Architecture and Space for Thought.

A Thesis presented for the degree of Doctor of Philosophy

by

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Volume 1
Main Text

The material in the thesis is organised into three volumes. Volume 1 consists of the texts. Volume 2, of the relevant illustrative materials that accompany Volume 1. And Volume 3 contains the twelve appendices cited in Volume 1.

Brunel University, Uxbridge,
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"Architecture and Space for Thought"

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ABSTRACT

This thesis is concerned with the description of individial experiences of (architectural) space in a social milieu.

Architecture, while considered to be primarily concerned with space as its medium, has a very impoverished (or occasionally, very contorted) verbal language in which to discuss space.

The author, as a beginner teacher, noted this in attempts to explore spatial experience with students of architecture, and resolved with their help to generate an appropriate verbal vehicle. The main body of the thesis relates this attempt and accounts for its failure.

The Thesis, thus, follows three intertwined streams.

1) A scientific investigation into means for the description of human experience of (architectural) space, using methods developed from Kelly's Personal Construct Theory Repertory Grids.

2) A partially developed spatial analytic language, my personalresponse to 1) above, which is to be seen as the start of a new research programme that may last many years (the future of which is outlined).

3) An account of a personal learning experience both from, around and through each of these.

These streams are organised into three parts.

Part 1: Background Studies - into work in associated areas and fields, with an assessment of their relevance to the undertaking presented here.

Part 2: The Experiments - attempting (and failing) to create a language, and the transition from verbal to visual, with critical arguments and observations.

Part 3: A New Beginning - learning from the failure of Part 2, and the argument for and commencement of a new research programme.

This thesis is dedicated to Sam Stevens.

"The end is in the beginning, and yet you go on."
Samuel Beckett, "Endgame" (1958).

Now will you help me with the final chapter?

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[1] Some of the Appendices are fully referenced in the Bibliography (Volume 1), but others are not. However, in the case of each of the Appendices a full reference will be found on their title pages.

ACKNOWLEDGEMENTS

Every time I read a list of acknowledgements, it seems to me to be a hedged list of potential omissions and excuses for making them. This is no exception, and I apologise for the inadequacy of this list in both its form and content. I don't know how I could mention everyone to whom I owe a debt in this work, even if I could remember them (you) all. So I start with the disclaimer that we all start with: if I have omitted you, I am truly sorry. Omission merely reflects my inadequacy, and all those who recognise their work, influence and ideas here are asked to accept that their own recognition is, in a sense, the best acknowledgement: for, in my opinion at least, the finest thing a teacher does is to make himself un-needed and unrecognised (and therefore largely forgotten) in the person he has taught.

But for my own benefit, as a way of, as it were, wiping the slate clean of this particular debt, I should nevertheless like to thank the many people named.

Firstly, all those who have been my teachers, who come in so many forms, from my mother and father Cecil and George, and step-father Rodie, to my son Severi! But, then, almost everyone is a teacher, and there are four who I would like to mention as formally occupying this role, by name. Firstly, there is my supervisor, Dr Laurie Thomas, who has put up with an irregular student whose irregular enquiries have often looked foolish but which, I trust, have finally borne fruit and are worthy of his attentions. Secondly, my former supervisor and now long-time colleague, Prof Dr Gordon Pask, who got me interested in the first place (and has since continuously nurtured that interest) in the academic way. Thirdly, there is my "Dutch Uncle", Prof Dr Gerard de Zeeuw, who has a remarkable knack of making the abstract appear real and reasonable, a skill I have lacked and yet often needed. And finally, there is Prof Thomas (Sam) Stevens, my dedicatee, about whom I can say little that is worthy of his magic. But that can't stop me, so I shall tell one anecdote: Sam it was who I overheard when I began as a student of architecture, giving what is still the only accpetable description of the critic's role that I have heard. He said that the critic does two things: he assesses the argument put forward on the grounds on which it is put forward (logic), and he questions those grounds when he feels offended by them (aesthetics). That opinion has served me ever since, and is just one example of how Sam can capture something complex and sophisticated in the clearest and briefest manner.

And then I should like to thank all those teachers who have been colleagues. I have been very lucky with those I have worked with. Not only have they been courteous and understanding, they have also been highly talented, and I have been lucky to be able to teach with and learn from them. They include, at the Architectural Association School in London Dr Grahame Shane, Leon van Schaik, Dr Dick Bunt, Prof Sam Stevens and Stephen Gage, and Dr Annetta Pedretti: and the staff of the School of Architecture at Portsmouth Polytechnic, many of whom doubled for me while I had leave of absence to write this thesis. And there are my colleagues on the newly founded "1.2 Project" ("Support, Survival and Culture") at the Subfaculty of Andragology of the University of Amsterdam, and my friend Janos Gerle. I am priviledged to have had the chance to work with such distinguished and generous colleagues.

Then there are generations of students who have tolerated my sometimes unusual approach to teaching and project setting, and who have supported me in my research by being willing participants and sensitive critics. Over the years there have been so many (and in so many countries where I have been invited to teach) that it would be impossible to list them. Without them there would be no experimental results, and there would have been no chance of proposing, testing and developing or rejecting ideas.

Similarly, there are the staff and members of the Centre for the Study of Human Learning, especially Dr Thomas and Dr Sheila Harri-Augstein, who have allowed my work to progress and whose own flow of creativity and imagination has remained an inspiration over many years. There are few places of which anyone can say that they have always enjoyed their visits, and always benefitted from the discussions there: the CSHL is one such, in my experience.

There are also those who kindly granted me access to sites in which my experiments could take place: for instance, the trustees of the Art Space Gallery, London, the committee of the Covent Garden Community Association, the vicar of St Paul's, Covent Garden, and the Bedford Estate, as well as those who provided sites for "demonstration runs" in, eg, Belfast. And there are those of my colleagues at Portsmouth - Dr Jonathan Sime, Dr Michi Kimura and Dr Chris Creed - who, as "proper" environmental psychologists have, as it were, allowed me access to that site, too, providing also encouragement, criticism and correction.

Finally, I wish to thank those who have given me substantive

support. The Architectural Association School, under its Chairman Prof Alvin Boyarsky, has allowed me the chance to run "wild" projects in which I had the chance to fulfil myself and that were not, I hope, merely self-indulgent: most of the experimental work described here was initially undertaken at and with the support of the AA. Portsmouth Polytechnic School of Architecture, under Prof Geoffrey Broadbent, has challenged me and given me the travel and experiential opportunities to develop the ideas I now have about space (probably quite unwittingly), and, through the offices of Prof James Powell (associate head of the School of Architecture), David Parham and Jay Potts (course leaders in the School of Architecture), Dean of the Faculty of Environmental Faculties, Dr Michael Bateman and Dr Harry Law, President of the Polytechnic, has given me the month off I needed to perform the major part of writing my material up in this form. And the Subfaculty of Andragology of the University of Amsterdam, under Prof Gerard de Zeeuw, has lent (= given) me the Macintosh computer and M/S WORD wordprocessor on which I wrote[1], as well as much other support, both general and specific.

And thank you Diana, Jo and Kiko, for things only you know about.

I am sorry to those who have been omitted but should not have been: all selection is arbitrary, but all omissions in the acknowledgements are mine and mine alone.

And so are all omissions and errors in the text. Mea culpa, and I am not ashamed of it!

Ranulph Glanville
Portsmouth
25.3.88

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[1] In preparing this document I have used a number of versions of this wordprocessor, including some test versions. This has lead to some strange page ejects that I have not been able to correct. Even consultation with the manufacturere has not lead to a resolution of this problem.

PROLOGUE

Author's note: this quote appears as an introduction in John Lilly's "Centre of the Cyclone" (Lilly (1972)), where it is stated that it is taken from George Spencer Brown's "The Laws of Form" (Spencer Brown (1968)). It is to be found towards the end of Appendix 1 ("Proofs of Sheffer's Postulates") of Spencer Brown's book.

Discoveries of any great moment in mathematics and other disciplines, once they are discovered, are seen to be extremely simple and obvious, and make everybody, including their discoverer, appear foolish for not having discovered them before. It is all too often forgotten that the ancient symbol for prenascence of the world* is a fool, and that foolishness, being a divine state, is not a condition to be either proud or ashamed of.

Unfortunately we find systems of education today that have departed so far from the plain truth that they now teach us to be proud of what we know and ashamed of ignorance. This is doubly corrupt not only because pride is in itself a mortal sin, but also because to teach pride in knowledge is to put an effective barrier against any advance upon what is already know, since it makes one ashamed to look beyond the bounds imposed by one's ignorance.

To any person prepared to enter with respect into the realm of this great and universal ignorance, the secrets of being will eventually unfold, and they will do so in a measure according to his freedom from natural and indoctrinated shame in his respect of their revelation.

In the face of the strong, and indeed violent, social pressures against it, few people have been prepared to take this simple and satisfying course towards sanity. And in a society where a prominent psychiatrist can advertise that, given the chance, he would have treated Newton to electric shock therapy, who can blame any person for being afraid to do so?

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* *wer* = man, *ald* = age, old. The world may be taken to be the *manifest* properties of the all, its identity with the age of man being evident through the fact that man is a primary animal with a hand ('manifest' coming from *manus* = hand, *festus* =struck). Thus the world is considerably less that the all, which includes the unmanifest, but considerably greater that 'the' universe (more correctly, than *any* universe), which is merely the *formal appearance* of *one* of the possible manifestations which make up the world.

To arrive at the simplest truth, as Newton knew and practised, requires *years* of *contemplation.* Not activity. Not reasoning. Not calculating. Not busy behaviour of any kind. Not reading. Not talking. Not making any effort. Not thinking. Simply *bearing in mind* what it is one needs to know. And yet those with the courage to tread this path to real discovery are not only offered practically no guidance on how to do so, they are actively discouraged and have to set about it in secret, pretending meanwhile to be diligently engaged in the frantic diversions and to conform with the deadening personal opinions that are being continually thrust upon them.

In these circumstances, the discoveries that any person is able to undertake represent the places where, in the face of induced psychosis, he has, by his own faltering and unaided efforts, returned to sanity. Painfully, and even dangerously, maybe. But nonetheless returned, however furtively.

G. Spencer Brown

FOREWORD

The work presented in this thesis has been in progress, at various paces and places, over the course of the last 15 years, and may be divided, loosely, into 4 periods. Three of these 4 periods are explicitly referred to here in the structuring of the main text into its 3 main parts (plus extensive appendices).

The first of these is familiarisation: with the area of constructivist psychologies and cybernetics, and of design research, and with the realisation that I had a problem in not being able to discuss clearly the main material of concern to architects as a medium - architectural space - which I was meant to be teaching to architecture students. This story is told in part 1.

The second was a period that, although it overlapped the first, may be thought of as distinct, for the purposes of this document. In it, the 3 experiments that are recounted here in specific detail were carried out, under various circumstances and on several occasions. This story is told in part 2. (Further experiments, as well as the 3 that are mainly recounted, are referred to in the appendices, but are considered secondary to the main argument as presented here.)

The third period is invisible. It is a longish period in which I was (actively) doing other things, of chewing the cud, and of seemingly idle dreaming (how often is a daydream productive!). There is nothing to report of this time: it is as if I was completely absent from this area of research, doing other things. But, during this period, ideas formed and formented, firmed up and fermented in the way in which they do, and the fourth period thus became possible, even necessary. This story is not told here.

The fourth period is the one I am still in. In it, I have found (and have needed to find) a different way in which to try to tackle my problem, one that is much more inward-looking and reflective. This period is represented by the story in the single chapter of the third part, which chapter should be taken as a start rather than an end. It may be considered as the beginning of a new and highly personal[1] research project that follows on from the failures

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[1] Especially in the sense that I am using myself as my own greatest resource, in the most introspective manner, relying almost exclusively upon my understanding of how I have come to understand....

recounted in the previous parts, and from what I learnt from them. Whereas what I recount in the first 2 parts might be largely familiar (although never previously co-ordinated in this manner) this part has not appeared in written form before, even if some of the ideas in it have been developed and presented in lectures, seminars and teaching projects[2].

These 3 parts, which constitute the first volume of the work are followed by two further volumes - the illustrative material, and the collection of appendices. The separate volume in which the illustrations appear is unusually organised. The reasons are two: I find it especially aggravating to have to turn backwards and forwards within one volume, looking for an illustration that cannot fit on the same page as the related text; and in the hope that illustrations of like material may be grouped together so that a better overview is presented. As for the appendices, mostly, these are publications prepared during the earlier periods, detailing larger ranges of experiments and giving examples, although there are a couple that have only just been written and are currently being submitted to the publication procedure.

The text is written, unusually for a doctoral dissertation, in a style that is informal, personal and chatty. I make no apology for the style in which I have chosen to write, but I should, perhaps, comment on it. The papers were, as I have indicated, largely extant before this text was commenced. Its role was, in essence, therefore, not so much to present new material (until part 3), but to compose old material into a coherent whole that was both attractive and sensible. It was my choice to do this in a very personal way, writing what I almost think of as a psychological detective story. I believe this is more interesting, informative and attractive to read than the story told in other modes of presentation would be, and I also believe that it is a far more honest account of what went on: for I cannot accept the traditional (and in my opinion, quite untruthfully misleading) position ascribed to the scientific observer as being external to his experiment. Especially in a study in a field in which the human is the concern, such as psychology, there is as much to be learnt from what and how this human (and every other experimenter) learnt,

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2 There is a generation of students at Portsmouth Polytechnic School of Architecture who still argue the toss over the notions of "+ ve, 0 and - ve space" (see chapter 10), which I introduced to them in the first year courses beginning 1980 and 1981, and which are central to the understandings developed in the third part of this document. See the later discussion, especially in chapter 11.

and how I can account for that, as there is to be learnt from the more formal results of the experiments themselves. The importance of this learning becomes apparent, even if it is not explicitly emphasised, in the last chapter, for the change in approach, and the difference in results (as well as the extra-ordinary fortuitousness and genuine good luck behind some of the sources) could not, I believe, have occurred had this whole process not been a profound and self-organised learning experience and adventure for me, and, equally, would be less comprehensible and, hopefully, valuable to the reader were I not to tell that (part of) the story.

Ranulph Glanville
Portsmouth
26.3.88

Architecture and Space for Thought.

ARCHITECTURE AND SPACE FOR THOUGHT

Introduction

INTRODUCTION

"Once we lose faith in the blanket formula of education, in the magic fashion in which education, using the passive capacities of children, is to create something out of nothing, we can turn our attention to the vital matter of developing individuals, who as adults gradually mould our old patterns into new and richer forms." ("Growing up in New Guinea", Margaret Mead (1942))

POSITION STATEMENT

There are many tasks that may be accomplished in an Introduction. For instance, in an Introduction an author can explain what he is concerned with and why, the approach he chooses to take and his method of working, and the general relationship of his work to other work in the field, the field in general and even other fields. He should outline the form that his presentation of his work takes, and can even be a little autobiographical! An introduction both sets the context of the work described and provides some sort of overview and guide.

In this introduction, I essay all of these, although not quite in the clearcut manner indicated above[1].

What I introduce is 3 areas and approaches that form the subject matter of this piece of work. They are:

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[1] IN GENERAL, I DO NOT LIKE , JUST FOR THE REASONS VICKERS (1983) INDICATES, FOOTNOTES, ESPECIALLY IN AN INTRODUCTION. HOWEVER, BECAUSE OF THE VARIETY OF BACKGROUNDS THAT ARE ASSOCIATED WITH THIS WORK, AND ALSO BECAUSE, ONLY IN THIS INTRODUCTION IS THE WORK OF SEVERAL PEOPLE WHO WERE ESSENTIAL PARTS OF THE CONTEXT WITHIN WHICH IT WAS CONCEIVED AND DEVELOPED MENTIONED, I HAVE DECIDED TO USE FOOTNOTES EXTENSIVELY: IN THIS CHAPTER TO ACCOUNT FOR THIS CONTEXT, ELSEWHERE, TO ALLOW AN (OPTIONAL) ENRICHMENT OF THE TEXT BY THE REPORTING OF THIS CONTEXT.

1) A scientific investigation into means for the description of human experience of (architectural) space, using methods developed from Kelly's Personal Construct Theory Repertory Grids.

2) A partially developed spatial <u>analytic</u> language, my own response to 1) above, which is to be seen as the start of a new research programme that may last many years, for which a future is outlined.

3) An account of a personal learning experience, by myself and others, both from, around and through each of these.

A SCIENCE OF PSYCHOLOGY

There are many different approaches to psychology, although perhaps not quite as many as there are psychologists! Most psychological discourse can rapidly be recognised as belonging to and espousing one of several distinct main approaches, usually referred to as schools. This text presents work that might be considered, perhaps, as another psychology from another psychologist, which, if it fits in anywhere in the general cannon, relates to the reflexive psychology of George Kelly and his followers plus R.D. Laing (1966), married to the constructivist approach pioneered by Piaget (1967, 1973), betrothed (almost) to the analysist-ic Adlerian approach to reliance on the self, and re-inforced and given backbone by the recent cybernetic approach to cognition and epistemology espoused by Pask, Beer, Maturana, Spencer Brown, von Foerster (to whose work Piaget

became much attached in his last years) and myself[2]. In turn, this derives both from classical cybernetics of Wiener (1948) and Ashby (1956) and from Wittgenstein (1971) (though not as appreciated by the Logical Positivists), and strongly moulded by the interactive, self-organisational inspirations of Thomas and Harri-Augstein (Harri-Augstein, Thomas et al (1977), Harri-Augstein, Smith and Thomas (1982), and, especially, Thomas and

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[2] This cybernetic work is characterised by its concern for the circularity of causality, and by the insistence on the unbridgeable distinction between the self and the other, especially as indicated in "self-reference". Thus, Gordon Pask ((1976a), but especially, and more movingly in "The Limits of Togetherness" (1980)), whose main original interest was the building of machines that could learn and therefore might be able to teach, has demonstrated that the means of our interaction is not the unidirectional causal chain, but the circular conversation, itself as much a part of the interchange as the "ideas" we are supporting, and that all those things that can be known (Pask, Scott and Kallikourdis (1975)), including ourselves, must be thought of as circularly formed - organisationally closed, but informationally open is the popular phrase; Humberto Maturana, of "What the Frog's Eye tells the Frog's Brain" (Lettvin, Maturana, McCulloch and Pitts (1959)) fame, working firstly with von Foerster, then with Francisco Varela and Ricardo Uribe, developed an account of the self-generation of living systems, where components (which can only be understood as such after the event) form into wholes which re-produce from within their environment both the components of which the whole is manufactured and the means of manufacturing - the procedure or organisation - referred to as "Autopoiesis" (cf "Allopoiesis") (see Varela, Maturana and Uribe (1974)), which, in turn, has spawned the more abstract musings of Varela (eg (1975)) in the area of self-referential and re-entrant logics, and the more socially based work of, eg, Luhmann (1986) and Beer - who worked with Maturana, Varela and Uribe in Chile in Salvatore Allende's tragic government - work in Management (Beer (1975)); and von Foerster's work on the Construction of Realities (1973), based strongly in Spencer Brown's (1968) logic of indications, and, most particularly on how self-regenerative systems (as beautifully described in the circular paper "Notes on an Epistemology for Living Things" (1976a)) can appear, externally, to have a stable and / or stabilising behaviour, and Eigen behaviour (1976b). It was he who invented the notion of the "Cybernetics of Cybernetics" (1974), of observing as well as of observed systems. My own research work lies largely in this field, and continues. Of works cited elsewhere in this text, the references (Glanville (1975) (1982) and (1987 a, b and c)) are, perhaps, of most immediate concern. My particular interest is in showing that, in order for any "normal" observation to be made, there must first be the observation of the self, and this is the form which gives identity (self-control), and is thus fundamental. A book of selected papers on this topic will shortly be appearing, in German.

Harri-Augstein (1985)). Ie, it may fall, possibly extremely unhappily, between several stools!

In many respects it <u>is</u> a story of failure: failure of method, failure of experimental result, even failure of the whole project (as it came to be seen). But, in this failure, there was much learnt, by me-the-experimenter, by experimental subjects and colleagues, and about the limitations of certain types of question and approach in the examination of human cognition. Most of all, I learnt that, if you keep your eyes open, you can learn a lot, frequently quite unexpectedly, from an experiment that does not do what you wanted: and that if you allow experiments (and experimental subjects) a certain life of their own, and watch what happens, you stand to gain. For, he who will know must take risks, and there is no learning without the risk of failure which, when it happens, may, nevertheless, be turned into a source of learning. Thus it is that this text records a history of (a selection from my) experiments, their failures and the successes that were (more often than not) accidental side-results: and it, therefore, naturally, records the development of <u>my</u> understanding - that is, the understanding of this experimenter.

I have explained, in the foreword, that I make no apology for this personal approach - for the involvement of my self as a participant in the experiment and learning processes - and I shall often write in the first person. Psychology is the study of (some varieties of) mental activity and mental activity is done by and large by people like you and me (I discount, on both experiential and theoretical grounds, the current claims for an

Artificial Intelligence: the structure of present-day machines, and their environments / sensory facilities, together with the instructional as opposed to self-motivational learning make a nonsense of this notion of intelligence as being anywhere but in the eye of the programming beholder. But this is another discussion. (See Glanivlle (1980) for an outline of my views.) Any proper study in psychology must include the observer in the experiment, for humans are, even under the most extreme of circumstances, not without interaction (Glanville (1987a), and to pretend otherwise is to take not only a very naive, but also a very unrealistic position. Equally, a scientist who does not learn is not a scientist. Asserting this, is not, of course, taking away in the least from the extra-ordinary achievements of scientists in the presentation of their concerns "qua Scientia". But, as Kelly (1955a) was so very fond of asserting (although in a slightly different context), we are all "personal scientists", and it is we who learn the truths of science and how to appreciate and manipulate them - including those entities of our social delight, persons.

In fact, it has been one of the substantial and profound contributions of cybernetics over the course of the last 15 years or so to make the position of the learning observer clear and respectable, arguing its necessity to the most rigorous of logical criteria, so that, now, it seems astonishing that any other position could have held sway: although, I suspect, it never did in the minds of creative scientists, who understood that the conventions of presentation used in science (as introduced in experimental write-ups at school, and required by the journals) are just that:

conventions (even prescriptions) of presentation (and not, as so many textbooks and popular philosophers of the scientific myth would have us believe, the actual content[3]). This means, in my terms, that we should appreciate Popper's (1963) position, for instance, as an assertion of what science should, or at least could, aspire towards (rather than what it actually is or how it actually is done, the social activity): we have Kuhn (1970) to thank for suggesting we look at what scientists do, not what they say they do, Lakatos (1970) for explaining the social reluctance of scientists to change (until a Thomian catastrophe makes it unavoidable, as I predict will shortly occur in, for instance, post-Chomskyian linguistics), and Feyerabend (1975) for making us question the special value and veracity we are prepared to give (above all others) to the scientific description of the world. All of which goes to support the argument I have been making for some time, that <u>knowledge is designed</u> (learning is a form of designing-in of new discoveries, for without designing them into what we already know, we merely have an unco-ordinated list of discoveries which is without coherence and, thus, characteristics such as constancy, prediction for action, etc): science is, therefore, properly considered as a branch of design (and not, as has been foolishly posited even by many whose work is referred to later, vice versa). This is usually seen, initially, as a rather surprising statement, but reflection gives it credence even when no further argument is presented.

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3 For an elaboration of my position in this matter, see "Why Design Research" (Glanville (1981)).

Thus, it is probably reasonable to say that my approach and interests have been much closer to those of the anthropologist of the "suck-it-and-see" school (as, for instance, depicted in the Introduction to Margaret Mead's (1942) "Growing up in New Guinea", where she claims she went into her study without a pre-ordained thesis to test, but rather to develop a thesis that might work) than of the conventional academic psychologist of recent times. So my "experiments" tend to be less concerned with testing hypotheses, as most scientific experiments are supposed to be, than with developing them so that learning can arise via them, for by and from myself. (Thus, I am at least in part my own subject, and, like - although not as rigorously as - John Lilly's medical professor, I carry out the experiment on myself (Lilly (1972)).) As a polarised over-simplification, I would claim that I prefer to do experiments in order to find out and generate ideas, more than to check ideas I've already had[4].

However, neither this introduction nor the work it introduces are intended as a philosophical discussion, even if philosophical assumptions can never be hidden far beneath the surface, and

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[4] This has been the cause of some (continuing) confusion and frustration between myself and my supervisor, who has often said to me that he is never sure what the purpose of one of my experiments is. This comment has caused me to think carefully and explicitly about what I have been doing, and the intentions behind it, and to formalise and assert this "anthropologist's" position (which I have checked to be accurate). In a sense, the view I champion here is somewhat old-fashioned, for it places enormous value on exacting, detailed and rather "cool" observation. However, it is still in use as a prime material source, in, for instance, studies of animal behaviour. The difference regarding my position, is that I use it to allow me to generate understandings, in myself, of myself and by myself, that I may test and then correct, and then account for as an experience: ie, in my explicit and expounded internalisations. But the essential "ambiguousness" and "openness" of my aims does, indeed, remain, and is one feature of this work that I consider to be important and a source of both learning and interest.

should never be forgotten or lightly dismissed (failure to appreciate and continue to take cognisance of them may make this appear a very strange document!) Rather, this is the record of a voyage of discovery and of the learning that resulted, summarising work that I have carried out over the last 15 or so years, since I first explicitly studied cybernetics and discovered I was also doing, without cognisantly or intentionally either realising or intending it, quite a lot of psychology.

THE VOYAGE AND THE VOYAGER

The sea (and, to me it was a very stormy ocean in which I felt myself becoming a progressively smaller boat) through which this voyage took place was architecture. I should explain why, for it was architecture, and my relationship to it, that caused the initial problems that were to generate the work described here to surface; provided the environment and the experimental subjects; taught me about design (and led to me studying cybernetics); and has remained mysterious and enchanting enough still to keep me entranced with what I would generally claim is its existence-beyond-the-utterable. Without architecture I doubt that I would have acquired the particular interest in psychology that I developed, or that I would have approached it as I did (and still do): nor would I have discovered the discipline that I was taught to apply to the imagination, and the value of this application, during my (continuing) studies of cybernetics, or have been able to see design, as I have indicated above, as an activity of great and general value in its own right.

When I studied architecture (which I did for my first 7 years of post school study), the "world" seemed a very different environment to the rather grim and conformist one we currently inhabit. Architecture students were led, for instance, by the Utopian dreamings of Buckminster Fuller, the cartoon fun architecture of Archigram, the scandalously off-hand and "respectless" approach of Cedric Price, and the belief that technology could master everything (a view largely encouraged by NASA's moon shots and the simplicity and apparent universality of the (quark) model in Physics, which seemed to finally solve the "problem" of matter). And they survived in the aura of hippy happenings where anyone and everyone could do everything and anything, felt an optimistic megalomania - in the benign interpretation that architecture was, and could achieve, everything - that now seems truly astonishing, but which allowed me to pass through architecture school doing the very minimum necessary - and always late - in the way of what would now be recognised as "architecture" itself.

Instead, I composed music, and performed with my own (one of the earliest live-electronic and mixed media) and other bands. Indeed, the current Chairman of the School I attended (the Architectural Association School in London) still chooses to introduce me as the student who got a diploma in architecture for writing electronic music, largely by frightening the examination committee out of the room before they could pass or fail him, because of the volume and audiousness of the concatenated noises presented at the examination. Thus, I got through and left architecture school with little more

understanding of the main concern of architecture, the generous creation of space, to provide "Commodotie, firmnesse and delighte" (as $$Sir Henry Wootton put it in his English translation of Vitruvius), than the average layman. I had scraped through with the minimal possible contribution, in an era when the maximum was often minimal, usually achieved through use of the most mechanistic devices of organisation, in the manner publicised and supposedly (though not actually) used by Maldonado and the Ulm School, to be realised in the Braun collection of commestibles that grace our yuppie designerly (and to be photographed) homes to this day.

Given this unlikely start, it was hardly surprising that I did not wish to face the tedium (as I then imagined it) of working in the conventional architect's office. I was too much a "free-thinker", and, in my own arrogant yet naive mind, "important" - or, worse still, "significant" - ask my employers from my student days. Instead, and rather to my surprise, I discovered I was studying for a doctorate in cybernetics. (Architecture, to this day, provides a very good general education, and a remarkable number of people, trained as architects, have turned out to be very good at something else, including the novelist and poet Thomas Hardy, and the mathematician-composer Yannis Xenakis). But much more surprising, even, than this, was that I was invited to teach architecture.

In teaching a field, it seems to me you must, necessarily, also be a student of the field and of your own students, at least if the field is one of those creative fields which cannot effectively be

taught by lecturing instruction and blind example. (I believe, ardently, that nothing should be taught in this manner.) And so, through no active effort or intent of my own, I found myself with a second chance to study architecture (at a rather better rate of pay than I had had through my student grant).

I soon found that there was this mysterious substance, previously unknown to me, that architects, in the dusk and confusions of the '60's, were beginning to talk about again, and about which I understood in an architectural sense virtually nothing at all. Yet I was expected to teach in the company of those who at least claimed they did understand this substance, which was SPACE. My first response was to find methods of controlling arguments, and ways of hiding ignorance, so that I could pick up on what was being said without loss of face, claiming all the time that it was my own (which technique I still find useful and exploit to this day, most recently with a builder about a conversion job): my second, to try to find a means of discussing space - a vocabulary - so I could make this material I neither understood nor appreciated tangible. Of course, I failed: and it took me a long time to discover why and to try to do something about it. But it was also the beginning of the voyage that I recount in this text, a voyage which, like almost everything else recounted above, began by accident and led to unlikely places and discoveries. Serendipity has served me well and with great generosity, and its kindness to me may help explain the slightly open, laissez faire attitude which I have tried to explain, and which I clearly have to experiments, experimental subjects, and the growth of knowledge, at least in comparison to some.

I stated that I in no sense apologise for the autobiographical non-exclusion of myself from this account. I have introduced my belief that experiments and science are enlightened by the presentation of the circumstances in which they happen. Without taking these positions, and in the light of the above, I believe it would be very hard to understand the why of the investigation, and its methods, from which so much else of my work comes, and related to which so much else of my work is.

PSYCHOLOGIES

Nor am I embarrassed by the way in which I have approached the field of psychology, with more than a little something of the naive innocent: for psychology was never a subject I studied, or even considered studying, at undergraduate level, but is rather something I happened upon when I found myself doing it. As I have already indicated, I believe there is a lot to be learnt from the "anthropological" method, when used in psychology, of just watching, allowing mistakes to happen so that they may be learnt from. However, this is not the full story. There are carefully considered reasons both for the way in which I have proceeded, and my attitude in discarding or ignoring various approaches to psychology that I shall argue I find are neither concerned with nor methodologically appropriate to the examination of areas of creativity - the making of the new (and unpredictable), and of novel behaviour. (I do not argue that there is nothing in the manipulation of architectural space that is controlled by habit, or the irrelevance of the trusty solution to

the standard problem: that is, rather, a convention of description with which I do not find myself particularly concerned.) The work described here is, however, particularly concerned with the elicitation of means of communication of individual mental models of a substance, architectural space, (which I believe to be sharp and precise, as I believe all thoughts to be exact: their inexactness comes from their presentation for communication in a social and public domain) that, while it is accepted as existing, has not to the best of my knowledge, been explored, in a psychological sense, experientially and as a material to be formed in the design process, but, rather, has been dealt with either in a private jargon that reflects the academic preoccupation of the author concerned (usually closely related to another area of study), or in terms not of its own qualities, but, instead of its enclosure. This latter is rather like talking about wine in terms of the bottle it was in instead of how it tastes[5].

Thus, the concern is with the novel: both in terms of creativity, and in terms of approach to that, and that it is the (individual) experience of this is to be described. Which, naturally, renders certain approaches unsympathetic, counter-productive and / or irrelevant.

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[5] The analogy I present of the relationship between wine and its bottles is, I believe, reasonably good: for there is also interaction, and we know a lot about either from the other. Vide Claret and Burgundy! Clearly, the form of an architectural container or focus has much to do with the experience of the space. My point is that it is not just the container that matters, and, even, that a case should be made for "positive discrimination" in favour of space.

In particular, for example, my work is singularly devoid of statistical analysis, for the simple reason that statistics concerns itself with blurring the precision of (ie fudging) the individual and particular, to create an overriding general social account (it is mega as opposed to micro), whereas I am interested in each individual and particular in all its precision and in its own right. The types of "truths" unearthed in statistics (and also in the use of fuzzy procedures), no matter how useful in certain circumstances, are exactly not what I have been or am today searching for.

Nor is the type of model presented by Behaviourism and other mechanistic psychological approaches[6] which treat external sign as being either devoid of or isomorphic with internal process, of any help, for, although I am interested in behaviour (eg the design of spaces), it is not the major concern of this work, which is better referred to as the cognitive models used by individuals in exploring and perceiving (architectural) space (in this context, design may be seen as the process by which an exploration and perception of a space that has not been experienced by anyone else before can be admitted: the first experience any of us has of any space is substantially the same as the experience the designer has in discovering, through creating, his space, as an experience, which is not quite the argument about representation, or the difference between synthesis and

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6 I have no problem with mechanistic approaches, even in psychology. The problem, here, is to do with the relationship between the cause and its expression, to use another way of putting it. The assumption that they are identical or that one doesn't exist seems to me to indicate a very weak understanding of the whole tenet of Wittgenstein's "Tractatus Logico Philosophicus" (1971).

simulation that Frank George (1971) presents. See, for exemplification, the assertion of von Foerster concerning the inappropriateness of the term "representation", when "presentation" would do better). Such a concern has, clearly, little to do with the input / output paradigm of Behaviourism, even though such a mechanistic model (ie, the Black Box) has, as I have shown (Glanville (1982) , considerable power in accounting for and justifying several activities including design, amongst other things.

Neither are such models as the highly symbolic (and causal) ones generally used in Psychoanalysis of much help to me[7], for they are concerned with the interpretation of whatever cognitive model we may be presumed to have in terms of a (universal) other by means of the (assumed) universal symbolism, and the development of (failures in) such a personal model that may be accounted for within these terms: whereas I am concerned neither with symbolic interpretations of whatever models there are, nor their growth, development, or pathologies. Should there be any (symbolic) interpretation, I would rather it came, reflexively, from the experimental subjects themselves, and of their own volition, than the experimenter: my concern is, as would be expected from a cybernetician, with the form rather

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[7] Although Carl Gustav Jung used his general theory to develop more than a mere written formulation of "Man and his Symbols" (1964) in the building of his own, and highly (personally) symbolic house, and Gaston Bachelard took his notions of "The Poetics of Space" (1969) to a considerable symbolic level in his image of the house as a type of allegory for the (human) body and the first room experienced as the key to all further experience of rooms and spaces which many architects have found attractive and even seductive.

than the content. (Cyberneticians are currently very concerned with systems that are informationally open, but ORGANISATIONALLY CLOSED. What they look at is the form and the consequences of this closure: the information, being open, is of less concern, for it can be more or less anything.) And I don't imagine any reader will seriously consider that either a physical / physiological approach, or one based on taxonomies of given classes will recommend itself for the tasks reported here, when opposed to the attempt to generalise classes from individual cognitive models, without loss of initial individual distinction and precision).

Thus do I justify the position I presented myself as taking at the beginning of this introduction, falling as it may between too many stools, as reflexive, constructive, conversational, formal, individual: as an approach that takes on board error, failure and mistake because of a concern with learning, no matter how it comes about or where and of what it happens. In many ways, I see this as being an approach that has more in common, as I have indicated, with that of an anthropologist, even in his guise as an urban geographer, than that of a psychologist, although I notice a change that I take to be a growing maturity in psychology, making it more like anthropology than, perhaps, it once appeared. In the introduction to John Lilly's "The Centre of the Cyclone" (1972), George Spencer Brown makes this point with great precision and elegance.

ENVIRONMENTAL PSYCHOLOGY

I have not, so far, mentioned the burgeoning field of what used to be called Architectural and is now called Environmental Psychology, which, one might imagine, should be of direct relevance to this study. I do not wish to go into extended detail here (an old, but nevertheless still relevant paper on the topic of the limits of Environmental Psychology can be found in Appendix B, and my current impressions of the topic, together with a full explanation of why I find it to have short-comings for what I am attempting, is summarised in Chapter 2), but I must at least outline in this introduction why it seems essentially to have little to offer to my undertaking. This becomes more significant since it relates forcefully to the positive choice I can be seen to have made in avoiding that variety of the scientific investigation which is appropriate when variables have been isolated and confirmed, in which experiments are arranged so that only one variable is changed at a time, but which is irrelevant in the actual isolating of such variables (should there be any) except when and insofar as the psychologist's sole concern, as the artist's in analysing works of his predecessors can only be, is with finding out how <u>he</u> sees things, <u>himself</u>.

To start with, there is a problem of substitution: of report for experience; of 2 dimensions for 3; of one medium for another. This is due, at least insofar as it is a limitation in the work described here (and therefore also in the work of others, specially in Environmental Psychology), to the need in the scientific as well as the practical scheme, for the repeated availability of identical material (this is not the place for a discussion of this tenet: see von Foerster's "On Constructing a

Reality" (1972) for a terse account of the weaknesses of this approach). For example, I used a primary experimental research resource in the first experiment I recount, slides of a building. But slides are clearly a report (by the photographer) of an experience, which is a substitute for the experimental subject having that experience, just as slides give a 2 dimensional presentation of what should be a 3 dimensional object (I assume time is present in both cases, and so does not enter the equation!) and use a a medium (colour film, white wall, dark room, bright projector, no tangibility, etc) that is quite different to the medium of experiencing the subject of this record and presentation, itself. (In the case of my work, a building as space and object.)

Then there is the problem of what to examine - what can be considered as the variables. When Environmental Psychology discusses perception and perception in architecture, it does not begin to confront the medium of architecture - space - but deals with easily isolatable and identifiable objects positioned in space (such as coffee table position, pitch of roof). To introduce the metaphor I shall use throughout this work, the discussion is of the bottle, not the wine!

I accept that not to talk about the bottle but rather the wine is, currently, difficult: even architects, speaking amongst themselves, do not manage it well. But Environmental Psychologists naturally bring with them their own tools, and conceptual framework, and these are not necessarily helpful to architects. One way in which they are not really helpful is that

the findings of Environmental Psychology are descriptive, but to make them useful they have to be treated as prescriptive. Yet the whole basis of making architecture is the generation of the new (and hence, before its generation, the unknowable), whereas Environmental Psychology (and any other descriptive field) requires the ready existence of the object, sos that when it is used prescriptively it presumes precisely what is, as yet, not known (the old difference between analysis and synthesis, and Mill's (1843) problem of induction in scientific method)! And this is not the only way in which the aims and assumptions made in Environmental Psychology, no matter how valid in their own terms, are not necessarily in sympathy with those of architects or architecture. For instance, as I shall describe the central activity of designing - a conversation with the self over the topic of the developing building project via a pencil and a piece of paper - is not an approach accommodated in Environmental Psychology, which has, until very recently, been concerned with gross and mass measurements, and not with the reflexive, inward, subjective approach that is essential if talking about design as I have been doing (although, fortunately, there are reflexive psychologies, even if they have never considered architecture and architectural space).

Finally, the approach of Environmental Psychology to the construction of its field of knowledge and expertise is essentially the partition of wholes into atomic parts that can be assembled to reconstitute the whole. This approach has been used with outstanding success for centuries in science, but all attempts to treat design (including architecture) as a science has proved to

be a failure. One of the discoveries presented here indicates that our perception of space is of a whole, into which we invest detail (was that crack in the room that we have just noticed there before, unnoticed, or has it just appeared: and how can we decide this). I believe that this approach, of wholes being enriched, is not only a matter of our perception of architecture and architectural spaces, but is also how we design through our conversation with ourselves via pencil and paper. Here is a case of the old adage of systems theory, that the whole is greater than the sum of the parts, being, if anything, too weak: the whole is distinct from the sum of its parts, and a part is a whole in a role.

THE FORM OF THE PRESENTATION

Finally, it remains for me to outline logic behind the form and content of this essay. But, before I do that, I should explain the existence of 3 separate volumes.

These volumes are this text, the illustrations referred to in the text, and the collection of appendices. I have kept these as separate volumes as a response to both the sensible division of material, and also my experience, gained over the years, of the intense frustration I often find in having to turn pages to look up appendices and illustrations that have already appeared elsewhere in the text, and trying to read the text when the relevant illustration is nowhere near it. In providing the material in 3 volumes, I hope to make the difficulties of correlating different elements easier, rather than to provide a main volume and 2 annexes. And I have also attempted, in the volume of

illustrations, to so organise them that, where there are diagrams of arguments in the main text, the diagrams may, by themselves, make a sense of their own when looked at in their volume.

Returning to the text (in this volume), the remaining text is divided, as already shown in the list of contents, into 3 main sections. The 3 chapters that immediately follow this introduction are concerned with setting the scene. In order, they provide and introduction to Space and Architecture, with a short history of architecture as it has been told, and an introductory discussion of spatial concepts present (which became apparent to me after doing most of the experimental work described), as well as discussing how the concept of space became articulated as <u>the</u> major concern of architects: an expanded version of the section above, in which the sort of things that Environmental Psychologists and others working in related fields have and have not done, and their values are discussed: and a summary of what my problem was, both as it appeared at the time, and as I see it in retrospect, with the benefit of hindsight.

