively involved in the life of the city's inhabitants (the hospital-cum-medical school is an example)" (Alexander, 2015/1965,

p.32). In a natural city like Cambridge, the university and the city are intermingled physically, because this reflects the overlapping systems of each. A parallel here can again be found with Team 10, namely in one of their seminal projects: Candilis-Josic-Woods's building complex for the philological institute of the Berlin Free University (BFU). It was the first widely recognised example of the 'Mat-building'. While the wider planning of the university is broadly on a campus model, this building attempts a more radically open and flexible configuration. The institute was to function as a miniature city with internal streets, squares, courtyards, and walkways drawing inspiration from the Arab medina. While most other entries for the original competition proposed clusters of skyscrapers, the Candilis-Josic-Woods's scheme did not venture above three storeys. Shadrach Woods described it as a "groundscraper" with greater possibilities of community and exchange than is possible between the floors of a skyscraper, where the relationship is mediated only through the "space-machine-lift" (Calabuig, 2020)[24]. While the broader campus planning of the university and the location far outside the city centre prevent the scheme from more effectively tying in to the city, these barriers are challenged by its organisation as a city and its modular construction, which allows for change of configuration and growth. Candilis-Josic-Woods also fought to integrate more functions into the scheme than were ultimately included, particularly housing (Schiedhelm, 2006, p.27)[25].

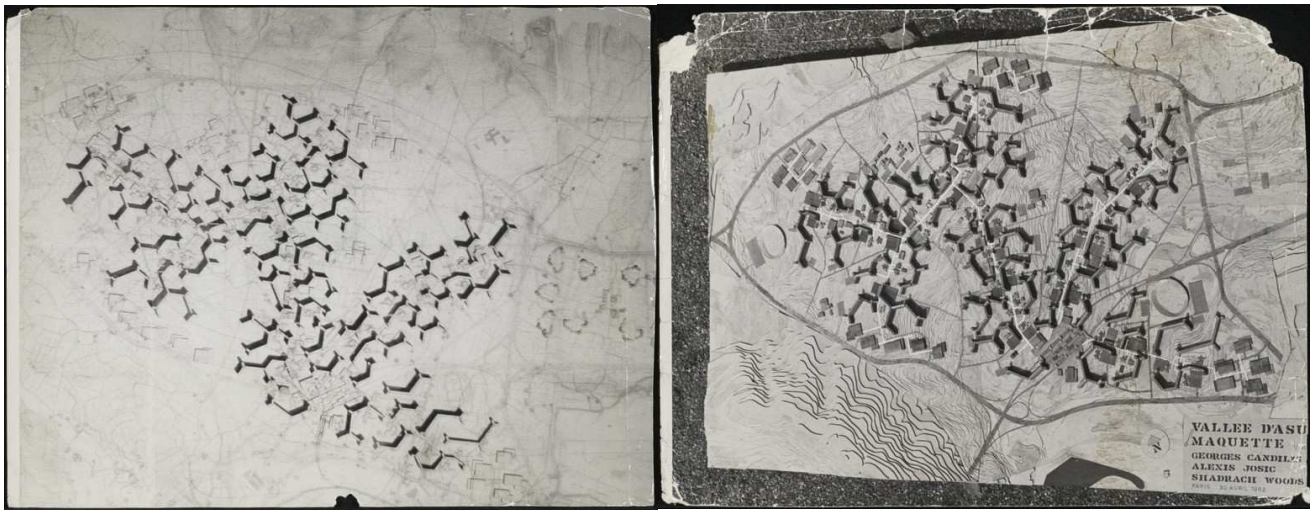


8 Model photo of the BFU proposal. The intra-connectivity is clear and in a more dense urban fabric the interconnectivity with the surroundings might also be strong

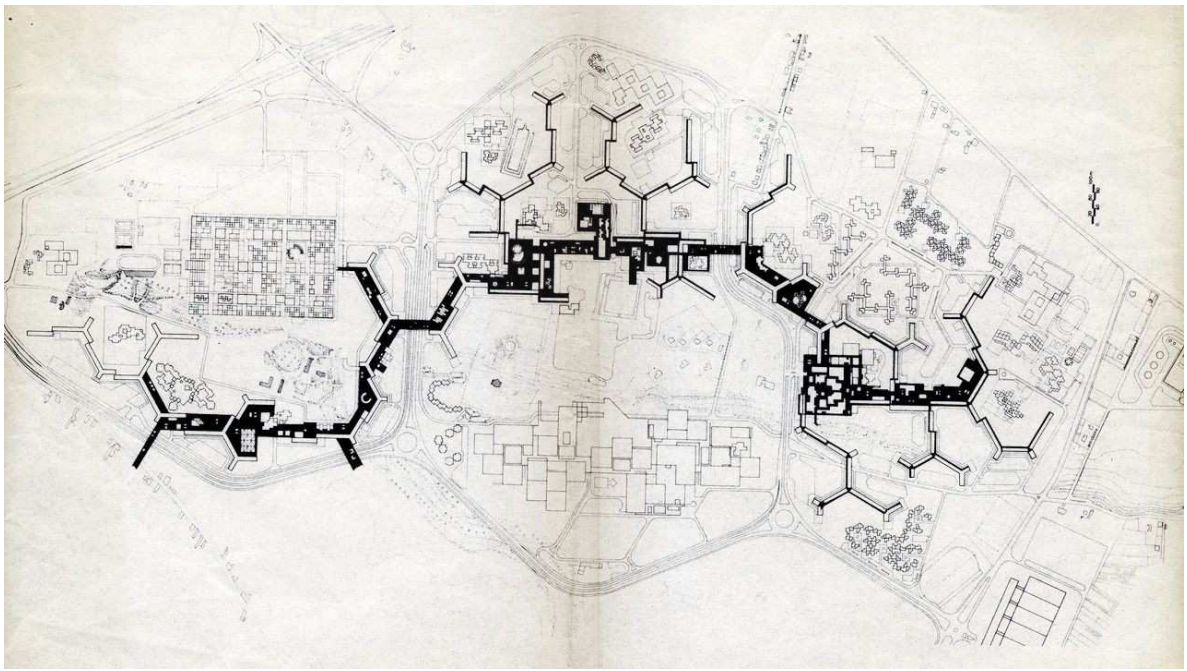
A final relevant example from the essay is the total separation of work from housing. Alexander traces the influence of this idea back to Tony Garnier's proposal for an industrial city and its subsequent incorporation into the Athens Charter. It was often justified in the context of the early 20th century when dirty factories needed to be moved out of residential areas. But this approach again ignores cases where the two systems need to overlap, for instance in the backyard industries of Brooklyn described by Jane Jacobs (Alexander, 2015/1965, p. 33). Team 10 had their own profound misgivings over the Athens Charter and, as already described, replaced the charter's narrowly defined function of 'dwelling' with the much broader concept of 'habitat'. In Ralph Erskine's presentation at Royaumont of his Brittgården housing project, we see a strong concern for creating community, including mixing living and working functions. The project is challenged for being too mono-functional, providing only different types of dwelling, but Erskine stresses that it also provides shops, a post office and workshops and also that changes of function are being allowed for (Woods, 1964, p.107). There is a discussion about how to create a community with a strong identity, or "flavour", and Erskine laments that he feels he has not achieved this, for instance the workshops lack character (Woods, 1964, p.117).

From Stem to Web/Matrix

The progression of Team 10 thinking from the idea of the 'Stem' as an organising principle to that of the 'Web' or 'Matrix' was a key development of Team 10 theory, resulting in the first Mat-buildings. George Baird described it as "the single most important formal idea embodying the relationship of architecture to the city […] established of the entire 20th century" (Baird, 2006, p.84)[26]. The Stem idea was included as an official theme of the Royaumont meeting (Vollaard & van den Heuvel, n.d.)[27]. While the definition of the Stem as "the environment in which cells may function"(Woods, 1960, p.181) (cells being a unit of dwelling) was broad and flexible, in practice the Stem projects tended to apply the organic metaphor of branching plant-like structures that grow outwards, without their branches interweaving. In practice, then, we see often a tree-like approach. Candilis-Josic-Woods's study for the Val d'Asua near Bilbao shows this clearly, as does, for instance, their master plan of Tolouse-le Mirail.