The middle chunk consists of 4 chapters. The first 3 describe a selection from series of experiments I carried out, using as subjects (partially because of availability, partially because of their position between layman and architect, and partially because of their willingness and inclination to investigate and learn) architecture students. What the experiments were, why and how they were designed, how they succeeded (or, more often, failed) in their aims and what else was learnt, is summarised in a chapter on what went wrong and why it did,

including a statement of the origins of my current position. In some respects, the reader may be surprised that these are so relatively short. There are 3 reasons that I should like to give. The first is that they are presented as key experiments that summarise the results and findings of many more experiments, without needing over-lengthy explanation and elaboration. The second is that they are discussed (with many of the other experiments that were omitted from the main text) at greater length in several members of the collection of papers (of mine) reproduced and presented as appendices to the argument. The third is that these experiments, and the development of the thinking behind them, relate to several distinct fields (as discussed in the first main section) - and presenting and clarifying the relationship (ie relevance and helpfulness) of these several fields to the main area of interest, necessarily requires the introduction in greater detail of more material covering a wider base (and, thus, not being straightforwardly directable at the expert) than is, I believe, normally the case. This is, of course, a well recognised difficulty in inter (and intra) disciplinary studies, and represents the anti-productive difference understood as existing between the approach of he that is thought of as a "generalist", and his "opponent", the "specialist".

This is followed by an "interval" chapter in which I recount some of the interesting and valuable spin-offs that have occurred as a result of the necessary development of techniques and ideas, and the exploitation of opportunism, as explained in the main text.

In the final two chapters, and the penultimate is rather longer than the others, I describe where I am now, and how I am attempting to describe architectural space as a phenomenon that I experience, instead of trying to access (verbal) mental models of others and forcing them into a social milieu, together with some analyses, and indications of the use of this approach in design projects that I have set my students, based on these understandings. And I discuss the future: what work may be carried out, what may be expected of it, and why it has the peculiar characteristics that I believe it has.

There follow usual bibliographic references. And, as I have said, the illustrations referred to in square brackets - [ ] - in the text by reference numbers of the form A.2.iii - where the A refers to the section, the 2 the group, and the iii the member of the group - appear in a separate volume, Volume 2, with the Appendices in Volume 3.

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Portsmouth

28.3.88

ARCHITECTURE AND SPACE FOR THOUGHT

PART ONE:

Background

ARCHITECTURE AND SPACE FOR THOUGHT

chapter 1

SPACE AND ARCHITECTURE

CHAPTER 1

Space and Architecture

"A satisfactory History of Architecture has not yet been written, because we are still not accustomed to thinking in terms of space, and because historians of architecture have failed to apply a coherent method of studying buildings from a spatial point of view." (Bruno Zevi "The Language of Modern Architecture" (1983), quoted in Dahinden (1984).)

BACKGROUND

A first-time visitor to a school of architecture may be a little surprised should he stumble upon a student presenting his design work for assessment by his teachers. This surprise will, initially, be caused by the means of assessment used (an open public criticism or review of the work, in character not unlike a doctoral viva), but it is likely that at least as much surprise will be occasioned by the topic and language of the debate, itself. For, as well as questioning buildability and durability, practicality of planning and safety, legality and finance, social contribution, effect on the surroundings and whether the proposal will give generously to the client, user and community, he will most likely hear much mention of the term "space", often followed by gesticulations and expressions of which "Y'know what I mean?" (almost always an assertion, rhetorical question or command) might be considered a rather articulate exemplar.

Architecture is not synonymous with building, for otherwise we would not need two words and we could not talk of, for instance, computer architecture: and while, for many, architecture has

always pre-supposed or at least entailed building, (the more especially in the rather entrenched and inward-looking atmosphere of today) for some architects building does not come into it. There are, as well as academics - teachers, historians and critics, many of whom do not practise - architects whose practice is almost entirely theoretical (who range from the Italian fantasist Piranesi to, more recently, the New York 5), and, alternatively, those who see architecture as an approach and discipline that can solve problems in a way that other disciplines cannot, often either without reference to building at all, or advising as to whether or not a building is a solution to some particular problem (eg Cedric Price). Thus, architecture and building should not be seen as synonyms, for the purposes of both my own involvement and, more importantly, in as far as the work described here is concerned.

Given this position, it is clear that it is not my intention, here, to debate the value of various, assorted views of architecture, although it is important that it is understood, from the outset, that, in this context, architecture is NOT to be taken as being synonymous with building - indeed, there is no primary concern, here, for building per se at all. So that, apart from a craftsman-like approach to the act of designing and a professional status and its consequent obligations and responsibilities, that which sets the architect apart from the builder is seen, here, to be his major concern - space - which is, if you like, the medium and material of architecture. Not even the act of design, no matter how fascinating (and I have examined both the actuality of design and its theoretical basis in some detail) is central to

architecture in the manner in which space is, for designing is a general and universal activity, one of the great techniques for problem (re- / dis-) solving, which happens to be applicable in the field of architecture.

It is this centrality of space in architecture (viewed, naturally, in architectural terms, as opposed, for instance, those of geometry or physics), and the happy interdependence of the two which are often agreed to be virtually mutually indistinguishable, that makes space the vital medium for architects, and therefore a good material to study. This is not to say that I disagree with the limitations of this amalgamation, or that I become worried by the interpretation that is given to architecture, in a different context, by such as Price, with whom I am usually in agreement. But, in my case, the need to (begin to) study the "spatial" view of architecture when I began teaching the subject which I recounted in the Introduction was all the more urgent, since I had failed to notice its potential, let alone its centrality, as a student being educated at a time when, in a progressive architecture school, anything went (and I made sure that meant ANYTHING).

THE DISCUSSION OF SPACE

The understanding that space is central in architecture is not new, and yet there is neither a good nor an established and generally accepted language within which to discuss it. (Hence the "Y'know what I mean" statement quoted above.) And, in some peculiar way, it is only just recently that the centrality of

space has become articulated as an explicit, studyable topic in critical works concerned with architecture.

Nevertheless, there is no doubt that architecture, throughout the ages, has had as a primary concern the medium and material that is, and is subsumed / constituted under the term "space". The classical Greek temple, for instance, is so arranged that it is a central and generative point, creating a vast space from and around itself (you could participate in a service or celebration as long as you could see the temple), and great attention was paid to its exact location within the landscape or townscape for exactly this reason, although reading many of the classic critical and historical works you would have no inkling of this, for they confined themselves to a discussion of (historical developments of) proportion, order and, occasionally, plan and symbolism within each age or style in architecture [A.2.i to iv, H.2.i and ii]. (There is, in effect, no inside public space in the Greek temple for the ordinary population: the building's interior is accessible, through an entrance at the back, only to the very few initiates who form the priesthood. In this respect it is profoundly different to the general notion that we have today of a religious building, be it temple, synagogue, church or mosque, in which the ceremony and worship are performed within the building. I elaborate and better demonstrate this point in Chapter 10.)

In fact, the change from a public architecture that was concerned with the building generating (or capturing, depending on the landscape) a spatial field around it was broken in what we refer to, over-simplistically, as the European tradition by the Romans,

for it was they who first covered over this public space, and brought it within the building. Thus the major public space in a Roman sports arena (such as the Colloseum) is contained within the building itself, and the walls project the space inwardly, from the walls to the centre. As a matter of interest it is worth noting that the Colloseum had a retractable roof, thus further emphasising the containment of the space [H.3.i].

And yet, in spite of the general acceptance amongst architects that what they handle is space, and discussion in architecture schools both at reviews and in tutorials, which is full of reference to the term space, it was rare, I repeat, until recently, to find critical and historical discussions of architecture in which space was given more than passing reference. Even Vitruvius (1914), commonly (though incorrectly) held to be the author of the first book, or rather, series of five books, on architecture ("De Architectura") does not discuss space. His requirement is that good architecture demonstrates, in the words of Sir Henry Wotton's late C17 translation (re-published in facsimile as Wotton (1969)),

> "Firmnesse,
> Comoditie
> and Delight"

(ie, consistency and coherence, convenience and comfort, and pleasure). His books are concerned with proper proportions and the elements to achieve them, planning layout and drainage, etc., rather than space. (Compare this definition with 2 of Le

Corbusier. The first is concerned, as is Vitruvius', with everything except space

> A Modern Architecture should be characterised by:
> Piloti,
> Roof gardens,
> Free planning,
> Horizontal windows,
> and freely designed facades.

(Le Corbusier (1927), in the classic "Towards a New Architecture: a curious translation of the French original, "Vers une Architecture". Most of these ideas were expressed in the ideal "Domino House" [H.15.i].)

In contrast, the second reflects much better my concern in this work, (although it is still more concerned with the container than that which is contained)

"Architecture is the masterly, correct, and magnificent play of forms brought together in light." (quoted in Broadbent (1987))

AND THE NON-DISCUSSION OF SPACE

This second definition of Le Corbusier's (although it pre-dates the first) is much more in keeping with the pure concern of architects, and with the recent attempts made by some critics to discuss architecture in terms of space. (Such discussions are usually either almost unreadable due to the use of opaque and,

arguably, unnecessarily obscuritan jargon, - eg Porphyrios ((1982a), (1982b), (1985)) - or evasive in that space, its qualities, interpretation and meaning, are nevertheless dealt with in terms of some other substance, such as Jungian universal symbolisms, or sign theory alias semiology (see, for instance, the collection in Bunt, Broadbent and Jencks (1980).) But it remains the case that there has been but small development in the the precise discussion of architectural space: most of the distinguished critical effort has concerned itself with other things.

This can, perhaps, best be described by analogy to the world of wine tasting. Wine tasters and others concerned with identifying, blending and buying drinks have a fairly extensive private language - including actions - of some idiosyncracy (at a certain whisky blending plant, according to a Radio programme broadcast some years ago, one of their descriptions of a notable smell is "green bush", which refers precisely to the scent of a particular plant that is just outside the whisky blending and distilling building), in which they discuss their beverages, with such success that they can often communicate to others who speak their language just what to expect of a wine previously not tasted. In contrast, architectural criticism concerns itself not with the wine (space) at all, but with describing the attributes of the bottle (building fabric) that contains the wine.

For instance, the noted and distinguished critic, scholar and cataloguer (almost county-by-county curator) of English architecture, Nikolaus Pevsner, from whom every schoolchild

studying in the architecture section of the old A level art examination first learnt architecture and architectural criticism, discusses an "Outline of European Architecture" (Pevsner (1963)) almost exclusively in terms of stylistic periods. Styles are made up of proportional and decorational - and sometimes planning - systems which retain a coherence and identity of appearance that allow the categorising together of various (grand and public) buildings which have occurred in various places over a definable period of time, and which, probably, show both some sort of development and local variations during that time. Pevsner (and most are like him) is not interested in space, but in the sculpture and proportions of the walls, and the dramatic sweep of roofs surging, symbolically, upward toward the heavens (Gothic Cathedrals), and this pre-occupation allows him to entirely miss the point I made above about the difference between Greek and Roman architecture. Indeed, for Pevsner, Roman architecture is seen as an architecture practised by engineers (the Romans as builders of aqueducts) with poor and clumsy appreciation of the principles of the Greek style: ie, Roman architecture was a regression from the fine, delicate and elegant perfection of the Greek. Yet, in spatial terms, the Greek may be seen as the culmination of one period which would include, for instance, the Egyptian Temples (which have, if anything, an even more private interior than the Greek Temples, and which generate enormous spaces and spheres of influence out into their surrounding desert), while the Romans created a revolutionary new beginning, exploring a totally new type of spatial appreciation that occurred within the building fabric itself.

Nor is the approach by recourse to style that I have personified, above, by reference to the work of Pevsner the only medium that critics, theorists and historians invoke. Returning to the Gothic style / period as a centre of focus, we can find examples that epitomise two of the other main substituting media used in place of space: technological development, and reflection of socio / cultural / philosophical ambience / mood.

SOME OTHER NON-SPATIAL CRITIQUES.

The technological approach is magnificently presented by Frankl (1946) (1960) in which he argues that the development of the forms of the buildings of the Gothic (Cathedrals) was determined by the inquisitive nature of the master builders as they began better to understand the structural performance of the forms possible in the materials available (largely stone, brick, glass and timber), and, later, to celebrate this in displays of structural virtuosity unparalleled previously in Western Architecture. Thus, the architecture is seen as consisting of an expression, in built form, of the understanding of structural principles of the master builder [H.8.i]. (The most extra-ordinary examples of this expression of structural virtuosity are found in the late English Gothic referred to as Perpendicular[1]. As part of the work

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[1] The Perpendicular is a style unique to the English Gothic, and is best exemplified in the Royal Chapels (Henry VII at Westminster Abbey, St George's at Windsor) and Royal Collegiate Chapels (Eton and King's College, Cambridge). Other examples exist in which it was used for the renewal of parts of older buildings - Gloucester Cathedral, for instance, contains a wonderful history of English architecture from about 1050 to about 1550, embodied in stone and glass. The style occurred between, roughly, 1450 and 1550. It may be of interest to note that the commonly accepted cause of the origin of the Perpendicular (and the cause of its uniqueness to England), was the Black Death, which killed off all the master builders. A new

required recently in restoring the chapel of King's College, Cambridge, it is said that the engineers computed that there was absolutely NO way that the structure, as built, could stand up, given their models of the structural performance of materials. Such was the fineness of the understanding of its master builders, the latest of whom, Gaudi [H.10.i], actually suspended strings and weights, to model his Sagrada Familia upside down.)

The other approach cited is epitomised in Erwin Panofsky's little book "Gothic Architecture and Scholasticism" (1957). It is of no importance, here, that contemporary scholars nowadays consider Panofsky's understanding of Scholasticism and of the content, intent and mechanism of the Scholastic Method to be entirely wrong: what matters is the pattern making that Panofsky attempted (and in which Norberg-Schulz (1974) has followed him).

Panofsky's thesis was that the architecture of a particular period must reflect the general thinking (or thought schema) of that period. This is not a very surprising notion, for we do talk about art objects as being some of the consequences of, and reflecting, a particular cultural background at a particular time. However, as far as I know, Panofsky was the first to explore the relationship between the "philosophical context" and the buildings created within it. Panofsky's particular endeavour was to show how the

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generation was left without continuing oral and apprenticeship traditions, but with experience of building simple rectanguloid buildings, such as halls, and the examples of the preceding late decorated Gothic: so they built elaborate halls with lots of daring decoration when they built their churches.

great Gothic Cathedrals were embodiments in stone of the Scholastic system of "world construction", ie reflected the (theological / philosophical) views of the times and the manner in which philosophers (priests) considered the world to be organised, which was according to the so-called "Encyclopaedic System" (all-containing and reflecting God's Holy Order, and not as currently embodied in our alpha-numerically organised reference books). Thus, for Panofsky, buildings are literal expressions or embodiments of these ideas. So he analysed Cathedrals into Trinities (both vertically and horizontally - see the plan [H.7.iii] of Amiens, which Panofsky used as an example, and try it), and demonstrated an encyclopaedic structure in the symbolism, positioning and organisation of the elements (including decorations) of some of the great French Gothic Cathedrals. In "Gothic Architecture and Scholasticism", architecture is seen as being philosophy in stone (although, as I have indicated, Panofsky's interpretation of Scholasticism is nowadays taken to be severely misdirected).

In both of these cases, the essential medium and material of architecture, space, is scarcely mentioned at all. Just as in the style approach of Pevsner, architecture is seen as being constituted in the qualities of its shell, and not of the space thus made: the discussion is still of the bottle and not of the wine.

I believe that these discussions have a value of their own, and do, indeed, tell us much about the architecture described. But it is <u>about</u>, about (some of) the (minor) constituent parts of architecture, about parallels, and is not the architecture itself.

These critiques highlight important areas associated with architecture (and its production, embodiment and culture), but they miss, and possibly even intentionally avoid, the central substance. And it is with this substance, and how and whether it can be described and appreciated that I am concerned.

VIEWS OF STYLE.

Although only as an aside, views of style deserve a short discussion here. The view of style that I attributed above to Pevsner is only one view, as a moment's reflection, or a look at the dictionary will confirm. The word has as its root, according to the Oxford Reference Dictionary (Hawkins, (1986)) the Latin "stylus", which refers, as does its present day use in English, to a long pointed device for making marks on some surface, such as a pen nib. In architecture it usually takes on the historian critic's meaning, although the meaning intended in the phrase "in-house style" is almost as important. I often use the word to denote a meaning at once more personal and, paradoxically, more general: more personal in that it refers to each particular person as particular, more general in that it refers to a (possibly socially shared) private general problem solving strategy (or solution) that permits the concentration upon one part of a complex problem while maintaining the confident assumption that other parts will, nevertheless, be soluble, either through the use of ready-made solutions, or because room has been left, in the approach to the problems already solved, for further solutions to

different problems[2]. Naturally, this adumbrates the historian critic's meaning. The origins of this more personal and more general definition of style lie with a group of three of us, teaching Architecture at the Architectural Association School in the mid 1970's - specifically, Stephen Gage, Thomas Stevens and myself (Gage, S, Glanville, R and Stevens, T (1975)).

ARCHITECTURAL SPACE AND VERBAL DESCRIPTION

It is not my intention to discuss the importance of space in architecture, or its strange omission from mention in critical works, in this manner at any further length at this point in my text (this is effectively covered in Chapter 10, where it forms a major part of the main substance of the Chapter). But, because it is important that the centrality of space in architecture is understood and accepted from the outset, I have allowed myself the freedom to at least introduce the areas, albeit in a very simplistic and limited manner, for they constitute both the background and a major part of the study of the work that is reported here. For, as stated in the introduction, in all my time at architecture school as a student, I had never realised the centrality of space in architecture, and to what architects manipulate and create that distinguishes them from builders.

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[2] It should be stressed that the relationship of these various problems is not necessarily one of scale: it is not, necessarily, a matter of fixing the site location, and then working out some plan, and then adding in the fixings, ending up with detailing and scheduling the door furniture - the relationship is not linear, moving from the general to the specific, at all. Often the site plan will come first. Equally, a door handle may be developed and assumed in later designs, thus preceding the site plan in a new job. The important thing is the ability to slip between the so-called levels, solving the various, interlinked problems that occur at each of them.

When, at last, I did, I discovered that there was no way of discussing it, of giving names and verbal representation to the substance of space itself, or the qualities that were attributed to it in the knowing yet inexplicit phrases of the architectural crit, "Y'know what I mean."

And so I undertook to explore, largely with my students, how we appreciate and perceive (architectural) space, with the intention of finding what I thought of as a common, shared verbal language, at least within the group who joined in the exploration. And, in all my innocence, it never once occurred to me that it might be that the reason almost no one talked about space, the reason, indeed, they talked about everything else but space, was that, (unlike the wine) space is very difficult to talk about: the built fabric (the bottle) is much easier to describe, thus leaving the space contained to become apparent and tangible through the skilled inferences of the experienced. (The difficulty of attaining this is recognised in the length of an architect's training in the UK, which is at least seven years: one of the particularly difficult skills to be acquired over this period is the ability to "read" drawings, by which is meant to be able to imagine the quality of the 3D space in the building through interpolation from several 2D drawings of the containing fabric. Many architects, some of them even teachers, never acquire this skill.)

Thus, I started with a material and an aim: to explore how individuals understood this material - architectural space -, and to find a shared common language within which this group could discuss their experiences: a problem of perception, but much

more of cognition and representation - two areas that I was pre-occupied with and exploring, without really being aware of it, in another field (cybernetics, eg Glanville (1975)), and in a much more abstract and theoretical way.

And, in order to help me in my search, I consulted psychology. Specifically, I was introduced to and looked into reflexive and conversational psychology (as represented, for instance, by the work of George Kelly (1955a, 1955b), and as proposed and discussed at Brunel University in the Joint Cybernetics / Psychology seminars organised by Gordon Pask and Laurie Thomas). And, naturally, I also looked into the burgeoning field of Environmental Psychology, which, I reasoned, might provide me with models and background in my search.

CHAPTER 2

Environmental Psychology

"By weighing, we know what things are light, and what are heavy. By measuring, we know what things are long and what short. The relations of all things may thus be determined, and it is of the greatest importance to measure the motions of the mind. I beg your Majesty to measure it." (Menicus (ca 335 BC), quoted in "Mental Maps", Gould and White (1974).)

BACKGROUND

It might seem that a subject that goes under the name of Environmental Psychology should provide a rich pasture in which to browse, for someone with my interests, problems and concern. But this turns out, unfortunately, not to be the case. In this chapter, I shall explain why this is so, and introduce the sort of psychology that appears to have the potential to be of greater relevance and value than Environmental Psychology (and was therefore used as a jumping off point) for the work I was undertaking.

Any attempt at an overview of a field is bound to distort that field, and it is, of course, extremely dangerous to attempt to summarise, under even the very best of circumstances, a particular field of study. This is even more so when one ends up providing a critique that explains the essential irrelevance of that field to a study that looks as though it ought, at first sight, to be within the scope of - or, indeed, even ideally suited and applicable to - that field. In the case of the study presented here, and Environmental Psychology it is, however, not, quite so dangerous

as might be expected, for the difficulties arise from differences in concern, as demonstrated in their two distinct basic and in principle approaches. However, I nevertheless undertake this foolhardy and dangerous act fully cognisant of the risks involved, and hoping that what I have to say will not appear to be either arrogant or lacking in respect for a field that has different values of its own. It is just that its values are not the values I am looking for: its aims, assessments and interests are different from mine and have a different origin: and I shall argue, by isolating these characteristics, that the fundamental irrelevance of that work to what I am undertaking here becomes quite clear[1].

ENVIRONMENTAL PSYCHOLOGY

The Hawthorne Study

The best place to start is often the beginning. Conventional wisdom often maintains that Environmental Psychology originated with the "Hawthorne Study" (see report in Roethlisberger and Dickson (1939)), frequently taken to be a model of experimental method and the articulation and expression of social psychological concerns. This study was of working conditions in a factory, and in particular, of the effect of lighting levels on the workers' comfort and performance, as measured by their productivity output. The hypothesis was that an increase in lighting level (up to a certain point, at least) should produce a corresponding increase in productivity resulting from the (luminous) increase in comfort in

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[1] This point is agreed by a number of Environmental Psychologists with whom I have spoken and who have read sections of this text.

their working conditions. This hypothesis was, in its turn, based upon the idea that there was an absolute comfort standard of lighting level that humans aspire towards, and that increases in lighting level towards this absolute comfort level would, because of the increase in both the workers' comfort and their morale, make it easier to see the job to be done and, therefore, less tiring to do it, thus increasing performance as measured by output (ie in terms of articles produced) because it became easier to work. Equally, at light levels above this absolute standard, output would drop off, because of glare resulting from too high a level, resulting in visual discomfort or disability (the two distinct types of glare that are recognised in the lighting sciences).

The hypothesis and conditions assumed, and the experiment that was carried out caused, at the time, great excitement, being hailed as introducing an important new branch of psychological endeavour and study, which became known as, firstly, "Architectural Psychology", and, more recently, "Environmental Psychology". This new field would contribute to our knowledge of the environment's role in conditioning our behaviour (and help us work more efficiently, thus increasing profits). However, perhaps there would not have been quite such a stir, had it been generally realised that the hypothesis had not been proven!

For what occurred under conditions of the experimental tests was exactly not what had been predicted by the hypothesis. Instead, it was discovered that, as the light level was increased, performance did not vary at all significantly when taken over a substantial time span. While there was an immediate improvement as lighting

levels were raised, this soon dropped off back towards the levels of output previously experienced. It seemed that common sense was to be denied.

In the end, it was the assumption of absolutism that was found to be lacking. The human response to light level is not directed towards what may be defined as an absolute preferred level. Rather, humans adapt to the ambient level they work at, becoming conditioned to it. And, the Hawthorne study showed, while their performance does improve as the lighting level is raised, it soon levels off and then dips back to the performance level that existed prior to this lighting increase until another increase is provided. These increases can be continued more or less indefinitely, for the glare threshold goes up, too (actually, there is a convergence of limits here, so that finally, in the long term, increases do lead to problems associated with difficulties caused by both types of glare. But the result nevertheless stands: as the lighting level is increased, performance improves and then dies back towards its former level as the new, higher light level is accommodated. (This effect is now widely known, for, as a result of this mechanism, the standard level of lighting expected for the comfort of the workers in work places increases every year, roughly requiring a doubling of lighting level every ten years.)

Why introduce this example at such length? The answer is not because of its inherent interest, nor because of its place at the initiation and as the foundation of Environmental Psychology. Rather, it is because it so clearly demonstrates the assumptions and aims that were present from the beginning of Environmental

Psychology, and which, generally, continue up to the present day. And it is these assumptions, to a great extent although not exclusively, that make the work done under the aegis of Environmental Psychology of little relevance or help to my work.

The Assumptions

What, then are the assumptions made, and the aims and interests expressed in the Hawthorne study? And what other assumptions and aims are to be found that are fundamental in Environmental Psychology, and which lead me to largely discard it as a source, example and inspiration? I think I can summarise them as follows:

a) That it is possible to divide up the experience of the environment into the experience of a number of uniquely and absolutely distinct and fixed factors, and that our experience is made up of the summation (however attained, and by whatever mechanism) of the experience of these factors: that is to say that the determination of variables that are accepted as existing in some a priori sense (ie, the lighting level is significant: we experience the environment through the summation of our experience of the lighting level and other salient variables).

b) That such variables are absolute and immutable, and that they can be assigned values that are also absolute and independent (ie, the lighting is the lighting is the lighting level, and nothing affects ur experience of its value except the lighting level itself). Thus the value of such variables is susceptible

to objective measurement, and such measurements have meaning in terms of the way we experience the environment.

c) That changing one variable independently from any others, will lead to a unique change in the experience and appreciation of the environment as expresses through quantitatively assessable environmental performance, and that such change may legitimately be made in isolation from other variables, because our appreciation of the environments is effected, in the first place, through these individual variables. (Note, however that designers know, through experience, that it is very rarely possible to change one variable independently of others, and that a change in anything leads, inexorably, towards a change in everything.)

d) That performance, assessed in terms of a measurable variable - in the case of the Hawthorne study, of productivity - is an adequate expression of the experience (in this case, the comfort and delight) of the human both in and of the environment.

e) That the effect of our understanding of our existence in the environment should be of immediate (and assessibly measurable) use: by understanding how, for instance, light affects performance, we should be able to increase performance (ie, productivity). Ie, the criterion is <u>(instant and immediate)</u> USEFULNESS[2].

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[2] This assumption is in sharp contrast to that indicated in the quote, in the Prologue, taken from George Spencer Brown's "The Laws of Form" (Spencer Brown (1968)), and also quoted in Lilly (1973). See also Glanville (forthcoming).

f) That any effects of changes made to the environment are properly expressed through the medium of social consensus and agreement rather than individual appreciation, and that uniform social behaviour, which is the expression of such social consensus and agreement, is indicative of a communal experience, appreciation and understanding of the environment by all individuals (ie, the interest is in the universal behaviours, not the individual conception).

g) That human experience can properly be measured, assessed and presented in a meaningful manner by reference solely to observable behaviour, and that there is no need to be concerned with the congnitive processes of our mental images and accounts of and valuations placed upon such experiences. The interest is that of the behaviourist rather than the cognitive psychologist, and excludes all but behaviour from consideration. (Of course, this accurately reflects one of the great curses that American psychologists, in spite of the work of Kelly (1955a) (1955b), continue to cast upon the study of psychology (see, for instance, Skinner (1972) and compare it with Pask 1980) and (1987)). It is interesting, in this light, to wonder how any sense can be made of behaviour, or how it can even be observed to be behaviour, without there being some cognitive process and evaluation by which to make that distinction, in the first place.)

h) That the obvious hypotheses (for instance, variables, predictable behaviours) are viable assumptions the central importance of which should be re-inforced and supported, and

that the research that should be carried out should be intended to support them (or, at worst, deny them only locally[3]). Thus, the Hawthorne study never questions whether the approach or the "obvious" (to whom, and why obvious?) variables should be assumed to have any significant value: rather, they are considered as undeniable and self-evident elements of a "true" global view, open to negation but not to the charge of irrelevance: the humble approach of developing an hypothesis to explain and account for what is observed and in order to discover what is significant, through observing and questioning, is not considered, the arrogance of the presumptively general view being preferred.

Space and Environmental Psychology

Apart from these limitations, there are also two further concerns exhibited in the sort of research carried out in conventional Environmental Psychology that make it of doubtful value and applicability for designers of spaces, and for the consideration of architectural space that is my concern, here.

Firstly, the interest expressed is in the user and his performance. This is quite reasonable, but is not of much help to those whose concern is with designers. The question of design, of how things come to be and come into being, and of how any discovery emanating from psychological studies such as Hawthorne may be used and integrated into the wholistic design process is never discussed or even considered. Ie, this is a case of evaluation after

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[3] By deny locally I mean that some individual point may be rejected, but the overall view should be maintained.

the event, rather than suggested integration into the creation of the event. (This is a very real difficulty, and leads, directly, to, for instance, the design scientist's complaint that designers never learn, and pay no attention to all the useful things that design scientists have done for them, which is counter-balanced by the designer's complaint that the scientist confounds and overloads him with facts that are formulated in a manner unsympathetic to the actual activity of designing. It is also the case that an assessment of a particular environmental design does not help a designer by telling him how to improve his designing: it only tells him whether what he proposes may or may not be not acceptable.)

And, secondly, the concern is not with space, but, in contrast with almost anything but space[4].

Another Example

A fuller example that supports this last statement can be found in a useful summarising introduction to Environmental Psychology by Canter (1974) [E,1.i to iv]. In this example, experimental subjects are invited to decide which of 4 sketches is of the most

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[4] This point is confirmed in discussion with Environmental Psychologists. Sime (1987), himself a product of the major UK Environmental Psychology factory (University of Surrey) reports, in verbal communication with me, that on one occasion he felt obliged, at a conference, to get up and ask when anyone was going to talk about the environment, about design, about space and architecture, so little is this considered. However, the field is changing slowly, becoming both more "designerly" and more reflective and reflexive in the sense in which Kelly introduced these notions into psychology (Kelly (1955a) (1955b)). By a similar token, the account I give, here, of Environmental Psychology is a little unkind and out-of-date, but it does reflect the state of the field that pertained when I was carrying out my experiments in the mid 1970's.

friendly room, a consideration that might be presumed possibly to owe something to the spatial qualities of that room.

However, this experiment is, effectively, rigged, for not only are the subjects told what they must decide in terms of (in this case, friendliness, when any other quality might seem to them to be more appropriate), but also the experimental material is presented in a manner such that only very tiny range of variation is covered in the most blatantly obvious and prompting way (ceiling pitch, furniture arrangement), so that the subject is directed that he must make his judgement in terms of these factors: this, in turn, is said to demonstrate both that these factors are relevant, and that they do indeed have something to do with friendliness. But this experiment produces no evidence that this is really so in any conditions other than those in terms of which it has been highly restricted, which, it can thus be seen, only really supports the views of the experimenter because it exists in the experimenter's own highly controlled and restricted universe, not allowing for the existence of any other views! And it is the experimenter who has decided that what matters is the ceiling pitch and furniture arrangement (and has chosen how they are to vary): which selection may or may not be "right", but which clearly has nothing whatsoever to do with architectural space, preferring instead to deal in isolated element variables, presented through a highly edited, fixed viewpoint, 2 dimensional linear image of a supposed 3 dimensional spatial reality. The experiment is not concerned with space, at all, but only with so editing the possible range of responses that the experimenter's assumptions (ie, that ceiling

pitch and furniture arrangement affect the friendliness of a room) and the ideas behind them must almost certainly be confirmed.

The above paragraphs, characterising (some branches of) Environmental Psychology through its set of assumptions and operations, aims and interests should make it clear, I believe, how so many studies carried out within the area (at least in those branches of Environmental Psychology for which my characterisation is adequate), are rendered essentially irrelevant and counter-sympathetic to the concerns that I am trying to confront. And they are so irrelevant not because they represent bad work, but because it is in and of the desired nature ascribed to them to be so. Nor can recent changes and refinements in technique overcome the basic philosophical differences in concern, no matter how much they move towards softening the approach and taking the less obvious and more ephemeral into account, or how they attempt to accommodate the more cognitive approaches of psychologies that interest themselves in individual differences: to hope for that would be to hope that careful blending would actually turn tea into coffee, or, more closely to my earlier metaphor, water into wine.

OTHER APPROACHES

Not all of Environmental Psychology can be properly characterised according to these conditions. There remain at least four other approaches that may be considered as part of the field. And, although none turns out to be ideally and particularly helpful to

us, they should be introduced in this short survey, for more reasons that just completeness: they also have their nice points!

a) The first of these is the approach of the Urban Geographer, particularly his concern for Social Schemata and Mental Maps of Urban spaces.

b) The second is the Orientation in the Urban Landscape approach of Planning Theorists.

c) The third is the Symbolic and Psychoanalytic approach of Jungian psychologists.

d) The fourth is the Semiotic approach culled from the study of Semiotics, and probably prompted by developments in literary criticism. In this category I also include the approach to spatial understanding and description through literature, although this may possibly not be a happy conjunction.

Urban Geography

For some years now, Geographers have concerned themselves not only with the projective measurement and mechanical representation of space on the surface of the earth that we are familiar with through cartography (see Glanville (1980b), in Appendix C), but also in the difference between such mechanical projections of space and other representations of space that better reflect individual spatial experience and valuation, ie in the productions of maps based on individual mental models generated

from individual personal spatial schemata[5]. This work has usually been carried out in towns and cities, probably for three main reasons: the density of population and hence the possibility of comparing different schemata presented by individuals living under similar locational conditions; the fact that there tend to be recognised social groupings and problems within urban environments that are frequently attributed to specific environmental factors, thus making research programs eligible for funding that examine local perceptions of such environmental factors; and, finally, the simplicity of creating comparable individual maps where there is a firm, regular and detailed cartographic base onto which to project the individual mental maps that define personal spatial schemata (which there is in towns, the more especially so where the town is built on a grid-iron plan). See [E.2.i to iii and E.3.i to iii].

There are a number of techniques that have been developed for the extraction of personal mental maps, and these, in turn, have been seen as being indicative of, for instance, areas of desirability and danger, and known and unknown areas within a city's fabric, together with social sharing (eg, ganglands). In some cases, major social theories have been based on concepts deriving from mental mapping processes (eg Wilmott and Young's (1950) epoch making notion of the communal social space, defined by shared physical edges for all inhabitants of the community and, consequently, remarkably akin to a ghetto, in East London - a finding fortunately, to my mind, no longer universally supported by more

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5 For an extremely lucid overview, see Gould and White's (1974) "Mental Maps".

recent work in the field). In one experiment I carried out with art students in Belfast, but which I have not formally reported, I discovered, perhaps not surprisingly, that mental maps of Belfast could be used to determine which of 3 groups - ardent Catholic, ardent Protestant, and mild "agnostic" (fortunately the majority) - the students belonged to just by looking for blank and unconnected areas within their mental maps[6].

Such work is fascinating, and does at least permit that individuals may evaluate and image a "common" area differently (so differently that one is left asking, on occasion, how the supposedly "common" area can still be considered to be so). But the scale of the space dealt with is far outside that which is normally the architectural designer's concern, and, in spite of discussions in architecture about so-called "urban rooms" (and, indeed, rooms in gardens), the nature of the city as a source of material, and the social intentions in the research are not really those of the architectural designer concerned with making spaces (albeit that users of cities may be thought of, in some senses, as designing their own (uses of the) city). And, in these studies, the spaces are evaluated by users, not by designers, and the editorial / selective design that the users do is not really quite the same design activity as that practised by architects.

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[6] Some examples, together with my own original work, may be found in my PhD Thesis (Glanville(1975) [E.4.i to v]). It is interesting to contemplate, here, just what we would have to learn about orientation and mental maps of spatial perception if we were to look at how the Melanesians (and until recently Polynesians too) navigate the open seas, or the camel drivers the Sahara and the Aborigines the Australian outback on their songlines during their dreamtimes (eg Chatwind (1987)), or how the old Finns could navigate the mid-winter forest at night (Mead (1968)). There we might find examples to assist our understanding.

Urban Landscape

However, although the idea of making urban spaces (including rooms) is an age-old one and has long been part of what architects consider as their realm, they have only recently been prepared to examine it extensively and with appropriate scholarly care. In particular, Kevin Lynch (1960), in "The Image of the City", has proposed a perceptual model of orientation, progression and spatial appreciation in the city, based on avenues, landmarks, focii, etc.. In his analysis, he argues that successful cities are constructed around such elements, which the contemporary civic designer must, therefore, keep in mind (if his urban design is to be successful both as a compositional entity and as a place which can be used with simplicity of orientation - often termed transparency - and joyous delight by inhabitant and visitor alike), by both hooking into existing urban elemental compositions, and making similar compositions of his own. There have been other similar studies (Cullen (1961) particularly springs to mind) of urban composition (including much detailed work), but , again, they fall short of what is being looked for: partially because of their urban scale, but also because of their tendency to be prescriptive in much the way that the Hawthorne study was: the theorist has some ideas, formulates them and explores them through this formulation, checks them out and then presents them as a (prescriptive) recipe for success.

Symbolic Psychology

There remain 2 other main approaches. The first of these I shall refer to as the symbolic. Although Jung is the origin of this approach (which becomes delightfully apparent in "Man and His Symbols (1964)), it is probably clearer to refer to Bachelard and his highly influential book "The Poetics of Space" (1969). In this book, Bachelard posits a metaphor for dwellings, extending Heidegger's notions of living and dwelling (1975). The metaphor is the human body, with the attic as the head, and the psychological identification of personality with the room of birth. I find this sort of work very hard to appreciate or accept, for I cannot go beyond the images that seem to me both preposterous and pretentious[7]. This is, undoubtedly, a weakness on my part (and I know many who I respect and who value this sort of approach). Thus, I am not really in a position to argue for or against this work: all I can say is that I find it so uncongenial and distasteful that I find I cannot consider seriously it at all.

Semiotics

The second approach I find nearly as difficult. It is the Semiotic approach. In a sense, my difficulty with this approach is similar to that I have with the symbolic, but, in this case, I find the arbitrariness of interpretation distressing, not in the sense in which de Saussure (1966) espouses the arbitrariness of linguistic attachment, but in the attachment of meanings, most of which

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[7] And I usually find the language ponderous and opaque.

seem mainly to convey a dark, Freudian picture more of psyches of those who attach them than of the spaces themselves! For the semiotic approach (see, for instance, Jencks and Baird (1969) and Bunt, Broadbent, and Jencks (1980)), when applied in architecture tends not towards the structuralism that has hit literary criticism (see, for instance, Kermode (1975)), but towards another very symbolic interpretation of meaning[8]. However, having said that, I should note the more literary interpretations of the experience of architectural space[9]. One of the first in recent times was by Hanson (1976), who compared the quality of spatial description in the writings of Thomas Hardy (who was, by training, an architect) and Jane Austin. Her analysis is largely concerned with two areas: the detail and specificity of place description[10] - which she shows to be very shallow in Austin's case compared to the richness of Hardy - and the social significance that may be attributed to places and the actions that are staged in and at them in the novels. But this, again, is not an examination of space and our experience of it per se, but rather of space as the location for the staging of

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8 I, in fact carried out a type of linguistic analysis (based on the grammatical structure, and the propensity of locality and spatial cases) into the relationship between Finnish language and Finnish architecture. This was, however, a much more formal examination that the other works referred to. I am not at all sure that the analogy drawn has any continuing value, but it was an interesting project to undertake, and helped me, as I now see, understand in a very preliminary and imprecise way some of the ideas that form the basis of Chapter 10

9 This is an approach that is eternally popular with architecture students in their major piece of critical work, and many of the best explorations of this approach have been by students whose work is only readily available in the departmental libraries of the schools where they studied for this piece of work.

10 The relationship between space and place always presents difficulties, and I shall not try to resolve them here.

other things, the qualities of which events the spaces are then imbued with[11].

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[11] I accept that my rejection of these latter two approaches is less than scientific, and is not rigorous, but I find myself so put off by them, and so unable to give them a fair examination, that I feel I must admit it and allow myself to discard them, at least for the time being. I recognise that the failing is mine, and regret it.

WHAT TYPE OF PSYCHOLOGY MIGHT BE SATISFACTORY?

If these various efforts at constructing theories in different branches of what may be thought of as Environmental Psychology do not satisfy our requirements, the question follows as to whether there is any psychology that will help.

In attempting to answer this question, it will be helpful here to list just what the requirements being called for are, for it is in these requirements that the answer, should there be one, lies. (The requirements are, naturally, largely the converse of the items on the list of assumptions, aims and interests of Environmental Psychology already introduced above.)

What is required is:

a) A psychology that supports learning (including learning by the experimenter), through the construction and modification of ideas and their relationships, rather than one that is based in testing ready assembled hypotheses (ie, an open and reflexive psychology, in which the experimenter is recognised as an active participant in the experiment).

b) A psychology that is not concerned to blindly perpetuate its own pre-determined valuation of its aims, assumptions and interests regardless, but is prepared to consider how these are of relevance, benefit and appropriateness to the subject in hand. A psychology that is open and undecided, as opposed to one that is certain it already knows what it is dealing with and how to do so -

that it has the answers. (This is almost akin to saying a psychology that works like anthropology.)

c) A psychology that is concerned, in the first instance, with the participating individual, and with the individual cognitive processes, understandings and values of each subject involved, rather than with gross and generalised behaviour.

d) A psychology that is not necessarily predicated upon the existence of absolutes and variables, which looks for qualities before (and, possibly, instead of) quantities, that is not obsessed with measurement.

e) A psychology that can look at our experience of (architectural) space in and of itself, and not as reflected in and through behaviours that may or may not indicate, through actions other than the experiencing of space, how we do experience space: a psychology that is concerned with cognition in preference to behaviour, and that is capable of and willing to be adapted or accommodate the project in hand.

f) And, finally, a psychology that is capable of helping explore and reveal a way of describing a new field covering an old experience.