9 Plan (left) and model (right) of Val d'Asua project by Candilis-Josic-Woods presented at Royaumont



10 Master plan for Toulouse-le Mirail by Candilis-Josic-Woods

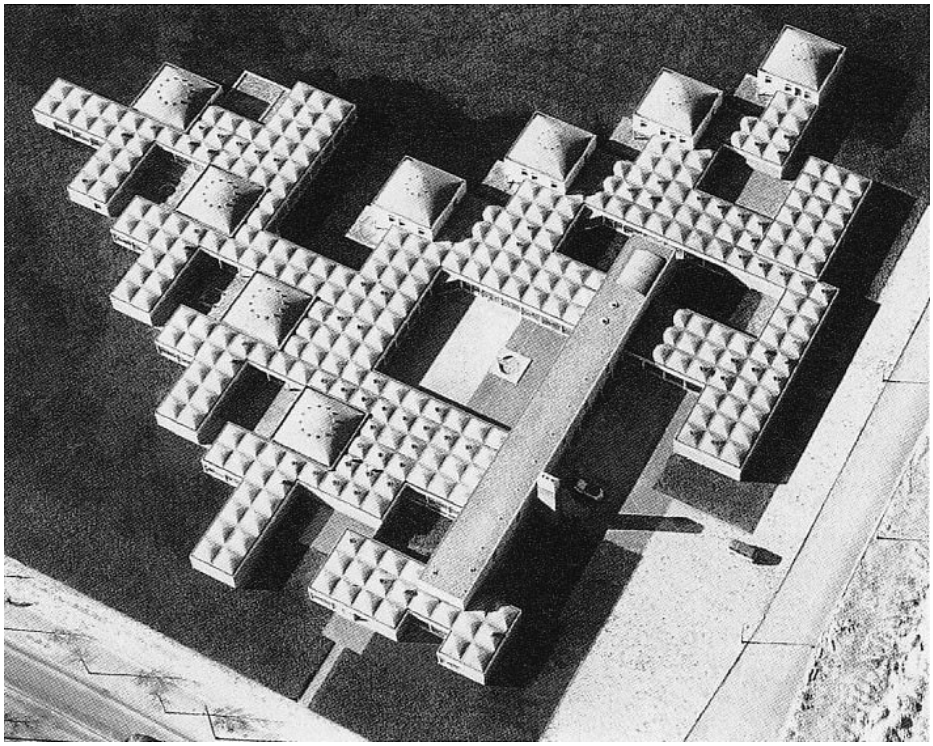
The Web was a development of the Stem concept, which took the lack of interconnectivity into account. It aimed to facilitate "chains of relationships" and multiple connections so that "no part of it [was] in danger of isolation" (Woods, 1962)[28]. Manfred Schiedhelm was a Team 10 member who worked at Candilis-Josic-Woods's practice on Stem projects such as Toulouse-le-Mirail and Bochum University and later on Web projects for Frankfurt-Römerberg and the Berlin Free University. He explained that the Stem model had been found to be problematic because "it didn't succeed in reuniting different urban elements that we believed should work together" (Schiedhelm, 2006, p.15). According to Schiedhelm, it would be very hard to draw a clear line when exactly the Web idea came into existence. He noted that there were also many other movements (outside architecture) pointing in similar directions (Schiedhelm, 2006, p.16) so inspiration for the idea probably came from various sources. Schiedhelm recalls in particular a visit to Venice and his formative experience there of the overlapping networks of the city or its "layers of fluids" (Schiedhelm, 2006, p.16). He gained a heightened awareness of how different networks in the city interrelated. Pedestrians, goods, vehicles, water, waste…all move through the city in different networks, which are neither completely separate nor wholly connected. Thinking of the city in terms of the Web offered more freedom of organization and a more polycentric distribution of functions.

In connection to Alexander's *A City is not a Tree* the evolution of the Web/Matrix idea from that of the Stem is very interesting. It seems to mirror the thinking in Alexander's essay. The Web/Matrix more closely resembles a semi-lattice whereas the Stem in practice was more like a tree. The fact that the Web/Matrix model superseded the Stem, that it seeks to address deficiencies of the Stem model and that it proved more successful and lasting as an idea, all suggest an acknowledgement in Team 10 that the city is indeed not best understood as a tree (whether they explicitly acknowledged Alexander's essay or not).

The Search for Invariants

The Web/Matrix idea also brings us back to Aldo van Eyck's presentation at Royaumont and its reception. The ability of the Web/Matrix model to offer polycentric distribution of functions is important given the observation of *A City is Not a Tree* that many systems in the city overlap without sharing the same nodes (or centres). While there may be a particularly dominant centre of activity in a city, there will necessarily be many of importance throughout. Generally, the Web/Matrix idea offered (or attempted to offer) interconnectivity, flexibility, and polycentrism. It seemed to be precisely the lack of the latter two qualities – the apparent rigidity and centric (radially symmetrical) geometry of the Noah's Ark project presented by van Eyck – that became a sticking point in discussions at Royaumont.

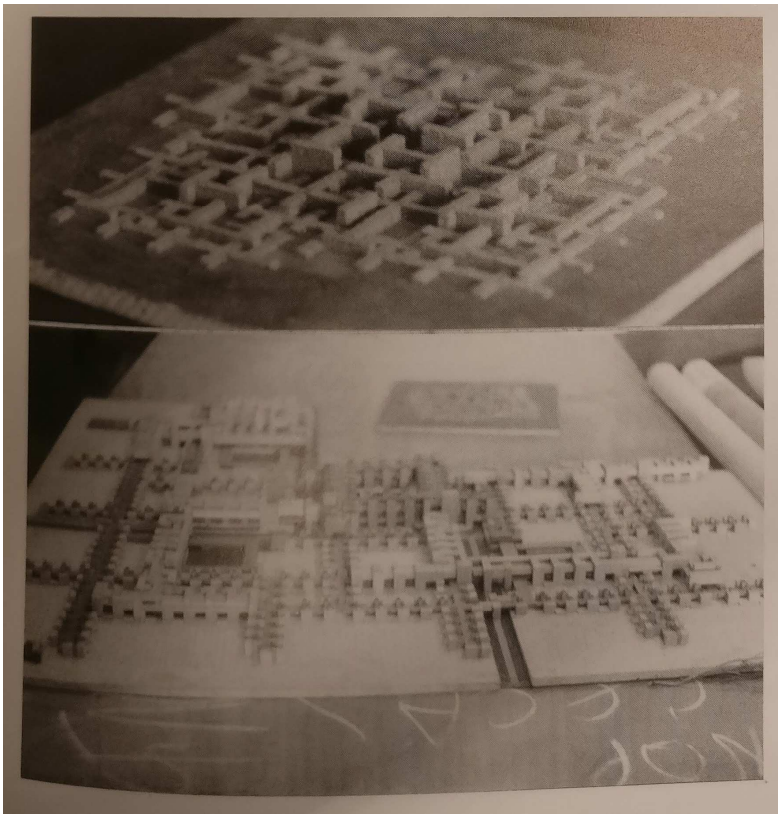
Some of van Eyck's projects, such as his Amsterdam Orphanage (completed in 1960), could surely be considered through the lens of the Web/Mat. The same goes for his student Piet Blom's work, including the Noah's Ark project, presented at Royaumont. Certainly, these projects show high levels of interconnectivity and interlock between elements, which facilitate "chains of relationships" and prevent any part being isolated from the rest. However, the conception of these projects as growing centrifugally outwards from a centre is less flexible and less polycentric than the characteristic Web/Mat buildings. Whether this really means that these projects fail at polycentricism or are more rigid than the typical Web/Mat building (and indeed whether this would necessarily be a bad thing) is not entirely clear.



11 Aerial photo of the Amsterdam Orphanage by Aldo van Eyck

Alexander himself was quick to point out that just because a city is more like a semi-lattice – i.e. polycentric and full of overlap – that does not mean that overlap is always good. "A garbage can is full of overlap", he writes. "To have structure you must have the right overlap" (Alexander, 2015/1965, p.39). Even though the Amsterdam Orphanage has one dominant open square (or centre), we see that each smaller part, or wing, also has its own central square. So technically it *is* a polycentric design, it is just that one centre is dominant. Also the geometrical repetition and modularity of projects like this, to some eyes representing rigidity and control, for van Eyck was the very expression of freedom. In response to criticism of the Noah's Ark project, he replied: "I am a bit disappointed, honestly, that what to me is a configuration of liberty that I find in its kaleidoscopic quality, […] you people seem to see as a geometric pattern" (Woods, 1964, p.264)[29]. He also made an analogy to the use of the alphabet, which while consisting of a small and restrictive number of letters, simply repeated in different combinations, give us all the words of the dictionary. Or, if we consider the multi-meaning of poetry, we can go even "beyond the dictionary" (Woods, 1964, p.264).

Alexander's comments on van Eyck's presentation were certainly not the most aggressive or controversial. These were reserved for Peter and Alison Smithson, who strongly criticised the Noah's Ark project. As noted by Francis Strauven, Alison Smithson also selectively edited the account of the meeting in *Architectural Design* to give the impression that Team 10 collectively rejected the Ark project, when this was not the case (Strauven, 2006, p.15)[30]. In the meeting, as the debate got heated, Alison eventually dismissed the project as "fascist" (Woods, 1964, p.262). This was largely because of its strict adherence to an organising structure, perhaps also because of the pin-wheel, centrifugal configuration which resulted in recurrent swastika-like motifs (see above). The project as presented was indeed strictly and rigidly adherent to a rotationally symmetrical geometric pattern, of a fractal-like nature. Yet this was not, it seems, intended to represent the completed built form, but rather a framework on which the city would grow (Strauven, 1998, p.400). Van Eyck tried to make this clear[31]. The design for a city of 150,000 people was divided into 11 neighbourhoods of 10,000 to 15,000 and a closer study of one of these neighbourhoods (with drawings and models) was presented. There seems to have been an assumption that each neighbourhood would be identical when this was not the intention (Strauven, 1998, p.400).

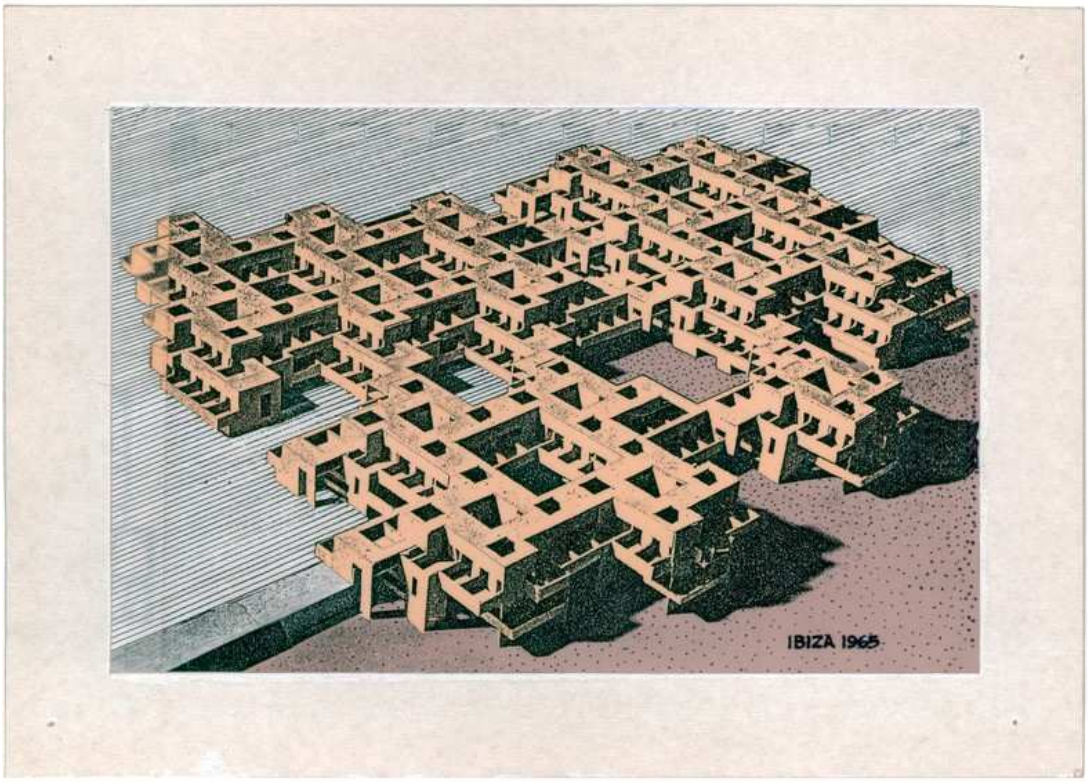


12 Noah's Ark models photographed by Kisho Kurokawa

Could there be another deeper reason for the rejection of Blom's project (by the Smithsons in particular)? If it had been clearer that individual variation was possible within the larger organising framework, would there have been less criticism? Nested within the question of whether the design offered freedom, is also the question of variety. One of Alison Smithson's first interjections during van Eyck's presentation was to say: "What worries us is that it all goes, north, east, south, west and just keeps repeating" (Woods, 1964, p.259). Peter picked up her point saying: "We're looking for systems which allow things to develop as they need to develop without compromising each other" (Woods, 1964, p.259). They were implying that in a truly free system heterogeneity (in the geometric structure) would be a necessary result and a sign of freedom. At another point, Alison Smithson critiqued Candilis-Josic-Wood's project for the Val d'Asua near Bilbao as being like the terrible growth of a fungus (Woods, 1964, p.372). The hostility here seemed to be directed again at the geometric structuring of the project into a repetitive or self-similar pattern. It is argued by Avermaete (2005, p.309)[32] that Alison distinguishes between Mat-buildings, which unify heterogeneous elements, and configurative (or structuralist)[33] buildings, which structurally assemble isomorphic elements. He quotes Alison apparently comparing van Eyck's orphanage to the Berlin mat project, but without giving a direct source. Van Eyck's project is the repetition of "plain sameness" while in the Berlin mat project "apparent sameness is the carrying order"(Avermaete, 2005, p.309). The same quotes are given by Avermaete in *Modern Architecture and the Mediterranean* (Lejeune & Sabatino, 2010, p.261)[34], where they are attributed to *How to Recognise and Read Mat- Building* by Alison Smithson[35]. But in *this* original source Alison does not compare van Eyck's orphanage with the Berlin mat project, neither is there any quote describing the orphanage in terms of repetition and "plain sameness", nor is the Berlin mat project being referred to with the quote "apparent sameness is the carrying order"! This latter quote is actually referring to an artwork by Louise Nevelson (below).

13 Artwork by Louise Nevelson shown in *How to Recognise and Read Mat-Building*

What remains true is that this work is being held up as exemplary of the qualities of the Mat-building, particularly in uniting heterogeneous elements. It also remains reasonable to conclude that the Smithsons regarded the structuralist buildings as ordering together similar elements while the Web/Mat buildings ordered together diverse elements. For the Smithsons, a truly free system would allow a variety of elements to grow and co-exist in one fabric "without compromising one another". The structuralist position on freedom, on the other hand, is perhaps more difficult to sum up. For van Eyck and his student Piet Blom, a free system sought to dissolve the distinction between part and whole and more generally between binary opposites such as outside/inside. It sought to identify the basic invariant structure of the system and distinguish it from the variant part. This underlying structure was relational, that is, the relationship between elements was key and not the elements themselves. One might also say they sought to find the simplest structure which would accommodate the whole variety of the system. This is why we often see self-similarity in structuralist projects: if the same structuring pattern can accommodate different functions (even at different scales), it will be preferred and repeated rather than creating a more complex or heterogeneous pattern. The focus on invariance, i.e. the search for universal structures which could be applied again and again in different contexts, was also evident in Jacob ('Jaap') Bakema's work and thinking. Christine Boyer (2015, p.29)[36] links Claude Lévi-Strauss's idea of structuralism, as the search for invariants, to Bakema who also believed in certain constants of life and in universal forms of existence. Bakema noted, like Lévi-Strauss, the challenge of translating meaning across cultures but felt that there was a certain universal grammar to be found that would make this possible. His concept of 'total human mind', rested on the idea that there was a language of visual forms that could communicate directly from one mind to another, regardless of cultural and contextual differences. However he suspected that architects often spoke in a language that was far from universal, understood by other architects but unintelligible to clients.



14 Project for holiday homes in Ibiza 1965 by Piet Blom

This focus on *invariance* might seem strange when the aim is supposed to be freedom. After all, freedom is associated with choice and choice with variety. Certainly, the Smithsons saw in the geometric invariance of the Noah's Ark project an oppressive lack of freedom. However, it is fascinating here to compare this structuralist approach with that of Christopher Alexander. It turns out that his point of departure is actually in many ways the same: he too wants to know what the invariant structures of architecture are. He begins his Royaumont presentation, a study of the village of Bavra, in Gujarat, India, by talking about components (which could equally be called elements). He makes the point that generally it is the structure of the components that affects the behaviour of a system, i.e. it is the relationship between elements, not the elements themselves, which affect the behaviour of the system. As an example he gives a cucumber sandwich: it is the way in which the components of bread, butter, cucumber etc. are arranged, and not so much the stuff out of which they are made, which make it what it is. Another more obvious example is graphite and diamond, which are both made of the same stuff: carbon atoms. In one case they are arranged in tetrahedral components and you get a very hard, shiny substance. In the other, they are arranged in flat components and you get a very soft, black graphite (Woods, 1964, p.160). Finally, he even invokes the difference between poetry and prose (very much like van Eyck's alphabet analogy). Both consist of words, but in a poem, these are arranged into rhythmic components, then lines and then verses, whereas in prose, these are arranged into sentences and then paragraphs.

Having established that it is very often the structure of the system which is crucial to the behaviour of the system, in other words, the relational structure between elements, Alexander seeks to uncover what the invariant elements of the system of architecture, actually are. This is because without this knowledge you cannot make a truly flexible system (i.e. a free system), which can adapt to a changing environment or changing desires. Taking the poetry/prose analogy, if you do not understand that words are the basic elements of the system, any attempt to change the functioning of the system, e.g.

from poetry to prose, will most likely result in a jumble of letters which is neither poetry *nor* prose. It is worth highlighting that what Alexander sees as the components of a system are themselves often subsystems, which can be broken down into a system of subcomponents. In the poetry/prose analogy, you can break down words further into subcomponent letters.

Thus Alexander seeks to identify what the functional components of architecture are, which he sees, similarly to van Eyck and Piet Blom, as relational structures first and foremost. What this actually amounts to in design terms, is "rather a long-winded way of describing the old principle of articulating functions" (Woods, 1964, p.160), or simply the dictum 'form follows function'. However, Alexander is quick to show that previous attempts to articulate functions were "really quite arbitrary" (Woods, 1964, p.162). This was perhaps because it requires a deep understanding of the interlocking structures of a highly complex system such as the city before you can hope to disentangle its functional components. This is where the understanding of the importance of relational structures is key. Alexander points to the Athens Charter's four functions as a famous but naïve attempt to articulate functions. For example, as already shown, the functions 'work' and 'dwelling', while sometimes independent, are often interlinked. Therefore this kind of articulation of functions cuts across the real functional relationships. This prevents the system from being truly free and adaptable because you find that as soon as you seek to change one functional component, it affects many others, such that you might have to change the entire system to make one small functional adaptation.

For Alexander's Indian village study, he attempted precisely to address this task of understanding the functional relationships of the system, from first principles. To this end, he sought to list all the functional needs, relating to the physical structure of such a village, which had to be addressed. The needs were obtained by combining the needs that the villagers themselves came up with when asked (e.g. "I need water to irrigate my crops"), with the needs imposed by the government, economy and wider society which the villagers might not come up with (e.g. the need to remove Untouchability, or the need for better sanitation) and finally the needs which are already addressed in the system which no one might think to name (e.g. it is traditional for the villagers to wash in the morning before work). Alexander ultimately came up with a list of 140 needs. The next task was to look at each possible pair of needs and ask whether they were related or not (for a list of 140 items this would have to be done 9730 times). Does satisfying one need help or hinder satisfying the other or are they independent? The answer to the question in each case was often based on common sense, sometimes on consulting someone with relevant knowledge and sometimes based on Alexander's own decision because the pair had never been thought of as either related or not. Generally, two needs were only linked when a direct functional connection could be established, not, for instance, "just because there was some feeling that maybe they were about similar problems" (Woods, 1964, p.166). However Alexander admits that, since there are decisions involved in establishing the functional relations between pairs – and some of these decisions may be incorrect – there may be some arbitrariness to the results.