Perhaps such a psychology only barely exists, and perhaps it may never do more than that. But there are psychologies that have at least some of the above characteristics, the sorts of psychologies that are based on the individual and which accept what is

frequently described as a "constructivist" position (as defined at length, philosophically, in von Glasersfeld (1987)). One such is the Psychology of Personal Constructs of George Kelly (there are, of course, other Construct Psychologies, which will be mentioned where appropriate), which has been an inspiration both to me and to many others - others who have been able to develop ideas and techniques that are akin in spirit to Kelly's, applied necessarily differently in different areas. Perhaps this work is a step towards further development: I would hope so, for it is this sort of psychology that I have followed, albeit imperfectly, and which I have chosen in preference to Environmental Psychology, because, as I have shown, Environmental Psychology is neither tuned nor turned towards my interests, which, as will become apparent, Construct Psychology is.

But, before that, we should examine the design act and research into that, to see what it may have to offer us in this context.

chapter 3

DESIGN RESEARCH

CHAPTER 3

Design, Research, Definition and Design Research

"And though they wrote it all by rote, they did not write it right"
(Lewis Carroll (1967), "The Hunting of the Snark")

BACKGROUND

The work I am concerned with here is not primarily design and the act of designing, but with the way that architects (can be taught to) understand and refine their perception of (architectural) space: and thus with the nature of space itself, and how to communicate experiences of it. However, since architects are designers, and since this understanding is intended to be of general use to designers when designing in whatever field, it is appropriate to introduce some ideas of what the design process is and how it works, all the more so because it is possible that consideration and investigation of the design activity may throw some helpful light on how to examine space itself.

As an activity (and I shall here normally use the word "design" as a verb), design is, I am convinced, rather mysterious (in part because it involves the creation of the new), for it seems to be describable in as many significantly different ways as there are those who wish to describe it. Furthermore, it seems to be an activity that defies most of our conventional explanations of how to define problems so that they may be solved with designerly quality[1]: and of how to proceed in solving them, as I shall show.

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[1] Quality is the big undefinable here: and yet, as many workers have claimed, it is central. Theories of quality are rare, just because theories are usually concerned with quantity, and are ill-equipped to deal with

Problem Solving and Design

To start with, design is not Problem Solving (although it does solve, or rather, dis-solve and re-solve problems), at least in the sense of problem solving methodologies, from the traditional scientific approach to the various attempts at sideways problem solving (such as de Bono's "Lateral Thinking" (1970), or, less excessively, Polya (1954) (1957)). (Architectural) design is rarely undertaken in a situation of much obvious and immediate precision or the unchanging stability of "conventional" problem definition, and that which it does have, while it may (or may not) be central to the purpose of that which is to be designed, is certainly not the sole central concern. In fact, when Maldonado (1965), (also Maldonado and Bonsiepe (1964)) and his colleagues at Ulm attempted to define a process for designing that was "scientific", rational, objective and completely unarbitrary, they did not create, as they had set out to do, objects that were exclusively and uniquely fitted to their purpose, and utterly without (subjectively determined) style: they created instead the Braun range of household goods that, in their '60's heyday, were almost uniquely and instantly recognisable as being the product of a particular and highly visible "house style" [D.1.i]. And, in effect, many of these objects were extraordinarily arbitrary in their design - to the point where their function was sometimes

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investigation of the "variables" they usually work in terms of. Of course, these variables are names for qualities. However, there is a project (called "Support, Survival and Culture" - de Zeeuw (1986)) which is running in Amsterdam, and of which I am a member, which is specifically concerned with the notion of quality.

compromised - because the method used to generate them was arbitrary (while not admitting to it). It depended upon the definition of criteria sets, and their assembly together to give the solution that was realised in the unique union of all these sets: but the criteria had to be chosen and defined, and it is rare indeed that it is not possible to choose some criteria that will not share a unique union with all others. (Even should this be possible, it is not hard to find and specify some novel and unpredicted criterion that will not fit such a union.)

If the critique of Maldonado's approach is that it is arbitrary in the selection of its criteria, that of, for instance, the builder-developer's housing projects is that it can hardly even be said to (actively) select quality criteria at all: normally, such projects (which are low in quality in almost every respect from standard of weatherproofing to the elegance of the siting of the house in its surroundings) are generated by an optimistic mix of borrowed fashion and unimaginative planning: the house is seen as posing a problem to be solved insofar as there is a plan to be compiled so that it works in terms of connectivity, furnishability and habitability (although it is remarkable how many schemes fail even this simple criterion), and most of everything else is dealt with by the assumption of the trimmings and trappings of a superficial, stylistic solution together with a number of ill-conceived "features". Here, the problem to be solved is seen as the arrangement of a plan: the rest is a matter of fashionable dressing up. Sometimes it works. But all too often the result of this simplistic approach is a pastiche, an impoverished mess with a scarcely adequate plan embodied in a building that demonstrates

the lack of concern and love for it that the so-called "designer" manifested, and an equal lack of richness of thought and of detail. And space, the architect's medium, is considered as a commodity to be supplied in quantity rather than quality.

From these examples, I hope it has become apparent that, as I asserted, designing is definitely distinct from the business of simple problem solving, and that problem solving approaches are not likely to be of primary use in designing: indeed, it is possible that there is, for the designer, no solution to a so-called problem, or at least that, initially, even the range or type of the solution is not apparent, and could never, therefore, be placed, beforehand, within a solution set. But this is not, I repeat, to claim that designers do not confront problems, or that, in designing, they should ignore them. Of course they should solve the problems (or rather, I believe, re-solve and dis-solve them). It is, rather, that problem solving methods are not generally intended for the design activity, for many of the "problems" a designer has to face appear contradictory, when they are stated, and otherwise cannot be made apparent in the first instance, becoming clear only during the process of designing - often in a way that feels very inadequate when verbalised - emerging so that, frequently, it is through the achievement of the solution that the problem becomes explicit (designers are particularly - and properly - adept at post-rationalisation, for pre-rationalisation presumes that there can be nothing new, and experience tells us otherwise). In designing, it is often the case that the solution defines the problem.

DESIGN

What, then, is design (in contrast to "Problem Solving")? Its etymological source is Latin (it entered English via Old French): *de* (out) + *signare* (to mark). However, one must be careful, for the value of etymology is in indicating histories and in helping trace developments in both linguistic form and meaning, rather than in defining proper contemporary usage. I believe that, nowadays, "designing" has properly come to represent something altogether more magical: the intentional creating of something from nothing: the making, purposively, of the novel. (I mean, here, that this activity is undertaken by the agent intentionally or purposefully.) For an architect, this involves the creation of space, together with its containers and generators. For designers in other fields (with which we are not specifically concerned), it usually indicates the creation of some individual and physical object such as, for instance, a piece of furniture, a business image or house-style, a street sign or an advertising poster.

Such an activity has a number of odd features, many (but not all) of which are consequent upon this characterisation. For instance, there is always an initial aim in doing a design (although possibly the only aim is the self-referential one: to do some designing, often referred to as "doodling"): and this aim may turn out, in terms of the end product and its post-rationalised justification, not to be in the least bit important except insofar as it provided a starting point and initial direction. This is not to deny that for many designers (including architects) there is usually some (minimal, or at most, medial) externally supplied set of aims most of which have to be satisfied eventually in some manner or other.

Furthermore, the activity is creative and generative, in that it results in something coming into existence where there was nothing before, even though there may be a strong precedent for what is produced (or, in the extreme case, a straightforward copy is made). Thus, design, as an act, involves and is fundamentally concerned with making something where, previously, there was nothing, with the creation of novelty, even where such novelty is constituted of ready-mades or re-creations[2]. And, finally, design, insofar as it is concerned with problems, is concerned with problem definitions that are incomplete and imprecise, and unable to generate, mechanically and without arbitrariness, solutions, where the problems that the designer faces may change, appear and disappear as the process of design proceeds, and where the problems that are actually, finally solved only become clear upon the solution being arrived at. (The designer knows that he has reached a solution, I believe - and shall elaborate later - through a process of recognition[3].)

There are other points about (architectural) design that are curious, but which originate from outside requirements normally

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[2] This is not the place to attempt a serious philosophical discussion of those hoary old chestnuts: viz, what qualifies as new - and in what circumstances - and what are the "degrees" of creativity: which are, I suspect, almost certainly meaningless notions, anyhow - for the new is new to him to whom it is new at the moment when it is new. Heinz von Foerster (1974) makes this point nicely when, in the "Cybernetics of Cybernetics", he asserts that the notion of "re-presentation" used in the Theory of Representations is meaningless: it is, rather, as Wittgenstein (1971) in effect asserts in the "Tractatus Logico-Philosphicus", a "presentation" of a particular, unique concurrence of understandings.

[3] For a general discussion of the role of such attitudes in C20 arts, as evinced specifically in the work of Marcel Duchamp, Jean Tinguely and Robert Rauschenberg, as well as John Cage, see Calvin Tomkins "Ahead of the Game" (1968).

laid upon (architectural) designers, in and as a result of their working environments. These are also largely concerned with the nature of the initial problem definition, and, although "externally" generated, become a necessary part of the design process as a result of the regularity and frequency of their occurrence.

The first such point is that some requirements may be unstatable in any generally communicable way. This may be for a number of reasons, such as the inadequacy of (the specifier's control of) language, and the inexactness of terms used in describing certain experiences (colour is often taken as an example of this: when is orange red, when yellow, and is it not brown, anyhow?). Later in this account, I shall introduce the notion that there is a conflict between the way in which we perceive space and the way we utter sentences, which makes communication about spatial experience seem extremely difficult in an ordinary verbal language. This conflict also affects the value to the designer of many research results in Environmental Psychology, as I indicated in Chapter 2. At very least this difficulty leads to under- or ambiguous - specification of the problem, to use terms from the field of Problem Solving, which inadequacies in specification are only worsened by the amorphous nature of the actual person(s) for whom a design is (often) being made, such as the fictional council tenant or office worker!

In contrast, the second is the proliferation of possible descriptions of problems, caused by the large number of people and agencies whose particular interests are allowed to influence the specification of problems for the problems that the architectural

designer is to solve, such as the various officers (planning, fire, building) and the assorted facets of the paying client (building use, client's public image, amortization accounts). Their concerned interventions can easily lead to overspecification, contrast and conflicting interests in outlook and weighting of criteria and, frequently, outright contradiction.

And, finally, there is the simple unknown or unknowable (eg change in technology, politico-economic climate or wilfulness on the part of the client himself changing his mind), which is perhaps best expressed through the effect of the evolving design itself: for the creation of the design changes, as if proceeds, the conditions (it is, after all, specifically intended as an intervention) affecting the conditions under which the reasons for wanting the design commissioned in the first instance are perceived and remain viable, and opening new possibilities that were not (obviously) present in the first instance.

Thus, all (architectural) design takes place, of necessity, in a flux that is both internally driven by the nature of the design activity itself, and, equally, is externally generated by requirements placed upon and opened up by the design itself[4].

It should now be clear that the conditions under which (architectural) design takes place, and the activity itself, are very

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[4] Thus, a former teaching colleague of mine, who has remained a successful architectural practitioner, Stephen Gage, insists that the only true measure of an architect's competence is his ability to accept continuous, endless and profound change, and contradictory conditions being placed upon him all the time that the development and realisation of a commissioned design continues.

complex and indeterminate, out of which not only is something generated where there was nothing, but also what was, at best, a very imprecise, incomplete and hazy set of requirements becomes something of extraordinary precision, clarity and finality: a substantial built object with an amortized lifespan normally taken to be 60 years[5]. So it is of interest to consider if, and, if so, just how this activity is explained and accounted for by theorists and researchers, and what justifications are given for any findings.

DESIGN RESEARCH AND METHOD

The field in which this is done is called Design Research or Design Method[6]. However, it seems to me that, as I have in effect asserted above, there are as many accounts and explanations as there are theorists. So, before I attempt to give an indication of the range of their theories, I will explain why this variety is almost inevitable.

The basic problem for a researcher into design is that the field is, of necessity, as I have asserted, interactively interventionist and concerned with the imprecisely defined[7]. It is, therefore,

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5 How designers handle this imprecision is of great interest, although outside the scope of this thesis. I have discussed it in Glanville (1984), which can also be found in Appendix I.

6 There is an international brotherhood of Design Research Societies that successfully support this field, even if most examples given here are taken from the English-speaking world.

7 It is also very expensive to execute architectural designs, and almost impossible to arrange "hard-nosed trial-runs": if a building is built, it can rarely be knocked down and re-built if (when?) it is found to be substantially inadequate, although this is now happening to some housing estates that were built in the '60's. It is interesting to consider whether, and if so why these buildings were so bad, and how they have been allowed to acquire an unquestioned universal symbolism indicating rottenness in the state of architecture.

impossible to carry out experiments which involve realistic, fair and precise comparisons between various approaches and "solutions" that different individuals propose, just as it is not possible to use placebo style control groups in experiments. Nor are the conditions in which some design proposal exists repeatable in the sense that a scientist looks for repeatability. Furthermore, the decisions made by (architectural) designers are not generally reversible or undo-able, either when achieved in the physical environment or when simply projects on drawing boards - the first because of the complexity of their intervention and the fact that they have created a change of some note for the sentient inhabitants of the physical environment, which means they cannot really be considered as prototypes or seriously modifiable tests, the second because designing is learning, and what the designer has learnt cannot simply be erased. Thus, ideas about how design is or should be carried out are not comparable or testable in any serious conventional scientific sense. And, indeed, different responses to a design brief are often welcomed precisely because they allow the client to look at various responses to his inexactly defined requirements, and choose that with which he feels most happy (this, for instance, is one of the purposes of the architectural competition). And it is this test, the test of feeling happy or at least relatively content with, that is applied to the alternative theses produced by each theorist, about what the design process is and how it works.

Schools of Design Research

If the designer and his activity of designing, as depicted above, now seem both clearer and more familiar that they did at the beginning of this Chapter, it is because I believe we are all designers (as Kelly (1955a) did when introducing the notion of the "personal scientist") and thus find that, after explanation, the lack of familiarity and the remoteness go. In my private pantheon, design and learning (as Pask has observed as long ago as 1961, humans are machines for learning) are both very hard to differentiate and of supreme importance (Pask (Pask (1985 et seq) now talks extensively about the "Architecture of Knowledge", to re-inforce this point). Our own individual bodies of knowledge - our knowing, which we use and embody in our base for action - is designed by each of us for our own personal aims: again, Kelly's point about our personal assembly of our own personal constructs. Thus, what scientists do is also a form of design: not only in the manufacture of scientific knowledge, but also in the acts of experimental testing (experiments are designed, and elements in experimental set-ups are re-arranged until some pattern is discerned in them, as I assert in "The Question of Cybernetics", (Glanville (1987))). Design is a basic human activity, for we are always making, organising, making constant and editing what is, to each of us, novelty at the time it is new[8]. But this is not central except as an assertion of a philosophical position, to this thesis, and I will develop it no further here. More detailed arguments may be found in "The Architecture of the Computable" (Glanville(1980a), and Appendix G) and "Why Design Research" (Glanville (1981), and Appendix F), and I believe Medawar (1963)

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[8] See footnote 2 of this Chapter.

was making an essentially similar point in his classic radio talk, "Is the Scientific Paper a Fraud?". As I said, if the designer, as painted above, and his activity of designing now seem more familiar that they did at first, it is because we can probably all recognise basic acts of living, when they are pointed out to us.

Having said which, Design Research is a very wide subject, with participants who range from the mechanist to the mystic. I shall summarise here the range of main positions as I see them. (For an extraordinarily encyclopaedic overview, see Broadbent's remarkable "Design in Architecture" (1973). For a more modest and more recent survey, see Lera's "Empirical and Theoretical Studies of Design Judgement: a Review" (1981b).)

Mechanism

The mechanistic position may be epitomised by the Ulm school of Maldonado, already mentioned in discussing the precision of definition (or, rather, lack of) in design problems: I will not add further explanation here. But, related to this position, is the position of those who believe that rules can be adequately defined for the mechanical (ie, frequently, computer) generation of successful design solutions. This position is occupied by those who attest one of two different belief structures. The first is that of the person dealing with a particularly complex but "properly defined" problem (calculating the trajectory, deviation and consequently necessary burns for moon shots, for instance): but he is not really designing, in the sense that I have espoused. The second is that of the person who will propose a model that seems to perform

adequately when run on a machine. Such a model may have little or nothing to do with the so-called variables (should they turn out to exist at all) and their structural interconnections, for the only criterion is that they perform "as perceived reality does"[9], over a defined and limited range, and who maintain that when the range is extended, their models will continue to act in this manner. Such models are synthetic (as opposed to simulation) models, to use George's distinction (1971). They can tell us nothing about what is going on in the assumed reality modeled, nor is there any reason at all, other than blind optimism, to believe their predictions within, let alone outside, the defined and limited initial range. Such models were initially developed by Forrester (of magnetic core memory fame) (1969) (1971), and had a vogue in what was called "Systems Planning" (Chadwick (1971), McLoughlin (1969) and Meadows et al (1972), in their "Limits to Growth"), but are now less in favour, due to the obviousness of their essentially arbitrary nature. See [D.2.i].

Mysticism

At the other end of the scale, the mystical position about design may best be represented by J. Christopher Jones. (I find myself, in my own arguments and to my continuing surprise, favouring this camp, although my disagreement with Jones is fairly basic[10].) Jones's current position derives most particularly from his interest in the music, events and writings of John Cage (eg "Silence" (1966),

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9 Whatever that means.

10 I summarise in more specific terms than used in my arguments about the nature of design how I see design, towards the end of this chapter.

"A Year from Monday" (1975)). (Earlier, his work was much more purposeful, model and orientation based - see his "Design Methods" (Jones (1980a)).) What has really happened in his work is that, in looking critically at design methods he came to believe there was little justification for any of them, and therefore that anything was as good as anything else (from a logical point of view). Taking this position freed his imagination from the restrictions of causal thinking, and allowed the occurrence of arbitrary events which could be appreciated, in this frame of mind, for the beautiful occurrences they were. This reflects Cage's insistence that "anything goes", and that we would do well not to bend sounds to our purposes by organising them, but rather listen to whatever occurs (whatever we happen to hear) with and in wonder. Perhaps the critical article in Jones' development of this position is "St Ives by Chance" (1980b). A similar position is taken by the Boyle family (1986) (1987), who recreate arbitrarily selected bits of land as paintings, "without editing", so as to wash away the confusions and preconceptions that we allow to brainwash us, thus uncovering what they presume to be the hidden but true reality. What happened in Jones's case was, I believe, that he gave up belief in and hence acting upon the method and criteria of critical appraisal in order to assume the mantle on one (non-) method, thus becoming a performer of designs, and extending the range of use of various tools in design (see Jones (1984) [D.3.i to xi])[11]. Naturally, as a "constuctivist" of sorts, I find this naive belief in a reality without interpretation touching but untenable, for even the interpretation of not making

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[11] See also footnote 2.

an interpretation is, in itself, an interpretation, just as there is no action without an actor, including the action of not acting - an old philosophical disagreement that I doubt can ever be resolved by rational argument.

Language

In between these two poles there are several other identifiable positions. Perhaps that nearest to the mechanist is that of those who try to define, or, on occasion, design "design languages" (language is the term they use)[12]. Probably the most influential of these in recent times (and one who is still one of the most productive and original) is the architect-mathematician Christopher Alexander. He attempted to develop a method of designing using diagram overlays, which had some of the characteristics of the mechanists' definitions and sets, but were also based on very careful consideration of the logic of how things fitted together. Titles are clear indicators of his concerns: "A City is not a Tree (it's a Semi-lattice)" (Alexander (1965)), "From a Set of Forces to a Form" (Alexander (1966)), and his early magnum opus, "Notes on the Synthesis of Form" (Alexander (1964)). See [D.4.i]. All were concerned with a language like method for producing appropriate forms and localities (rather than with space). His later work, centred around the creation of a "Pattern Language" (Alexander (1977)) is even more concerned with language and

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12 It should be noted that the idea of an architectural "language" is nothing new. It has, for instance, been common to talk about the "Language of Classical Architecture" (Summerson (1963)), and, indeed, a grammar-like notion of the correct assembly of architectural statements was certainly the norm in the Renaissance (eg Palladio (1965)).

with the conventional domination of language over thought, using terms such as syntax, semantics and pragmatics, and also with precedent. A similar general outlook is used by Hillier and Hanson in their "The Social Logic of Space" (1984), which again tries to find a syntactic structure to support decisions upon which sorts of (primarily) location plan arrangements are likely to be able to carry semantic meaning for inhabitants, but which is inhibited by the arbitrary nature of Hillier and Hanson's abstractions and patterns (that others are asked to assume and take on board, wholesale), and the fact that their approach is prescriptive rather than descriptive, thus generating laws that are restrictive rather than generatively inventive.

Conjectures, Refutations and Tests

A slightly different position has recently been taken by Broadbent in his professorial inaugural lecture "Towards a Theory of Architecture" Broadbent (1985)). He takes the work of Karl Popper (specifically "Conjectures and Refutations" (1963)) as a starting point to argue that designers work like scientists and other "reasonable" people, by making conjectures and then being unhappy until they manage to refute them. As far as I am concerned the appeal of this approach must be tempered by my belief that we do not perform like this at all. Popper's work makes excellent sense as an ideal, but psychologically it is naive. Few of us will (or can) test all our ideas (I'm not likely, for instance, to check out my ideas concerning potentially terminal activities), nor do we want to: we are very conservative in what we do, working hard to maintain that which has become unmaintainably non-

sensical. And, as Medawar asserts (1963), it's not how scientists do science, anyhow. Nor is it always even theoretically possible to test ideas in order to refute them, as I have already argued, for that is part of my assertion about the nature of the design activity! So while I admire Popper's view as providing an ideal, I find the refutation mechanism unrealistic, preferring the model proposed by Lakatos (1970). Nor does his view help me understand how to generate a (new) view, or even whether (and if so how) it is possible to do so. Do I make any random response to a problem that I have argued cannot be stated yet? But still, architects are very good at explaining ("justifying" is the technical term) what they did, after the event, and recounting tests they tried: and it is possible that the ideal is more achievable than I estimate. What is certain is that it is a very good creed that designers should, at all stages of their designing, test their ideas in as far as they can, and respect and act upon the failures they thus discover.

Implementation

We come now to a group of workers who may be thought of as more concerned with the implementation of design decisions. For instance, James Powell talks about design as an enabling activity in his professorial inaugural address "Is Architectural Design a Trivial Pursuit" (Powell (1987)). By "enabling", Powell means two distinct things. Firstly, that design should be seen as an activity which enables people (including the designer himself) to do things better, and secondly that work (meaning designing) should be done on providing tools that make the designer's job easier to do.

For Powell, personally and in practice, a large part of this involves the extensive use advanced technology to handle considerable quantities of information (much of it very hard to come by at first hand). For instance, working with a team of colleagues lead by Sime, he is researching behaviour in buildings on fire using computer controlled video disc (Powell and Sime (1987)). See [D.5.i]. Given that it is generally both difficult and dangerous, and also illegal to produce fires in buildings, this simulation allows real-time examination of a very rich set of data (including such intangibles as facial and bodily expression) and of the generation and evaluation of behaviours in conditions probably about as close to reality as is possible in practice. This work is leading to major changes in understanding (and hence, it is hoped, legislation) of how best to accommodate this risk so that its associated dangers are minimised, thus better enabling people to live and designers to reduce the problem.

In contrast, there is also what may be thought of as a more European approach (sounding less similar than it perhaps is). This would be epitomised by the work in Praxiology led by Gasparsky in Poland, and a group I am associated with in the field of Andragology at the University of Amsterdam, led by de Zeeuw, to which work I shall refer to here (see de Zeeuw (1986) (1987) and some summarising comments by myself - Glanville (forthcoming)). This work is subfused with the notion of change, and the concomitant that change produces change and therefore exists in a different environment than that in which the change was initially required: this should indicate the similarity between their approach and the way in which I have describing design. This and

other side-effects have to be carefully considered, and at least a means for dealing with (containing, negating, celebrating, playing with) them has to be built in if change is going to be intentionally, knowingly and responsibly engineered. There is another important point: that if a professional is going to provide a service for others, that service should not reduce the autonomy, ability to accept responsibility for their own actions and self-confidence of the those for whom he is acting, rather than making the professional ever more essential and irreplaceable. (This is clearly a matter of designing in the sense that I have described the successful teacher's role as being to design himself out of a job). What is interesting about this group is not only that there are several research projects being pursued, but also that theoretical aspects are being considered and developed, and models are being made and tested. Thus, de Zeeuw's group is attempting a theoretical analysis of the concomitants of change, which, if successful, will be of the greatest concern, relevance and value to designers, especially architects.

My Position

Although I work with this latter group, and share their enthusiasms and convictions, their basic concerns do not always marry up with those I find myself facing when I must, as a teacher of architecture, wonder what the architectural design process is. It is here that I find myself moving to the more mystical end of the scale, for I work encouraging people to make

the new (even if it has precedent and is only "new" to them)[13]. The creation of the new is, as I have asserted, essentially mysterious (it is what causes Mill's "Problem of Induction" in science (1843)), the source of that weakness in the position already ascribed to Popper - that he cannot account for the generation of novelty, only to the need for it. My account of the process of design can be summarised, simply, as holding a "conversation with yourself" (usually through the medium of making marks on a piece of paper). This is why doodling is so important! Having some sort of general and probably impoverished initial idea, the designer starts dreaming and doodling, gradually pulling ideas off the sheet either as they form, or on later examination. This process is imbued with the idea of enrichment: the attempt all the time is to make something that does more, more beautifully, but it is modulated both by testing and by the transient immediacy inherent in the inquisitiveness of the aim-less wanderer: the ability to go off on side-tracks (because there are no main paths), the ability to enjoy and delight in the unexpected views as they occur (because there is time to "stand and stare"), the ability to decide to finish (recognising that an end has been reached) and the ability to start again (abandoning all previous work, if necessary). Gradually, through these processes (influenced by the working environment - a studio with its informality, chatty camaraderie, and the friendly participation of teachers "guiding from behind"), the student learns to wander effectively in the ideas landscape of his paper

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13 I have, in fact, found, very recently, that it has become more and more necessary to talk in these more architectural sorts of terms, in tutorials with members of de Zeeuw's group in Amsterdam, so the differences in approach and concern may be becoming rather less noticeable.

and pencil. And, at points, he learns to say "Hold it! That's interesting! That's just right!". It is this dreamy wandering in the conversation with the self, and the sense of recognition that, I am convinced, is what is special in what designers do (that is outside definitions of the norm), and is what makes design so wonderful[14]. This imaging is based on my teaching experience as well as my time as a student, on how I design now (albeit that what I design is not architecture, but education), and on discussions with colleagues and friends. And, by way of specific justification, I argue this as a process which can be explained through the Cybernetic model of the Black Box, and the observer's development of a description for its behaviour[15]. See [D.6.i to v].

BUT THIS ISN'T THE EXPERIENCE OF (ARCHITECTURAL) SPACE

But the trouble that should by now be apparent is that neither my own model, nor any of the above discussion of what design research is, and how design researchers have viewed both their field and the activity of design itself, has told me anything at all about our experiencing of (architectural) space. To use my analogy, it has been a wandering, essentially irrelevant and getting us nowhere with our problem, but, hopefully, pleasant

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[14] I should indicate, here, that I believe this way of behaving is positively encouraging to the generation of creativity in general, and can equally be taken as a metaphor for the creative work of the scientist. In a sense, what differentiates designers is not that they behave like this, but how often they do it, and how much it is expected of them. See Glanville (1988).

[15] Although I have often lectured about the relationship between the Black Box model and the activity of design, I have not yet committed this argument to paper. I expect to do this shortly, in a paper entitled "The Cybernetics of Design and the Design of Cybernetics" (Glanville (forthcoming)).

enough anyway!

PART TWO:

Experiments

chapter 4

MY PROBLEM

CHAPTER 4

My Problem

My problem, then, was the following.

I wished to access the cognitive structure by which, I believed, people generated their personal mental models of their understandings and experiences of architectural space, and to find a way of describing this experience and understanding, in a form communicable between different people, so that I could learn about it and teach it to my students, by the use of a fairly exact, precise and shared "language".

And yet, even though there were the writings of architects and critics, and the work of researchers in Environmental Psychology and Design Research, none of this seemed either to fit the bill or even to be able to assist me in what I wanted to do: which, thus, became quite an undertaking, starting, as it were, from scratch!

For, as I have explained, architects very rarely write about space: preferring, instead, to write about everything but[1]! It is a case, as I have already alluded, of confusing the bottle for the wine, of thinking that talking about the bottle will tell you how the wine,

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[1] This is becoming progressively less so, although most of the recent writing by architects and critics about space is still more bottle than wine orientated. A good example is the collection of papers presented at the 1984 meeting of the Union International des Architects and published under the name "Man and Space" (ed. Dahinden (1984), and including the Zevi quote to be found at the beginning of Chapter 1). But it must be remembered that I am talking about a problem that existed in 1972, and which is to be understood against the background of that time. Hopefully, the field has progressed since then - and I would also hope that the work reported here has made and will continue to make a contribution to this development!

itself, tastes. And environmental psychologists and design researchers are intent on areas of concern, the uses of method and the justification of opinion that are also not really primarily spatial in the architectural sense I have indicated.

So it appeared that, in order to have any chance of succeeding in my aims of solving the problem outlined, I would have to undertake to design and develop a set of concepts and research methods, as well as the desired spatial language, more or less all of my own and from scratch, using whatever few resources I knew of and could unearth and inventing the others as necessary.

And yet, I did not want to invent a language and impose it upon others: that was too like the use of experiments to justify the researcher's own opinion that I have complained of in the approach of other workers: rather, I wanted something that came out of the social understanding of others, as all language, it seems to me, should, and with as little external reference given by me as was possible.

My knowledge consisted largely of, and my leanings were towards, reflexive and constructive psychologies, self-assessment and self-expression of personal understandings, the sort of thinking that pervaded the work of Piaget and Kelly, of Pask and Thomas, and, as it happened, of the new order in Cybernetics that had just been established by von Foerster, Brown, Maturana, Varela and Uribe, Beer, Pask, and in my own doctoral dissertation in Cybernetics[2], all

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[2] References to work all these people can be found elsewhere in the text, where specific contributions are relevant (particularly in the

of which seemed to be sympathetic to my original wish not to enforce my views and expression, but to allow a group to generate their own language, from scratch, in a social environment.

So I pursued this goal with my students as the subjects originating the language, with, as it turned out, less and less success (and, it began to seem to me, likelihood of success), as I recount in the next 5 chapters.

Introduction). I am not giving references here, for it seems to me not to be relevant or useful to the argument, which is very general, in this chapter, to confound it with references.

chapter 5

FIRST EXPERIMENT - A SHARED LANGUAGE

CHAPTER 5

First Experiment - a Shared Language

"We think that if we can give something a word we can understand and control it." (Laurie Anderson, Radio Interview, June 1987, with reference to the writer William Burrough's statement "Language is a virus from outer space." (Burroughs (1968)).)

PREAMBLE

As I have recounted, I still had my problem: although there exist areas of study that I might reasonably have hoped would be able to help me devise means to assist in my attempt to break into the big architectural mystery that I had denied myself access to as a student, and which I now as a teacher needed to get to grips with quite urgently, they didn't seem to be able to help me: their outlooks, concerns and modes of operation were quite different to those I believed I had analysed that I needed. And, even though space was reputedly the major concern of architects, I could find little or nothing they had written about it which was useful and that I could understand: what is written about is, as I have said, effectively everything but space. As to the discussion of space in practice (for instance, in the architecture studio), it became a combination of gesticulation and seemingly inarticulate, meaningless utterances of the sort "Y'know what I mean" (which I certainly didn't). Furthermore, I had students who knew as little as I did about this "material of architecture", and urgently wanted to grasp it and master its manipulation. What was it about space that made it so hard to talk about in an articulate manner, and what would make it less mysterious and more available to those not yet initiated into its secrets?

Under the illusion that everything that could be expressed ought to be able to be expressed in words, and feeding this view upon the prejudice that architects chose to present themselves as fuddy-duddy and waffly (being either intentionally oblique, and hence mysterious, or damned lazy), I decided to attempt to find a vocabulary (a "language", I called it) in terms of which to express with precision feelings about and understandings of our (ie, human) perception and experience of (architectural) space. The naivety of this view - that everything, including some of those things such as emotion which we feel so sharply but about which we talk so inadequately, should be precisely statable in exact terms - seems to me now astonishing, although the presumption in the undertaking does not. Architectural (theoretical) texts are usually so extraordinarily oblique as to be virtually incomprehensible: and, just at the beginning of the 70's, that (technological) optimism which particularly fired my generation of architecture students (allowing me my peculiar and highly original passage through architecture school!) did not make our assumptions that we had finally got it right, that we could change the world and that the sky was the limit so peculiar or out of place[1].

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[1]I am glad they did not, for in changing my views, over the years, I have been given the chance to enjoy a wider experience and learn more than most are fortunate enough to be permitted, and because I believe some good came out of the research I set out on, even if what appeared was not always immediately related to my aims (sometimes, indeed, effectively destroying them).

Thus began my attempt to develop within a group of (first year) students of architecture[2], a set of terms (a language) generated by and agreed, socially, within the group, in which to discuss experiences and understandings of (architectural) spaces.

METHOD

Background to the Choice of Method

The method chosen was based, as already indicated in Chapter 3, upon the notion of the personal construct that George Kelly developed in his Psychology of the Personal Scientist (normally called Personal Construct Psychology - PCT. See Kelly (1955a) (1955b)). The reasons for this were of two varieties:

Firstly, as a psychology, being personal, constructivist and possessing a method which already had a technology (for instance, Thomas's early computer implementations at Brunel University, eg Mendoza and Thomas (1972), Thomas and Shaw (1975)), for the apparently precise external expression (referred to as elicitation) of personal constructs to others, PCT seemed appropriate to my aims and almost purpose made for my requirements.

Secondly, I had access, initially through their joint seminars, to Professor Gordon Pask (then of the Cybernetics Department at Brunel University), and Dr Laurie Thomas (Director of the Centre

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[2] Chosen because, since they were my students, I had ready and easy access to their time and efforts.

for the Study of Human Learning, CSHL, also at Brunel)[3]. Both were constructivist psychologists (with, initially, non-psychological backgrounds, just like me), both were concerned with explicit external representations and structures of meaning (as it happened, on computers) of personal understandings (which it was my intention to achieve), both were interested in teaching and learning (which was my professional concern), and, to my good fortune and delight, both were available and willing to advise and help me. Furthermore, both had experience in the arts: Pask in the theatre and as an environmental sculptor (his "Colloquy of Mobiles" was shown at the "Cybernetic Serendipity" Exhibition in London, 1968 (Pask (1971)), and as a consultant to the Architectural Association School (AA), London (which was how I met him), and Thomas in working with sculpture students at St Martin's School of Art, London. It was this work of Thomas's that so particularly interested me, seeming in certain respects to get very close to what I was attempting, for he had used Kelly's technique of construct ranking scales together with actual pieces of sculpture as elements, in order to get sculpture students to be explicit about both their preferences and their construing of sculptural objects, by-passing the need for speech[4].

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[3] Pask was then supervising my studies for a PhD degree in Cybernetics (Glanville (1975)), as Thomas is the supervisor of the work presented here. I have remained a member of the CSHL, and have also retained close working links with Pask in basic research, course design and writing.

[4] The relevance of this work will become obvious, below, when I introduce the method I decided to use. Although I have discussed his technique with Thomas on many occasions, I have never found, nor has he ever directed me towards, a really good reference: and some points still remain hazy. For that reason, I refer to this work of his, which is central to my efforts, through his joint paper (Thomas and Pope (1971)), which is the nearest I can get.

Material Requirements of the Method

The experimental material had to accommodate a number of distinct requirements:

The use of tangible, repeatable material, that could be stored and used in the same way (be taken as being seen the same way) by all subjects on all occasions. This is not so easy with architectural material.

To be personally viewable by each subject, both individually and in groups, and to be shared between those group members.

To be individually and clearly labellable and to appear obviously suitable for verbal description.

The experimental method had to accommodate the above, and also permit:

Individuals, and their working in and between groups (ie, socially).

The verbal expression of individual understandings of visual spatial experiences as a source of potential communication within and between groups.

The modelling of how other participants understood and experienced the same material, so that it could be discussed and agreement arrived at.

The testing of the results for similarity of use and hence the sharing of understanding necessary for the assertion that a (social) language has been developed.

This is a tall order, and the consequent method used relies very heavily upon my understanding, through discussion with him, of Thomas's St Martin's method.

Account of Method Used[5]

The subjects chosen were first year students of architecture in the academic year 1974 - 5, from one of the teaching units (of which I was a member) at the AA School[6]. They were chosen because of their continuous availability on a regular basis over a long period. In the end there were 9 regular participants, although a few others took part on an occasional basis (their contributions are not referred to separately here).

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5 Several of the Appendices make reference to this experiment. For a general overview of this and the other two experiments presented here, as well as several others, of peripheral interest, that I have carried out, see Appendices A and G .

6 It should be explained that the AA does not work in the manner of a conventional architecture school. The 5 year main course is divided into 3 sections: First Year (1 year's duration), Intermediate and Diploma Schools (2 year's duration each). Each of these is made up of several "Units" (small groups of staff who develop an individual course appropriate to where in the school they are operating, and whose courses are selected by the students in a sort of gross cattle market at the beginning of the year). This particular unit was one of three in the First Year, and was quite explicitly the most experimental, and the one that most questioned the status quo. For a fuller description of the AA's peculiar educational approach, history and environment, see any Prospectus from the last 15 years (eg "Architectural Association School of Architecture Prosepctus, 1987-8")

The material chosen was a collection of 35 mm colour slides that I had taken of the remarkably fine Tuberculosis Sanatorium at Paimio, Finland, designed by Alvar Aalto, 1928 - 33. These apparently satisfied the requirements (mainly of handling and identity in viewing): and it just so happened that I had a large collection of such slides and an intimate knowledge of the building (and could therefore clarify any points arising), and that the building is highly regarded internationally. (For a brief introduction to this building, and a summary of themes in Aalto's work, see Glanville (1978a). See [A.12.i to v] for some of the chosen slides.)

In order to allow each student to begin with slides of views he found interesting for their (architectural) spatial qualities, the collection of about 180 slides was shown to the 9 participating students, and each selected 5 slides. From the 5, a further selection was made reducing the number to 3 each (the interim stage was included so that each student had 3 slides both personally chosen and exclusive to him. Thus, there was no duplication of interest through possession). (For technical reasons, 5 extra slides were included, but were not judged to threaten the results, and their presence will not be further remarked). Thus, we had an experimental material of 32 x 35 mm slides of one building, selected from the original collection of ca 180 by the students[7].

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[7] I was aware that it might have been better to have chosen from a wider base than one building and from a wider experience than students early in the 1st year of a 5 (academic) year course. The students were chosen as the only subjects readily and reliably available to me - a problem that has always occurred - and I wanted to limit my participation in forming their opinions, so I choose to use the building I had most slides of, giving the hopefully credible reason to the students that it was a good idea to have one building and examine its space consistently and in detail.

We then divided into 3 groups (A, B, C) each of 3 students (1, 2, 3) and each with 3 slides (i, ii, iii). Later these groups would be mixed up in various ways.

The slides each student brought to the group were pooled, and, in accordance with Kelly's procedure, 3 of each collection of 9 were selected at random. These were positioned along a 5 point construct ranking line, in such a way as to have a singleton at one end (say the low end) and a pair at the other (say the high). This is the means by which Kelly elicits a construct from an individual, and it is of the greatest important to him[8]. (Kelly's method in eliciting a construct was to ask that the pair should be isolated, and an explanation given of what was held to be similar in the pair that was different in the singleton.) I asked that each student do this in his group, in turn, with a randomly selected triple, telling the others in the group what the construct he was using to describe spatial qualities, and giving further elaboration, if necessary. See [C.1.i].

After several attempts by each student, more slides were added, to be placed at any of the ranking points on the construct line (and, often, in between these points), as seemed appropriate [C.1.ii and iii]. Although there was a very precisely specified set of steps

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[8] As time wore on, this stipulation became less so to me: I found I was interested in the concept of a constructivist psychology, and the availability of the technique, rather than its precision in dealing with pathologies and the analysis of psychoses, which Kelly-the-psychoanalyst was. I am not alone in varying from Kelly's procedure: many of the most eminent of his followers, such as Fransella (see Bannister and Fransella (1971) have done so. See, also, any of the Proceedings of the Biennial Meetings on Personal Construct Psychology.

to be followed, students then (and all other students / subjects I have worked with since) have found it impossible to stick to exactly, and I no longer believe it to be strictly necessary or practical to be rigid about this.

The next stage involved one student setting up the construct, and the other 2 in the group placing the remaining slides on the construct line, where they felt the first one would have placed them, explaining their reasons. In the case of major disagreement[9], the first would move the slides placed by the other two to other positions that better fitted in with his ideas, and an "argument" would follow, in which slides were moved and explanations exchanged until an agreement was reached, and the construct named, or the students gave up that attempt to reach an agreement in despair. See [C.2.i to iv], although these illustrations are of more immediate relevance to examples mentioned in Chapter 8.