Finally, Alexander had a list of needs, each of which was connected to certain others. This list was sent off to a computer at the Massachusetts Institute of Technology which aimed to determine, mathematically, which parts of this network of needs were most strongly interconnected and which the least. The calculation returned the list of 140 needs with 12 subgroups of needs that were strongly interconnected within themselves whilst being relatively independent of each other. The remaining presentation focuses on Alexander's proposed building solutions for the Indian village, which he felt could be applied similarly to villages across the region. He produced diagrammatic drawings which enshrined some of the basic relationships required to address the various networks of needs identified in the research. The exact built form of these solutions could vary from site to site and case to case, thus the diagrams could be thought of as prototypes. A further investigation of the presentation, as it delves into more technical

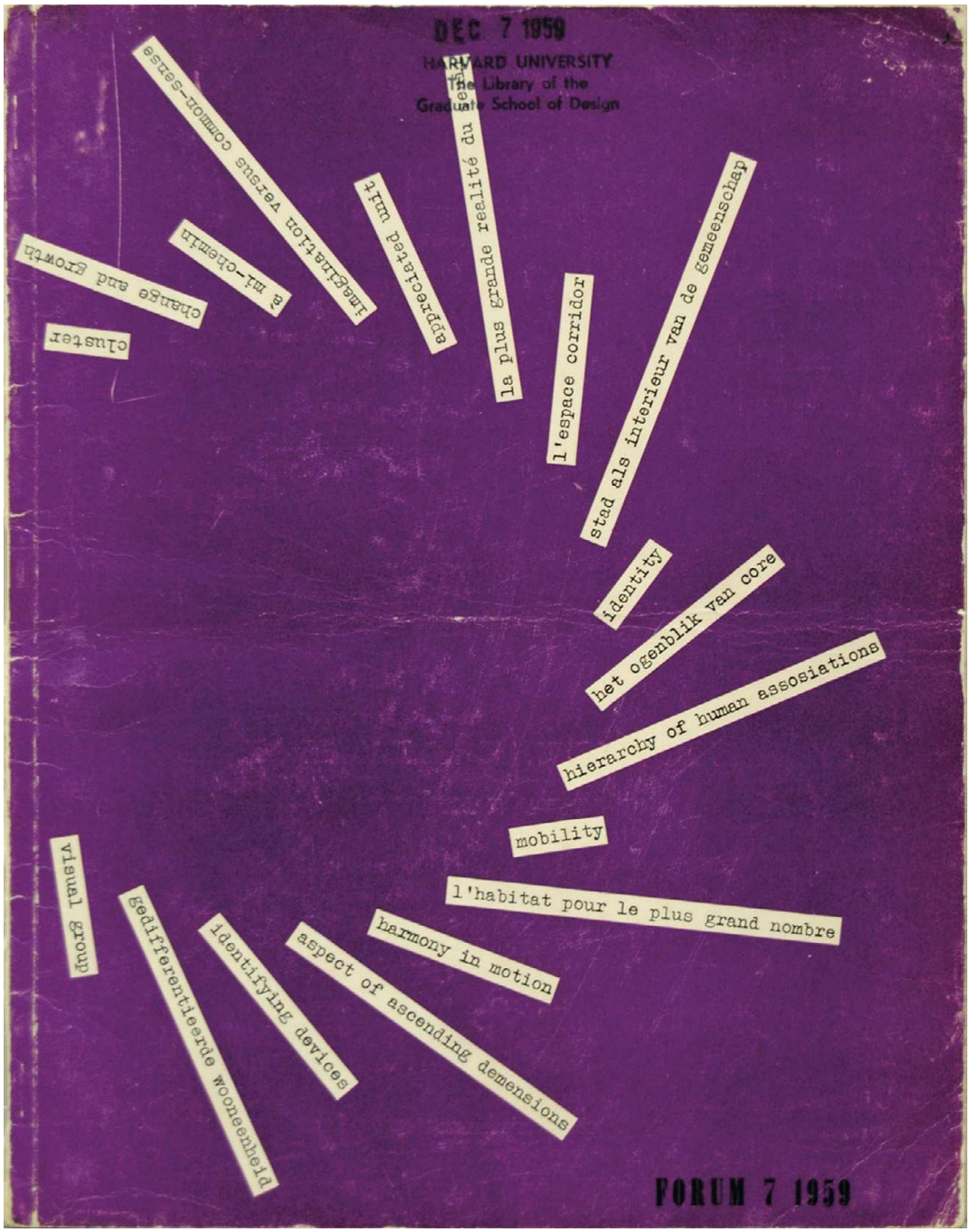
details, is not highly relevant to this essay. Unfortunately, the reception and discussion of the presentation, which *would* have been highly illuminating, has been lost. Suffice it to say that Alexander's thinking here can be thought to develop and mature into the much more comprehensive and widely known theory of *A Pattern Language* (and *The Timeless Way of Building*), which similarly to the above proposal lays out a system of 253 interrelated 'patterns', each one a prototype solution to a specific need, and describes how these patterns come together to create architecture from the scale of windows and doors to that of houses, streets and entire neighbourhoods. Each pattern helps to complete certain 'larger' patterns and is itself completed by certain 'smaller' ones.

We can say with some confidence that the relational thinking of Alexander had strong parallels to the relational thinking in structuralist design. In fact, it is suggested by Strauven (1998, p.472) that Alexander was deeply indebted to van Eyck for his relational thinking. Firstly, we can point to the presentation of Noah's Ark, in which van Eyck emphasises the interrelation of part and whole in the house/city and tree/leaf images and criticises the use of the tree analogy to denote thinking in strictly hierarchical terms. Strauven (1998, p.398) argues that this was an implicit criticism of certain projects presented at Team 10 which had an overt tree structure including the design for Toulouse-le-Mirail and Alexander's diagrams for the Indian village study. It seems questionable that Alexander's proposals created a tree structure (since they were based on a relational network of needs that was very much a semi-lattice). Nevertheless, it is not clear exactly what material Alexander presented at Royaumont. Assuming it resembled the presentation in *Notes on the Synthesis of Form*, there were indeed tree *diagrams* used to illustrate how the various functional components came together. This does not mean that the resulting built structure would itself be a tree. Also, the whole point of the initial study was to identify components that were truly functionally independent of one another. The criticism in *A City is Not a Tree* is not levelled at trees *per se*, but rather at trees applied incorrectly. In other words, trees which separate components physically when they are not actually separate functionally. At any rate, regardless of how tree-like Alexander's proposal was, it does seem fair to suggest that Alexander was at least still open to the idea of seeing a city as a tree at Royaumont. For example, we know that during van Eyck's presentation Alexander questioned *why* van Eyck thought the direct analogy of a city to a tree was unhelpful. Strauven writes that Alexander entered a discussion with van Eyck on this matter (Strauven, 1998, p.473). Presumably, this is the discussion already covered. It is tantalising to speculate, though, if there was any further discussion, not recorded in the transcripts by Clarissa Woods, which might lend further credence to the idea that *A City is Not a Tree* was inspired by debates at Royaumont.

Strauven argues that patterns in *A Pattern Language* such as 'entrance transition', 'entrance room' and 'positive space' strongly correspond to ideas on the relation of outside and inside which van Eyck already wrote about 15 years earlier (Strauven, 1998, p.473). It is clear that both were very much in agreement on the importance of transitional spaces and that there is a strong resemblance between van Eyck's ideas on 'form and counterform' and Alexander's thoughts on 'positive space'. Both were convinced, in their own ways, that certain universal constants can be found in the architecture of traditional societies from around the world and that traditional architecture possesses vital qualities which are being tragically lost in the modern world. Alexander's Indian village study could be contrasted with van Eyck's own time spent immersed in the culture of the Dogon of West Africa. Both believed that architecture can become 'great' in the same way that poetry can – through multi-meaning. In this view, poetry is more profound than prose because each word carries multiple meanings and the poem as a whole therefore carries a huge density of interlocking meanings which illuminate the whole. Poetry and architecture, then, are by definition more dense in meaning than mere prose and mere building. Strauven also considers Alexander indebted to van Eyck for these views on traditional culture, universal constants, and the concept of architecture as a language (Strauven, 1998,

p.472).

It should also be made clear that many of these ideas from van Eyck and structuralism were very much a part of the wider Team 10 discourse. So much so that the last CIAM congress at Otterlo in 1959, which simultaneously can be considered the first Team 10 meeting (since Team 10 devised the program), is *also* understood to be the official start of the structuralist movement (*Structuralism (architecture)*, 2020)[37]. The importance of in between space was already a theme at this meeting under the heading "*la plus grand realité du seuil"* i.e. "the greater reality of the threshold" (as cited in van Eyck, 1959, cover page)[38] .



15 Cover of *Forum* 7 (1959) designed by Jurriaan Schrofer showing the themes of the Otterlo meeting.

For Alexander, like van Eyck, the idea of in between space was incredibly important, especially in urbanism, though it is unclear how deeply he already felt or understood

this at Royaumont in 1962. He certainly had already outlined by this point concepts of 'goodness of fit' and 'functional expression' which emphasised that any successfully designed form must be shaped by the context in which it exists. In the case of the urban fabric this would imply that the space around (and in between) buildings is equally important to the buildings themselves. Later in life, this became Alexander's explicit position. In his essay "The Heart of the City" (2006) he wrote: "What is missing from our present consciousness of space, is the awareness that space must be viewed as a solid substance. It is not the absence of buildings, the leftover. Rather it is a solid material, with its own shape, as powerful and as much in need of shape, order and substance, as any building" (Alexander, 2006, p.36)[39]. Alexander by this later stage had a much fuller conception of the need for transitional space. Not only in patterns such as 'entrance transition' or 'entrance room', but in the interplay between outside and inside throughout the city (in gardens, streets, squares, parks, courtyards, verandas, balconies, arcades etc.), between public and private spaces within the home, between city and country, between pedestrians and traffic, between dense and sparse urban areas, between big and small open spaces, between dark and light areas etc. The importance of in between space and transitional space in all kinds of situations (and across all scales) is clearly enshrined in three of Alexander's 'fifteen fundamental properties' of good design, or 'wholeness', as described in book one of *The Nature of Order* (Alexander, 2002)[40]. These are 'positive space', 'deep interlock and ambiguity' and 'gradients'. To a lesser extent, they also play a role in the properties 'not-separateness', 'boundaries' and 'good shape'.

Most of what we can glean about the reception of Alexander's presentation is confined to Alison Smithson's commentary in the article "Team 10 at Royaumont 1962" in *Architectural Design* (1975). She writes: "The Alexander Team 10 discussion appears to be missing, but essentially Team 10 thought Alexander should go on to build; and by so doing, accept responsibility for his analysis. Team 10 are all builders by nature and tend to be nervous – if not suspicious – of those who proceed from one research to another" (Smithson, 1975, p.677)[41]. Ironically, around the same time, Alexander turned down an opportunity to put his theory into practice after a high-ranking official in the state of Gujarat contacted him. The government needed to relocate a village of c.a. 2000 people for the construction of a dam and the official had come across Alexander's study and his diagrams. He suggested that Alexander could oversee the construction of the new village. Though initially excited about such a sizeable commission, on reflection Alexander turned it down because the felt he did not know enough to build a successful project. It was the chagrin over this failure that spurred him on to further research and ultimately to write *A Pattern Language* (Alexander, 2002)[42]. In a sense, therefore, this confirmed Alison Smithson's stereotype of an academic moving from one theoretical research project to another. However, one could also say that *A Pattern Language* affirmed Alexander's commitment to built work since it is intended as a practical manual to help people without formal training to design and build for themselves. Therefore the book was a means to have his theories tested through building, not only by himself and colleagues, but by anyone who read the book.

While Alexander's presentation supported some of the key ideas of configurative and structuralist design, it could also be used to justify criticism of it. For instance, Deyong (2014, p.236-237) argues that one of the Smithsons' key criticisms of Noah's Ark and similar projects was reinforced by Alexander's presentation. They were concerned by the lack of distinction between different scales of association (house, street, district and city). Alexander argued that different configurations of a system lead to observably very different behaviours (e.g. in his diamond/graphite analogy). One might infer that systems at very different scales, dealing with different forces, must necessarily be configured differently. The Smithsons made essentially the same argument in reverse: by observing different behaviours in systems at different scales they inferred that this should be reflected in different configurations. "Because the 'appreciated unit' is felt that it

must be different for Village, Town and City, its whole organization must be different, it must be a new idea. It is impossible to build up a large community from 'appreciated units,' which are valid only for a small community (e.g. houses round a square)" (as cited in Deyong, 2014, p.246). The difference, then, between Alexander's approach and the structuralist one, might be in the readiness to assume that the same structure can be applied to different systems at different scales. Or one might say there was a different emphasis: Alexander proceeded first by trying to understand the functional systems involved and then trying to design the physical structures to embody them. The structuralists proceeded first by exploring physical structures and then seeing how well they could embody the functions of the city. Both approaches ultimately aimed at finding physical structures to embody the underlying functional (or relational) systems of the city. Whereas Alexander was hesitant to *impose* a structuring system without sufficient knowledge of the underlying forces, structuralists were reluctant to *deviate from* a structuring system without sufficient knowledge.

Building for the Greater Number

"I suppose what one's really talking about in this case is are there any alternatives – which could be positive – between structuring everything and structuring nothing[?]" (Woods, 1964, p.156)

Ralph Erskine posed this question during the discussion of José Coderch's presentation. This was following what had already been a lot of back and forth on the question of user participation in design. Coderch presented a project which was based on a study of a slum in Barcelona. Similar to Alexander and van Eyck's intuitions on traditional communities, Coderch felt (through first-hand experience) that there was a vitality in slums which was missing in modern developments. Tasked with rehousing the slum dwellers he attempted to design a minimal structure that would address the basic needs of sanitation, structural integrity and durability, but otherwise offer maximum freedom to the owners to complete their dwellings as they wished. This was by no means the first time topics such as slum dwelling and individual freedom had come up in Team 10.

On this question of freedom of choice and the level of control that an architect could, or should, exert, there were many different positions within Team 10. As is already clear from the Noah's Ark discussion, there were different interpretations of what freedom and control even *were* in architecture. Aldo van Eyck was sceptical of the idea that freedom of choice really constituted meaningful freedom. For example, he described how, when faced with a multitude of options on a menu, he would often end up basing his choice on what someone else was having. He also observed how, at a bar with a huge variety of drinks to choose from, many people stick to the same few drinks that they are familiar with (Woods, 1964, p.159). "If I really knew what I wanted to drink when I entered a bar with all these drinks, and I really could detect the single drink which is the right thing for me now, then I think I'd be very happy with this enormous orchestra of drinks" (Woods, 1964, p.159). Although van Eyck was sceptical of offering great choice and seemed content with the geometric restrictions of, for instance, the Noah's Ark plan, he also talked about the importance of architects recognizing the limits of their abilities, particularly when faced with the challenge of designing for the 'greater number'.

The Smithsons on the one hand criticized Noah's Ark and other projects for their geometric rigidity, on the other hand defended Corbusian urbanism, which was often no less *dirigiste* and controlling. They questioned whether people really wanted the freedom to design their own environments, or whether they were happy to choose environments designed for them (provided they had some choice among these). For instance, Peter Smithson laid out how Le Corbusier and Mies van der Rohe saw their role as offering people an ideal, of a new way of living, which people could choose or reject

(Woods, 1964, p.48), rather than offering them exactly what they asked for. They also, like van Eyck, questioned what constituted *meaningful* choice. Alexander described a project in Hong Kong, where only a minimal structure of six storeys was built in advance, with the rest being up to the occupants to build. In theory, this offered a lot of choice. Platforms, staircases and basic services were provided. All the rest was up to the occupants to build. The Smithsons immediately denounced this as giving choice "only in a terribly. [sic] terribly minor field" and "only in a very limited way". They worried that the project would be so crowded that occupants could only build "saracophaguses [sic]" for themselves (Woods, 1964, p.49). The answer was not necessarily about more choice, but about meaningful choice. Peter Smithson for instance defended, as a personal preference, the kind of collective structure found in the city of Nancy, against the more fractured geometry of the Kasbah (popular at that Team 10 meeting). For him, Nancy represented a highly civilized acceptance of a collective structure. It was *for* the people and chosen by them – not something imposed. You could still see the mark of the individual in it, but the collective structure was much more emphasized. For Peter, the voluntary acceptance of certain limitations on freedom in exchange for something else of value was a key part of civilization. In architecture, this might mean accepting certain collective forms, or building codes, in return for a better overall organisation.

These questions about control, freedom and choice revolved not only around the great variety of people in modern society but also around increasing awareness of the great masses of people in the world who might benefit from good design (if only it could be supplied). Alexander stressed the problem early on at Royaumont, when he drew attention to the fact that there were three thousand million people on earth and not nearly enough designers to design for all of them. At least, it would not be possible if the assumption remained that the professional designer needed to be personally involved with every project he or she designed. Alexander saw the only solution to this problem lying in the creation of prototypes, by this he did not mean "plastic prototypes", but "organizational prototypes" (Woods, 1964, p.36). In other words, design solutions that could be applied to solve similar problems across many different situations. The diagrams he later presented for his Indian village study could be thought of as prototypes of this kind. Unfortunately, he was misunderstood (at least by Alison Smithson) as proposing that *actual buildings* should be used as prototypes and exactly copied. In the summary of his presentation for *AD* magazine, he wrote "I was saying something about prototypes, and I think I was taken to mean sort of actual buildings and things; but I would never dream of calling that a prototype to be repeated" (Smithson, 1975, p.677). It does not appear that, to meet the world's design demands, Alexander proposed that more design needed to be done away from site without intimate project knowledge. Rather the tools for solving design problems needed to be given to laypeople, so that they could solve problems themselves on site.

Jaap Bakema was also concerned with knowing what the limits of the architect's decision-making powers should be. He felt that certain decisions could be made when designing for oneself "[b]ut I personally don't know why I should have the right to do it for four thousand people" (Woods, 1964, p.44). He argued for the importance of user participation in design and conducted some basic research into how many buildings were actually built with the client/user as part of the design process. He felt this was important because he concluded, after making his own inquiries, that design committees often had very superficial reasons for making key design decisions. If there was any deeper analysis involved at all, it was (necessarily) biased towards measurable criteria (e.g. productivity), but ignored other factors that could not be analyzed (or were hard to analyze). This was significant because Bakema felt intuitively that certain hard-to-measure factors might actually be crucial to the user experience and highly valuable. Aside from the measurable productivity of a worker, what about their happiness, or creativity, consistency, the quality of their work, or their sense of belonging? These factors might play a huge role in the success or failure of an office and yet, for all anyone knew, they might be promoted by such simple freedoms as having a windowsill in the

right place to put a milk bottle on (Woods, 1964, p.23). Thus the architect is often left as the lone voice to defend the intangible things they feel impact the quality of life of the user. “I like to condition my circumstances in life”, Bakema said at Royaumont. “I like it, you like it, he likes it. And I’m so sure everybody likes it” (Woods, 1964, p.46). Bakema was sure everybody liked to have the freedom to design, or at least play a role in, their own environment. He felt that society was currently over-organized (Woods, 1964, p.46), taking away this freedom. Architects were the first to reject these limitations, because “we are specialists who see that the emotional conditions and the conditions which cannot be analyzed, and which are in our fingers when we have a piece of paper, that these things are dried up, are not used” (Woods, 1964, p.46-47).