This process was continued with other initial triples. In theory, it should have happened for all possible combinations and until substantial agreement was achieved virtually all the time. In practice, students got bored and / or failed to increase the number of construct names they generated. Nor was it possible, under the circumstances to cajole students to conjoin or split constructs, as is possible with such computerised programs as PETRA (Shaw (1981)), Shaw and McKnight (1981) and Thomas's own programs (eg Thomas and Shaw (1976) (1977)), especially when such

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[9] Generally, one in which the difference in position was more that one ranking position.

programs are used individually. Also, in practice, the discipline of the initial triple being arranged by one and the other slides by the others in the group, etc, was not adhered to: it was simply too mechanical and repetitive to maintain the interest of students over a prolonged period. At the time I was concerned, although there was nothing I could do about it. However, experience since, using a variety of objects (and often not allowing any form of verbal comment or communication) has shown that this fluidity is, in itself, very revealing in an enriching and unpredicted manner, and allows an extraordinary and desirable form of interaction. (See Appendix E for a more precise description of the method, as it has been applied on other occasions.)

Members of the groups were now re-allocated so that the new groups were made up of individuals from each of the 3 original groups, delegated to act on behalf of their original group, and the whole process was repeated, with further construct names being generated. By now, these construct names had become terms, with a single word or phrase being used to describe the whole sense of the construct. (Although pole qualities could be extracted from the students by slow and painful interrogation, they did not want to use the original construct names in which the polar duality was expressed, preferring the terms.)

If time, and, more importantly, patience had permitted[10], we would have had cross-checks between these new groups, but,

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10 We worked on this project for a total of 25 x 2 hour long weekly sessions, with me carrying out collation and any appropriate analysis in between the sessions, to feed back to the students where relevant at the beginning of the next one.

apart from informal conversation and over-hearing (we were all in one room), this was not possible.

What we did have, however, was a list of construct terms: a list about 100 items long. This, however, was an unhandlable list both for experimental purposes and for general cognitive processing (see George Miller's "The Magical Number Seven, Plus or Minus Two" (1959) for a delightful argument that there is a limit - even if, nowadays, the limit he proposed of roughly seven simultaneous data is no longer accepted). So it was necessary to reduce the list to a more handlable length.

This was achieved by not very democratic and rather ham-fisted means. Because of a lack of time available, and also because of a general reigning tedium resulting from the length and intricacy of the negotiatory processes that had been involved, I felt that asking for much more negotiation, even if it might have lead to fairer and more personally relevant results, was unlikely to be well greeted by the students, or, at best, would merely to lead to a proliferation of terms as subtleties of understandings became further terms for the group. Instead, we used a crude technique in which, under my highly directed and rather forceful chairmanship, the students were obliged to reduce the number of terms. This was achieved by ignoring the difficult ones (in the sense that noone could be very explicit about their meanings) and the ones that refused to "fit in", and the rather gross forced forging together of the others until we were left 15 terms that were accepted, with more or less grace, by the group, and to which Kellyan polarities of

range of meaning were attached[11]. By this makeshift and crude means we arrived at the basis of what we hoped was a common "language" in which to describe at least some aspects of the understanding and experience of (architectural space) in response to a single building (Paimio Sanitorium) and through the medium of a collection of slides selected (from a larger collection taken of that building by me) by the students [F.1.i]. The question, then, was whether, after all this rigmarole, this "language", in use, had any social validity.

The examination of this question was undertaken by exploiting a very simple procedure. All 32 selected slides were shown (in a sequence that attempted, within the limit of the slides selected, to provide a guided tour of the building) to the group, who were asked to note which of the 15 terms they would use to describe their experience and understanding of the architectural space depicted in each slide. After this, their notes were removed, and they were asked to rank the same given terms in the order of the frequency with which they believed they had used them.

RESULTS

This process, it was assumed, would show some social commonality in the choice of which terms were used in describing

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11 This way of arriving at a group concensus of agreement is quite commonly used in management exercises and studies. See, for instance, Janes (1987). I have used this sort of approach on several occasions, without there being too bad a feeling amongst other participants (for instance, in the generation of a Hypertext Guide to "Impossible Worlds", resulting from a course on that subject, that I am currently composing with my students in Amsterdam, being constructed in the Apple Macintosh Hypertext Environment called "Guide", by OWL (1986)).

each slide, and also show, by the similarity of the believed to the actual frequency of use, how confident the students were in using, and how well they understood their use of, the "language" they had so painstakingly generated.

However, what was actually discovered was not at all the similarity that was expected. The terms selected by each student as appropriate to describe each slide were quite different, with some students using, on average, many terms (max 7.72) to describe each slide, and others using very few (min 2.34), which made it hard to carry out a significance test on the usage of terms between each of the individuals (because one used more than half the terms per slide to another's less than a sixth).

Furthermore, there was very little general pattern in the overall use of terms, so that one could only, at the most, modestly contend that there were strong patterns in those used most and least by the group at any level of group significance. This seemed to indicate that, within the conditions of the test, the terms were used by each individual in quite different ways (they were considered applicable to completely different slides, and a wide variation of numbers of terms were, on average, used. Nor were any slides consistently much more or less popular than others [F.2.i]). We had, it seemed, failed to find our social "language" (set of terms), and each student would choose to make quite different utterances (selections of the terms) expressing his understanding when confronted with nominally the same experience of architectural space (ie the same slide).

This confusing finding was further borne out by the confidence rankings, comparing believed with actual frequency of use of the terms by each individual, where it was found that the relationship between the two rankings was so low as to be only accountable to chance. (Using a Spearman's Rank correlation test (which had to be slightly rigged since the formulae I could find were only given for even numbers - Segal (1956)) the correlations were between 0.656 and -0.300 with an average of 0.286, standard deviation 0.370 over the 15 terms. See [F.3.i])

So it appeared that, not only was there effectively no agreement between the students about the use of the terms, but also the students had, individually, very little idea of each term's relative importance to them, expressed by frequency of their individual usages.

However, by some streak of good fortune (caused by my frustration and disappointment with our verbal failure), I invited the students to draw diagrams that indicated the kernel of what they thought each of the terms meant. And, lo and behold, the resulting sets of diagrams each produced appeared, visually, by and large to be very similar, both to me and to the participating students [F.4.i].

It appeared that, in spite of the enormous effort we had put into developing together a collection of verbal terms (a "language") for use in describing our understanding and experience of architectural space, we had failed - at least, until we presented the terms in a diagrammatic visual form. Undoubtedly there were

weaknesses in the experimental method, although I doubt that any method that attempts to derive a precise social language and requires the prolonged active and interested involvement of intelligent participants could be developed that did not have such, or at least similar, failings. However, some weaknesses that may be particularly pointed to are:

Slides of buildings are not architectural spaces, but selected and highly composed 2 dimensional records made of them by a photographer.

Crushing the terms together may have so lost a precision that might have been essential to the individual original terms that the results could well have been, in effect, either such gross distortions as to be meaningless, or completely new and therefore unnegotiated terms.

The process went on for so long, and was so demanding, that boredom, forgetfulness and carelessness inevitably crept in.

The students were too inexperienced to have developed any way of experiencing or understanding architectural space[12].

The experimenter was, likewise, too raw, too naive and too ambitious in attempting such a bold task[13].

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12 But accepting this point would suggest that the lay public are even less equipped, which would be very sad, for, while professionals and specialists undoubtedly do have expertise, the total exclusion of the non-expert would be tragic and might be considered to render the expertise irrelevant.

13 The notion of the dangers of naivete, ambition and innocence is brought into question in Soudijn's "Creativity: a 'Tour d' Horizon' in Impossible

However, these did not seem important to me at the time (many did not even occur until much later). What immediately gripped my imagination was that, while there was no agreement in the use of the terms verbally, when they were translated into diagrams there was a remarkable similarity between the expression by each student of the meanings of the various terms expressed visually. And so I started to consider that I was getting no results because I was using a language of the wrong form: a verbal (and hence serial) language to express a visual (and, I was to reason, wholistic) experience. It looked to me as if I was using an inappropriate medium. So I set to finding another way of exploring (which, as it turned out, largely and fortuitously disposed of the other potential sources of failure referred to above.)

And at least I had some spin offs (see Chapter 8).

Worlds" (1988) , a survey of the field, in which he notes many authorities who claim such qualities as necessary for creativity to exist.

chapter 6

SECOND EXPERIMENT - THE BLINDFOLD SURVEY

CHAPTER 6

Second Experiment

"A Picture is worth a Thousand Words" (Traditional)

PREAMBLE

I had singularly failed, in spite of the immense efforts of all concerned, and a really rather precise and exacting method (even if it had been allowed to slip a little) requiring explicit responses and necessary social interaction, to develop with my group of students a collection of terms that they used with consistency either individually, or in the group as a whole, when describing their experiences and understandings of architectural spaces (as edited, preserved and presented in photographic slides). These results had all looked most depressing until, on the off chance, I asked each of the students to draw what the terms meant to him, upon which they came up with remarkably similar visual diagrams. I took this to indicate that the problem lay, somehow, in having required verbal (as opposed to visual / diagrammatic) descriptions, and that, if I wanted to get at the understandings and experiences individuals have of space (through whatever cognitive structures they have developed in order to produce and maintain their understandings), then I must use some visual means of exploration and expression. For, my purpose in developing a verbal language had been to communicate these understandings, and, if I couldn't make such a language verbally, then I had to try to get at the presumably largely visual understandings directly.

For, from the diagrams that were produced, and their apparent similarities, it seemed that there were, indeed, cognitive models that could generate these diagrams and that were waiting to be accessed, if only I could find a way[1].

Yet there was an apparent difficulty here, for how could I get at these cognitive structures (and hence mental models) if I had no means of sharing understandings through some form of explicit external expression of them, which would permit all the individuals to express their cognitive structures, and allow me, as experimenter / director, to try to understand them? (This is an old problem for the study of mental processes: how much is in the thought, how much in the expression? The only possible practical position seems to me to be that taken by Wittgenstein in the "Tractatus Logico-Philosophicus" (1971), to the effect that you cannot see behind what you cannot see behind - which is like a screen - and that, therefore, all you can see is what you take to be an expression or projection of something you presume to know to be behind the but, yet, <u>can never confirm</u> either to be that thing that you presume to, as it were, cast its shadow like the Balinese Wayang puppet theatre, or even to be present at all, for it may just be the screen itself.)

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[1] This is, of course, the concept behind, and demonstrated in "mental mapping", particularly as used by geographers is exploring the notion of locality in cities. See, for instance, Gould and White's "Mental Maps (1974). As it happened, I had, independently, developed similar ways of imaging the city (city structures), and Annetta Pedretti had developed a distortion technique for demonstrating discrepancies in understandings of urban space - see later in this Chapter, and Appendix A.

Since my problem was that I had no means of expression (no language), and had not been able, in spite of the efforts of myself and my students, to develop one, how could the cognitive structure I wanted to believe was there ever be expressed in such a way that I could examine it, and so that the group could communicate and comment upon their understandings between themselves?

I thought about mental maps (such as were introduced in Chapter 3 and footnote 1 below). Here some form of spatial understanding could be obtained by looking for distortions between personal maps and cartographically generated ones. This might provide some basis for action, were it not that architects' formal drawings, while similar to cartographic projections (see Glanville (1980b)), are not so in that most particular of respects - architects drawings are made of as yet non-physically-existent artefacts.

Further, there is the fact that architects' drawings generally represent structure (walls, floors and windows, etc of the container) and the space has to be interpolated between them: they do not really express space at all, but, rather, its physical container (the bottle, not the wine). The interpolation skill necessary to permit the interpretation of spatial qualities from architectural drawings of walls, floors and windows, etc is, in fact, very difficult to learn, and is one of the reasons an architect's training is so long, and his drawings are so deceptive (seductive?) to the public. Furthermore, architecture students are encouraged to draw "properly" (that is, within an accepted and quite rigorous

convention, which both dominates their means of exploration and creation of possible architectural spaces).

Finally, even should it be possible to get architecture students to express their cognitive structures, their mental models for understanding and experiencing space, how, other than by getting many drawings and then talking about them with the students (impossible, in exact terms, as I had already discovered, and, therefore, bound to be full of sentences of the "Y'know what I mean" type that I still did not understand) would the commonalities, the cognitive structures become apparent? For, the difficulty of handling visual material, especially in terms of the mathematical precision normally required by, for instance, statistics, is, as Pask has commented (1975), notoriously difficult.

Therefore, I rejected the idea of using a straightforward mental map type of approach. But there did still seem to be something powerful in the idea of <u>distortion</u> that mental maps use as one of their means of expression in order to present and make comprehensible individual differences. So I wondered if it might be possible to access mental models, by somehow restricting the availability of information, by distorting the means of accessing it (rather than presenting information conventionally), so that the cognitive structure had to really fight to apply itself to exploit (or create) a mental model of (a particular) space, which cold then be presented so that the "distorted" image of the space could be compared to the space when presented without informational distortion, even if this involved the use of standard architectural drawings.

Hence was born the idea of forcing visualisation to take place through and in spite of the denial of access to the visual sense: the idea of carrying out a "Blindfold Survey" of a space, where the subject was allowed to explore the space by any means they liked except vision, but were required to draw what they believed the space looked like: that is, to represent, stage by stage in their development of a mental model, through drawing, what they thought this space they had explored but had not seen looked like. And it also seemed to me, then (although, again, I am no longer so sure) that the space to be surveyed should be unfamiliar, so students could not simply latch onto their ready-made "archetypal" mental models (which came, as it were, rather like the drawn experimental room mentioned in Chapter 2, ready built and fully furnished, and such as they might have of, for instance, sitting rooms), but rather should really have to search the cognitive structures in their minds in order to construct something - a mental model - unfamiliar and novel, from scratch. Ie, not a space for which they had already constructed, through their experiences, a "package deal" model such that no effort of visualisation was either required or relevant.

I was not and am not aware of any other experiments of this type, even though it lies, I believe quite obviously, within the scope of the constructivist approach to knowledge generation and experimentation[2]. The only experiments that use some form of

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[2] Although it should be remarked that the children's game of feeling objects in order to guess, while blindfold, what they are is clearly similar in concept. I have carried out some analyses of this game at children's parties. This transfer across senses is one of the experiences that is commonly

sensory deprivation I am aware of are John Lilly's experiments (reported in "The Centre of the Cyclone" (1971)) in which he deprived himself of virtually all sensation and certainly all change in sensation, and passed into a LSD induced reverie, Jack Vernon's experiments on panic, hallucination and sense of time reported in "Inside the Black Room" (1963) - which experiments are, I suppose, but formalisms of ancient Sufi meditation practices and Guinness Book of Records attempts for the longest habitation of mine shafts and caves - and R.L. Gregory and J. Wallace's (1963) "Recovery from Early Blindness: a Case Study" in which they argue that the visual perception of their subject, a man who regained the sight he lost when only a few months old, was never as in normally sighted people, because the man had had to learn to "visualise" from a particularly restricted realm of touch experience, since, for his own safety, he was not allowed to touch all sorts of dangerous things[3]. Of course, work has been done on the effects of sensory deprivation used as an inhuman device in torture, but that is quite another matter with a different purpose altogether.

However that may be, I am not aware of any experiment in which access to one sense was specifically excluded, and transference to that sense was required to be made from other senses, in order to attempt to access the cognitive structure used with the excluded sense. And so I could find no precedent to use in the design of an

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described and given as an explanation, by those who go blind, as to why they cannot state when, exactly, they did loose their sight.

[3] Thus, for instance, he could never draw the front of a bus, because, as a blind child, Gregory and Wallace argue, the front was far too dangerous a place for him ever to be allowed to stand and touch, for fear of being run over.

experiment into which this characteristic was built as the over-riding concern, to allow me access to the mental models I presumed were produced by individual's using their cognitive structures.

METHOD

Requirements of the Method

The experimental material had, therefore, to have certain characteristics

Whatever space was used had to have features that could define space to the temporarily "blind". (In practice, a room with walls, floors and windows, etc.: ie, a bottle for the wine.)

There had also to be an anteroom which did not give too many clues (and certainly no views) as to the space to be surveyed, in which students could remove blindfolds to draw, and which they could enter and leave, preferably independently, while still blindfold.

The space had either to be safe for the (touching and feeling) blind, or the subjects had to be very carefully supervised [4] - which might distract them.

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[4] On the first occasion this experiment was tried, a warehouse space being converted into an art gallery was used. This involved a very long walk along planks over a basement that was being excavated and upstairs, into a large space that was missing one wall. All of this was overcome, but the last student (on this occasion, each student was taken to the space individually and alone, and had the space to himself) cut a hand on some broken glass

Arrangements had, ideally, to be made for students to experience the space, and to try to draw it, alone. (This was usually not possible, and not even the strongest insistence could stop them looking at eachother's drawings, and asking whether another had found this or that.)

Account of Method

The experiment has been carried out on 7 occasions (2 of which were rather threadbare versions that I assented to solely in order to make certain limited and particular points to the participants). In all, about 140 students have taken part in a Blindfold Survey (some more than once). With minor variations, on all occasions the procedure followed essentially the same course, and the essential results did not vary. They will, therefore, all be represented, here, by an account of just one attempt, (as it happens, the second), which took place in a multiple editing room at the London Film School, with a dozen students from the 2nd and 3rd year of the architecture course at the AA, all of whom had also taken part in the first run of this experiment [5], and several of whom had

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and had to stand perfectly still, blindfold, with a tourniquet around her wrist while I left to find a chemist with a bandage. Thus we learnt about safety! This space also lacked an anteroom, leading to terrible difficulties for the students when trying to develop their visualisations through drawing and then returning to test their ideas. Ever since, I have run several pilot studies for an experiment, before deciding on an experimental procedure.

[5] The 3 other main locations were: a basement disco at the Bedford Corner Hotel, London, for which Air India supplied blindfolds (in distinctive styles for both ladies and gentlemen) and recorded the event for their staff magazine; a ramped outdoor area at Brunel University (with members of the CSHL); and an emergency exit staircase from the lecture hall at the Art School of Ulster Polytechnic (as it then was) in Belfast. This latter event

participated in the first experiment, described in Chapter 5. The run described here was the most thorough and wide-ranging of the seven.

The students were blindfolded and led, individually, into the space to be surveyed, and then to the anteroom, which they were taken into in order to remove their blindfolds. From then on, they were allowed to roam freely (as long as they were blindfolded) around the space, and to return to the anteroom at any time to make a drawing, look at an old one, or check test results, having removed their blindfolds [B.1.i to iv]. When they felt they were learning no more, or they had completely lost interest, they were allowed to leave. In practice, it was not possible to keep the students from bumping into eachother (quite literally), and although speech-silence was maintained, they got some sense of the space from their collisions[6], just as they did from inevitably glimpsing the drawings others were making.

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provoked an extraordinary response. The blindfolded students scrambled all over a vertical glazed shaft which housed the staircase, and which came down onto an open concourse. They had no idea, but their activity caused the shaft to be surrounded by army commandos crouching, covering each corner with their guns pointing at us all. This, in turn, caused a queue of busses on the main road, with all the passengers looking over at what was going on. This, in turn, created a semi-circular audience that surrounded us and eventually started pelting us with empty cans, stones etc. At this point we ushered the students out. It was an extraordinary experience, that says a lot about that troubled place. Our reaction (that is, the reaction of the 3 of us conducting the experiment) was of suppressed but hysterical laughter, which is probably not very easy to understand unless you have visited Belfast. It also says a lot for the students that, when they were told, they too laughed and they were not angry with us for letting this dangerous situation continue, to our nervous amusement.

6 I cannot object to the information gathered through the collisions, since all they were being intentionally denied was visual information.

As well as their attempts to draw their visualisations, and the way they were developing, students were also asked to describe the way they had gone about collecting their information and building their visualisation (the tactics they had used).

Whether or not the students had actually managed to create a visualisation of the space was tested by asking the students to draw the space not only while they were able to move in and out of it, but also some time later, on the premise that, if they had created a successful visualisation that had any potency for them, they would be able to recall it with some degree of power, accuracy (consistency) and conviction.

A survey session would take 1 1/2 to 2 hours, including drawing time. This was typical for all runs of the experiment.

RESULTS

The students' drawings were generally of plan type (there were occasional perspectives). Since architects nowadays often "think in plan" this was not surprising[7]. I suspect that most people faced

[7] A major reason comes from an assertion of Le Corbusier. In "Towards a New Architecture" (that curious translation of "Vers Une Architecture" (1927)), Le Corbusier asserts "The plan is the generator", thus placing planning and layout at the centre of the architectural stage, and encouraging the idea of space as a vertical projection from the plan plane. This is in stark contrast to his definition of architecture as "the masterly, correct and magnificent play of forms brought together in light" (quoted in Broadbent (1987)), and has lead to the strong dominance that the plan, and notions of planning (as opposed to spatial delight), have held in much architecture since the 1920's. Until very recently, students have been, under the influence of the slogan, encouraged to think of the creation of space in a building as secondary to the planning. Hence, also, the concept of "elevating" a plan after it has been completed. I think this also helps

with the task would also do this, because the way most search the space is by following the walls around, feeling upwards and downwards at selected points, and because few have been trained in the expression of their spatial sensibilities through drawing. (There are few spaces where a normal human being can touch the ceiling, but when the students could do so or could find some device such as a broom that they could use as an extension, thus reaching the ceiling, they were very intrigued.)

The drawings they did during the process were, typically, fairly crude, and were certainly used, in part, as aides-de-memoire and prompts, for they would go back out to check over things that they were uncertain about, or which seemed to them to be nonsensical, and then add more information, enriching and modifying their drawings - and, one supposed, their mental models[8]. Their graphic crudeness is to some extent a reflection of their abilities in graphic presentation and expression, which was not expected to be generally developed at this stage in their architectural education, but it is hard to see how this limitation can be avoided, but also probably reflected their uncertainty and their wish not to take too long before they could out and discover more, in case they were forgetting anything.

It was quite common for students, while (blindfoldedly) examining the space, not to venture out into the centre of the space at all, but rather to hug the walls (with amusing and

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explain the use of the plan as the main way of exploring the spaces used in the "Blindfold Surveys".

[8] This really <u>is</u> a case where Broadbent's architectural "Conjectures and Refutations" (see Broadbent (1981)) fits the bill.

interesting results when 2 bumped into eachother). This helps explain the lack of detail in drawings concerning what was to be found in the centre of the space (which was sometimes very full of things). Even when students did venture out, they often managed, with uncanny - almost extra-sensory - skill, to miss things that were there, and were visually obvious, such as columns (although this may not be as surprising as it appears, at first glance, to be).

There was, also, often a difference between the drawings which is so extreme that it is hard to reconcile them as being of the same space. This may be to do with orientation and other, similar factors. But it is certain that such discrepancies would not be expected between drawings drawn by unblindfolded people, even though they had been in the space only a tiny fraction of the time that the blindfold surveyors were there. See [B.2.i and ii].

The attempts to explain essential tactics used in trying to build an image of the space indicated that the students were, in the main, attempting to generate an image of the space in one of 5 distinct ways. In one, they constructed an imaginary grid, and attempted to visualise the position of walls in relation to this grid, much in the manner that a lot of space planning is done. In another, they thought that the wall had to contain the space, and therefore saw it as one continuous element that they tried to wrap around until the end joined up with the beginning. The third was to imagine the space as a balloon being blown up and taking on the form of a restrictive (and hidden) container or mould. The fourth was somewhat similar, where the space was thought of as being like a fluffy and slightly amorphous ball, or a lump of clay, which the

student firmed up bits of until the whole thing was firmly and finally modeled. The fifth tactic was not any of the above and may be characterised as "highly individual". I find this tactic very hard to grasp. See [B.3.i to v].

The drawings that the students undertook of the space after some time had elapsed produced quite unexpected results. (The delay period is normally about 4 weeks.) I had assumed that, if they appeared to have created, initially, some drawings that were reasonably convincing as visualisation, indicating what I took to be a robust mental model, they would be able to remember the visualised space. But the resulting follow-up drawings were abysmal: they lacked conviction, detail and precision: they were scarcely husks.

I found this surprising and distressing, and so did the students, who said they really couldn't remember the space at all, but they were sure they would have if they really had seen it. I took them back to the survey space to let them actually see it with their own eyes wide open. The response was almost incredible. A gasp of astonishment in unison, eyes open wide, amazement. "It's nothing like I had imagined!" And they were not talking about the enrichment that naturally occurs when you "add" colour or light, but about the sense of the space actually being, of its actuality and immediacy.

CONCLUSION

Wrong again! I was beginning to get used to it. In spite of all my efforts to encourage the synthesis of a visualisation by denying sight and thus preventing immediate and direct viewing, requiring instead a transfer between senses via the cognitive structures that generated mental models, the results were so poor that they could hardly be considered as visualisations at all, and were so lacking in content in the students' minds that they were not in the least memorable. As consolation, I should have had the tactics, but I was not really interested in them, seeing them as a potential eventual spin-off: they were not central to what I wanted to find, so I wasn't looking for anything very special in them, and missed any opportunity there might have been there. (In retrospect, I think they might, with a lot of work and further research, turn out to be worth a very great deal. However, the dispersal of the original student groups, and the length of time that has passed since would oblige a completely new beginning, if they were to be used.) I hadn't managed to tap what I had wanted to tap: the cognitive structure that allowed people to create mental models demonstrating understandings of space by assembling together, or growing, a balanced and evaluated selection from their cognitive structures - as it were, a personal repertoire of deeply held and well-developed spatial ideas that an individual would use in setting up his mental model of a particular space.

It seemed that I had made only one discovery, and it was obvious: if you stopped people seeing, they did indeed stop seeing.

I was downhearted and distressed. I had failed again. Of course, a way forward was staring me in the face, but I couldn't, for the moment, and in my disappointment, see that. All I could see was that I couldn't find a way into these supposed cognitive structures that, in spite of all the discoveries represented by the body of "cognitive sciences", I was beginning to think might not exist.

chapter 7

THIRD EXPERIMENT - CONTROLLED VIEWING

CHAPTER 7

Third Experiment

Quote: "He who hath eyes to see, let him see" (The Bible)

PREAMBLE

The saga of failure continued. I couldn't construct a "language" and I couldn't, it seemed, access the cognitive structures I believed people had and used to account for and generate their mental models that constituted their understandings of their experiences of architectural space. At least, not in the ways I had tried (in spite and as a consequence of all my arguments about what is expressed and its mode of expression, and that which (was assumed to) lie, in Wittgenstein's (1971) manner, behind this expression). These attempts had involved, firstly, the carefully contrived attempt to construct a socially shared (verbal) "language" of terms in which to describe the experience, and, secondly, the exclusion of the visual sense in order to tap the visualising ability of the cognitive structure to interpret different sensory material from the non-visual senses, in the creation of a visual mental model of a space. I just couldn't make it work. The terms weren't shared, and the users had little awareness of how they had used the terms, themselves, because, I reasoned, they were verbal, not visual. The change in sensory input wouldn't cross over from one sense to another under the circumstances I had arranged, and there was no lasting sense of reality, to the experimental subjects, in the images of the drawings because they did not, apparently, represent visualisations.

Or was that it? Surely we transfer information between senses? (For instance, wine tasters would argue that much if not most of the experience of a wine's taste comes from smell, just as certain smells, such as the dankness of a dungeon, are quite distinctive, and bring to mind quite precise visualisations[1].) I was not happy to think that our senses were so exclusive. Some people, for instance, see colours when hearing sounds (the composers Scriabin and Messiaen are examples, and have peppered their scores with allusions to the colours to be seen with particular harmonic and timbral structures). Whenever I see a picture of Strasbourg Cathedral, I hear it[2]. That is not intra sensorially exclusive: the senses do indeed cross over. So we can reasonably assert that experience shows that the senses do not only blend together, but also cross over when we deal with architectural space, bringing about, for instance, "visualisations" as a result of the perception of entirely different sensory material[3].

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[1] For me, the most marked expression of this is the smell and sound of the old Gentleman's lavatory opposite platform 16 at Waterloo station. It was so distinctive that whenever I hear the sound, or smell the smell, not only the smell and sound, but also the sight of that space immediately springs to mind in great detail!

[2] What I hear is an amazing low pitch that wah-ed and wah-ed as the harmonic overtones modulated while I walked around the cathedral, changing its timbre as the standing waves unraveled: a wonderful experience that shows my simplification of architectural space as constituted of the purely visual for what it is - a simplification (but I knew this: it is a simplification of both convention and convenience). This strange, absorbing and haunting sound was caused by the action of a kango hammer on the outer skin of the cathedral, cutting out rotten stonework for replacement!

[3] The cross-overs described here are between intra sensory material that is present: in the Blindfold Survey, visual sensation was removed as completely as was practicable, and so the cross-over can now be seen to be of a different type to that in the other examples given here. This may be an explanation, although it did not occur to me at the time. I wonder, for instance, how much of an orchestra's sound I could imagine from just watching them.

However, for whatever reason, the visualisations the students were getting from their "Blindfold Surveys" were not doing the crossing over. I was confused, and leafed aimlessly through the drawings the students had made until a quote on one brought me back to life. "I can't remember, but I could if I'd seen it." Maybe the senses do cross over, but maybe it is very difficult for them to do so when one sense, the very sense that by being excluded is being encouraged to express itself so that it can be examined, has been removed. So maybe I should consider whether there was another way of getting at the cognitive structures, the mental models, but, in contrast, this time through the sense of vision, itself? And maybe the way the students had been obliged, by the very nature of the visual restriction imposed upon them by the experiment, to build up their mental models, step by step, gradually trying to construct a sense of some unknown whole from the sum of parts that they could only acquire (and thus assemble) in a linear sequence as they felt and fumbled their ways around the space was not how we experience things, at least visually. After all, as I, myself, had argued, "A Part is a Whole in a Role" (Glanville (1978b) (1980a), and Klir (1985)).

I remembered the instantaneity with which the students had reacted upon actually <u>seeing</u> the space that they had surveyed, blindfolded. Could it be that when we see spaces we see them instantly as one, a unique whole, in some kind of a gestalt-like[4]

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[4] I am not convinced that the Gestalt psychologists (see, for instance, Katz's excellent "Gestalt Psychology" (1951)) mean quite the same by a gestalt as I mean by a whole. The difference as I see it is that a gestalt is still seen as being composed of parts, than which it is, however, greater. My notion of a whole is much more "top-down", and I see the "parts" as becoming accommodated (in Piaget's (1973) sense) in a process of enrichment. The

object, perhaps elaborating and enriching them through time by the addition or incorporation of detail, rather than by taking stock of all the elements present and adding them slowly together to create the sense of the whole (but how do we know they are all the elements, and that the elements are elemental: we have here a problem akin to that of sub-atomic particles - see Glanville (1980c))? Perhaps if the first, wholistic[5], case were so, it would go some way to explaining how, in some rooms with which we are extremely familiar, we nevertheless gradually see things that we say we had never noticed before (and how are we to know they were there before they were noticed?). I thought of how I would describe a room in words. I would tend to talk about how I got to it, and then sketch a general outline of what I thought was important, finally adding in detail as necessary. This was what Ginali had shown in her analysis of the layout of New York Apartments[6] using Discourse Analysis (although she did not grasp this point: for her it proved the value of the analytic tool, rather than the way we perceived the space and sequence of spaces). It was the way, as I recalled, that writers generally tended to describe rooms - unless there was some particular object within, or part of the room they particularly wanted to draw attention to ("The logs crackled in the fire"). And it was also how I would draw:

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difference is, perhaps, not immediately clear, and a little difficult to grasp, but it is, I believe, important. This is why I do not (any longer) refer to my wholes as gestalts.

[5] I prefer to use the incorrect and idiosyncratic spelling "wholistic" (etc) that the "correct" version "holistic", for it reminds me - and, I hope, others - more immediately of the intent in the word to refer to a sense of wholeness, without need for recourse to knowledge of the Greek original *"holos"* = whole. Since we spell the word "whole", and not "hole", I feel quite justified in my idiosyncracy.

[6] In spite of my best efforts, I have not been able to trace a reference to the paper that presents this argument, although I have read it.

indicating the generality of the shape and then enriching it with detail.

And so I took it that the instantaneity of response could probably indicate that the identity of the space (or was it the room), its sense of wholeness, was what came first. And this assumption could account for both of my earlier failures: for in both, the parts were being given priority, and the whole had to be constructed, willy-nilly, from them. Thus, as I have indicated, the "language" we evolved was based on names for characteristics and qualities, and students were asked to explain their understandings through these terms, which were necessarily partial: and the blindfold survey naturally lead to the serial accumulation of (felt) details, that the students attempted to compose together to give the space visual identity. Yet, it is a truism of Cybernetics, and Sytems Theory in general (including Gestalt Psychology), that the whole is greater than the sum of the parts, and so there must be something that exists and gives identity beyond just the constituent elements.

And so the new question that arose was, could I test this: could I find a means of controlling the viewing of a space by experimental subjects so that I could extract an expression of their experiences of that viewing which could be examined, and, if so, how could I evaluate these expressions as results?

The answer was, I decided, yes. I could arrange to allow views of a space for different periods of time, and I could ask for drawn expressions to be made from the visualisations of this space that

the subjects made during their controlled period of viewing, which drawings could be examined. If my hypothesis was right, the space as represented in the drawing of a particular viewer who caught only a brief glimpse should be pretty much as recognisable as that of one who had a long time to examine - except, in all probability, in richness of detail. And I could push the viewer who was only permitted to view the space for a short time to hunch his way in his drawing, going as far as he dared in including more detailed elements, even if it meant that drew things he did not feel absolutely sure of, or guessed at or invented.

Thus was born the experiment I called "Controlled Viewing", which I have performed under different circumstances on 5 occasions with a total of about 100 students, and which I have extended for use as a design device (I would almost risk calling it a "method"), that I detail in Chapter 8 and, as catalogue presentations, in Appendices K and L[7].

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[7] Three of these five occasions have, in fact, used the experiment as a design method. The individual perceptions as demonstrated in drawings made after only brief viewings were compared to drawings made with free visual access, and the differences used as the sources of designs (referred to under the generic project title "MOTIF 8"). On these three occasions, two different sites were used: St Paul's Church, Covent Garden, and, twice, Bedford Square, London. The projects were done at the AA School and London International Summer School for Architecture.

METHOD

Requirements of the Method

A means of controlling the viewing period (ideally all sensation should be denied except during the viewing period, because of the clues that can be picked up and may bias the subject's notions of the space he is in, to either his "advantage" or "disadvantage", but this is simply not practicable).

A space of some distinctiveness and unusualness, and with some degree of complexity in detail, so that it may not be claimed that the subject was working in a space for which a conventional psychologist could claim there ought, naturally, to be some "archetype".

An unfamiliar space[8].

A space that could be freely accessed by a blindfolded subject, and that had an anteroom or other similar area in which drawings could be done after the controlled viewings of the space (but without seeing the space itself). (In this experiment, naturally, subjects were not allowed back into the space until their drawing of the space were considered complete.)

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[8] Although on one occasion what should have been a very familiar space (Bedford Square, London, home of the AA) was used, and the students were not allowed to see it but were asked instead to draw directly from memory. They had not been primed that this was what they would be asked to do. It turned out that it was such a familiar space that hardly any of the students had bothered to notice it, even though they had been going there daily for 3 or so years!

Account of Method Used

(There have been several variations in the method used, depending not only upon development and refinement, but also particular circumstances as they presented themselves, and the desired outcome (ie experimental data or basis for design). The particular occasion I shall refer to here was that used in the Controlled Viewing of the club room of the Covent Garden Community Association.)

Students, wearing blindfolds, were taken individually into the club room (being guided by the experimenter). They were taken to one of several particular view-points, and allowed to remove their blindfold, on instruction from the experimenter, for a selected, pre-determined set period: 2 seconds, 10 seconds, 1 minute, 5 minutes and "as long as you like" (in practice, generally about 15 minutes. These students were permitted to perambulate, since they refused to remain stationary). At the end of their allocated viewing time, they put their blindfolds back on and were guided out of the room. As soon as they left, they were encouraged to make a drawing of their understanding of the room (they had not been allowed to make any notes or sketches while in the room). They were invited to invest their drawings with as much detail as they could.

The drawings were then pinned up, with no extra information (such as name and viewing time), and were examined by each of the participants in the experiment, all of whom were invited to

determine how long a viewing each drawing represented. As has already been remarked, visual material generated in psychological experimentation is very hard to handle as raw data. In this case, some students were, inevitably, notably better draughtsmen than others, just as some undertook the exercise with much more care than others. Furthermore, the experience of standing at one spot, blindfold, and then being allowed a controlled period of viewing of a (highly eccentric) space is hardly commonplace, so there was an element of unfamiliarity that might "throw" some more than others. But it was hoped that the students could be assumed to have based the judgements they made on at least some commonality of experience within the group which would make up for some of these difficulties by the use of what I hoped was an established group "community of interest", where shared experience would act as a basis in the making of the judgements.

RESULTS

The results of the experiment demonstrated that there appeared to be little or no correlation between the length of the period of time of viewing represented in the drawings and the time period of viewing that the group, as a whole, assumed to be represented by each drawing[9] [G.1.i]. Where there is some relationship it is in the drawings representing a second viewing (the shortest period), although it should also be noted that those given the shortest viewing tended to be less competent and committed draughtsmen

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[9] Although, it must be admitted, there may be a problem associated with limits in short-term information storage and handling of the sort raised by Miller (1959) and already introduced. I cannot see any way around this.

(this was nothing more than the luck of the draw, and is the sort of bias that it is hard to avoid or compensate for). When I ask teaching colleagues looking at the drawings, or hold straw votes in lectures, showing slides of drawings, neither my colleagues nor the audience is any more capable of deciding how long a viewing the drawings represent than was the original group [G.2.i and ii]. It was certainly possible for even those students with the shortest viewing periods to invest their drawings with a lot of detail, although that detail was generally found to be somewhat less "accurate" that that drawn in by those who had had a longer view[10], when compared to the club room itself.

It was also found that students could redraw the room two weeks later, with a sense of conviction that it actually was the room they had seen, and with a fair degree of similarity and accuracy, as interpreted by both the student-draughtsmen, themselves, and by me, the experimenter.

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10 It is precisely this "inaccuracy" that provides the source material for designs carried out in the MOTIF 8 exercises, where the inaccuracies in the drawings representing short viewing periods (when compared to later drawings made in situ and with unlimited time) were taken to be assumptions that the student made about the nature of space and architectural elements, and thus to be constituents of mental models. The tactics by which the drawings were composed were also taken into account, and were translated into design strategies, and strategies for the exploration of the original space through the design produced by the student using the information I have indicated. (Because of the reflexive nature of the design as undertaken in these projects, they are rather complex to explain in full, although, there is a summary of the intention of these exercises in Appendix J).

CONCLUSIONS

It appeared that my supposition that there was a sense of wholeness and immediacy in our experiencing of architectural space was true: that we do indeed perceive space as some sort of totality - in the manner that I have described as a "whole": and that we then add in, either through the richness of our memory of the particular space, or through the richness of our imagining generating associative embellishments, what we think of as "detail". In fact, this imagining in of detail, together with the self-conscious awareness of how the representative drawing was executed, provides an access that probably even falls into line with Wittgenstein's (1971) assertion about the nature of evidence and its relationship with reality, as to how we understand our experiencing of architectural space, and which was used in the generation of the design projects that were completed under the generic headings "MOTIF 8". (See footnotes 4 and 6.) However, it is precisely the privacy and self-consciousness, and the arbitrariness of the chosen space for viewing that makes the information that each student generated and exploited in MOTIF 8 so unavailable to external analysis.

Thus, this phase of my search had ended. I had demonstrated my tenet concerning the essential wholeness in the experiencing of space, that helped me explain and understand the problems that my students had experienced when made to try to construct understandings by serial and partial experience, and in moulding experience to match a language built out of terms that represented characteristics. I had got students to make mental models of their

experiences of spaces that they could represent through drawings, and in which their presumed cognitive structures could be allowed to participate in a demonstrable manner by proposing embellishments that appeared in their drawings but could be found, by the students themselves, upon visiting the space, not to be present in the original. But I had also ended up with a method that produced results that, in as far as they could be comprehended, could be comprehended and used privately by each student, but which were not really accessible to others, at least under any circumstances that I could establish.

And so I was left having demonstrated what was probably blindingly obvious all the way through to all but myself, feeling rather lost and at the end of an undistinguished cul-de-sac.

chapter 8

THREE SPIN-OFFS

CHAPTER 8

Three Spin-Offs

"On the whole, I'd rather be in Philadelphia" (Deathbed assertion of W.C.Fields)

PREAMBLE

If my quest so far had failed in its main aims, it had produced a number of other benefits - and not only those I have indicated in some detail (such as my learning), but those which, in as far as they have been mentioned at all have, generally, only been mentioned in passing. These came in the form of spin-offs - and it may even be that the whole penultimate Chapter of this story (still to be told) should also be considered as a spin-off.

Of the various spin-offs, three stand out as being special, for they involved the development of general techniques that may be used in various ways quite independently of the experimental arena that I have been concerned with here, and because they work. It is these three that I introduce in this chapter, briefly describing how they originated, the techniques themselves (with a fuller description where there is not one in the appendices), and their ranges of usefulness. In a sense, after all the gloom of repeated failure, these are pearls that mark success, no matter how unintentional, and are therefore of special value.

The three are referred to as (in chronological order of invention and by the names under which they have been published): "Construct Games"; "Construct Heterarchies"; and "MOTIF 8".