16 Bakema sketch relating grouping of buildings to a family. Intuitively architects design using feelings and metaphor, but how do we measure or analyse the value of these methods?

Bakema was therefore also deeply interested in slums, which he saw for instance in St. Louis, where people had lots of freedom to build what they wanted, even if they could not build to a high quality. James Stirling paraphrased his view on slums as “substandard in terms of living conditions, but superstandard in terms of the atmosphere and the life that can grow in these places” (Woods, 1964, p.43). Bakema accorded very well with Coderch’s view that there was a vitality in slums and felt that man had “the right to have a personal opinion about life” and that he must have “the possibility to define in space his personal opinion about life” (as cited in Smithson, 1968/1962, p.24). Giancarlo de Carlo announced similarly: “[t]he need [of the individual] to represent themselves is fundamental, and it is not present in modern architecture” (Woods, 1964, p.150).

In fact most, if not all, Team 10 members expressed some view that there was value in the individual choice and freedom found in traditional societies and/or in modern slums where building occurred in a more spontaneous and organic way than in modern schemes. This was the case even while it was acknowledged that modern construction mostly achieved higher standards of living and without any members wishing to celebrate poverty. Van Eyck reminded the group that most people willingly give up the freedom to build their own house if it becomes a choice between that and having a house with running water (Woods, 1964, p.156)! Debate remained about what choices and freedoms were meaningful, whether choice meant variety, whether people wanted choice and whether people in contemporary society, given choice, were actually capable of designing for themselves. Giancarlo de Carlo felt that people had lost the ability to design for themselves and that the only solution was to allow great freedom of choice,

even if this led to mistakes, so that people could regain their ability to express themselves (Woods, 1964, p.158). Van Eyck expressed similar views in his musings on the problem of number: "If society has no form, can architecture build the counterform?", he asked in *Forum* in 1962 (as cited in Clarke, 1985, p.29). And then at the Pacific Congress in Auckland in 1963: "Can architects meet society's plural demand? Can they possibly substitute the present loss of vernacular and still build a city that is really a city?" (as cited in Strauven, 1998, p.404). The implication was that people in traditional societies (perhaps through recourse to the vernacular) had the ability to express themselves architecturally and that this was an ability which modern society had lost.

To sum up across various Team 10 positions: it seems that there was a general if not universal consensus that slums and traditional societies had within them important freedoms that modern societies lacked, that it was important to give people choice, and that modern society may have lost the ability to express itself architecturally. Most critical of this view were perhaps the Smithsons, who stressed that people today *were* generally free to build for themselves, but willingly gave up this freedom for better organization (Woods, 1964, p.155). Also that successful examples from the past such as Nancy and Amsterdam showed that high levels of collective organization (through acceptance of by-laws etc.) could be achieved without requiring tyrannical impositions on freedom.

Christopher Alexander himself stood firmly by the view that traditional societies had encoded within them great wisdom about good design and that the freedom of individuals to design their own environment was crucial. This was already clear to him after his research in India. He remained convinced that the best people to make design decisions were usually the users themselves. He also saw it as vital that any designer should be in direct contact with the site and the construction process. His attempts to understand good design evolved from a more mathematical formulation, using set theory, to a more linguistic model with *A Pattern Language*. This was where Alexander came to agree with some of the Smithson's criticisms of freedom and choice and with de Carlo and van Eyck's suggestion that people in modern society had lost the ability to design for themselves. In the modern world, when people were given the complete freedom to design for themselves, the results were often poor. This was, Alexander thought, not because people had the wrong instincts or the wrong desires, but because they did not possess the language with which to express themselves. "[W]hen a culture is broken apart and the people of that culture have no living pattern language, then no amount of self-help or self-design will give them the knowledge to build a house wisely for themselves. The people […] have forgotten everything they ever knew (culturally) of how to build a house, and are making something without knowledge" (Alexander et al., 1985, p.200)[43]. Alexander made an analogy to cooking: anyone may cook for themselves, but without knowing *how* to cook they will struggle to produce something edible. For instance, to make an omelette, you need to follow certain rules, but knowing and accepting those rules when you want to make an omelette is not oppressive, it is simply necessary to achieve what you want. In this way, although Alexander broadly stood for freedom of choice, he agreed with the Smithson's view of Nancy or Amsterdam, that accepting certain rules often benefitted everyone. In an interview many years later, he summed up his view on freedom in the following way: "this whole discussion about totalitarianism – what it really boils down to is the contrast between freedom to be arbitrary, as opposed to freedom to be appropriate. And if – of course if you want to have freedom to be arbitrary, that's one thing. And much of what we've got going on in the world of architecture today is based on that supposition. If you want to be appropriate, you can still do a million different things, but being appropriate is going to guide you, and that is what is going to tell you what to do" (Mehaffy & Alexander, n.d.)[44]. He also pointed out his experience of traditional crafts, which generally have many elaborate rules: "I've known quite a few traditional craftsmen, in real traditions,

in different societies and different cultures. I've never met a person who was in one of those traditions, who felt themselves to be in a bind, who felt themselves to be locked into something, who felt themselves to be under authority. Of course what they actually feel is free. Because they know what to do, and therefore they can do whatever they want" (Mehaffy & Alexander, n.d.). The rules of traditional crafts allow people to solve complex problems sensibly and appropriately. So do these rules really constrain craftsmen or empower them, control them or make them free?

Jaap Bakema referred several times at Royaumont to the folk opera *Porgy and Bess*, by George Gershwin. It centres on Catfish Row, an Afro-American slum in Charleston, South Carolina. Much of the social life of the community takes place on the platforms and staircases that the tenants have built at the back of their crowded tenements, to make use of space and light and air. The freedom of the people to build for themselves gives a special atmosphere and vitality to the community. For Bakema, the real value of the slum was to be able to say "I lived there. You can still see what I did on this spot" (Woods, 1964, p.35). *Porgy and Bess* was emblematic of a certain quality of freedom and Bakema felt it represented an important reminder that the architect needed to know when to say 'no'. The architect needed to know where the limits to his or her knowledge and decision-making power lay. All these questions around freedom vs. control, rules vs. choice, individual expression vs. collective form, fed into the great debate about how to bring good design to the masses, how to build for the greater number.

The Bifurcation of Nature

Both Team 10 and Christopher Alexander were influenced in their work by the thinking of Alfred North Whitehead. Whitehead was a mathematician and philosopher who problematized the split created since roughly the time of Descartes, between the scientific worldview and our conscious experience of the world. On the one hand, we have the scientific picture of the universe: it is a highly complex system of mechanisms, consisting of matter which is essentially inert, devoid of value or life; on the other hand, we have our conscious experience of the world: as we interact with it we encounter our sense of self, our feelings and we perceive meaning and value both within ourselves and all around. This split between objectivity and subjectivity – or roughly between reason and emotion – Whitehead termed the bifurcation of nature. Whitehead believed we will not properly grasp the universe, or our place in it, until the self which we experience in our selves, and the machinelike character of matter we see outside ourselves, can be united in a single picture (Alexander, 2004, p.13)[45].

This thinking was introduced to Team 10 through Sigfried Giedion, secretary-general of CIAM. In the introduction to his questionnaire "The Synthesis of the Arts" of 1947[46] Giedion proposed to shift the focus of CIAM from the pre-war emphasis on rational techniques and mechanisation to questions of emotional expression. On the recommendation of his friend and colleague, art critic Herbert Read (Deyong, 2014, p.227), he referred to the arguments of Whitehead, showing the split between reason and emotion and the "one-sided rationalism" (Deyong, 2014, p.227) of science. The future Team 10 member Aldo van Eyck responded to the questionnaire making his own criticism of the "one-sided rationalism" of CIAM (Deyong, 2014, p.227). This was of course to be a core issue of the future Team 10 discourse, notably in the critique of the four functions, in the questions about freedom and user participation, about slums and traditional societies, about high-rise living, about the concept of the street, about multi-meaning, about relativity and in many other areas. In the *Team 10 Primer* (1961) Jaap Bakema noted that "[i]n 1947 there was a new attempt by young architects in CIAM to abandon the gap between thinking and feeling" (Smithson, 1968/1962, p.23) though he did not directly acknowledge Giedion's influence. Nevertheless we see this quite clearly in the following from van Eyck: "The old struggle between imagination and commonsense ended tragically in favour of the latter. But the scales are turning: CIAM

knows that the tyranny of commonsense has reached its final stage, that the same attitude which, 300 years ago, found expression in Descartes' philosophy…is at last losing ground...During the last 50 years or so a few, ranging from poet to architect, from biologist to astronomer, have...turned our senses to a new dimension"(as cited in Deyong, 2014, p.227).

Christopher Alexander was profoundly influenced by the bifurcation problem and identified Whitehead as one of the first philosophers to describe and draw attention to it around 1920 (Alexander, 2004, p.13). He deals with it extensively in his four-volume magnum opus *The Nature of Order.* Alexander has nothing but praise for our present scientific world-picture and its achievements, but he goes on to mirror van Eyck's sentiments that something is missing in this understanding. Though he acknowledges that: "All in all, we have succeeded in building successful models of the matter in the universe and its behaviour, in a way that is wonderful and powerful. It is a collective achievement of an order incomparable with almost any previous human achievement" (Alexander, 2004, p.12-13). He goes on to note that: "In order to create this effective scientific world-picture we had to use a *device*: the intellectual device of treating entities in nature as if they were inert, as if they were lumps of geometric substance, without feeling, without life — in effect, merely mechanical elements in a larger machine. This mental trick was invented by Roger Bacon, Descartes, Newton, and others—and has been the foundation of our modern understanding. Even the models of quantum mechanics— they are mathematical mechanisms, to be sure, not actual physical mechanisms—work because they work *like* mechanisms. The elements are defined, and the rules of interaction are defined, and everything then follows when this mechanism is let loose" (Alexander, 2004, p.13). The weakness of this world-picture is that it leaves little room for our conscious experience of the world. Statements about *feeling* and *value* make little sense within any current scientific framework and – if they are explained at all – it is usually as a by-product of the interplay of matter (e.g. neurological processes), without any inherent meaning. Finally, like van Eyck, Alexander suggests that a new avant-garde is challenging this view: "Because our world-picture is inadequate, during the second half of the 20th century many scientists began a serious attempt to repair the world-picture. There was a spate of serious effort, primarily concentrated on the importance of wholeness, and of the whole. This attitude came from a confluence of quantum physics, system theory, chaos theory, the theory of complex adaptive systems, biology, genetics, and other sources" (Alexander, 2004, p.15). Though Alexander emphatically praises and defends our powerful scientific understanding of the universe, which has flourished since Descartes, he felt it ultimately needed to be deepened, or modified, to deal with the bifurcation problem.

These similar positions held by Alexander and Team 10, informed by the bifurcation problem, lead (as we have seen) to some strikingly similar views. Where van Eyck rails against "the assaults of stratified logic by compartmental minds" (Woods, 1964, p.220) in his presentation at Royaumont, Shadrach Woods decries the terrible planning "that only the civil servant's completely compartmented mind can accept" (Woods, 1960, p.181) and Alexander laments the bad urbanism "born of the mania every simple-minded person has for putting things with the same name into the same basket" (Alexander, 2015/1965, p.33). Where Bakema insists that man must use his intellect and emotions simultaneously (Boyer, 2015, p.27), van Eyck stressed "the necessity of giving each articulated place a fuller experience potential in terms of intellectual and emotional association" (as cited in Lammers, 2012, p.61)[47] and praised a new avant-garde who "tore down the barrier...between outer and inner reality" (as cited in Deyong, 2014, p.229) and Alexander proposes a new world-picture in which "the connection between the outer or objective world and my experience of the self is profound and immediate" (Alexander, 2004, p.314). Where van Eyck advised to "[m]ake a welcome of each door, and a face of each window" (as cited in Teyssot, 2013, p.153)[48], Alexander claimed "I am trying to make a building which is like a smile on a person's face, and which has that kind of rightness about it" (Grabow, 1983, p.21)[49].

Conclusion

"*I myself would watch with extreme interest the work that Alexander is doing*" (Woods, 1964, p.423) – Ralph Erskine

As I believe has been demonstrated, there were many notable overlaps between the views of Team 10 and Christopher Alexander. Though Alexander would go on to greatly deepen – and to some degree change – his design theory over the coming decades, many of the key ingredients were already present at Royaumont. Equally, Team 10 and its individual members, though they still had a lot of new territory to cover, continued discussing the same core themes already present at Royaumont. The Web/Matrix idea, for instance, was an evolution of the previous Stem concept and not something completely new.

While at first it may have seemed to the reader that the limited interaction between Alexander and Team 10 would reflect divergent interests, the question might now be: why did both parties not have *more* influence on one another? Why did they not meet again or enter any collaborative projects? Why did they hardly acknowledge mutual influences or refer to each other's work? I think there are several plausible explanations.

Firstly, we have a clue in Alison Smithson's summary of the Team 10 reaction to Alexander's presentation. This was that Alexander should go on to build and thereby put his analysis and theory to the test (Smithson, 1975, p.677). This does seem to reflect Team 10 opinion (and not only Alison's). For instance, Colin St John Wilson spoke up about Alexander's work, being familiar with Alexander's thesis: he felt Alexander would only prove his case by going on to build and producing a successful result (Woods, 1964, p.423). Ralph Erskine also qualified his interest in Alexander's work by expressing a desire to evaluate the built outcome, though he felt that even a string of failures would present a valuable learning opportunity (Woods, 1964, p.423). There seems to have been a consensus that the proof lay in construction.

Alexander surely agreed that built work would be the true test of his ideas. In his time studying the village of Bavra, he did build a small school[50]. But it is true that at the age of only 25 he had almost no built work to his name. Therefore perhaps an older Alexander with building experience would have made a greater impression. Tantalisingly, the first opportunity to build on a large scale came along shortly before the meeting at Royaumont, but Alexander turned it down, because he did not feel confident enough in his knowledge to take on the responsibility. However there is every indication that this was not because he did not value building, but rather the opposite: that he thought it was too important to get wrong (on such a scale). In fact, throughout his career, Alexander was consistent in believing and claiming that one of the greatest threats to good design was to distance the designer from the site and the construction process. During his time teaching at the University of California, Berkely, he insisted that his students gain hands-on experience working on site and making furniture, something which "in the late 70s and early 80s, […] was not ordinary" (Kohn & Alexander, 2002) and even drew hostility from other professors (Kohn & Alexander, 2002). In his reception speech for the first- ever AIA Medal for research, he warned that: "Research, divorced from design, is almost always dry and lifeless." And that: "The only kind of research that I consider worthwhile is the kind that is carried out within the actual task of planning and designing towns and buildings, so that it is constantly being enriched by actual experiences and difficulties of the building task" (Bryant, 2014). Alexander admitted that it was the dismay over having to turn down the commission for the relocated Indian village which led him to the further research which culminated in *A Pattern Language*. This research occupied him and though he built and made designs throughout this period, he did not commit to any large-scale construction until about 1969, when he entered the PREVI Lima social housing competition by invitation. This competition pitted him against, among others,

the Team 10 members Aldo van Eyck, James Stirling, Kisho Kurokawa and the trio of Candilis, Josic and Woods. Alexander's entry did not win so only 14 prototype houses were ultimately built. It did however generate sufficient interest to create a split jury, with a minority of judges officially favouring the entry of Alexander as a worthy winner. This verdict was recorded in a minority report[51].

Indeed, it was not until after the dissolution of Team 10 that Alexander worked on his first and only truly 'large' project, the Eishin Campus in Japan. As Alison put it: "Team 10 are all builders by nature", as such they were clearly most comfortable judging real buildings and/or detailed design drawings. Real projects, planned or built, tended to be the focus of Team 10 meetings. Without a body of built work behind him and given his youth and relative inexperience, Alexander failed to make the strong impression he might have.

Another reason why Team 10 and Alexander failed to form a strong connection at Royaumont may be revealed in van Eyck's response to the city/tree discussion. Firstly, when he claims that: "As long as he [Alexander] doesn't know that [a tree is a leaf] he won't be able to make a house – he won't even be able to make a chair, and he won't know how to sit on it. I'm sorry for you. The poetic reality that you do [sic] is discarded if you think a tree is not a leaf". And later, when he responds to *A City is Not a Tree*, that: "Anyway, a city is no more a tree than it is not a tree. That goes without saying, hence also without Alexander's mathematics." Alexander's early approach to architecture was methodical, analytical and often abstract. He used his background in mathematics to try and reach the core of what architecture was about, returning to first principles. Clearly this approach caused some friction, not only because Team 10 members were "builders by nature" and thus more concerned with the tangible and concrete, but also because there was scepticism that such an approach could grasp the essence of design. On the one hand, van Eyck (and others) worried that a strictly rational approach failed to capture the ambiguity and multi-meaning of poetic thought and understanding. On the other hand, members worried that Alexander was using an elaborate method to justify what was already common sense, without any indication that it could be extended to solve truly complex problems. Alison Smithson for instance said she was "nervous" about Alexander's Indian village study because she felt she "didn't learn anything you couldn't in a geography book about India" (Woods, 1964, p.422). Peter Smithson also wondered if what Alexander had found was "just another tool" and suggested that while it may give the designer confidence, or a means of checking a design, it did not help with the creative act of designing (Woods, 1964, p.422). Van Eyck similarly suggested that while there are techniques and instruments that are undoubtedly useful to the architect and help them to "be accurate", there always comes a point where "[y]ou just have to jump" (Woods, 1964, p.429). Sooner or later the creative act must occur where the designer relies on their intuition to balance many complex design requirements. For van Eyck, although the use of techniques and instruments could prepare the designer for the 'jump', they also created the danger that the designer would postpone it for too long. Or, even worse, that the designer would convince themselves they could follow a method blindly and produce a final design without any creative input.

Of course, Alexander's approach was not entirely dismissed and was defended for instance by Colin St John Wilson and Ralph Erskine. Erskine pointed out that "from the way our discussions go backwards and forwards in the most extraordinary [sic] unclear way" it was clear that almost *any* sort of methodical thinking could help (Woods, 1964, p.423-424). Nevertheless the criticisms had some validity and in fact (once again) implied more difference between Alexander and Team 10 than probably existed in reality. As already shown, Alexander valued the importance of real building work over abstract theory and criticized CIAM rationalism similarly to Team 10. He also did not dismiss the validity of poetic meaning but came to embrace it. He did not claim that any great design could be created by following a formula and emphasized strongly that a good designer must always listen to his inner feeling. However it is fair to say that these positions only became clearer later in Alexander's life. It is surely worth

speculating that some of them emerged out of, or were influenced by, his experience with Team 10 at Royaumont. For instance, it is only after Royaumont that Alexander moves from the mathematical formulae of *Notes on the Synthesis of Form* to the more linguistic theory of *A Pattern Language* and *The Timeless Way of Building,* where he fully embraces the idea of poetry as multi-meaning. Also, there appears to be a definite link between Royaumont and *A City is Not A Tree* in which Alexander argues strongly for the importance of overlapping meanings and functions in the city, mirroring some of the Stem and later Web/Matrix thinking.