Construct Games

In the experimental attempt to generate a "language" (or rather a shared set of terms) within and through which to describe the individual experience and understanding of architectural space, and to communicate it socially within the group of experimental subjects, I had used a technique, based on my development (following extensive conversations), of Thomas and Pope's (1971) realisation of Kelly's constructs for sculptors exploring the values they attributed to pieces of sculpture.

The technique that I arrived at was a complex procedure in which groups of students using a collection of slides of a building as their basic material, revealed their constructs to eachother, and then began guessing how other members of their group would arrange a particular selection of slides in a construct (by building a conversational mental model of each other group member), eventually beginning to construe together as a social group, and reaching mutually acceptable constructs within the group. (The technique has been more fully described in chapter 5, and is fully documented in Appendix E.)

It struck me that this was not the only possible way by which socially agreed constructs could be derived by a group of people arranging a collection of objects along a construct line, nor was the original purpose of developing a shared descriptive "language" (of terms for use in describing socially experiences of architectural space) the only possible use for such social construing.

In the technique as already recounted, all the elements were arranged along one bi-polar construct (ranked) line, and, as it turned out, participants (when in the interactive group construing mode) would often move even those elements that were placed at the ends (poles) of the construct (in supposedly fixed positions) - for they indicate the meaning / semantic range of the construct - as they hunted for some arrangement that had meaning for all of them. So that, the common changing / reselection of the pole elements allowed the development (and change in semantic range) of the construct being negotiated and finally agreed, which compromise allowed the generation of some completely new but genuinely shared construct that might be far removed from the initial one asserted through the original selection and positioning of the pole elements: ie, the social act of negotiated construing produced a result that derived from a sort of (not necessarily verbal) conversation, the progress of which could be recorded by noting which elements were moved where, when, and by whom [C.1.i to iii].

Another sort of compromise could be generated, however, if the group's freedom was circumscribed, and the pole elements remained absolutely fixed. Yet, since the groups had been made up of 3 people, (largely for "conservative" reasons, although it is conventionally sensible to have more than 2 participants), a simple bi-polar construct line would not accommodate all 3 participants making personal assertions at the same time. So a triangular version was evolved, in which the poles were fixed (by a complicated process of wrangling between pairs), and the remaining elements were, then, fought over by the participants, in

order to force a (not always very happy) compromise between the views of all 3. This technique is also described in detail in Appendix E.

The spin-off is, however, more than just a couple of techniques for the elicitation of shared constructs: it is the creation of an environment in which groups may "play" together, and, through playing, discover. The first of the techniques has proved more useful for this, because, apart from the feature that it may be used with non-verbal material (which it shares with the second technique), it does allow general development and the generation by the group of the completely new, and because it is "conversational"[1].

This has been demonstrated, for instance, at the 3rd International Congress on Personal Construct Psychology (held at Breukelen, the Netherlands, 1980)[2], where my primary intention was to introduce the technique as an aid to non-verbal construing. On this

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[1] The centrality of the Conversation (meant in the refined technical sense as first introduced by Laing (see Laing, Phillipson and Lee (1966), and the more poetic Laing (1970), and since developed by Pask (1973), (1976a), (1976b) and (1976c), and Thomas and Harri-Augstein (1985) as the appropriate paradigm for studies in the areas of human and social sciences) is assumed throughout this work. The conversation is appropriate because it accommodates the simplest imaginable mechanism for the interaction of 2 sentient beings - that each may respond to the other -, and builds on from that with its insistence on the modelling by each participant in the conversation of the behaviour and mental processes of the other (ie, I am another's other). Within this paradigm, anything that is not (potentially) conversational in form is trivial. My own recent work on control and interaction (specifically Glanville (1987a), (1987b) and (forthcoming)) supports this view, and shows the requirements for a formal consideration of interactive system to operate both actively and interactively through consideration of the information transmission characteristics, seen as a product of the cybernetic variable, variety.

[2] And on many other occasions, for instance, as a research tool for the generation of group discussion in Amsterdam, and at Portsmouth in order to highlight aesthetic differences in taste between students.

occasion, Congress participants were asked to bring along 6 objects (as opposed to 3 slides) each, and the construct lines for each group of 3 were drawn on the floor. (I have found it very helpful to use the floor: it stops people playing too many power games and getting too grand, although one prominent psychologist has refused to take part, claiming it was undignified to crouch on the floor.)

My demonstration did, indeed, prove my point about the technique. The room was full of silent, slouched and hunched figures seriously moving cigarette lighters and packets of asprin, handkerchiefs and wallets, passports, keyrings and flowers around the floor along the chalk construct lines, and reaching conclusions that were agreed arrangements, and that were, indeed, both non-verbal and, rather more interestingly, apparently also non-verbalisable constructs. But it also became apparent that the actual activity of playing the game was, itself, extremely revealing. Amongst the comments heard afterwards, the late Don Bannister Consultant to the CSHL) remarked that he had no idea how aggressive he was until this game had revealed it to him, and there was a general concensus that playing the game was a wonderfully rewarding psycho-therapeutic exercise. See [C.2.i to iv], which feature Bannister playing.

Construct Heterarchies

There was, however, also a second technique, deriving from the same experiment that was intended to develop this same "language" (of terms) for the social description of the

understanding of the experience of architectural space, which lead to the development of the Construct Games. This was based on the idea of examining whether students might derive and relate the terms that they had elicited working as a group, together, in some manner that would exhibit any similarities between their views.

In order to introduce this idea here (the technique is detailed in Appendix H), I need to refer to Pask's work. Pask maintains (Pask (1973), Pask and Scott (1972), Pask, Scott and Kallikourdis (1975)), for reasons both commonsensical and logical, that what he calls "topics" (things that may be learnt) must be so arranged that any one topic in a knowledge structure may only be derived from at least two other topic (otherwise there is, strictly speaking, no source of difference between the topics to generate the novelty and distinction of the new topic), and that, if topic A can be derived from topics B and C, say, then topic B must equally be able, somehow, to be derived from topics A and C, and topic C, likewise, from topics A and B: and that individuals might, therefore, progress on their learning Odyssey within the particular area of knowledge being studied, through the vast circles of topics relevant to a particular subject in whatever, personal heterarchy forming manner they chose.

It occurred to me that, in the collection of terms we had generated, some of the topics should be seen, by the students, as related to others in such a manner that the interaction of 2 or more of the other topics in our list might generate that particular one (also in the list), as in Pask's scheme. In fact, it seemed that, if what we had was a reasonably complete and coherent collection of terms,

then most of them should mesh in with others, none should be unconnected (for the unconnected ones would not be part of the general collection), and, even, that the students might relate some of the terms together in similar ways to eachother (ie, with common derivations) if the terms held similar meanings for them.

So the students were asked to show how they believed each term was derived from at least two of the others (and the special, "catch all" term "A", used to indicate all the seriously required but missing-from-the-list terms)[3]. Multiple derivations were allowed [C.3.i to iii]. The results, in the original usage[4], were, in the light of the lack of commonality of usage of the terms that had already been found, not surprising: each student had a remarkably different collection of derivations.

However, there was an interesting side-result: the nature of the heterarchical structures formed when the consequences of the term derivations were displayed, unraveled from the derivation forms and presented as a personal heterarchy (see [C.4.i to iv] for how to transform the ring form into a heterarchy), seemed to reflect very accurately the teacher's (ie my) opinion of how the

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3 In the original usage, the terms were placed in a circle, and connected arrows drawn to show derivations. This technique, similar to that used by crossword enthusiasts in solving anagrams, was suggested by Heinz von Foerster. I have also used a matrix table, which is easier for large collections of terms (over, say, a dozen), but this form is less immediately explicit.

4 Other uses have been various. The technique has been used, for instance, as a management tool to help organise terms so that personalities and beliefs could be examined, as the provider of a personal mirror for students to examine how they learn and think, and for the generation of knowledge structures allowing multiple routes to be taken through them, specially in the current development of the "Impossible World" Guide document with my students in Amsterdam (using the Hypertext realisation "Guide" on a Macintosh computer (see Glanville et al (1988)).

students tackled projects and, indeed, generally set about designing and learning: those who sailed through, simply, appear to have straightforward heterarchies, those with confused minds have great difficulty in leaving the base level - for everything is interconnected, and any start is, arbitrarily, as good as any other, so that no hard and fast decision can be made from which to progress -, and those who get into a mess in the middle having, literally, messy middles [C.5.i to iii]! I cannot and do not claim that this is an "objective" finding: I am not even sure how it would be possible, objectively, to test this finding, or even whether it can ever be tested at all, but my experience did find a reflection I felt to be true in my interpretation of the diagrams.

And another important use became apparent: for one of the central problems in dealing with any form of Computer Aided Learning (or, for that matter, non-linear (course) book such as a Hypertext document, eg Nelson's computerised original Hypertext Book "Literary Machines" (1980-4, 7), or Powell's Interactive Videodiscs, such as the "Behaviour in Fire" test and training disc (Powell and Sime (1987))) is to find means of describing alternative, legitimate and "Hygienic" ways of moving through (learning) a field of knowledge, and of trying to match learning style to how the material is presented to a particular student. (See Thomas and Harri-Augstein (1985) , and Pask (1976a), (1976b) and (1976c).) The technique allows this: experts can relate topics and the alternative relationships they propose may be constructed into the knowledge structure as providing an enrichment to the possibilities that may be followed. Further, by getting students to show their topic derivations and charting the route they followed

through the topics, it is possible to check for gaps in their knowledge and for accuracy of derivation. This possibility is, of course, just why Pask was interested in (mis) using the technique[5], and why the CSHL sponsored certain developmental work on it.

"MOTIF 8"

The final spin-off reported here took the form of a series of design projects going under the generic name "MOTIF 8" (motivate - get it!), already described to some extent in chapter 7, and represented in Appendices J, K and L. These push the understandings gained in Controlled Viewings to an extreme of reflexiveness, and use this effect to generate designs based on the self-referential, personal use of personal understandings of personal understandings in the generation of designs.

The process is almost, but not quite, as convoluted as that description makes it sounds. It requires two constituent conditions / elements. The Controlled Viewing element is familiar, and I shall leave discussion of its role until later. The second element is a design vehicle, what would normally be called a "brief" for a building. The requirement is for a vehicle that is in some way self-referential, paralleling the reflexive use of the findings of the

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[5] Pask has used the technique I describe, but, in doing so, forgot his most important point: that unless there is something to make a topic change into another, both will be the same - and whatever makes the one change must also be a topic about which we can learn (Pask (1976a)). Pask allowed that one topic could be derived directly from another, whereas, in my technique, it is necessary that there are always at least 2 topics interacting to make a third. Hence the use of the "catch all" topic "A", which means that some topic is required and being used that is not amongst the set already defined.

Controlled Viewings. One such design project is the design of an exhibition of (or monument to) some existing building, sharing, with that building itself, the same space: a (new) building that provides a key to the understanding of the original building, of / for which it is an exhibition, within the space of that building, but by adding to it, rather than destroying it. This exhibit building is to be constituted of the results of the student designer's own perceptual processes: ie, the exhibit will be an exhibit of how the particular student understood and experienced the particular space in question, as a product of the student's own way of understanding his experience of space, as evaluated by himself, ie, an exhibition demonstrating one person's key to understanding that of which the understanding is the exhibit.

To let the student discover the nature of his experiencing of the space, he was subject to a Controlled Viewing - the first required element mentioned above. (See [G.2.i to iii] for photographs of St Paul's Covent Garden, which was used as one of the sites for this exercise, and for which Dunnett's scheme - see later - was designed.) However, in this case, the student was instructed to push his drawings of the space as far as he could, well beyond - even the furthest he had imagined possible: to consider whether there was something he might have left out, and, if he thought so, to invent something appropriate if he could not exactly remember what he thought he had seen. He was also asked to record the manner and sequence in which he drew the building, ie his tactics in re-creating and representing his experience of the building and its space: for instance, did he draw in all the windows in outline, and then add in the panes of glass, or did he draw in each window

together with its panes of glass in full detail, one at a time[6]? (For a near analogy in the use of architecture related to memory and visualisation, see Frances Yates' seminal "The Art of Memory" (1966), and her abbreviated and specialised article "Architecture and the Art of Memory" (1980).) The student then drew the same space while both sighted and within it, taking as long as he wished (thus creating, in effect, a "control" drawing). Finally, he was asked to compare the two (sets of) drawings both for content and for the drawing tactics used. Those that were produced after the Controlled Viewing were taken to be of greater significance than those drawn in the space, for they reflected the students' assumptions and beliefs about what they thought ought to be (ie, in the terms of earlier Chapters, they made more explicit use of the student's cognitive structures in the creation of the mental model). So, differences between what may be, a little improperly, called the "invented" and the "recorded" spaces, details and tactics were noted. It was these differences that provided the insight, as evaluated by the student (I defy any other person to do it, for the meanings of these drawings and of the gestures in them are representations of intuitions, assumptions and understandings that are intensely private, and not really publicly articulatable), and it was an exhibit of these insights that was to be created. See [G.3.i to iii] for a scheme designed in this way by Charlie Dunnett.

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6 In recent research work, yet to be reported, I, working with a team oif my students at Portsmouth Polytechnic, have examined how children represent their notion of "home", both verbally and visually. One thing that we are looking for is whether children use tactics such as those described above in drawing their notions. I hope that it may turn out that there are specific representational styles, similar to learning styles such as are reported in Pask (1976b, 1976c).

Thus, although there was no "scientific" data resulting from this process, there were the relatively hard "facts" of exhibition building designs that the students believed reflected and introduced others to how they had understood the building and its space through their own mental models, to be demonstrated within the building under consideration, itself: ie, their "commentary" on the building became a part of the building in physical form, as opposed to remaining conceptual. Reification with a vengeance!

CONCLUSION

In three quite different ways, spin-offs that resulted from the quest for a solution to my problem were developed, and turned into demonstrably useful devices, standing on their own, without necessarily needing to be part of the experiments in and through they were, initially developed. They are:

i) a couple of "games" that allow both social and shared non- verbal construing, and an alarming form of self-revelation

ii) a means of reflecting upon learning styles and tactics, and of constructing complex knowledge structures

iii) a way of designing that takes on board, explicitly, both personal spatial understandings and their use as a commentary upon the space of which they were understandings.

While these techniques cast little light on, and offer no solutions to, my problem, they can be seen to have considerable use and value, in quite different ways. So that, even in these spin-offs, themselves the results of failed attempts (from which something, at least, was learnt by me), there is a further added value, a further special enrichment, which, in a peculiar way, reflects exactly my characterisation of learning and design.

chapter 9

THE END IS IN THE BEGINNING

CHAPTER 9

The End is in the Beginning (and yet you go on)

". . . If you could finish it . . . you could rest . . . sleep . . . not before . . . oh I know . . . the ones I've finished . . . thousands and one . . . all I ever did
. . . in my life . . . with my life . . . saying to myself . . . finish this one . . . its the right one . . . then rest . . . sleep . . . no more stories . . . no more words . . . and finished it . . . and not the right one . . ."
(Samuel Beckett, "Cascando" (1964))

My researches so far recounted had led me to a conclusion about which I was less than happy. It appeared that my quest was, indeed, for something as unrealistic as the philosopher's stone, and, even though I had, in the search, incidentally acquired some fortunate and valuable learnings and spin-offs along the way, I had consistently failed to solve my problem.

However, I had, I believed, at least discovered that the visual sensation, if no other, of architectural space is understood in terms of a whole, into which detail is added in a process of enrichment. (This ties in very closely with some of my ideas of how architects design - see chapter 3 and Glanville (forthcoming) - which is not surprising, since the result helped me formulate my ideas.) When we view a space, we get an immediate sense of its totality, its wholeness. This makes it, at the very least, extremely hard (I would, I think, still maintain impossible) to build an understanding of our experience of it in terms of combinations of characteristics (although we might describe strategies used in developing our understandings, in the manner, for instance, of Discourse Analysis as was mentioned in chapter 7). Thus, it is probably absurd to attempt to provide an isomorphic

representation of our understandings of our spatial experiences through a "language" constituted of individual and separate terms: indeed, if we have to try to construct an image of it by the assembly of component parts (as in the Blindfold Surveys), we have the greatest difficulty. Thus, attempting to find a collection of constant and socially agreed terms by which to describe understandings of experiences of (architectural) space is not likely to (and, in the case reported here, did not) either prove or provide a viable proposition.

And so I am, in the end, still left with my problem: what about architectural space[1]? Can our understandings of our experiences of architectural space actually be described at all, and, if so, by what means? Can our experiences and understandings of it be made available, through explicit articulation, to others? Can we discuss it at all in any coherent, clear and cogent way? Is to hope to do so a vain hope?

But, if, in contrast, the answer to these questions is (in spite of the failures presented as the body of this thesis) "Yes!", how can we talk about our experiences and understandings of architectural space.

I remembered, as an 18 year old, going to visit the composer Harrison Birtwistle. This was before I started studying architecture, while I was still writing music. He placed 2 musical

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[1] Although, through years of teaching and utterances such as "Y'know what I mean", and, equally, as a result of undertaking this research, I am no longer, I believe, quite so baffled and ignorant as I was when I started out.

scores in front of me, one of Olivier Messiäen's "Chronocromie" (which is full of strange time signatures) and one of his own "Monody for Corpus Christi", and then he left me alone for 3 hours in his kitchen. When he came back, having gone shopping for the nappies and tinned peas, he asked me what I'd discovered. I asked him about the time signatures in the Messiäen, the notation of which was new to me and which I didn't understand and could only guess at, and then I demanded that he tell me about how he had constructed his piece. He refused. He said that analysis was something you did for yourself, and that the purpose of analysis was not to learn about what someone else intended (the art work should do that, directly and without excuses): it was to tell you, and, thus, to help you learn about yourself. That was a terse but profound lesson, and one I try to keep in the forefront of my thinking. Although I don't always succeed.

And I remembered an early lesson when, as a first year architecture student at the AA, the painter and Blues critic Paul Oliver asked me to analyse a painting. Not having fully absorbed Birtwistle's lesson, I refused ("There's no point in trying to get into Beethoven's head! Analysis of what others mean is impossible, so why do it?"). Oliver asked me to prove it was impossible to analyse a painting, so I set to it, using a painting by Paul Klee - "The Mount of the Sacred Cat". By the end of the day, I had of course proved analysis was not only possible but also worthwhile, and I had already found out a lot about me, drawing an analogy between the way Klee handled his grids and Messiäen controlled his rhythms. (This lead to my first published paper, "Klee and

Messiäen", Glanville (1966).) I think I had, by now, fully learnt my lesson about analysis, even if I did not always remember it.

And so it suddenly occurred to me that there was no more getting away from the consideration of <u>how I understood</u> (how I understood) <u>space</u>. I had to take into account, and account for my own experience. In particular (and especially since one of the purposes of my research was to undertake some learning myself), I began to wonder how I could have failed to look into how I could both account and recount to myself my own understanding of space? Analysis is for the self - the lesson I had learnt from Birtwistle and Oliver. Why, I began to ask myself, had I been so mean, unrealistic and lazy as to expect others to do my work for me? Where were all the assumptions of new order Cybernetics (in which I already had a doctorate) that I was involved in reflected in my approach to this area? How could it be that I had failed to attempt to take cognizance of my own cognition as well as attempting to take cognizance of the cognition of my students? Was real the answer (scientific) caution, as I supposed, or a simple lack of daring? Whichever it was, I had, now, to look for myself: I could no longer justify asking others to do what I would not do myself!

I decided, therefore, that <u>my</u> examination of space, the phenomenon that <u>I</u> constructed and construed, needed attention. Not just attention, but <u>my attention</u>. I had to look into how I could account to myself for how I thought of space. I had to be prepared to take a risk, but with the humility of the child enquiring, NOT as an imposition to be made by me upon the subject. And what I

could find out, from and by myself, I would have to be prepared, eventually, to put to others in the "what if" manner.

But in this account I am not really being entirely honest, either. For the idea that there were ways in which I (and, I hope, others) can construe and communicate our experiences and understandings of architectural space hit me head on, as I shall recount, (with the immediacy and clarity I associate with Saul's vision on the road to Damascus) at the first Mayan architectural / archeological site I ever visited, in Palenque, Mexico, in 1981, when the local English speaking guide, a maths teacher by profession, took me, a Dutch companion and colleague on the trip and a well-prepared middle-aged American couple up the steps of the "Pyramid of the Inscriptions" and told us of the mathematics of the Mayans, and its embodiment in their buildings.

And it is from that story that the final part of my account stems, an account in which I shall explain what I have been able to learn from assuming that I can both make and explain my own (personal) constructs about architectural space that permit it to be treated as a phenomenon, which I take to be the beginnings of a new, and grand research programme, and, yet, which already has at least some value in accounting for this particular personal scientist's experiences and understandings, and in which I shall also speculate about future directions and developments in my research.

PART THREE:

A New Beginning

chapter 10

ARCHITECTURE AND SPACE FOR THOUGHT

CHAPTER 10

Architecture and Space for Thought

"Perhaps this book will be understood only by someone who has himself already had the thoughts that are expressed in it - or at least similar thoughts. - So it is not a textbook."
(Wittgenstein "Tractatus Logico-Philosophicus" (1971))

PROLOGUE

Unlike most endings (at least, as we choose to recount them), this one represents a new beginning rather than a conclusion. As I have indicated, I had, by and large, failed, although I had learnt a lot from my failures. But I had also realised that I had omitted myself from the experiences being represented, and that if I wanted to develop a way of describing experiences of (architectural) space, I could do worse than rely on my experiences.

I also decided that, since I had failed to find a means of describing, socially, the experience of space, in spite of the best efforts of myself as experimenter and the participating student subjects, I could not go on: and for some time, as I have explained, things stood still, apparently stagnating, but actually fermenting in the quiet of the back of my brain, while I used the techniques and discoveries that we had nevertheless made "merely" as teaching devices.

And yet there were three personal, revelatory experiences, apart from the failure of my experiments, that suddenly opened up the whole field to me in a completely new way, releasing the

(figurative) gasses and liquids of the potent forment that had been brewing up in the back of my brain, and which formed the basis for this new beginning that I like to refer to as a research programme that is only just beginning.

The three were:

A visit to the Mayan City of Palenque in the Chaipas region of Mexico, my first experience of this architecture.

Discussing the apparent non-spatiality of Greek Temples with two architect friends.

Realising (as I suggested above) that I had excluded myself, my own greatest resource, from participating in the whole experiencing and describing process, and that, to be true to my aims of learning, and the philosophy of both Kelly and his followers - especially at the Centre for the Study of Human Learning - and my cybernetic colleagues, I could not allow myself to do that. By taking on board my own experiences of space, and trying to find a means to account for them and to explain them to and for myself, I could both treat space as something in its own right, and use the development of my means of explanation and description to try to improve both the quality of my own experience and to communicate about this with others. Thus, I had, in fact, learnt to exerience architectural space myself, in the course of the work done - an ability I had not had at the beginning!

I do not believe I need to further justify or explain the third revelation. All that is remarkable about it is how long it took me to realise it. But the first two need elaboration, and, because they are stories, I shall tell them as such.

DISCOVERING MAYAN ARCHITECTURE; SPACE AND ZERO.

Palenque is a Mayan city (in the Mexican state of Chaipas) dating from about 600 AD, and celebrating, particularly, the King Pacal. It is at the end of a savannah, in the foothills of Sierras that eventually rise to Guatemala. I arrived there one August morning in 1981 after a bumpy and dusty ride from the oil town of Villahermosa (centre of the earlier Olmec civilization) in the back of a lorry.

On arrival at the entrance to the site, I was approached by a man who asked in English if I wanted a guide. Being completely new to this sort of stuff, I said yes. He lead the small party I was with in to an amazing world of pyramids, Temples, a palace, ballcourt and other buildings set in lush meadows around a rivulet, and surrounded by dense green jungle banked steep up the hills [H.5.i]. The sun was brilliant and hot, the sky blue with random white clouds, and the shadows cast provided great contrast. It was a truly amazing first experience of a Mayan city, never to be, nor in fact forgotten.

The buildings were extraordinary. Generally rather squat, they had unnecessarily, even unjustifiably thick walls with either lintels or coffered arches at their openings [A.3.vi and vii], and

were often covered with intricate carvings in several relief layers (although this is more remarkable at other sites, such as Uxmal [A.4.i and ii], in the Yucatan). Above them were freizes, also ornamented, crowned, frequently, with an intricate "cock's comb", and the buildings were raised on plinths (pyramid bases being the most marked of these) and immediately surrounded by lawns. They were built of a light brown-grey stone that the sun bleached.

On the pathway into the site, as all this revealed itself to us, the guide explained that he only did this job in the tourist season, and he was sorry about his English (which was, incidentally, fine), but he was only the local school's maths teacher.

One of the first buildings we approached was the "Temple of the Inscriptions", a pyramid unique in Mayan architecture in that it contains a burial chamber in which is the sarcophagus of King Pacal (Pacal = shield) [A.3.i and ii, H.6 i and ii]. It consists of a steep stepped pyramid base with a stairway up the middle, and a small "hut" on top[1].

Panting, we reached the top, perhaps 75 feet up. There, our guide lead us towards the Temple building itself. This is a relatively modest building with five equi-sized and equi-spaced openings that occupy the long wall facing you as you ascend, inside which is a long room with three anti-chambers. As he took us slowly across the platform, he began to explain about the tomb within, and how

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[1] The form of the Mayan temple is taken from that of the Mayan house-hut, which still exists virtually unchanged all over Mexico to this day. See Turvil (1987) and Gallenkamp (1987) for good summaries of the development of Mayan Architecture: I am no expert.

it had been found. But as we got to the central opening in the extremely thick wall, he stopped, and asked the most unlikely question:

"Did you know the Mayan's were very clever mathematicians, and they invented the concept of 0 (ie zero)? Did you know that 0 is a very special number with properties quite unlike any others?"

I answered that I did know a little about 0 existing as a notation that permits the subtraction of a larger from a smaller number, thus symbolising the crossing over between the positive and negative number series (which it allows to be generated), consequently also having strange effects on ordinal numbers, division etc., but that I did not know about the Mayan's having invented it.

He then went on to say, "Well, they built their mathematics into their buildings, and we are currently in the space they considered as 0."[2] See [I.1 i to iv].

I thought about this for a little, because I could not immediately understand. We were, after all, only standing in a doorway. And then, suddenly, it all became clear to me. The doorway, together with the wall itself were an embodiment - a representation, even - of the 0 space, the transition from outside space to inside space,

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[2] I have not been able to find any information to either confirm or deny this assertion in any of the (few) books on Mayan architecture, in English, that I have been able to locate. Its absence should no longer, however, appear entirely surprising to the reader, since it merely confirms my point that little discussion in architecture is concerned with space.

from positive to negative. And so my mind began racing. Didn't that make sense of walls with pilasters, of the galleries of Mediaeval Cathedrals, of niches and bays carved into walls, of columnated and pilastered walls, of military corridors within castle walls, of the spiral staircase enclosed .... the list went on and on. With this one, simple remark about a mathematical idea we now take for granted (even if it is immensely sophisticated and not generally very well understood), my schoolteacher part-time guide had suddenly explained so much to me that he had literally opened my eyes. For the first time I could see a value beyond the cosmetic in architectural decoration and articulation. For the first time I had been given an insight that helped me to understand my experience of architectural space. For the first time I could understand what the spatial function of a wall was - and, therefore, why the Mayans built them so unnecessarily and unjustifiably thick.

It really was a revelation, for which I have to thank that school teacher. And it doesn't matter in the least whether he was right about the Mayans, in the context of this work, for he had provided an eye-opener and a way of experiencing and discussing space - that made immediate sense to me[3].

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[3] This attitude to the purpose and meaning of analysis was first explained to me by the composer Harrison Birtwistle who, when I asked him about the construction of one of his pieces, replied to the effect that the purpose of musical analysis was to learn to understand yourself, not the mind of the composer of the piece. This was re-inforced by Paul Oliver, the painter, jazz and architecture critic, who insisted, when I refused to do a pictorial analysis for him, that I prove that there was no point in doing one. This, naturally, led to me doing an analysis, and to my first publication, "Klee and Messiaen" (Glanville (1966)).

The Space of the Solid Blob: the Greek Temple.

In Chapter 1, I asserted that there was an alternative way of looking at the difference between Greek and Roman architecture to the traditional one of style and engineering (the manner of, for instance, Pevsner), considering it, rather, in terms of the way that space was generated and contained. Having been brought up in the Pevsner tradition, I was very surprised when I discovered this.

The discovery came about thus:

Separately, and in great bemusement, I asked two architectural colleagues, Dick Bunt and Leon van Schaik, what it was about the Greek Temples that made them so spatially significant to architecture, when they were essentially just rather elegantly decorated "solid" lumps, with internal access restricted to the few special priests permitted to enter, and which, therefore, through their privacy and solidity, had, to all intents and purposes, no socially real space in them.

The answer I got from them was that the space was generated out from the Temples themselves: that the space they were making was outward going, and external [I.2.i]. This was, to me, a completely novel concept, for I had failed to connect what I knew about, for instance, the relationship of an English Cathedral to its Close, and of its spire and the space generated around it (which was of great significance for several reasons, including navigation), with the the siting of the Greek Temple, just as I had failed to

realise the significance of the altar and its spatial influence, especially when used in the highly centralised plan referred to as the "Greek Cross" [I.2.ii]. Indeed, speaking figuratively, the Greek Temple can be taken to be a sort of altar, with the landscape, itself, forming a shell or container[4]. I had considered space as exclusively internal: elevations of buildings were essentially murals and reliefs. The notion of the Cathedral Close as a space generated by the Cathedral and defined by the Close bounds was unrecognised even if accepted [H.9.i].

This new idea (to me) that there could be space outside, and, even more, that buildings, even solid lumps, could generate space outwards from themselves, was also a revelation. It made sense of the way some critics speak of the "space" occupied or generated by a piece of sculpture, and it allowed me to view the "periods" of architecture in a completely new way, a way that reflected means of spatial generation rather than changes of style and structural developments. It even appeared, I was told, that participation in a Greek ritual could occur so long as you could see the Temple: ie, the building had a spatial influence, a domain it controlled, that could extend for miles around itself.

Thus, Greek architecture (in terms of its main public buildings, Temples and theatres and urban routes) takes on a new position as the final and glorious culmination of a long tradition, rather

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[4] This point was first made by Vincent Scully (1962) in his remarkable book "The Earth, the Temple and the Gods", in which he introduced his exposition of this notion of space and the Greek Temple. See also Boyarsky (1972) for a thorough account of the siting of Greek buildings and towns within their surrounding landscape, and the significance of the inter-relationship and sequence of the buildings and public spaces.

than the high point of a tradition that was to go down-hill with the Romans, to whom was left, as I hinted in Chapter 1, the task of initiating a new one [H.2.i and ii, H.3.i].

(When I finally got to see these Temples, this architecture, as I did in that Mecca of Greek culture (Turkey) 4 years before writing this, I knew why architecture students were told to go and experience it, and I knew how foolish, once again, I had been not to have done so. But I also knew that the explanation I had been given held good for my understanding.)

THE BEGINNINGS OF A WAY OF DESCRIBING MY SPATIAL EXPERIENCES.[5]

I have already, above, introduced a means of describing some of my spatial experiences, through the Mayan concept of the wall as embodying the notion of 0 space, with the outside as the equivalent of the + ve and the inside as the - ve. And I should like emphasise the metaphorical nature of the analogy between wall, 0 space and mathematical 0, to prevent any possible misinterpretation resulting from literalism. But before I examine, develop and integrate this concept, however, I shall return to the Greek example.

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[5] I should like to emphasise several points about the undertaking in this chapter, here, for some readers of earlier drafts have found them difficult. The first is that this is a personal document, and what I produce here has the value associated with such a document (if it has any value at all). It makes no claim at being universal. The second, concommitant with the first, is that the revelations presented here are revelations to me: no one can share my revelations, although they may help create in others their own revelations - just as I cannot do other people's learning for them. Indeed, these personal revelations may have no revelatory quality at all to others. The third concerns the notion of language and term (which I have addressed in chapter 5, and to which I shall return in chapter 11): other readers have suggested that the word "template" would be more appropriate than the word "term". I see the point (especially insofar as I also use diagrams): a template is something you hold up and compare other things to or make them from, which is much what I am doing here. But a template cannot, as I understand it, really be part of a language, and it is a language I wish, and need, to assist developing. Then, there is my approach to explicating the terms I introduce. This involves the media of words, diagrams, photos and drawings - all of which are necessary. It also involves an approach to complimantarity between terms (akin to Kelly's construct poles, yin and yang, and all those other, similar partitions of the universe), which treats the terms as, themselves, phenomena used to describe other phenomena, and where terms are understood as often covering a continuum also inhabited by their compliments (and / or opposites). I do not, however, exclude the middle (as in the law of the excluded middle): indeed, it is from the interesting and valuable existence of the middle (zero) that the understandings I describe here in the first place derive. Finally, I also make extensive use of analogy and metaphor. I do not mean, for instance, that a wall IS mathematical zero. I do mean that they perform certain similar functions (and that I derived my understanding of the one from the other, by analogical reasoning). I have attempted to make sure that the analogical nature of my intent is apparent in the text.

The Greek Temple is, of course, a much more sophisiticated architectural object than I have just indicated, and it was not without an inside: around the back of the Temple, there was, typically, a room used by the priests (from which they would announce, in the appropriate God's voice through a sort of trumpet amplifier, whatever message seemed necessary, and enjoy the sacrificial offerings left for the God). But the space inside was essentially private: the public space was not only outside the building, it was also generated outwards from the building, which was, to all public intents and purposes solid [A.2.i to iv].

Thus, in considering the spatial concepts involved in the Temple, we have a number of terms that help us indicate the nature of its spatial operation. These terms (with their compliments) are:

Inside (or internal) / outside (or external)

Inward / outward

Public / Private

Solid / Void[6]

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[6] It will be noted that these terms do not refer, exclusively, to the visual sense. It is important, for me and, I believe, for the development of any serious language in which to describe experiences of architectural space, that the current almost exclusive pre-occupation with the visual is dropped in favour of a wider sensory base. Spaces can be touched, smelt, even tasted. And the importance of sound in buildings cannot be over-estimated. Indeed, my overriding image of Strasbourg Cathedral is not visual (I am not sure I could recognise the interior visually), but acoustic. Although, for reasons of brevity, I shall largely use the visual metaphor, non-visual senses should also be taken as included.

and it can be asserted that the nature of space, in the case of the Temple, was that public space was both outwardly generated and external - and the building was publicly solid - yet it was internally private, through its private internal space.

Then what of other Greek buildings?

Consider, for instance, the Greek Theatre (classical Greek buildings were, as with the buildings of most periods and styles, of such general uniformity, developing so consistently, that I take it, under the particular circumstances prevailing in this work, as reasonable to talk in such a generalised manner [A.1 i to vii])[7].

The Theatre consists, essentially, of 4 elements placed in a landscape. There is a raised stage with a lower forestage and a wall behind it, and there is a vast sweeping auditorium, rising up in roughly a semicircle and at about thirty degrees elevation. Where possible, the auditorium structure was built upon a natural slope, but not always - which lead to some remarkable and vast supporting structures. In as far as possible, the Theatre was situated in the landscape so that it could take advantage of the views, and also so that it could exploit the natural evening air updraft to aid the vast audience to hear. The action of the play, generally, takes place on the stage, and the chorus is located on the lower forestage [H.3.i].

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[7] Although much conventional architectural history is, as I have said, naturally concerned with accounting for developments within the types, and the historical sequence of occurrence of particular stylistic and planning details (ie, the development).

Spatially, we have, in my analysis, something very similar to the conditions pertaining to the Temple, for the whole purpose of the spatial arrangement is to allow the actors to perform (outside) outwards from the stage, and for all those within view (ie, within the auditorium) to be able to participate in the action. There are, naturally, differences: the backstage area in the Theatre (behind the wall) is private and interior, but has much less significance to the public than the interior of the Temple. It is also possible that the role of the landscape in the Temple and Theatre differs. But the central duality of the public container of a private interior space dominating and generating a vast outside space outwardly from it holds for both.

I do not wish to push this characterisation of the Greek architecture too far, for its relevance is to demonstrate that the dualities I have mentioned can be used in the description of an analysis of spatial experience, rather than to insist upon their essential correctness, or their absolute universality. Nor is it my intention to present an architectural history[8] based on these (and

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8 However, I should perhaps remind the reader of two example cited earlier in this work: the architecture of the Egyptians and of the Romans. In the case of the Egyptians, the Pyramid is a clear example of a building containing an intensely private space (its privacy supported by centuries of myths such as "The Curse of the Mummy"), which generates, outwardly, an enormous external space, dominating, as it does, the surrounding desert for ten's of miles [H.1.i]. A variant is the Temple at Luxor, which was carved out of the rock starting from the top and working downwards, thus originally creating an internal (and relatively private space) with no external space at all! This architecture is closely related, thus, to the architecture of the Greeks, inasfar as I have presented my initial analysis. The architecture of the Romans and all since, however, differs in its basic spatial conception in that, while it certainly had buildings which almost only generated external spaces outwardly (for instance, Triumphal Arches, Viaducts), it also had a majority of buildings with large and public internal spaces, and spaces that were generated inwardly. These include important public buildings such as baths and courthouses, which, in their form as Basilicae, introduced another level of complexity, and provided the basis

other descriptions I shall introduce later), although as Zevi (1974, 1983) has pointed out, it is necessary, and should be undertaken as part of the future research programme that this work (particularly this chapter) lead up to, and, I hope, start. Rather, I shall return to the Mayan concept of the 0 in space, for in it there is a further concept that can be applied to the Greek, and which is central in the constellation of the descriptions I am developing.

Zero Space and Mayan Architecture (the Origin of the Thick Wall).[9]

As I recounted above, one way of considering how the Maya understood space was as consisting of three varieties of space (as opposed to the "normal" two - inside and outside). These I have referred to, in deference to my mathematical guide at Palenque and in order to differentiate between the two differing notions of spatial construction, as being positive (+ ve, ie outside), negative (- ve, ie inside), and zero (0) space. The difference lies in an analogy to the transitional nature of the number 0, that is the edge between inside and outside space that is defined by some boundary that has the property of existing, distinct, on its own[10].

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from which the cruciform church plan of European Christendom developed.

9 I do not, by this, intend the chronological origin, but the origin of my understanding of the concept of a 0 space analogically embodied in a thick wall.

10 This notion, of a boundary existing in its own right and with its own distinctive qualities, becomes central to the distinction logics introduced to Cybernetics by George Spencer Brown's "The Laws of Form" (1968). The work on the nature and consequences of his logic for the properties and behaviours of boundaries was largely carried out by me (Glanville (1979), Glanville and Varela (1981), and a note to Glanville and Varela by Glanville (unpubl)). I shall leave summarising our findings (which were developed before I visited Palenque, and without any thought of the notion of zero that takes, as a metaphor, such a central place in this chapter).

Thus, walls and other dividing elements have "thickness" (the metaphor should not necessarily always to be taken literally) - a quality of being and of having spatial existence in themselves, and of having quality (self-identity / self-value)[11].

In looking at Mayan buildings, we find this is exactly what happens. The insides and outsides of the buildings are defined by walls, ceilings (often coffered or vaulted) and floors that are literally thick. But the walls, themselves, have intricate surfaces of carvings, made, on the outsides, to several depth levels, often painted on the insides. The roof springs from an architrave that projects in several steps, often with a freize, and the floor continues outside the building as a plinth that drops below the threshold, which extends as a platform around the building and finally descends (steeply and dramatically in the case of the pyramids) to the level of the surrounding land. (See [I.3.i] for a typical section through such a wall, based on both Palenque [A.3.vi and vii] and Uxmal [A.4.i and ii].) In a simplified form this can even be found in the (to this day surviving) traditional house-hut, with its mud platform, overhanging thatched roof, and adobe walls [A.6.i].

What this gives us, in terms of spatial experience, is a series of concatenated zones that exist in their own rights, each of which, as a result of the nature of boundaries, has an inside and an outside:

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11 One criticism often made by both users and certain schools of criticism about Modern Architecture is that the walls are so boring, flat, thin, lacking in character. The argument about thickness offers a theoretical explanation of this failing.

ie, a series of zones, each of which can be a 0, + ve or - ve space, which leads, eventually, to the amazing construction of the (logically paradoxical) outside external inside space of the courtyard [I.3.i, A.3.iv and v]. This indicates the power that the Mayan spatial concept has over the more traditional and straightforward inside / outside interpretation.

I referred to the Mayan concept of space as the origin of the thick wall, and emphasised in footnotes that I did not mean either that this "origin" was chronological, but rather the origin of my understanding, or that "thickness" should be taken as literal and material thickness. For, clearly, examples may be found of a concept such as this that precede the Maya by centuries, if not millenia. One such is the aforementioned Greek Temple.

As well as the elements I have already introduced, the Greek Temple shares much in common with Mayan buildings (including its putative origin in the simple, peasant hut - see Stevens' criticism of this concept as presented through the idea of "The Noble Savage" (Stevens(1966))). For instance, it, too, sits on a wide plinth approached by steps from ground level, and it has a raised threshold. The roof projects, significantly, out over the eaves, and there is a decorated frieze along the main axis. It has literally thick walls, but, instead of carvings on the wall, it is surrounded by a colonnade of roughly equi-spaced columns which create a wall-zone of their own, and a further zone between them and the thickly constructed wall that defines the ultimate interior spaces [H.2.ii]. (The comparison with the Egyptian Pyramids is interesting [H.1.i], for their walls, although immensely thick (literally), are

almost as bland and simple in their approach as those so often criticised walls that were produced by so many of the Modern Movement architects. There is a sense in which metaphorical thickness equates with richness and enjoyment.)

Nor, of course, are Greek Temples alone in this. All sorts of colonnades. arcades, niches, carvings, articulations, screens etc have the same sort of richness through their metaphorical thickness - hence the delight in going along bridges, and the English tradition of the "Long Gallery" [A.7.i]. The most remarkable single example I have come across is the "Colonnade Room" in the Hermitage in Leningrad [A.11.i to iii]: a room with a colonnade down the middle, pilasters and niches around the walls, and a colonnaded gallery above accessed from a staircase carved, in layers, into an end wall.

Thus, it can be seen that, using only this small selection of terms derived from the accounts of two experiences, a tour round Palenque on my first visit to a Mayan site, and the explanation that the space of the Greek Temple was generated outwards from it, it is possible to begin making a description of the space and of the experience of the space of at least some buildings. And so arise four questions:

Can this collection of terms be extended and codified, for general use?

Do they describe experience?

Can their use clarify and amplify experience?

Do they work as a means of communication between people?

The latter three can hardly be answered precisely, in a manner supported by hard scientific evidence, for the moment, although I could assert what I believe to be true, from my limited experience[12]. They are the questions that are to be answered by the research programme I propose, and are clearly massive questions, far beyond the realm of this (or, indeed, any) thesis. I shall return to them, in a different form, in the chapter 11, where I go some way towards suggesting modes of investigation, possible outcomes, etc.. But the first question can be answered, at least in a limited form, by extending and codifying what has already been presented here.

AN ENRICHED DESCRIPTION BASED ON THE MAYAN INSTEAD OF THE GREEK

I have listed some of the characteristics by which Greek architecture may be characterised (ie, through the use of which I can describe my spatial experiences of it) as being:

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12 Which is that they do both describe, and amplify and clarify my experience (hence this chapter), and that, when used even with first year architecture students as a teaching device, they do communicate. In fact, at Portsmouth Polytechnic School of Architecture, the terms 0, + ve and - ve space have become a sort of in-house jargon used by many of the students and staff in discussing the spatial intentions in architectural designs. Thus, students with whom these terms were used and in terms of which projects were set during their first year course, have, in their final year (1988) produced major (final) designs rich in thick walls of both the articulated and the habitable kind. For an unsolicited student comment upon the usefulness of these concepts in discussing and generating architecture (both Mayan and in general), see Turvil (1987). It is clear that the introduction of these concepts has lead to a type of architecture and architectural understanding in which the quality of boundaries - walls, zero spaces, etc - has been far more widely and richly considered than has generally been the recent case. However, more work is obviously required, the first part of which is being undertaken in 1898.

Inside (or internal) / outside (or external)

and

Inward / outward

Public / Private

Solid / Void

and I have shown that, in the case of Mayan architecture, at least, there is a similarity between the first of these pairings and the Mayan concept of + ve, 0 and - ve space. But there is a major subtlety that exists in the Mayan schema (as I have taken it from my school maths teacher), which is absent, yet, I believe, sorely needed in our account of the Greek, and which also has a serious philosophical parallel and base. I shall explore these here, before I look at the other pairings for possible enrichments, and then at some further ways for the potential description of spatial experiences.

To talk of an inside and an outside is to talk of a boundary between them, which boundary creates them. In architecture, this is normally a wall, roof or whatever, which is taken to absolutely distinguish the inside from the outside.

However, such walls may not be such simple dividers, for they may - indeed must - have qualities of their own. There does not exist a wall or a roof that is without its own substance (and therefore character), no matter how trite or self-depreciating that substance may be. In Greek architecture, many walls are made into purposely and particularly rich "zones". Thus, the elevations

of a typical Greek Temple will have, as I have explained, not only the screen-wall itself, but an area in front of that, and then some columns, sitting under (in the case of the front and rear elevations) a projecting pediment that extends beyond them, all sitting upon a raised plinth with steps from ground level up to it [A.1.v to vii, A.2.iii and iv].

With such an arrangement, it could seem hard to determine just where inside stops and outside begins: and this is a common problem in architecture, for few walls (at least until recently) are literally thin, simple and un-interrupted[13]. They have windows, doors, porches. The great English Perpendicular Gothic churches had the first "picture windows". The walls of the Renaissance Palazzo are moulded, columnated, pedimented and rusticated. Yet we talk about inside and outside.

This is where the Mayan concept of 0 space, missing in our account of Greek architecture (and in all our accounts, generally), comes in. Whereas in the inside / outside paradigm, the wall is seen as a boundary the only characteristic of which is that it divides the inside unambiguously from the outside, the notion of 0 space allows for there to be a space of distinction between the inside and the outside which is at once a part of both and yet is neither, having a distinctive character of its own (just like its source analogue, the number 0). Then, by convention, (Greek)

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13 The closest example to a thin, uninterrupted wall that I know is that at the back of the patients' "airing" wing at Aalto's Paimio Sanitorium, which is seven stories high and has only one small ground-level door in it - which is carefully obscured in the photo [A.12.iv]. It is unarticulated and makes a bold architectonic statement. Other examples (eg so called "curtain walls") do not have this sort of expressive power.

inside and - ve space are essentially homomorphic, as are outside and + ve space, the subtle difference being that, in the "Mayan" case, there is a shared "zone" between the + ve and - ve space (the 0 space) which is lacking in the original inside / outside paradigm [I.1.i to iv].

Using this notion of 0 space, it is much easier to accommodate the actuality of the Greek Temple in description, for the "wall" between inside and outside is seen as being part of both yet, having a character of its own, being neither.

Thus, for the Temple, the whole of the area from at least the base of the steps to the inside edge of the opening in the wall (at the back) may be taken to be a 0 space, with + ve space outside and - ve space inside[14].

However, although this may seem, at first glance, simple and elegant, it is highly sophisticated, and should be seen rather as complex than simple. In order to discover why, it is necessary to turn, for a moment, to Cybernetics.

The work of George Spencer Brown, and, following it, of Francisco Varela and myself, has already been mentioned both in the Introduction and in both the text of and a footnote to this chapter. It turns out to be of central relevance and significance here, for it

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[14] The convention governing whether + ve space is inside or outside is entirely arbitrary. I am sure I have used + ve to indicate inside before now. But a convention must be established, and this is it. It may turn out to be an inversion of some actuality, but then so is the convention of electrical polarity!

is concerned with the nature of boundaries in a fundamentally philosophical manner[15]. I shall therefore introduce a brief characterisation, and a summary of the argument.

Distinctions, Boundaries and Möbius Strips.

Spencer Brown begins his revolutionary book the "Laws of Form" (1968) with the command "Draw a Distinction". He asserts that it is in the drawing of a distinction (making a mark) that some object (a value) is distinguished from all that has not that value. He develops, from this initial assertion, a calculus of great beauty, sophistication, power and terseness.

Varela (1975) pursued this notion in terms of a re-entrant calculus, that is, a calculus for self-reference, a condition essential to the viability and continuity of, for instance, living systems (Varela is a biologist, and worked with Maturana and Uribe on the conditions necessary for a living system to continue living, published as "Autopoiesis" - Varela, Maturana and Uribe (1974)).

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15 This happy co-incidence of Cybernetics and Architecture goes back a long way - to the roots of my interest in Cybernetics 20 years ago. I used notions I now find to be remarkably similar to those I present here in analysing the boundary (s) and connectivity (s) of a small Yorkshire town, Kirkbymoreside. In that analysis, I provided what was, in effect, a twisted taurus of sometimes intersecting, sometimes concentric boundaries, with communication gateways. These boundaries succeeded eachother to great depths, and seemed to provide a very rich description of the experience of "place". Ever since, boundaries have fascinated me (I have a collection of slides of their international variety, and give lectures on the topic), and I frequently use them, and conflicts between them, as a means for setting up projects for both students and myself. See Woolston, G, Hambury, C and Glanville, R (1967).

I noticed that there were a number of apparent flaws in Spencer Brown's assertion[16]. One such derives from the difference between the mark and the value. If it is the drawing of the distinction that differentiates, what differentiates between the mark and the value (which are the constituents of the distinction)? Surely, in Spencer Brown's terms, it is another distinction. In which case we have an infinite regress of distinctions. This can be resolved by saying that the distinction marks its own value, in which case it does not cleave a logical space (as Spencer Brown thought it did). It is as if the distinction were, metaphorically speaking, a Möbius strip rather than a circle. However, the problem with this is that then the value of the mark is a "self" value, where we have been hoping to obtain a value that we, as outsiders (others) can treat. Under these circumstances, a distinction, seen for itself, cleaves no space and is only itself. But seen from the point of view of an other (ie, us), the mark is drawn again and again within and / or without itself in order to create the separate value. This is the infinite regress of self-reference, which Varela, in one sense, and both of us, in another, have shown to be logically necessary.

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16 For the full arguments see Glanville (1979), Glanville and Varela (1981), and the unpublished note, Glanville (unpubl.) which I prepared as a condensation and summary of the joint paper with Varela.

THICK WALLS AND RICH EDGES

Inside and Outside: + ve, 0 and - ve Space, and the Thick Wall

If we consider that the wall (and roof) of a building are the equivalent analogy of physical embodiments of the mark of a distinction (thus bringing together Architecture, Cybernetics and Philosophy in mutual enrichment), giving rise to the value of the space, this infinity may be thought of in 2 ways.

The first is, again, Spencer Brown's. He insists that, if you draw a particular distinction once, and then draw it again, you have still, in effect, only drawn the same distinction. Then, no matter how often a distinction is perceived and enjoyed, it remains the same distinction. Ie, we may look, and look again for as many times as we like, and we are drawing that distinction. Translated into architectural terms, by looking at a wall and the space it makes, you are re-inforcing and strenghtening the character and existence of that wall (not taking away its soul, as some have thought about photography).

The second (and more important) is that, if you draw a distinction, then you must draw another one within its space, and then another, to create the value. (It is the continuous drawing, again and again, of the next distinction that continuously re-creates the value.) These distinctions may be seen as layered, thus enriching, eg (and architecturally speaking), the wall that is the mark with

its own value. So not only is the wall seen as being, in itself, literally thick, it is enriched by having further distinctions (space, columns, pediment, overhang, plinth, steps) added to it - potentially ad infinitum, but in architectural practice, not quite! That is, there may be many interpretations of where the building begins - which gives it metaphorical thickness.

Consider, for instance, a fairly typical Mayan section, that of the Governor's Palace at Uxmal in the Yucatan. Here, there is an opening that is indeed through a literally thick wall. On the "outside", there is a step, creating a threshold. There is also a very deep relief carving in 3 layers on the exterior surface: so deep that the wall can hardly be said to have a recognisable and clearly definable surface. Above this carving there is a projecting eave, a moulded cornice. Below the threshold, there is the plinth, with steps rising from the ground level. It is hard to know where the building begins, for there are many possible interpretations of the 0 space, and the + ve space seems to be constantly re-defined outwards [I.3.i]. Perhaps the most extraordinary Mayan building of this sort is to be found at Chichen Itza: a building, called the the Temple of a Thousand Columns (attached to the Temple of the Warriors), which consists only of columns, and is, in effect, just one great thick wall [A.5.i to iv][17].

You may find a similar elevational treatment to the Uxmal Governor's Palace[18], in the building at Palenque called "The Palace"

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17 It is interesting to compare this with the way that almost all beginner architecture students choose to draw walls, etc, as pencil thin lines, as if there was no substance, either physical or intellectual, to them!

18 And generally throughout Mayan architecture.

[A.3.iii to vii] (the names for Mayan buildings are products of their archeological discoverer's fevered imaginings), where the sectional arrangement is like that at Uxmal, but which is also turned round upon itself, forming a courtyard of the sort I referred to earlier, where the outside, which is outdoors, becomes - through the action of wrapping round - another inside [I.4.i]. On some occasions, this process may also happen within a building, for instance in Aalto's "Rautatalo" [A.13.i and ii].

This notion of thickness, metaphorical as well as literal, which is the physical realisation of 0 space and of the continuous re-drawing of distinctions that I have summarised as resulting from the creation of boundaries, together with the ideas of + ve and - ve space, may be explained and compared with the traditional idea of inside / outside by means of diagrams. I believe the relative richness of the + ve, 0, - ve space idea, of the thick wall, in comparison to straightforward and simple inside / outside can by now be clearly appreciated, and I will, henceforth, take it as read. Therefore, I shall turn my attention to the three other ideas of space, deriving from the Greek, to both enrich those that can be

enriched and to find a diagrammatic embodiment of each[19].

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19 I could go into a number of examples here, but will not, except by way of indication in this footnote. For to do so would be to undertake the research programme, and would certainly extend this work far beyond its intended scope, making at least one further PhD. Nevertheless, it is my conviction that the relevance and value of the means of describing space that I am presenting here should be obvious, and may be appreciated by anyone in possession of a plan and picture book of examples taken from architectural history. As indicative, however, consider the sculpted form and use of pilasters virtually omni-present in buildings of the Renaissance: the complex forms, whether in terms of secondary columns or carving, of the grand churches of the Romanesque and Gothic periods: the use and celebration of corridors and their various siblings such as long galleries, arcades, colonnades, etc, all of which are thick walls for living in (it is nice to contrast this idea of the corridor as provider of delight with the mean attitude of today, that it is wasted space): the internal courtyards and balustrades of industrial architecture from the last century: the tunnels and lighting, and the carved foliage spilling over surfaces of Art Nouveau: one could go on and on, giving example after example from paths through the landscape to coastlines, from mirror glass to mazes. The point that I make is that the notion of the boundary space-to-be-inhabited, and of the richness and multi-distinguishedness of edges is widely used, yet we do not, today take cognisance of this. For further specific evidence, there is a series of (architectural) lectures that I give on this topic to students, covering boundaries, edges, corridors, axes and the drama of progression.

Inwards / (Static) / Outwards.

This pairing concerns, as we have seen, the dynamics of the generation of space. It is clear, from the discussion so far, that Greek architecture was primarily concerned with the generation of space outwards from the building, rather than within it, while the Romans added the quality of space generated within the building from the enclosing surfaces, an aspect which seems to be a relatively minor concern for the Maya. (This contrast between outward and inwardly generated space provides the evidence that I have argued to support my claim that there is a significant conceptual difference between Greek and Roman architecture.) But, here, too, there appears to be a quality missing, as the quality of the wall in itself was missing in the simple dialectic inside / outside: the quality of stasis. In contrast to spaces which are focussed inwards (for instance, the Colosseum in Rome) or thrown outwards (as with the Greek Temples and the Egyptian Pyramids), there are spaces without any such generative property: static spaces of tranquility. One example is the Chapter House of the English Monastic Cathedral (I think particularly of Bristol and Salisbury). Another is the prison cell as originally designed to Bentham's specification as the "New Model Prison" (Evans(1982)), such as was created by Barry and Jebb at Pentonville [H.15.i]: a space which was designed to be self-contained, without any sensory or spatial focus, devoid of sensory connection with the world outside the cell as it could be made. There are, naturally, many others: most spaces designed for reflection or contemplation are of this sort.

Are there, then, similar sorts of Mayan spaces? I am not sure, but I believe that most courtyards, being simultaneously both inside and outside spaces, belong in this category, which would make Palenque's Palace an example. In fact, it is remarkable hard to visualise what actually occurred on a Mayan site, for the buildings that remain, in their apparent grass surrounded and splendid isolation, are (as is usually the case) the grand and ceremonial buildings. Yet, in between them, the land was full of adobe huts and small chicken yards, inhabited by the ordinary citizens - and it is the problem of visualising this that contributes so greatly in making any assertion about static space difficult [I.5.i to iii].

Solid / (Intermediate) / Void

Although the medium of architecture is space, the material which allows the articulation (and, hence, enjoyment) of such space is the solid physical material of which buildings are, in truly mutual and complimentary fashion, made. For any architectural space to exist, there must be something to define and generate it (just as that something needs space within which to remain distinct). Thus, there is a reciprocity between solid and void in the creation of architectural space, a reciprocity with which we are all familiar, and yet which tend to forget in favour of the convenience of discussing only the solid (which is taken as the more tangible and

being, as it were, the mould, without which the space would not exist)[20].

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20 The creation of a space may be thought of as taking place in one of two ways: carving out and constructing. In the first case, the concept is of a solid lump, which is carved until there is both an interior and an exterior that is appropriate (one thinks, metaphorically, of Michaelangelo's assertion that David was in the piece of marble: all he had to do was see it). In the second, space is seen as the given, into which are inserted solids, planes and lines that create objects containing and excluding parts of this space - the idea made most explicit in constructional and polemical terms in Tatlin's tower.

It is clear that architecture depends on this reciprocity. Without solidity, space would run amok and, being undefined, would be undifferentiated and therefore undiscussable[21], just as, if everything were solid-without-void, we would never be able to experience it. And yet, to talk only of solid and void is to be, in my opinion, over-simplistic, for there are architectural elements where the two are so inter-twinedly equal that there is no longer a contrast. I refer to such inter-twining, in this context, as "intermediate", but it is clearly very similar (if not identical) to a thick wall [I.6.i to iii]. Examples of such an intermediate would include the "Temple of 1000 Columns" [A.5.i to iv], and parts of many "heavy" buildings. For instance, spiral staircases within columns, and most ambulatories around the altars in Mediaeval Cathedrals, and that most particular of spaces that is between the main body of a highly articulated wall, and the major space next to it.

Public / Private

This is the equivalent in the availability of a space to the"forbidden fruit" concept. There have always been spaces that are private, that is, to which access is explicitly restricted, by whatever means: physical, legal, gender-based, class-based, moral, traditional, even spiritual. The ordinary house is an obvious and everyday example, and the rituals involved in entering it may be

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21 This rebuts Scruton's (1979) rather silly argument to the effect that if architecture is about space, why not discuss open fields: a trivialisation of architecture made, typically, by one who has not been educated in its appreciation, but rather in the philosophy of aesthetics.

of the greatest importance[22]. It is often argued that the English make a particular fuss of this, with front gates to front gardens, porches, storm halls, and special rooms only used for entertaining. But other examples abound: the spatial qualities of the Egyptian Pyramid are exactly reflected in respect of its public and private aspects - the outside space is intentionally public, while the inside is intensely private (as is the case with most Graves and Mausolea) [I.7,.i to iii]. Napoleon, at Les Invalides, was so intensely aware of this difference, and its potential, that he had the public viewing gallery (inside the building, overlooking his tomb) so raised that the public had to pay abeisance to the dead founder of the Empire by explicitly bowing their heads to look at the tomb. In contrast, Monastic Cathedrals had another interesting way of asserting the public and the private within the same building shell. At the altar side of the crossing, where the choir begins, they placed a screen called the "reredos", which was acoustically transparent but visually virtually opaque, and prevented most forms of human intercourse. Thus the public congregation and the monks could take part in the same service without "soiling" one another, for the monks could retain their seclusion behind the reredos, while still leading the service in the presence, and for the benefit of the public at large [I.8.i and ii].

Clearly, then, the idea of public and private has an enormous effect in architecture. But the idea, itself, has an interesting characteristic that is similar, in some respects, to the behaviour of

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22 See, for instance, my description of entry zones in Finnish farmhouses (Glanville (1970, 1977)), van Schaik's (1980) description of degrees of privacy in southern African settlements, and, indeed Margaret Mead's discussion of (particularly) access to houses in New Guinea (1942).

the 0 space. For there are degrees of privacy: just what is public and just what is private is by no means absolute, both potentially existing along a sliding scale. Thus, in a house, some rooms are more public than others, even within the group of inhabitants (as in the English "front room"), and a "public" space, such as Trafalgar Square may seem quite exclusive to some either because they feel themselves not to be part of that public (they may be agrophobic), or because the space is taken over by a particular group for a particular event (such as the C.N.D. protest meetings). Indeed, some cliquish so-called "Public Houses" are most particularly private, and the sensitive stranger would be keenly aware of this.

FURTHER TERMS

If it can reasonably be claimed, as I have done above, that the four elementary and essential terms within which Greek architecture has been discussed by, for instance, Scully (1962) may be seen as both general in their application and may also be expandable rather in the way that the Mayan notion of space enriched the classification of outside (+ ve) and inside (- ve) space by adding 0 to give a subtler interpretation for which there is, at least in the case of the making of boundaries, a serious philosophical and logical base, it is worth asking whether any more such terms exist. I believe they do. They are fairly familiar terms which have already, by and large, been introduced into architectural criticism (although they are not all in general use), which have a similar power to describe our experience of architectural space to that of the four terms already introduced, and which can also be expressed diagrammatically. I, therefore,

include them here as providing further concept-tools that are intended to, and I hope will enrich those which I have already presented as relevant to the research programme I have outlined.

Transparency / Translucency / Opacity

The term transparency (used on its own) was given its current currency by Colin Rowe in a delightful article entitled "Transparency, Literal and Phenomenal" (1976). The point Rowe was making was that, while we can consider transparency in the literal sense of being able to see through things (albeit that how we see through - the quality of the literal transparency - may be very varied, ranging from plain glass windows or even open holes to layers of screens, glass blocks (as in Chareau and Bijvoet's "Maison Dalsace", also known as the "Maison de Verre" (1927 - 32), one of the buildings that was most influential in inspiring Rowe's article), there is another sense of transparent - the transparency of statement, meaning, even interpretation [I.9.i to v]. So, as has been observed, the reredos of the Cathedral is at once visually (virtually) opaque, yet acoustically completely transparent.

Thus, to return again for an example to Aalto's Sanitorium at Paimio, the building is transparent insofar as it is a matter of relative ease, particularly when the programme of the "Modern (or International) Movement" is known, to interpret the type of space that the elevations enclose - the phenomenal transparency of the building. Therefore, it may taken as being obvious, in, for instance, the elevation to the right hand side of the main entrance, that what is behind the long strip windows should be a series of long strip spaces (it is, in fact, a stack of corridors) [A.12.ii], while the other side of the same wing, made up of identical cellular windows indicates a series of cells: the patients' rooms [A.12.iii].

These parallel meanings of the term "transparency" delightfully echo the two interpretations in + ve, 0 and - ve space, of literal and metaphorical thickness. Nor does the similarity cease there: for transparency in the literal sense, has an intermediate state between itself and its converse (opacity), which is open to myriad interpretations - as is the nature and extent of the thick wall, or 0 space. This may be thought of as translucence (to use a term from lighting), which exists, in a variety of ways, in the middle ground.

Space and Anti-Space

These terms were introduced by Peterson (1980) in an article of the same name. In some ways, Peterson is handling concepts that are closely related to several of those already put forward here, although his approach and concerns have different origins and foci: for instance, he is largely concerned with inwardly generated space, and, I suspect, considers the outwardly generated as at least inferior, and possibly not really space at all[23]. Where he contributes something that has not yet been introduced into the scheme already presented here is in his notion of the leakage of space - and hence its loss of identity as space - when it is not adequately defined: that is, space looses its identity as the vessels that contain it begin to lack coherence, rather as wine seeps out of the cracked or badly corked bottle - a type of mutuality.

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[23] If I am right about this, he is thinking in much the way I was before I enquired from my friends about Greek Temples.

It is probably easiest to present this concept of leakage and its root in lack of definedness, by reference to open urban spaces. (Although Peterson discusses buildings and, particularly, their interiors, at length in his article, he does not use those examples to present the idea of leakage. [I.10.i and ii]) A fine example of an urban space that does not leak can be found in Bedford Square, London[24] [I.11.i]. Here, the uniformity of the buildings around the square, and the tight planning of the corners so that even a major road running through the square does not disturb its identity, create a cohesive and tightly defined square with a sense of identity and enclosure: it certainly does not leak. By way of contrast, Sallyport[25], in Old Portsmouth, is so weak on one side, and so lacking definition at what should be the corners, that unless in the vicinity of the Round Tower, or facing and close to the wall by the sea, it has almost no presence or definition, and the space is without character or distinction, just leaking away [I.11.ii].

There is, however, one rider that should be pointed out concerning the notion of leakage: this is that leaky containers do not contain, and are, hence, contradictions of themselves. The existence of this paradox may explain why we seem to find leaky spaces

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[24] The location of the Architectural Association. Appendix L is a catalogue for an exhibition of one of the design projects I set, based on the "Controlled Viewing" technique, that was based in Bedford Square. The background photos and the plan are of that square.

[25] In my opinion, one of the potentially most delightful urban spaces, which is, at the moment, a lost opportunity. There is, however, now a chance for it, as the weak side has been virtually completely demolished (winter 1987-8) and is not yet built on. It will be used as a site in terms of which to explore the ideas presented in this chapter, during the academic year 1988-9.

unsatisfactory: our brains recognising the paradox, and thus causing us unease[26].

Connectivity

Another aspect of space (particularly internal space) is its connection to (and with) other spaces. There are basically two complimentary sides to this: the nature of the connection between spaces, and the nature of their division.

Connection / Separation

Connection implies also separation. In the extreme, connection breaks down and separation is complete. (This is equally true in reverse: in the extreme, separation breaks down and there is connection, becoming, in this extreme, continuity without distinction (Spencer Brown's "perfect continence").) The extreme of connectivity occurs when many activities take place simultaneously in an open space. While we often come across this situation in open places (urban spaces, parks, etc), it may happen, also, within a building, as with Norman Foster's Sainsbury Centre at the University of East Anglia, a gigantic "hanger" with no articulated divisions of its own. Conceptually closest to this, but having some articulation of divisions, is the arrangement of a "chain" of spaces connected along some common route, rather as

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26 This paradox must not be confused with ambiguity, where spaces may, for instance, be understood as being inside or outside, or part of more than one other space. Such ambiguity gives much of the power that we appreciate and find more than satisfactory in Mies van der Rohe's famous Barcelona Pavilion.

shops occur along streets. The next step towards separation is where the connection is to some extent impeded or broken, either by a temporary (and moveable) barrier, or by a barrier to direct access. This is the role that a door fulfils: to separate, yet connect two spaces. Finally, before total separation, there is inferred connection. This is most often achieved by such compositional devices as the setting up of axes. Many an urban landmark works in this manner - as Lynch(1960) has rightly pointed out - and such devices can have enormous power, creating a sense of connection even when there appears to be a barrier in the way, as, for instance, in the case of the drive and gateway at Stowe House, where there is a driving sense of connection, which, it becomes revealed, is hindered by a lake that exists in a dip between the gateway and the House [A.9.i, H.11.i, I.12.i to iv].

Division

Related to connection and separation is the notion of Division. Just how spaces are divided from each other is a matter of some importance in achieving the type of connectivity desired. Division occupies a scale from total division to total lack of division, a scale very similar to that occupied by Connection / Separation. But what is of interest here is the stages between. There appear to be 3 of these. The first is explicit division, where 2 spaces are clearly and articulately divided from eachother. I do not, here, refer to impeded connection, as introduced above, so much as to the type of division that may be found so often in the English terrace house, where two rooms are separated by a type of frame with doors that fold away. In contrast to this is the division of the thick wall,

where the frame is no longer solid, yet is still quite explicit, as may be found in the Hermitage's "Colonnade Room" [A.11.i to iii]. Finally, there is the implicit division that is just hinted at [I.13.i to v].

Scale and Size

Scale and Size are two concepts that have been used in architectural criticism, probably since before it even formally began, and which are so closely related that it is sometimes hard to clearly differentiate between them. The difference can probably best be explained by reference to the relative and the absolute. Size is absolute: a space (and the building(s) associated with it) may either be big, or small, or somewhere in between. However, although size is (relatively!) absolute, what consititutes big and small depends to some degree upon function. Thus, what may constitute the space of a small urban square would be almost inconceivably large as a bedroom, just as a small palace will be much bigger than a big house. In contrast, scale is definitely relative, and refers to the existence of a space in the context of its function, and of other spaces around it. A tower block or skyscraper will seem "out of scale" in a rural village, while being entirely "in scale" in Manhattan, where a cottage would be of quite inappropriate scale. To use an analogy from computing, size is absolute in a way similar to the way a digitizer has absolute co-ordinates (although both the actual size of the digitizer and its resolution may vary according to its function), while scale is relative in a way similar to the way a mouse has relative co-ordinates.

Thus to talk of space in terms of size is to talk in absolute terms (in relation to some function), while to talk of space in terms of scale is to talk of relative size: relative to the context of the surrounding spaces.

Proportion

Closely allied to the notions of Size and Scale is that of Proportion, a concept that surely hardly needs any introduction. Proportion, in architecture, refers to the ratio (produced by division) of the size of various elements, for instance, the height to width to depth proportions of a space (and its generating solid). Proportion, and what constitute "proper" proportional ratios, have been at the forefront of architectural criticism for as long as size and scale, just as they have also been dominant in discussion of other arts, particularly painting, sculpture and music. Indeed, Plato, who perhaps originated the discussion in a formal sense, can appear to be totally dominated, in much of his thinking, by the idea of proportion, and related concepts such as perfection. However, I do not wish here to join the arguments for and against various proportional systems, merely to note that proportional ratios are of significance in discussing the experience of architectural space, even if the mathematical precision of proportional systems may be a rather over-exact way of expressing that a space feels "tall and narrow", for instance [I.14.i to iv].

Modelling

The final concept that I wish to introduce, here, is the concept of the modelling of space. It is true that, in terms of light, most modelling is done on the building fabric, for we appreciate light when it has some material substance to illuminate. The light we see in space is either falling upon us, or becomes apparent by illuminating the dust particles suspended in the air. However, with sound[27], for instance, the story is quite different. In any large building, one way the space is articulated is through the occurrence of standing waves (the effect I was referring to when I said that my memory of Strasbourg Cathedral was acoustic), which produces an effect similar to the "wah-wah" effect (increase and decrease in intensity of harmonics) when the space of the building is traversed. It is also articulated by reverberation and echo: the effects of sound being reflected within the space, giving it its acoustic life. In the case of sound, it can truly be said that it moulds, models and articulates the space[28] in a manner that combines the characteristics of both solid and void.

SUMMARY

Thus far, I have introduced and elaborated upon the four terms that have been used in the explanation of space as used in Greek

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27 For the purposes of architectural analysis, sound may be thought of as slow light. Light waves create similar interference patterns to sound waves, but our senses do not distinguish them as they do in the case of sound.

28 For an example of an account using both subjectively and objectively measured descriptions of the acoustic experience of space, see the report of a survey carried out on Southwark Cathedral by first year students at the Architectural Association School (Gillieron and Glanville (1975)).

architecture, and modified them, so that they are, I believe, richer in content, by introducing to them ideas that essentially concern the quality of distinction and differentiation, thus, on occasion, accommodating certain philosophical points (in effect, a logical non-excluded middle), which derive, initially, from my experience of Mayan architecture, and what I have referred to as its thick walls, or 0 spaces. These were characterised as + ve, 0 and - ve space (where 0 is also referred to as a thick wall, and + ve and - ve are outside and inside respectively); inward / (static) / outward; solid / (intermediate) / void; and public / private.

In fact, it is the + ve, 0 and - ve space that is the real innovation here, which inspired the other modifications, and is the means which gives me both the most powerful single way of describing my spatial experiences in a way that students have found to be a particularly strong way to generate an architecture of richness and interest.

I have also introduced and elaborated upon 6 other terms that are of use in describing experiences of architectural space: transparency / translucency / opacity (due to Rowe); space and anti-space (due to Peterson); connectivity (connection / separation, division); size and scale; proportion; and modelling.

I have illustrated the terms by reference to buildings in relation to which these various terms might be used, as well as by verbal description and by a collection of diagrams.

I have not, however, carried out an extensive analysis of any individual buildings, for the reasons already given, viz that my essential purpose, here, is to outline the beginning of a new and massive research programme, the need for which has resulted from the discoveries, including the failures, of the earlier experiments I have already described, relying upon my experience and understandings (which I had, in effect, excluded from the experiments). Nor is it my intention to begin such a task here, although I indicate some of its features, requirements and possible outcomes and uses in the next (and final) chapter, where I also discuss certain features of a more abstract, general and performative nature that I believe emerge from (are inherent in) what I have presented in this chapter.

However, I would feel that I might reasonably be accused of cheating if I did not indicate, at least, how some of these terms might be used in an analysis of (my) experience of some architectural space. This I will do by taking a short, analytical look at perhaps the most original and idiosyncratic building ever produced in the United Kingdom, the home of Sir John Soane, architect, surveyor to the City of London.

SIR JOHN SOANE'S MUSEUM

Sir John Soane's Museum, in Lincoln's Inn Fields, London, was the architect's private residence, left to the Nation as an Architecture Museum by the architect upon his death in 1833.

It is, by any standards, a remarkable building, although it is beyond the scope of this work to consider it in toto[29].

I shall concern myself virtually exclusively with the library, and (to a lesser extent) the dining room, that form the front section of the ground floor of the central house (no 13) of the 3 houses that Soane eventually occupied.

These 2 rooms, the library at the front overlooking Lincoln's Inn Fields, the dining room behind it looking (like Soane's beloved breakfast room [A.10.v] next to it) into the central courtyard, are connected and almost continuous. Their division is implied by a small, partially transparent, protruding nib of wall and an articulated, curved downstand from the ceiling that exists between the two, otherwise continuous spaces. This division is further emphasised by the quality of the natural light which, coming from the Fields (which are to the south), illuminates the library through the front windows, with the dividing downstand helping to make the dining room relatively darker [A.10.i to iii]. These two front windows are placed within a (both literally and metaphorically) thick wall, which serves an an intermediate zone between the interior and exterior of the house, and which is defined in a multiplicity of ways: the window itself in the fabric of the brick wall, inside which there is a narrow passageway (as is also to be found in the drawing room, directly above on the 1st floor

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29 For an interesting and in depth analysis of the building, see van Schaik (1985). For a historical account see Summerson (1986) (7th revised edition of the 1955 original). For a fine collection of Soane's drawings of the building, together with some photographs, see the book "John Soane" (edited by David Dunster) in the Architectural Monographs Series.

[A.10.iv]) which runs through between the windows, inside which is another thick wall defined on either side by pilasters and double-skinned arches[30].

The walls of both rooms are also "thick", exploiting several layers within the so-called "tartan grid" that van Schaik (1985) shows Soane to have used extensively, both in his own house and elsewhere, as a basic organisational device [I.15.i and ii]. Taking the library as the example, the side walls are made up in several layers. The most internal layer of the wall is formed into a semi-circular arch surrounding, at each end, a flattened arch. Within the space made by these arches and the back of the wall space, there are recessed bookshelves, filled with books, with a large mirror in the centre. These do not, however, rise up to the springing points of the arches, but stop short, leaving a recess above them, which is partially filled with further mirrors. Here, the space is generated both inwards (the reflection shining back at you) and outwards, with the further recession of the thick wall's space, creating a boundary to the room that truly exists in its own right and with its own character [A.10.i to iii], and which, through the open space ambiguity left just below the plane of the ceiling, also creates a rich thickness in the ceiling. Thus did Soane create a pair of spaces of great richness (and beauty), for which several of the terms that

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30 The window was not originally on the outer skin, but was on the inside, with the edge area being an exterior verandah on both this floor, and the floor above (the south drawing room). It should also be noted that the colours in the building are in the process of restoration to those originally used by Soane. The modifications to the colouring that had continued since his death had radically changed the building, but it is the modifications that are usually referred to and illustrated. In contrast, the originals, as they are being replaced, are truly shocking, and a real eye-opener to those who had become accustomed to the old replacements.

I have isolated above provide means of description of the experience I, at least, have of these spaces that seems appropriate to me.

CONCLUSION

As I have indicated, this is only a beginning. It may seem a little strange to finish the main explorative work of a thesis with a beginning, and to end that beginning with a conclusion. What I have attempted to cover in this last chapter should be seen as an attempt to outline the start of the development of a diagrammatic and verbal language in which to describe experiences of architectural space, together with, in some cases, some explanation of how the terms came about and a justification and elaboration of the meaning of these terms, together with some examples. It should not, however, be seen as an attempt to explore them much further than this. Nor should it be forgotten that what has been presented here has been presented as very personal, an account and extension of a personal revelation[31], and as a way that I can see of going forward in a research programme: it is not presented as a truth, let alone THE TRUTH.

However, some questions do arise, and remain to help form the next steps in the research programme. They are:

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31 As personal as Saul's: but without, it is my hope and sincere intention, the insistent self-righteousness of the reformed, who believes his truth is the only truth, and assertively proselytises those who do not, cannot, or do not wish to agree.

Does it work: can the terms be used for a meaningful analysis of a large range of architectural spaces?

Can the diagrams and verbal descriptions interact as a language for discussion and communication of experiences between people?

Can they be developed in range and scope, and can their use together lead to the generation and expression of new thoughts - both about architecture, and as expressed in its making?

My work on this has only just begun. Only now have I refined my understandings so that they might constitute a research programme. Only now have I managed to develop a description, justification and codification of some of my concepts of architectural space, so that I can begin to explore and develop. Only now have I a few words of vocabulary, so to speak (my terms, and their verbal and diagrammatic expressions), with which to begin to try to speak. Only now, in the final chapter, can I begin to grasp and sketch out the consequences of these understandings. The process has been tortuous, but I have learnt. The process will be tortuous, but I will learn.

chapter 11

LEARNING: A SHORT HISTORY OF THE FUTURE.

CHAPTER 11

Learning: a Short History of the Future

"Spatial experience is outside the door and inside the head. My wish is to make human space in space." (Anthony Gormley (1985))

PREAMBLE

Nothing is ever quite as simple or straightforward as the dramatic account would lead us to believe: indeed, that is a significant part of the role of drama in our lives. The Research Programme to which I have referred is not so simply and striaghtforwardly unformed and virginally nascient as I have indicated - any more than any of the positions, questions and experimental tests that I have described have been. Therefore, I include this final chapter which, while almost appearing as an aside, is in truth an indication of what has already been learnt, what is to be learnt in the immediate future, what may be learnt eventually (for I have not been able to learn to give up this optimism, in spite of everything), and how what may be learnt may be evaluated and used, thus generalising further lessons. So this is a veritable history of the future.

Aspirations: something old, something new

It is salutory, on reaching the apparent end of (as well as during) the course of a piece of work, particularly one as extended, and, on occasion, apparently directionless as this, to return to reflect upon and consider the original aims. In this case, I find the experience more than salutory: I find it extra-ordinary. For what I set out to

do in the very beginning, and what I so singularly failed to do, directly, with success (apart from my personal learning, and that of those students who participated, together with associated spin-offs) during the course of my "peregrinations", was to find a language in terms of which to describe and discuss, socially, understandings of individual perceptions of architectural space. It appeared I had failed to do so, and, in consequence, I certainly despaired, often even loosing track of my intentions.

Yet, in the preceeding chapter, I discover I have, in a sense, found something that begins to resemble this, that is, to achieve the aims of making a language for social use, albeit by means very different to those originally considered. So that, in spite - or, perhaps, even, <u>because</u> - of all the failures, it seems that the hoped for aims are, possibly, finally beginning to be achieved.

It thus becomes necessary for me to return to the notions of language and of learning, to clarify my more developed attitude to both, and to explain how I see the work presented in Chapter10 as the beginning of a Research Programme proceeding, being tested and evaluated, and proving its value, as well as introducing at least some of the facets that may influence and form the Research Programme, daring to go beyond the perhaps rather coy presention I have already made.

<u>LANGUAGE</u>

The original notion of language (or, more properly, "language") with which I was initially concerned was, as I have indicated, at

once very naive, and rather sophisticated. Its naivetie was contained in the notion that a language could be the sum of a collection of the terms of which it was constituted. It was these terms that we attempted to isolate (using PCT) in the experimental events described in chapter 5. In contrast, its strength and sophistication came from the assumption that meaning us established by interaction between participants, ie, conversationally (see Thomas and Harri-Augstein (1985) and Pask ((1976a), (1987)), in contrast to the rather more "wired into the brain" notion of language proposed by, for instance, Chomsky ((1957), (1968)), thus satisfying, for instance, the conditions proposed by Maslow ((1954), (1959)) and others for a "creative encounter". -

The intention behind this search for terms was to be able to describe, in a communicable way, architectural experiences. This is, of course, a quite reasonable facility for a language to be assumed to have, and it allows two kinds of interaction: the communicable assertion of potentially equally valid experiences within a peer group (such as a group of students or a group of practising architects); and teaching (by, for instance, the clarification of the student's ideas by the teacher, and the explicit encouragement of the student to develop concepts and experiences - naturally, in the light of either the student's or the teacher's world view). Both were the kindling intentions, and neither were achieved before the insights leading to the work described in chapter 10[1].

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[1] Assuming that they are achieved, at least to some extent, there.

However, a language is more than just a collection of terms, be the terms verbal, diagrammatic or both. For this reason, I feel it necessary to highlight my attitude to language here.

Language is a cultural artefact, and, especially important in this context, it is constituted in the continuing developing and enacting of a set of relationships: between (that which is) the described and the described; the described and the describing; the describing and the describing; (and, completing the circle) the describing and the described. And those who participate, also circularly, in this (essentially, even necessarily, social) activity.

Such a phenomenon is, of course, seen in terms of the social (actor) actions involved, multi-levelled, as well as circular: the development of described / describing is circular, but only because there are levels of social action that engender and affect their interaction, within a culture, just as linguistic action is also, formally, circular (Pask's conversations, of course (Pask (1973))). And, anyhow, such circularities consitiute potentially, a myriad of other circularities (Glanville (1982)). Thus, the idea of a language existing, in any fixed and final form, and without these levels of recursion, is not to be contemplated. So that, when I discuss, here, my ambition to create a language, it should not be understood that I intended something monolithic, all on one level, constituted of isolated items that lack relationships (linguistic, social and cultural) - even if the initial attempts (floating the terms of Chapter 10) may seem to be that flat and isolated.