It is, of course, a much less black-and-white picture than Alexander entering Royaumont as a hard-nosed scientist and leaving as a spiritually- minded artist. In the same way that Team 10, though it heavily criticized CIAM modernism, never fully rejected it (and indeed came to defend it, particularly against postmodernism), Alexander continued to try to approach architecture as rationally as he felt possible. Even in his much later work *The Nature of Order*, in which he frequently uses spiritual language, he makes several attempts to define his thinking in strictly mathematical terms. He makes clear that he believes that the phenomena he describes, which create what he calls 'wholeness', can be understood in those terms. At the same time, already in *The Timeless Way of Building,* he writes a compelling passage about 'the quality without a name', showing that the essence of what we tend to call 'beauty' always eludes definition. Also, already as early on as the Royaumont meeting, Alexander was more conscious of the limitations of the computer and of numerical analysis than some architects are even today, saying that the deepest architectural problems are not solvable by "anything you can get out of numbers" (Woods, 1964, p.424) and writing an essay laying out these limitations not long afterwards (Alexander, 1964, p.52)[52].

Rather than the Royaumont meeting definitely changing Alexander's opinions, it is fairer to say that it influenced his not- yet- fully- formed opinions. Alexander saw it as perhaps the central intellectual struggle of his life to reconcile the dispassionate scientific worldview, which he thoroughly learned reading mathematics at Cambridge, with the personal and emotional experience of the world, which he felt played a key role in the creation of great art and architecture. Undoubtedly there was plenty of discourse at Royaumont to nudge him into this intellectual confrontation. However, it would surely have occurred eventually and Alexander rarely, if ever, acknowledges Team 10 directly as pivotal in his thinking.

Finally then, we come to one last possibly significant factor, which may have prevented close ties between Alexander and Team 10. This was Alexander's falling "off the radar screen", as Eisenman euphemistically put it years later. It was Eisenman's suggestion that Alexander fell into relative obscurity because he no longer had anything ground-breaking to say. Though the wide-ranging success of books such as *A Pattern Language* appears to negate this claim. Of course, if these books were only interesting to laypeople and not experts, then this claim might be valid, but they in fact inspired thinkers on the cutting edge of their fields (such as in software engineering). It is my contention that Alexander "fell off the radar screen" in architecture because the arguments he made became increasingly uncomfortable to many of the elite in the profession. Though Alexander never sought to defend any one style over another[53], his work increasingly vindicated many features of traditional architecture and construction. Features which were generally missing from examples of contemporary architecture, even by leading architects (or sometimes especially). These were not vague or abstract failings but practical and measurable ways in which such works fail to provide comfort and utility to their users. For instance many of these features can be seen to conform to one or more of the patterns in *A Pattern Language*, thereby solving the associated functional problem(s). At a deeper level they also often exhibit one or more of the 'fifteen fundamental properties' listed in *The Nature of Order*.

Though Alexander's debate with Eisenman was not until 1982, after the time of Team 10, the tension between the traditional and modern began to emerge much earlier. Alexander distinguishes in *Notes on the Synthesis of Form* between (generally modern)

self-conscious and (generally traditional) unselfconscious cultures and shows that unselfconscious cultures are better able to produce well-adapted forms. The criticisms of modern design at this point remain relatively mild. There is no direct mention of CIAM or modernism and the failings of some famous works of modern architecture are presented mainly as trade-offs: Mies van der Rohe's Farnsworth House is "marvellously clear" but "is certainly not a triumph economically or from the point of view of the Illinois floods" and "Buckminster Fuller's geodesic domes have solved the weight problem of spanning space, but you can hardly put doors in them" (Alexander, 1964, p.28). In *A City is Not a Tree*, however, some of the criticisms are already directed squarely at CIAM and modernists and they are more pointed. For instance, a city planned by tree-like thinking: "will cut our life within to pieces" (Alexander, 2015/1965, p.42). By the time of *A Pattern Language* he calls not only general problems of culture and planning into question, but many modern design practices, from the urban scale down to that of the doorknob, and from the planning system, to construction methods, to material choices, and even questions of detailing.

While Team 10 came to defend the legacy of modernism, Alexander continued to distance himself from it, neither did he adopt postmodernism, which, in one documentary, he suggests identified problems of modernism correctly (e.g. monotonous repetition and lack of differentiation) but tried to solve them in ways that are "utterly insincere" and "make you feel like death" (Landy, 2016, 12m 15s)[54].

17 Pictures comparing a pleasing form of alternating repetition (left) to the monotonous repetition (right) often found in modern buildings. Taken from *The Phenomenon of Life*

Thus Alexander soon found himself outside of any mainstream movement in architecture. He recalls in an interview that even as early on as the completion of his PhD he was "petrified. Because I'd made myself completely unemployable" (Kohn & Alexander, 2002). He clarified that he felt the problems he had uncovered made it impossible to contemplate working in a typical large architecture office, or even as a teacher, because "there's and [sic] almost unbearable tension between what you know and what you're asked to do" (Kohn & Alexander, 2002). Thus he was incredibly grateful to become a fellow at Harvard, which gave him time and freedom to pursue his own research. His fears were apparently not unfounded. For one thing, there was his heated clash with Peter Eisenman in 1982, who said that Alexander's PhD thesis "so infuriated me, that I was moved to do a Ph.D. thesis myself" (Steil et al., 2004). He also faced considerable hostility against his teaching methods at the University of California, Berkeley, so much so that he initiated a First Amendment legal case to defend his ability to teach. The case lasted seven years and eventually ruled in his favour (Kohn & Alexander, 2002). And later, when he was working on the Eishin Campus, a construction company reportedly offered the clients $80,000 in a suitcase to get him out of Japan (Permasolutions, 2012, 1h 16m 12s)[55]. The chief client for that project was beaten up and hospitalised by thugs (Alexander et al., 2012, p.291)[56]. Such anecdotes offer some

startling evidence of the passions which deeply held views on design can raise and the potentially massive real-world consequences, where the construction industry is concerned.

In conclusion, it is hopefully evident that Alexander and Team 10 shared important core ideas and even that they were mutually influenced in their directions of travel. Yet at the same time why they may have had relatively limited interaction. We may wonder what might have been different if both sides had maintained more contact and perhaps been able to find more common ground. Common ground which was sometimes lost behind superficial differences. This is arguably the case in van Eyck's dismissal of *A City is Not a Tree* and of "Alexander's mathematics" (van den Heuvel, 2006, p.104). Alexander was in fact defending the same kind of multi-meaning which van Eyck championed in other situations and attacking the same shallow rationalism which van Eyck and other Team 10 members dismissed as the work of "compartmental minds" (Woods, 1964, p.220). Yet the superficial difference between van Eyck's poetic and playful language and Alexander's rational and mathematical reasoning created an apparent schism.

Perhaps it was ultimately clear that the views of Alexander and Team 10 would become irreconcilable, since Alexander's criticisms of the modernist project were to become fundamental, whereas Team 10 remained on the whole sympathetic (if only to the core principles). Even so, however, it remains an intriguing counterfactual: how might architectural discourse have been different if Alexander and Team 10 had maintained links? Despite their differences, it is possible they might have presented a powerful united front against the rise of postmodernism. Perhaps it would have prevented the further ossification of the debate between traditionalists and modernists and dampened the infamous 'style wars' of the 1980s. A common ground between Alexander and Team 10 would have implied a common ground between traditionalism and modernism, which also would have reinforced the idea that functionality (in modernist parlance) or beauty (in traditionalist terms), exists independent of style. If certain empirical qualities produce better design, this stands against the postmodern view that all styles are broadly equal and that preferences come down to taste, which in turn shifts discussion from the realm of functionality into the realm of style. If there are no (or few) objective criteria with which to judge architecture, then debate about the purpose and function of architecture leads nowhere, because arguments cannot be tested. Beyond the basic function of shelter, architecture becomes largely a question of taste and of the stories one tells about it. In such a world, the 'style wars' are all that is left, since the only way left to determine who wins an argument is who shouts the loudest. It is clear that both Alexander and Team 10 stood against this.

We will never truly know the answers to these historical questions. What we do know is that the battle lines were drawn. By 1982, Alexander was accusing architects like Rafael Moneo and Peter Eisenman of "f***ing up the world". In 1984 Prince Charles delivered his controversial speech at the 150th anniversary of the Royal Institute of British Architects (RIBA), in which he accused a proposed extension to the National Gallery of being "like a monstrous carbuncle on the face of a much-loved and elegant friend" (Charles, 1984)[57]. Alexander found himself on the side of Prince Charles. He even ended up working with him. Thus he stood across a seemingly unbridgeable divide from the bulk of the architectural profession. But with all the finger-pointing and the talk of carbuncles on faces, what had happened to the deeper, subtler and ultimately much more positive discussion about how to make a building "like a smile on a person's face"? How many people deny that such a thing is pleasing? Who, indeed, is unmoved by the appearance of a field of flowers, a starry sky, a stormy sea, or a golden sunset? If we agree on such things in nature, which please us, why not in the built environment? Acknowledging that there are in fact discoverable qualities in architecture, which most people like, which can be measured, is something which, in theory, unites modernists and traditionalists. And as high-profile representatives of each group, Team 10 and Christopher Alexander represent a powerful question mark in architectural history of what that alliance might have been and where it could have taken us. Perhaps, in future, once the stumbling blocks of style and of superficial differences are removed, we can once again talk about great design based on

universal properties, which both modernists and traditionalists believe in (even if they cannot quite agree what they are). And perhaps then the place of Alexander and of Team 10 in architectural history will be reappraised.

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