It follows, therefore, that I cannot claim (nor do I see) what I have presented as being a language, any more than the set of terms I was seeking in Chapter 5, and which I naively referred to as a language, is. But it is, I believe, a beginning, in the way that it is sometimes assumed that our ancestoral apes ostensively created a connection between sounds and items by uttering and pointing at the same time, thus allowing them communication by the building of Saussurian relationships (de Saussure (1966)). If they can be used to help build relationships, socially, in ostensive pre-languiage, and between them, thus enriching all, it is possible that a genuine language, as opposed to a set of terms, may evolve.

It is also the case that the development of a language not only makes it possible "to speak about", but also to look at the various "speaking abouts" in order to assess them.

LEARNING

Since I carried out this work through the Centre for the Study of Human Learning at Brunel University, it is appropriately incumbent upon me to discuss whatever learning has so far originated in this work, and its immediate use in helping further learning in the short term future. But, anyhow, I would want to do this, since I am a teacher and, as I have said, I believe a teacher must be, above all, the supreme learner - maybe even more than the student.

This document stands as an indicator, a symbol, for one piece of learning: for it traces, albeit in hindsight, my progress through an

extensive and extended learning process - as I have indicated throughout: hence the personal, first-person presentation of my experiences. In this respect, the whole experience has been a learning process. But, then, it seems to me almost impossible to do anything without learning - even if failing,, for recognising failure is, itself, a form of learning. However, the more appropriate question, here, is whether there is anything of value in the study and improvement of learning beyond that embodied in this document as my own experience, and, possibly, communicated to a reader who learns something, himself.

The answer is a tentative yes. As I have noted, the notions of the "thick wall" and of +ve 0 and -ve space have, in particular, been found useful by both students and colleagues at Portsmouth Polytechnic, where discussion is often based around these terms, and where many students have taken to attempting to explicitly build such concepts into their designs. I believe this will continue and grow in strength and influence.

So that now that I have evolved a rather richer set of terms, I shall aim to introduce them to colleagues and students, to see whether they, alone or with other terms that may come from their active involvement or be imported directly from elsewhere, also become part of our architectural description currency. Indeed (see Research Programme below), one particular effort will involve the extensive use of the terms in both analytical and design work over the course of a 6 month period, thus providing for both evaluation and expansion.

Finally, and on a dirrerent plane, it should be remembered that, for any form of assessment of learning, language is necessary. I am not making the argument that being able to describe something makes it easier to learn about that something (although I believe this is true, if perhaps undemonstratable), but rather that without a common means of communication for discussion ABOUT some area of concern, it is impossible to make critical judgements and evaluations (of, for instance, progress). In order for learning to be studied, it is necessary to have some means (a language) through which communication can take place, an a priori for evaluation and criticism. And, in order for that evaluation and criticism to be meaningful, there must be a common language for disputation to take place through. In this sense, language is an action enabler: noone would know whether I, for instance, had learnt anything in the studies reported here, unless I had acted to express, through some mutually comprehensible medium, what I have done.

Thus, the development of the terms indicates learning by me, and has made possible learning by my students[2] and colleagues, and has made it possible to discuss that learning.

THE RESEARCH PROGRAMME: first steps

If this were a grant proposal, it would be necessary to define quite explicitly what work would be undertaken to achieve some explicit, pre-stated and defined objectives, and what the

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[2] Including, I trust, those who took part in the experiments and projects from which those presented in Chapters 5, 6 and 7 are selected.

anticipated results would be. I believe this is an awful way of structuring "pure" (particularly as opposed to "applied") research, because it is deterministic rather than designerly (Glanville (1981), (1984)). It is, however, in this case, both inappropriate and impossible. Research is necessarily both interactive and generative (de Zeeuw(1986), (1988)), and to think of it otherwise is to do both it and those who undertake it a grand disservice.

Imagine sitting down in order to create "English" from scratch. The result would probably be like Esperanto: an andequate interpersonal code, but a slave language, as opposed to one that opens up opportunities - that has, as we say, a life of its own. "English" came about , at least in part, through an open and shared development, and there is no doubt that any language not only allows us to utter, but also promotes certain utterances over others - ie, it limits us. That is the trade off, the price of expression: action resuces potential freedom.

It is the same with this Research Programme. It will involve many people, with the same common concerns mentioned, and with their own interests and influences, who may participate in the development of a language (including personal and group dialects), where the language will not only facilitate certain communications, but also necessarily act in limiting that which can be said. It is the desired nature of the beast, and is why I decline to define and schedule the Programme. It is not Popperian (1963), Kuhnian (1970), it is not Ackermannic (1961) nor is it even Lakatosian (1970). It is, itself, a design project: a massive one, shared between many, that intends producing a social artefact, if it is

anything at all - and that will be, to a large extent, the appropriate measure of its success.

However, there are a number of initial stepping off points. And those that I can foresee, I will introduce below.

I have already mentioned the use of some of the terms that I have developed by students and staff at Portsmouth Polytechnic School of Architecture. Over the next couple of years, it will be possible, through my teaching programme, to examine the full contents of Chapter 10, to test their usefulness, and to edit and expand them, according to the requirements of a select group of both students and staff , so that they become richer and more applicable. Other ways of discussing space may also be incorporated, deriving from the experiences of my contributing others: and the relationships between the various terms and groups of terms, and the quality of experience will also be developed. This will be done in both the analysis of existing architectural spaces, and through the designing of new ones (for which a spatial explication in the growing language may be expected)[3] . If this work produces agreement and enjoyment, and the students seem to improve in their design abilities and their ability to discuss their designs cogently, it must be judged, by any standards, a success.

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[3] This work falls short of the aim to make such a language generally available for social action, unless the students, for instance, are considered to be what might be called "clients" in a more social environment. In part, this is because education is normally thought of as taking place away from the distractions of the "real world". I do not wich to argue the pros and cons of that view here, but it would be nice to be able to involve non-students in the Programme.

At the same time, we will attempt to produce a series of both verbal and diagramatic terms and relationships using the Apple Hypercard program, to make our discoveries more generally available, and to allow a wider debate both within and without the School. The creation of this resource, and the monitoring of its use and modification will, I trust, indicate both some features of its usefulness, and how the "language" grows in interaction. Eventually, it is hoped, this might become a more public device, allowing a wider public to begin to interact, thus further increasing the range of the language, and making the concept of self-help and an architectural actor language more viable (de Zeeuw (1986), (1988)). Maybe we will yet achieve "Firmnesse, Commodotie and Delight". (This is a partial answer to the shortcoming pointed out in footnote 3.)

The results of these initial steps may, it is hoped, lead to the development of a usable and enriched language (as opposed to a set of terms) that will make it easier for the client (student, architect, architect's client) to express and evaluate both needs and experiences, and to learn from their own actions, perhaps, eventually, without even the initial aid of an expert. It will also make possible the Architectural History of Space that Zevi (1974) asserts is yet to be written.

After this, what?

VALIDITY

A Research Programme is usually expected to demonstrate the validity of its findings by some agreed test procedure that will generate a repeatable result. Such a sensible scientific criterion is, however, neither helpful nor relevant in this case, for the whole purpose of the work is interaction and change, and to interact so as to produce change, rather than the production of some fixed and repeatable entity: by definition, learning can never do that, unless it is considered not as an experience but as an (empty) token.

Should an agreement (in Pask's (1976a), (1980) sense) be achieved by a user group of this language, that will be regarded (as I have said) as a success. But there are criteria other than such an agreement. They include the central idea of generosity - ie, if what is produced aids people without taking away from them, it is judged a success. They include usefulness, not in the overriding sense of the dominance of the pragmatic, but in the sense that there is nothing wrong with being useful (in whatever way). They include the more classical idea that is perhaps akin to Occam's Razor: that if less explains more, or something becomes richer than it was in its application, it is deemed to be better. But most of all, the criteria are those that provide the foundation for (and are yet being developed in) the Research Programme "Support, Survival, Culture", being undertaken at the University of Amsterdam. These include the concpet aims of growing self-help, expert mystique removal, and failure prediction such that it is also remediable.

That mammoth Research Programme, however, is another story, not to be told here[4].

CONCLUSION

This is a sampler, nothing more: I have argued that it cannot be. It is a future hope, the beginning of a wandering that will, some time, end somewhere (Glanville (1978b), (1980a)). It is a hint of a possible way forward, but it is not what this document was about. That was like an alchemist's search for the mythical philosopher's stone. But, just as all the good of early chemistry came out of the alchemist's continuously failing search, so, perhaps, something has already come out of my failures. As far as I am concerned at this moment, and in this text, if the text has communicated to you it has, to some degree, worked: it is, to some degree, useful: and it has, to some degree, supported self-organised learning. What more could be wanted?

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[4] For a summary, see de Zeeuw (1986).

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Architecture and Space for Thought.

A Thesis presented for the degree of Doctor of Philosophy

by

Ranulph Glanville.

Centre for the Study of Human Learning,
Brunel University

Volume 2
Illustrations

INTRODUCTORY NOTE

The illustrations to the Thesis "Architecture and Space for Thought" are presented in this Volume. They have been separated from the main text so that the appropriate illustration may be viewed with the appropriate text, regardless of the availability of space on the page by the text, or the illustration having already appeared earlier in the text.

However, they are not arranged, as might be expected, in the order in which they are cited in the main text (Volume 1). This is, in part, a response to the citing of illustrations more than once, but is mainly designed to create a coherence in the illustrations themselves, so that, for instance, all the various views of Paimio Sanitorium appear together, rather than being interspersed with the other illustrations that would appear between the various views were it possible to follow the text sequence - thus giving a better overview of the building.

I should like, also, to add a note about the quality of the illustrations. Several of these exist only in old dia-positives of what were, in the first palce, very delicate and soft drawings. The processes of reproduction, here, have involved making negatives, printing (photographically) and then photocopying the prints. The result is that some illustrations are several removes from the originals: indeed, in the simple case of the original slides of mine, the minimum copy trail iinvolves the slides being copied to negative, photographically printed, and then photocopied. What is remarkable, under these circumstances, is that there is any discernible image at all! So I ask for indulgence in the case of images that are not as clear as you or I might wish.

It is hoped that, nevertheless, this unusual arrangement will prove to facilitate the reader's access to and enjoyment of the Thesis.

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SOURCES OF ILLUSTRATIONS

NOTE: All Illustrations not cited here are the author's. Some have appeared in publications, notably the Architectural Association Quarterly (AAQ), but the copyright remains with the author. Many will be found duplicated in the Appendices. Publications Referred to in the case of cited illustrations appear in the Bibliography in Volume 1, the Main Text, unless given full reference below.

Architectural Association Slide Library: A.7.i, A.9.i, H.11.i, H.15.i

Audio Visual Aids, London: A.2.i to iv

Broadbent, Geoffrey: D.1.i, D.4.i (from Broadbent (1968))

Canter, David: E.1.i to iv (from Canter (1974))

Carlson, Loraine: H.5.i to iii (from Carlson (1980))

Chadwick, Geoffrey: D.2.i (from Chadwick (1971))

Dunster, David: H.12.i and ii, H.13.i, H.14.i (from Dunster (1983))

Fletcher, Bannister: H.1.i, H.2.i, H.3.i, H.4.i, H.7.i to iii, H.8.i, H.9.i (from Fletcher (1946))

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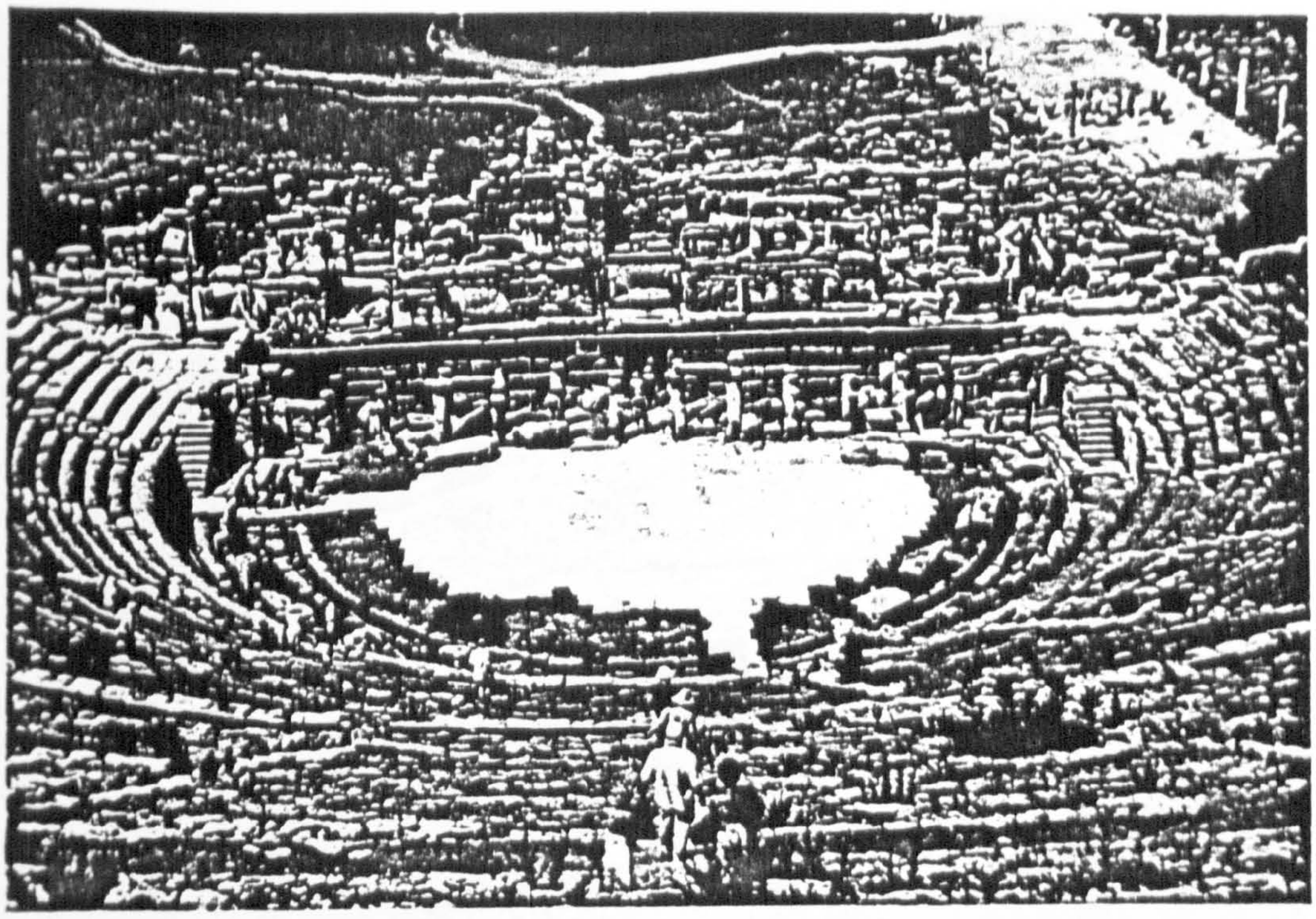
ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

SECTION A

Architectural Photographs



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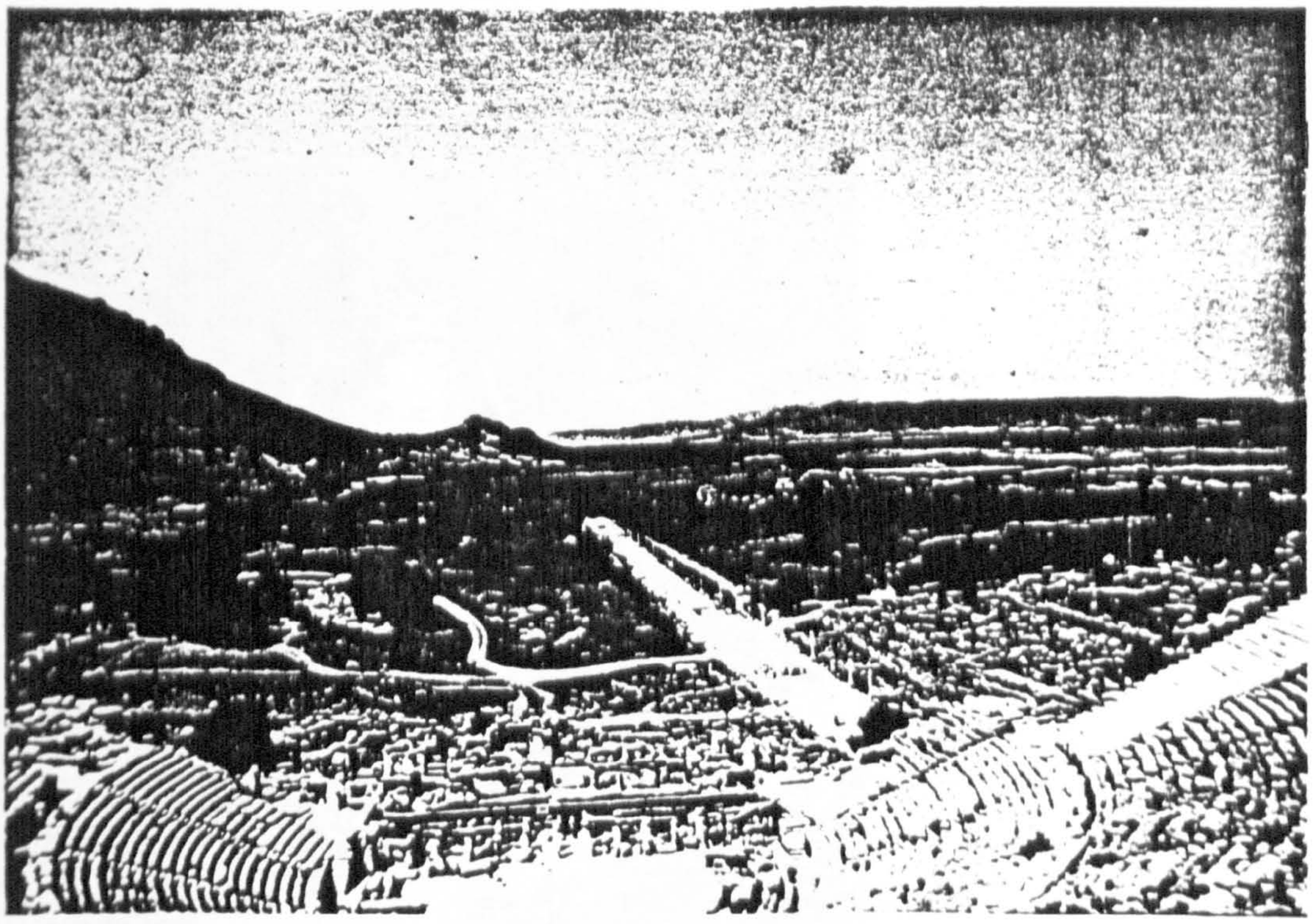
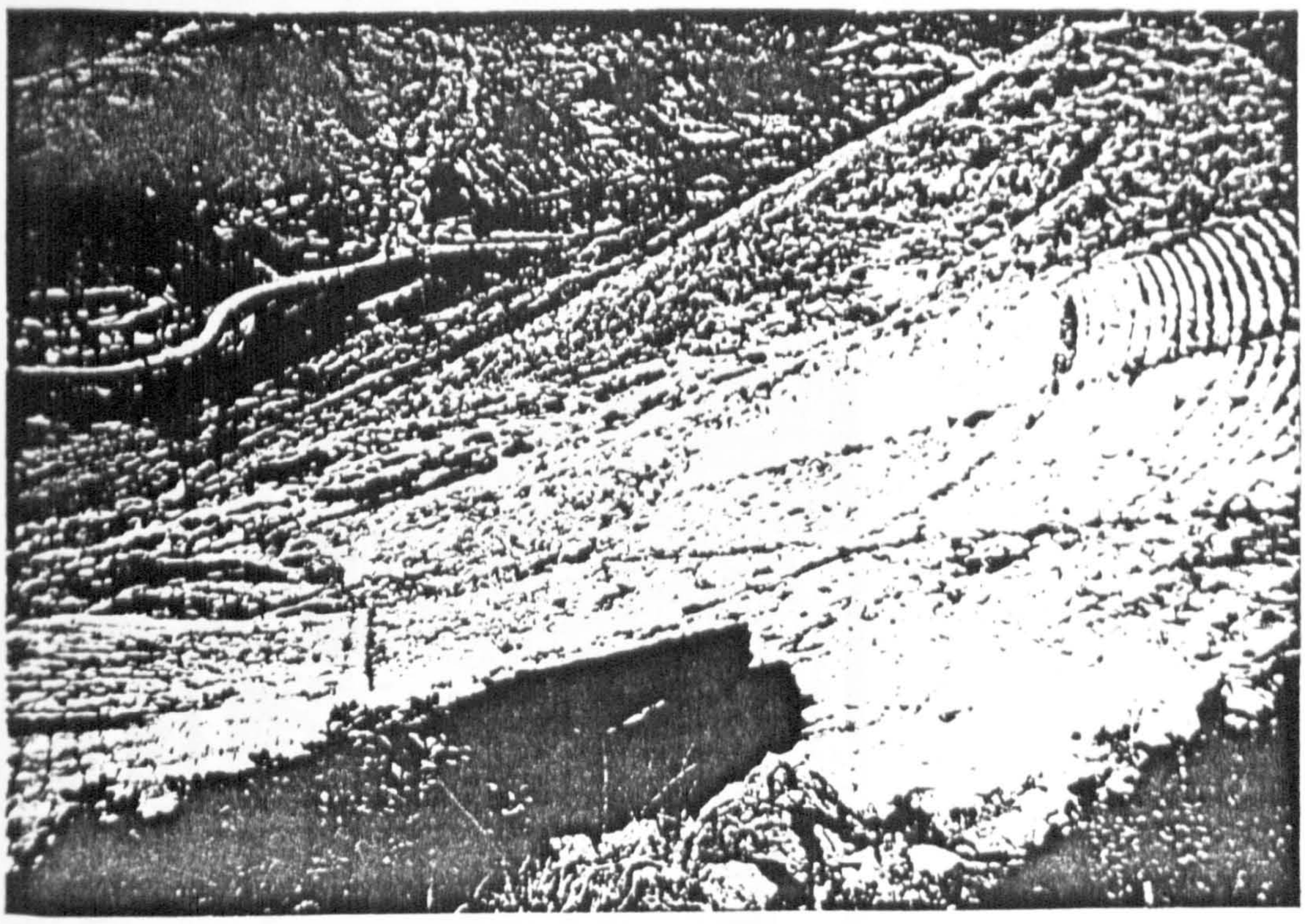


A.1.ii The Theatre and the Quay, Ephesus, Landscape View



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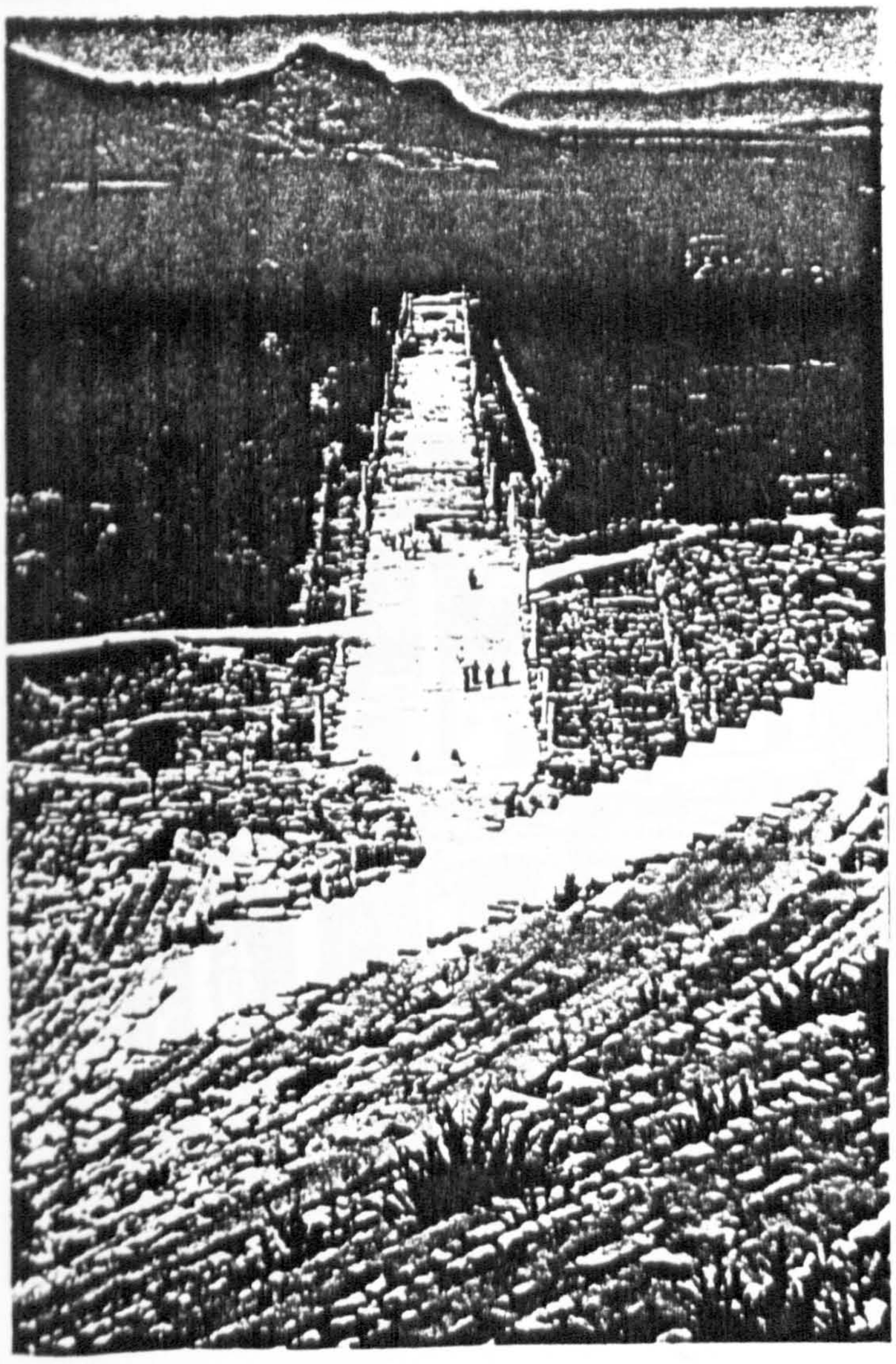

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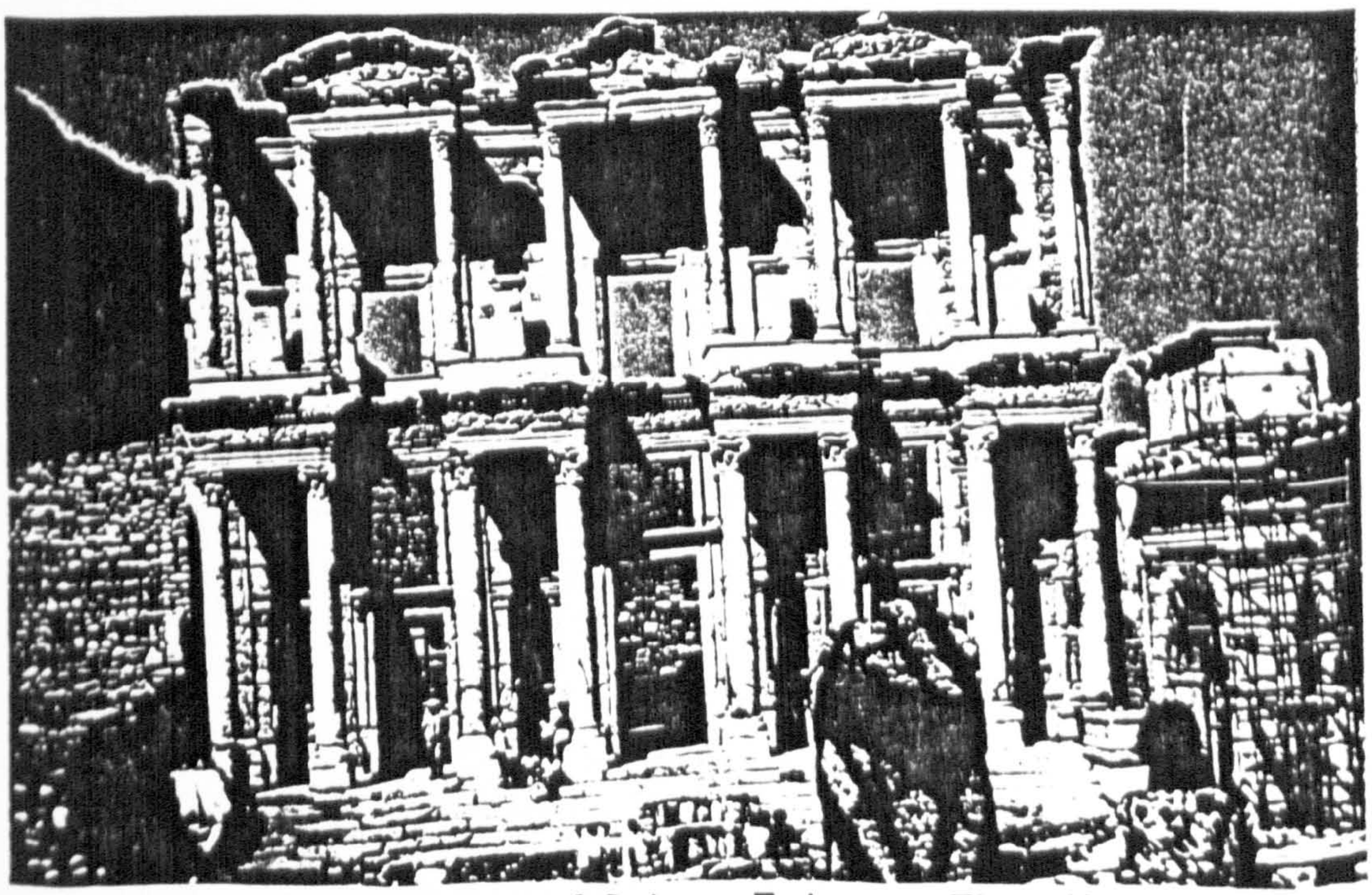

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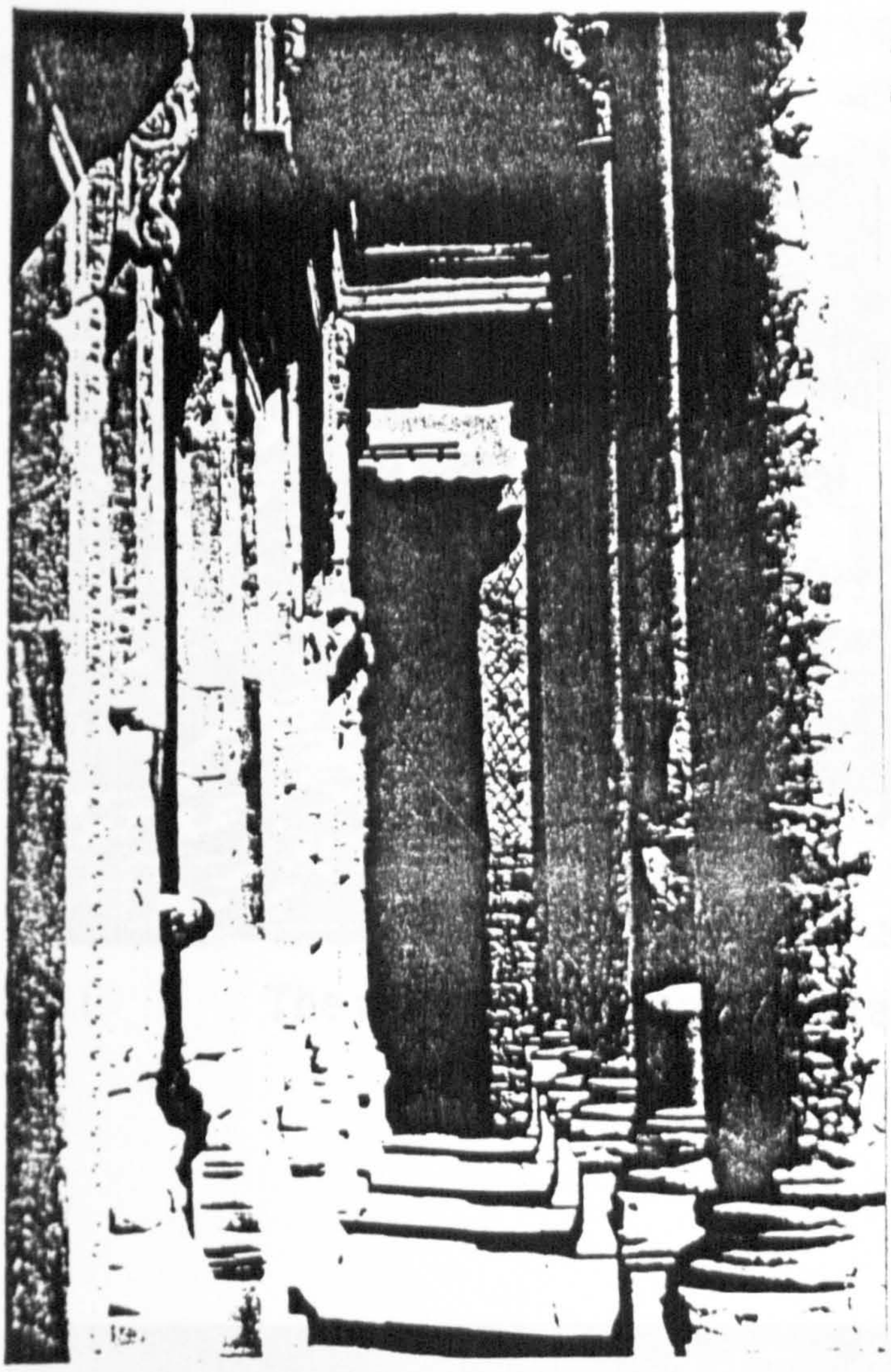

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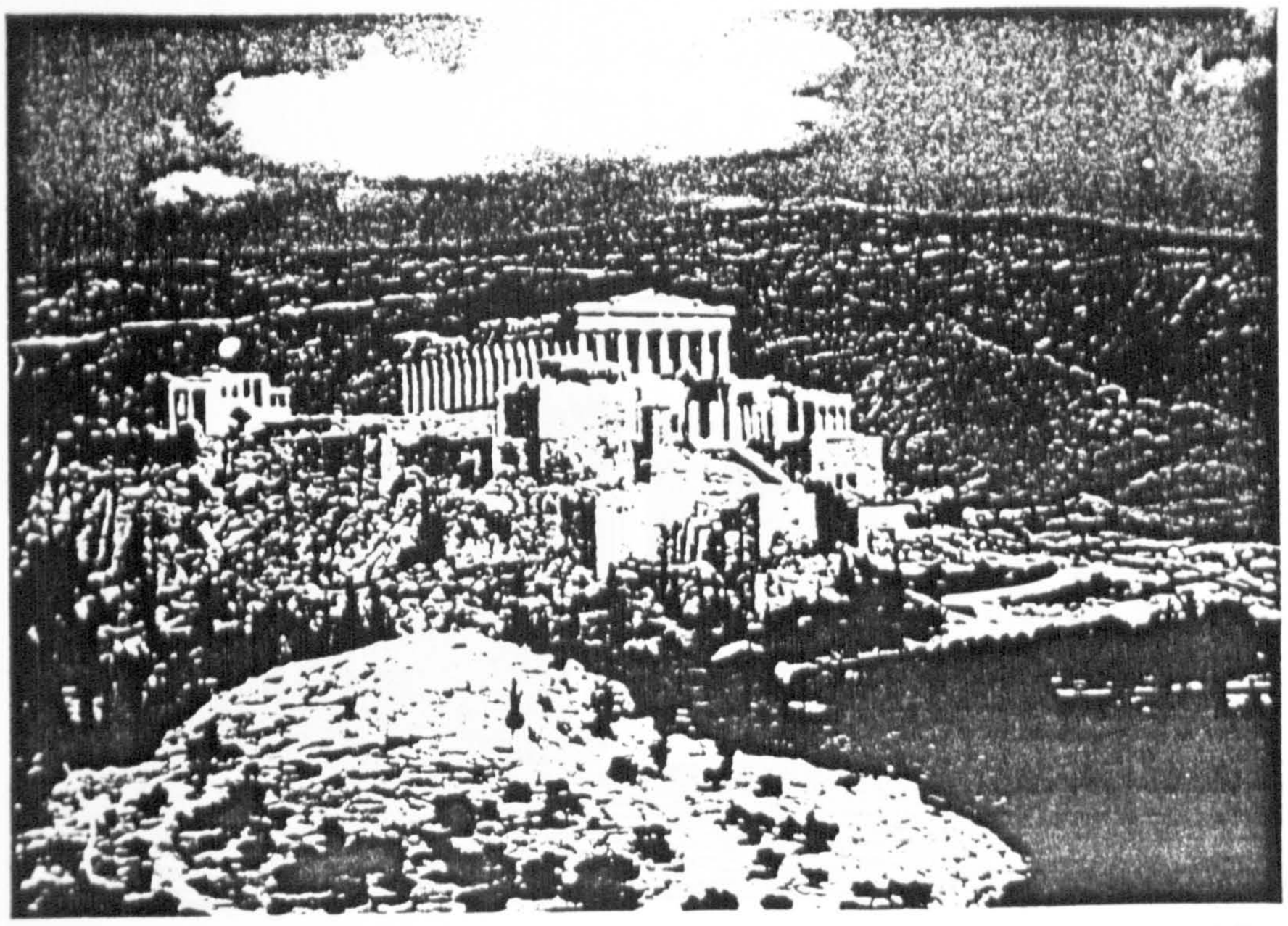

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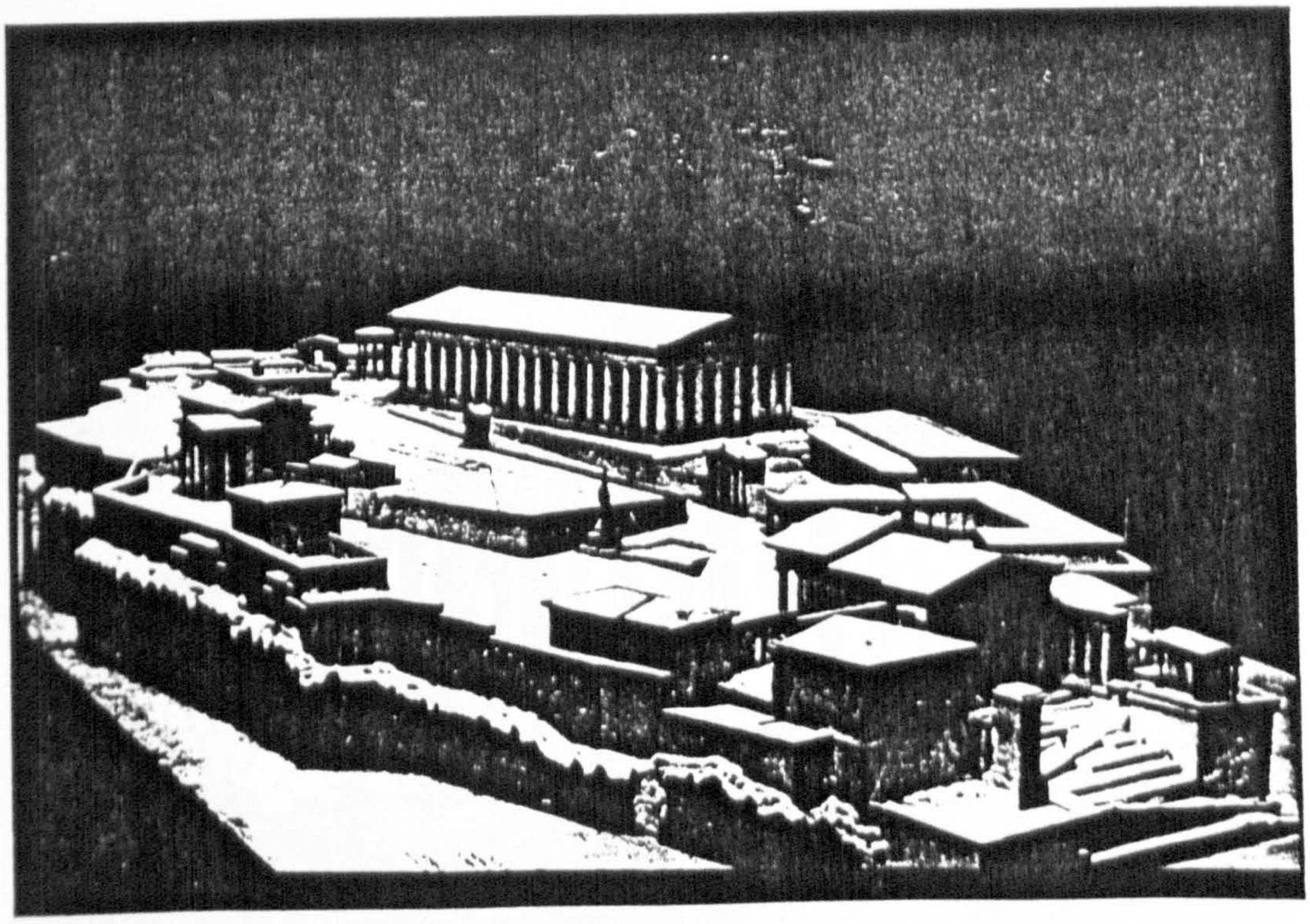

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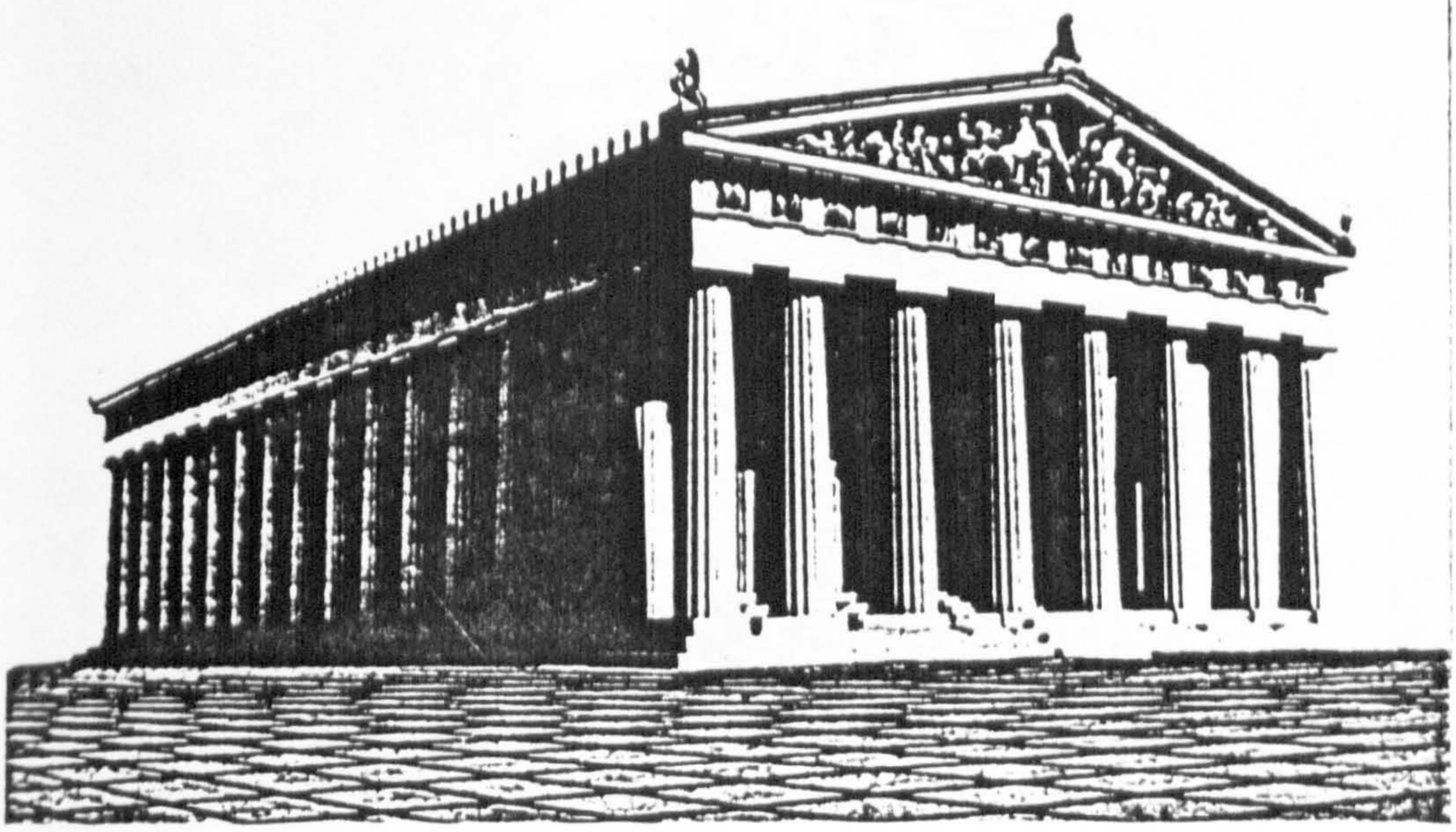

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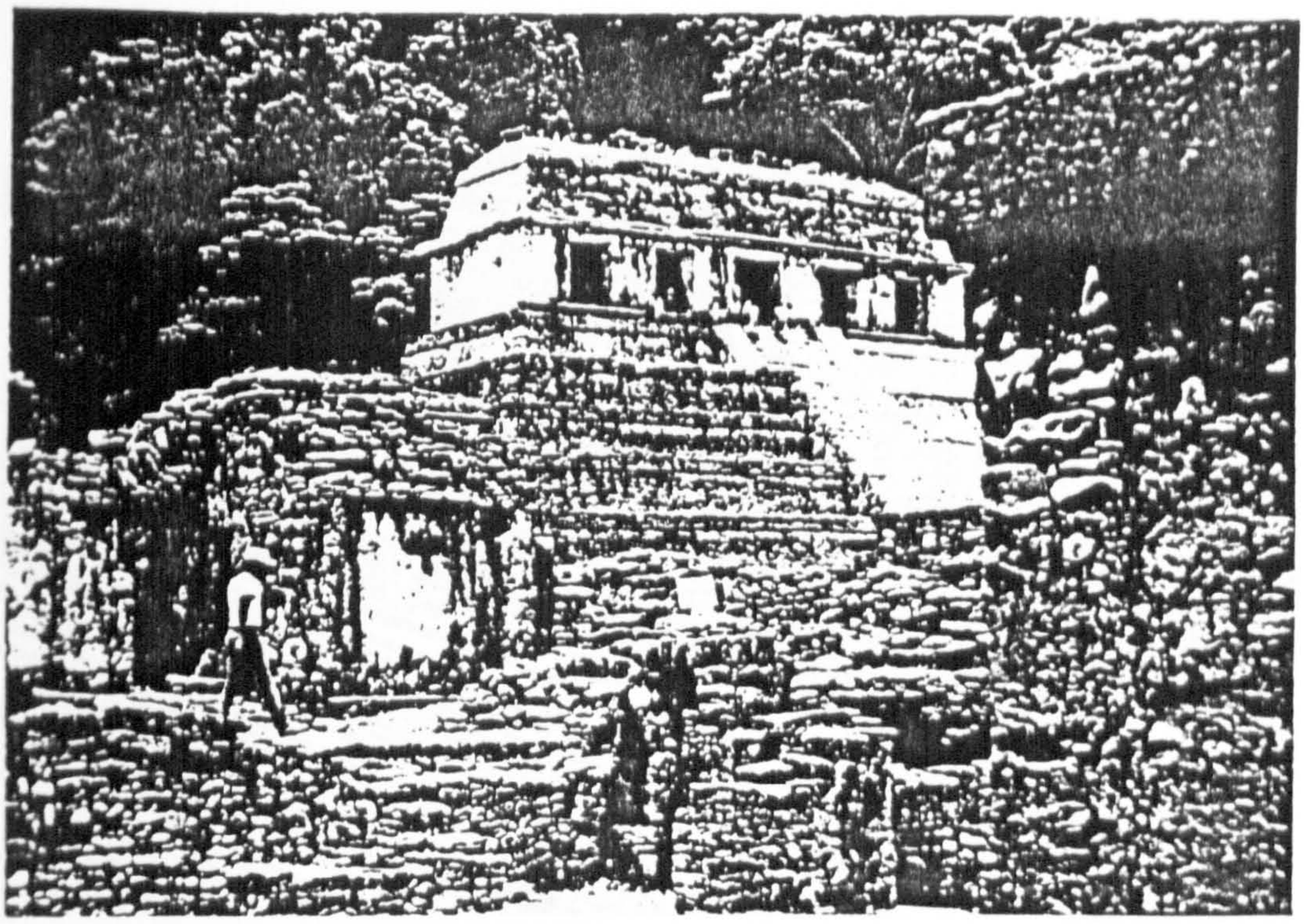
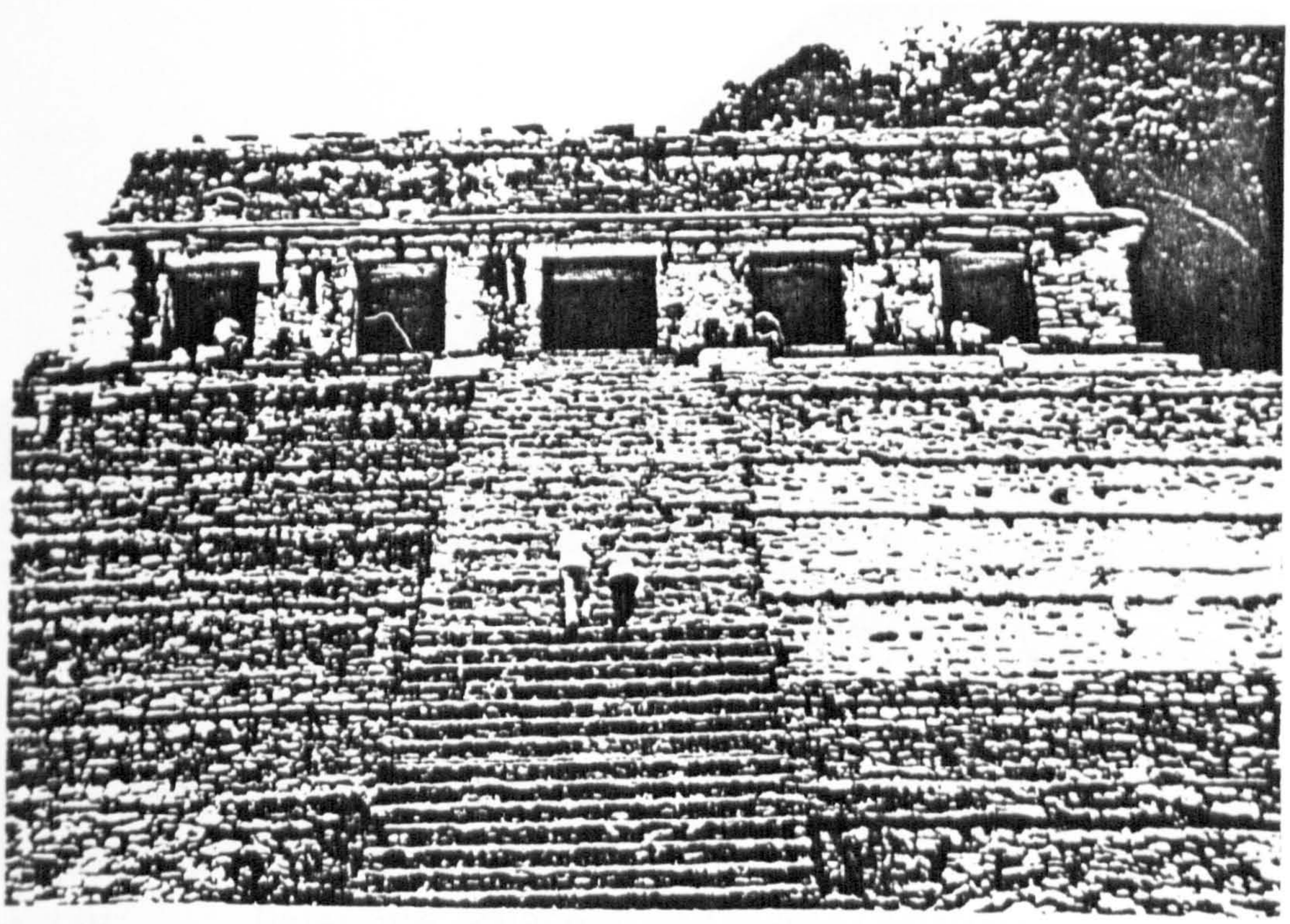


A.3.i Palenque, Temple of the Inscriptions, General View



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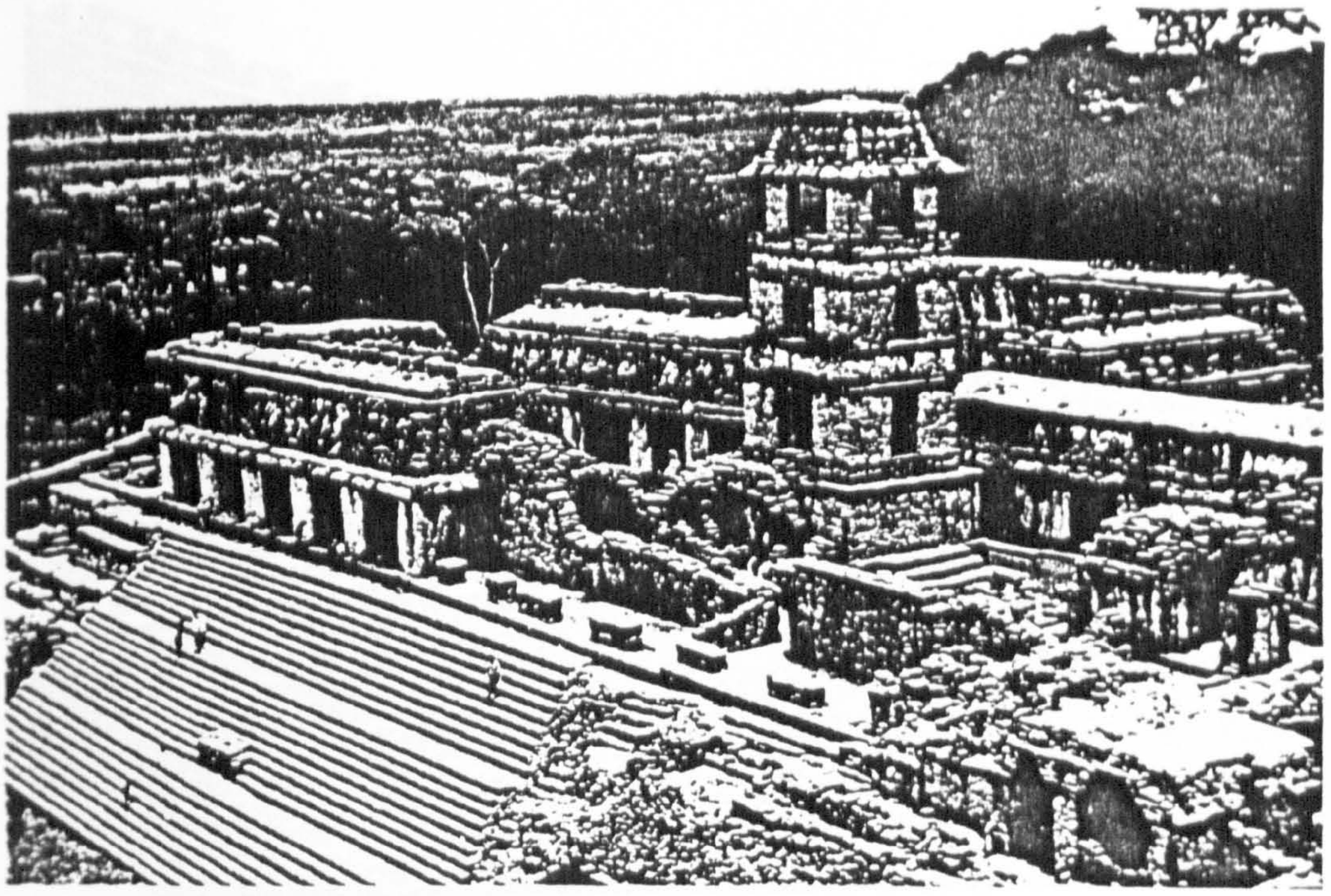

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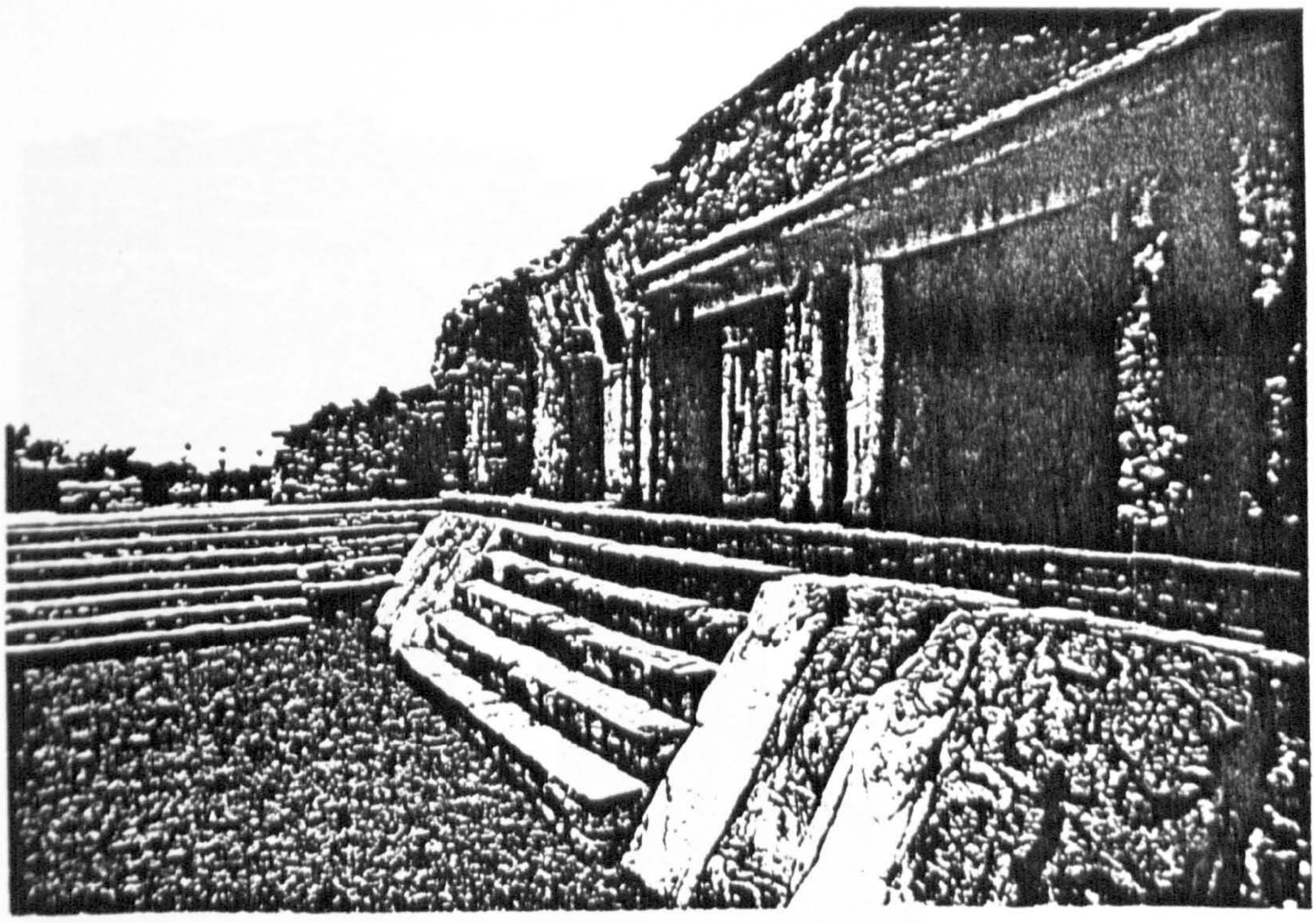

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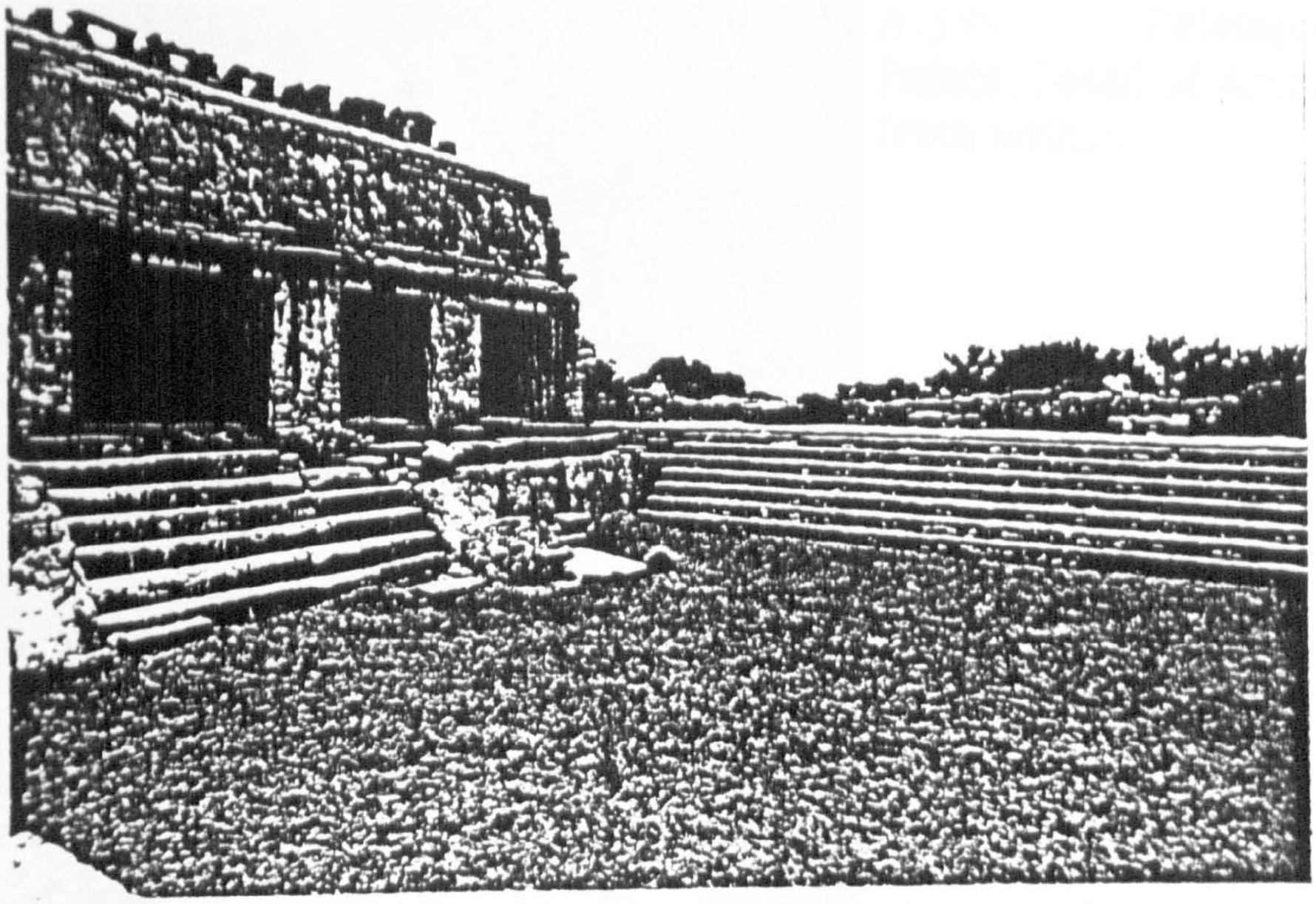
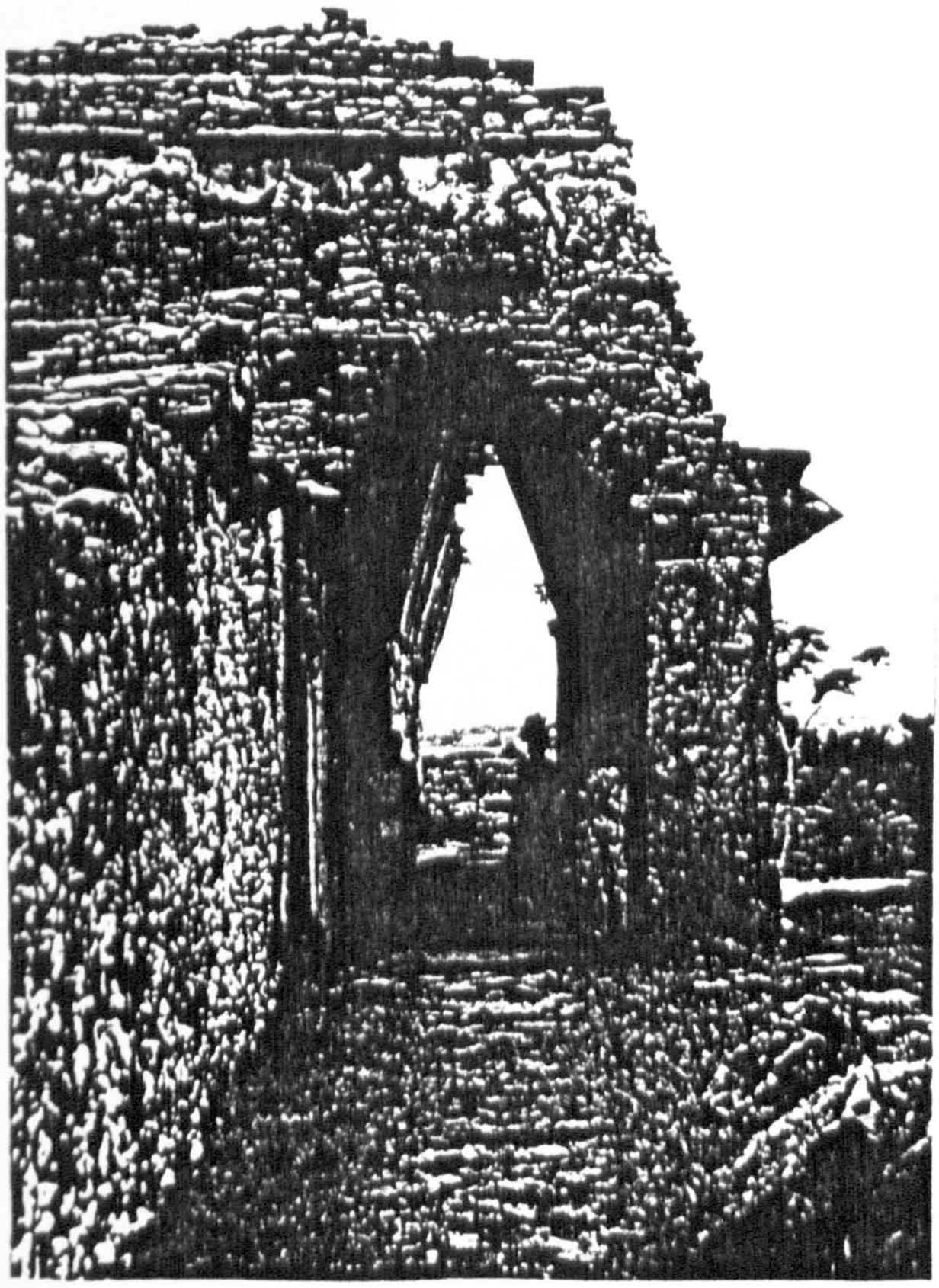


A.3.v Palenque, Palace, View inside Courtyard



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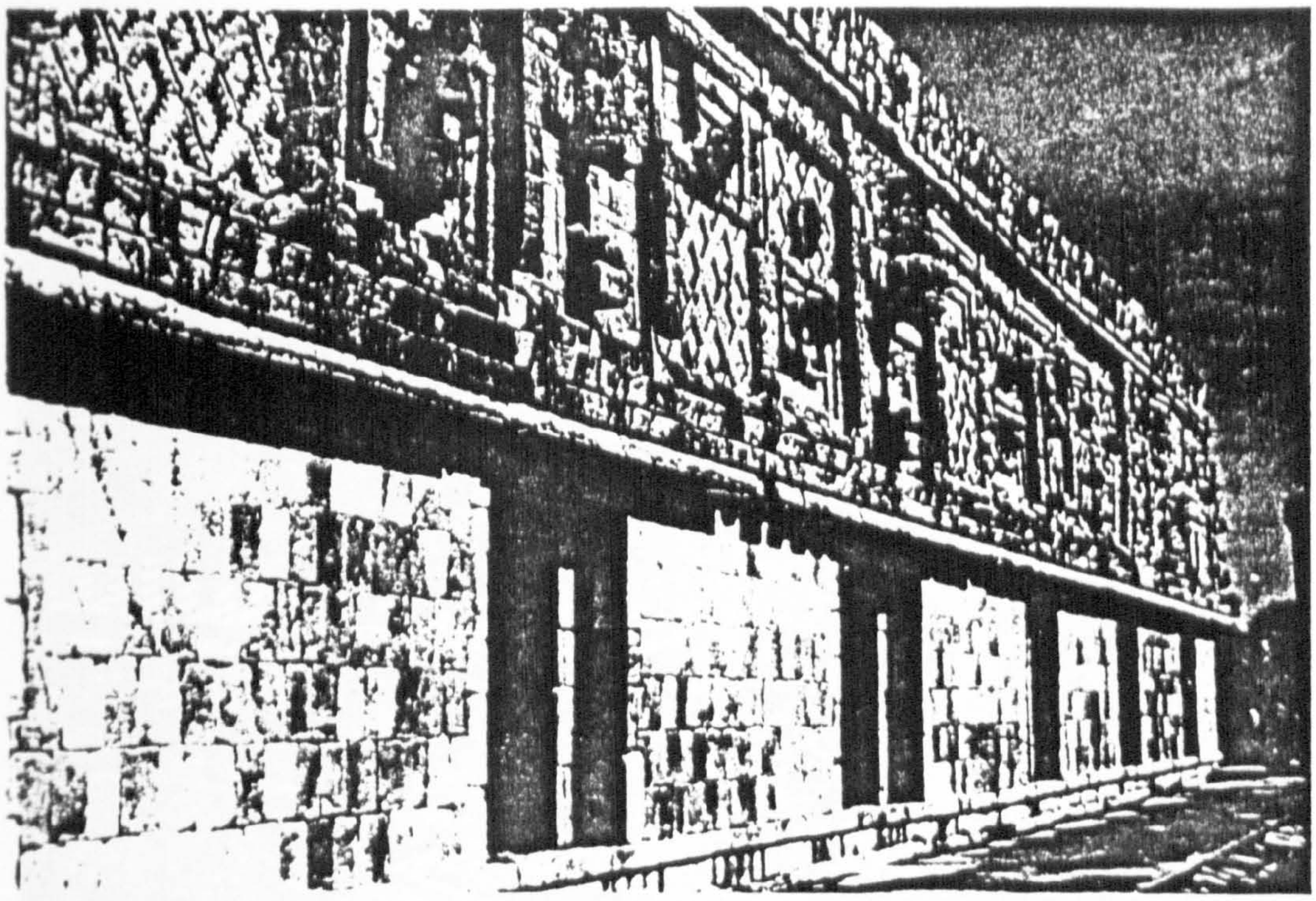

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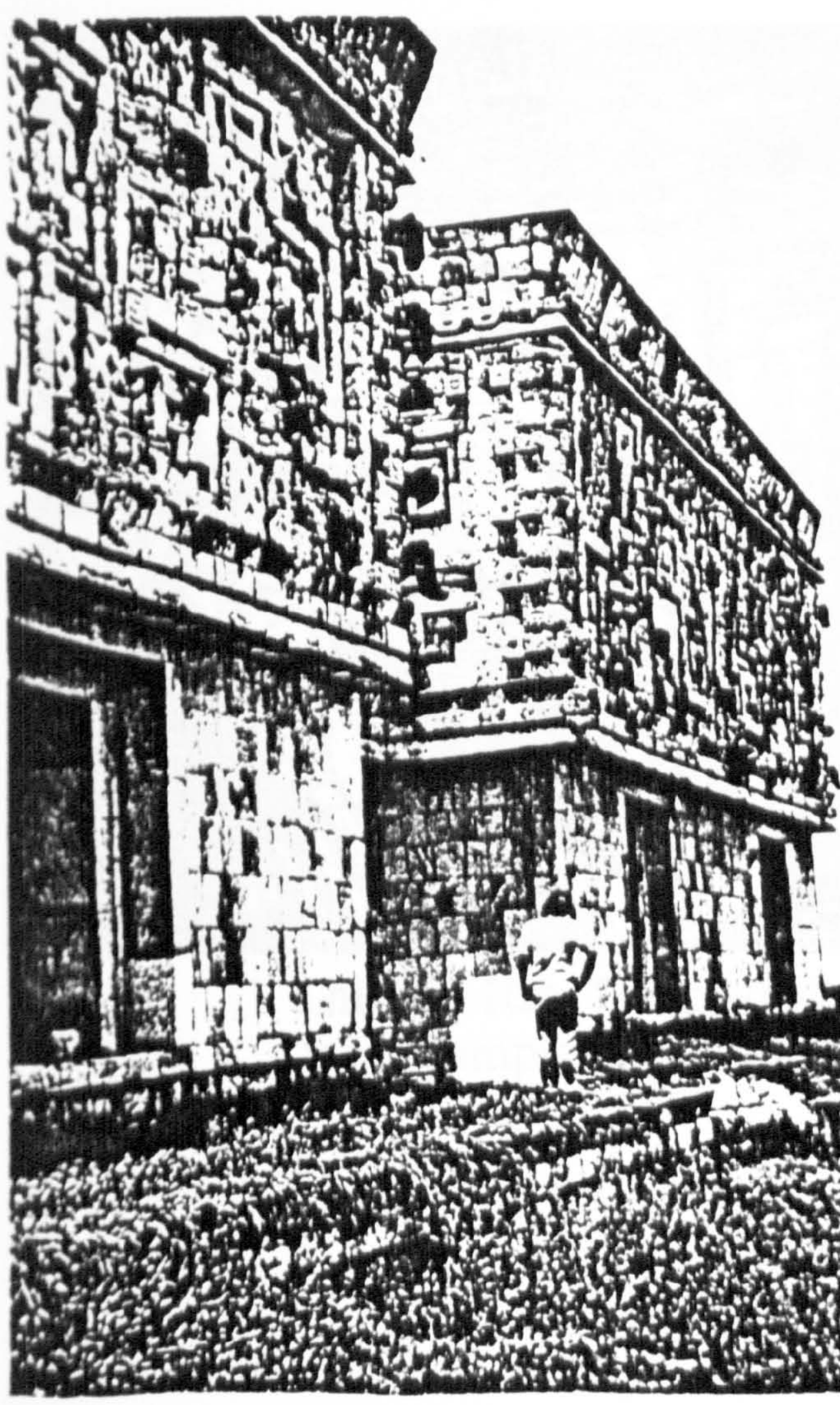

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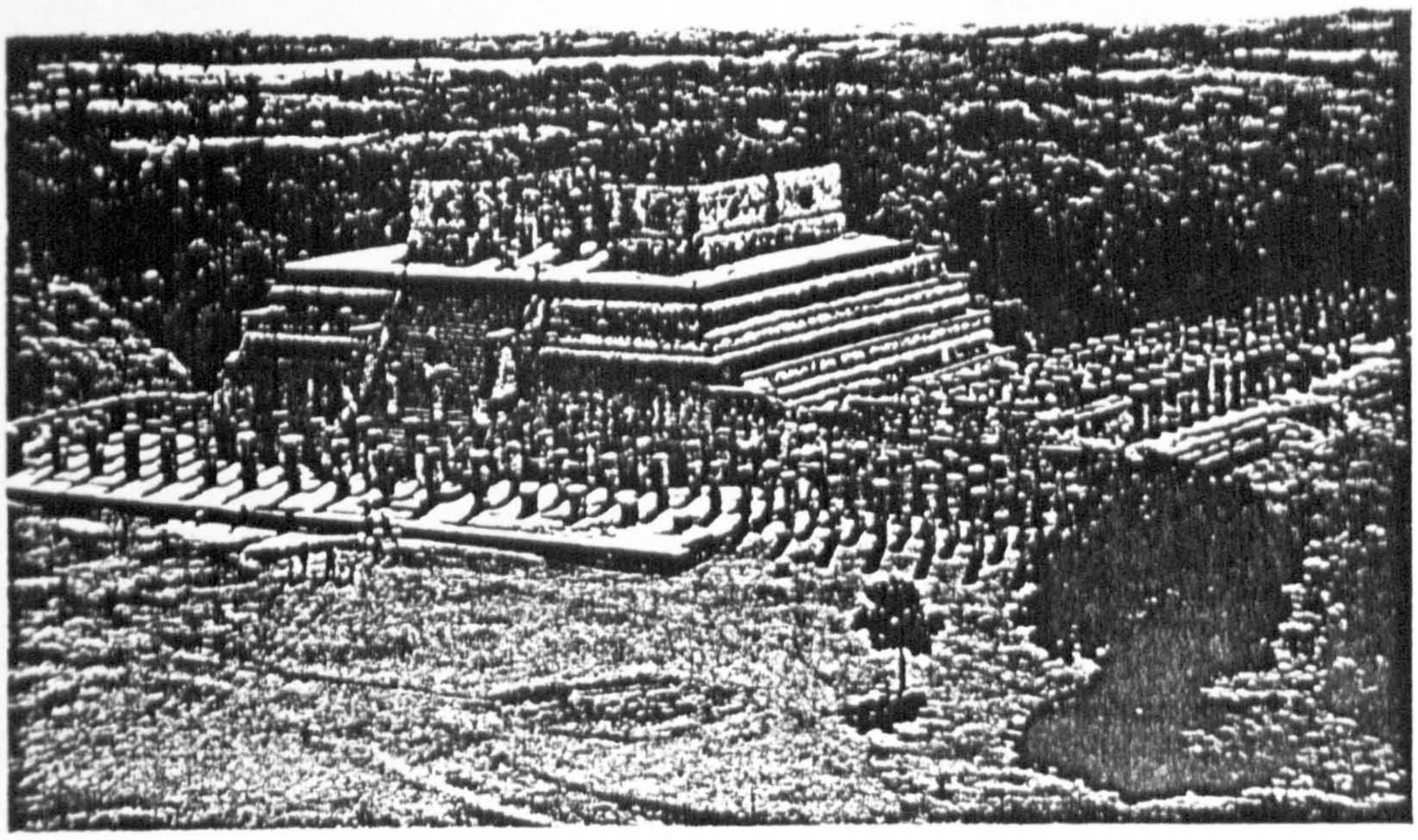
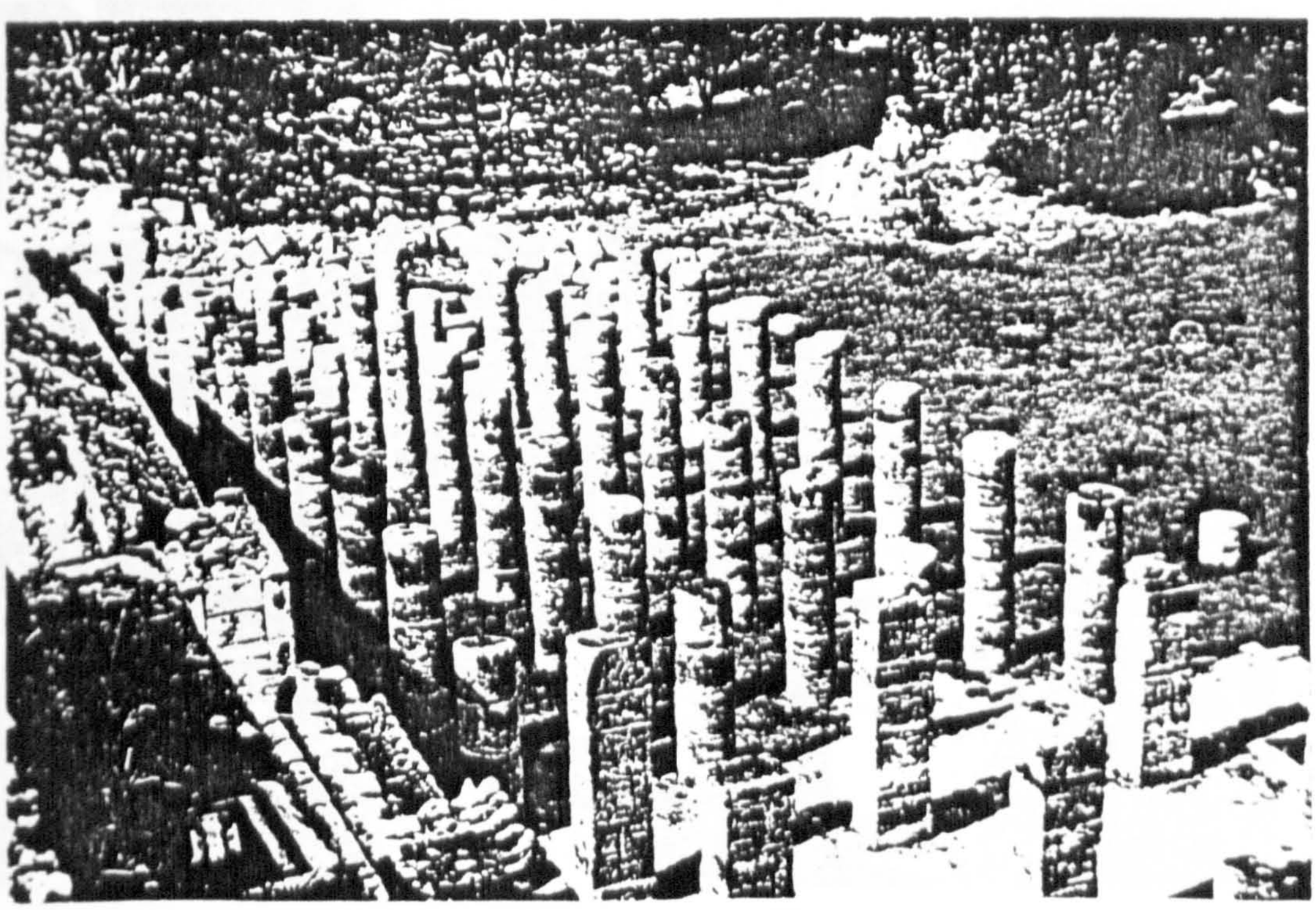


A.5.i Chichen Itza, Temple of a Thousand Columns, General View with Temple of the Warriors



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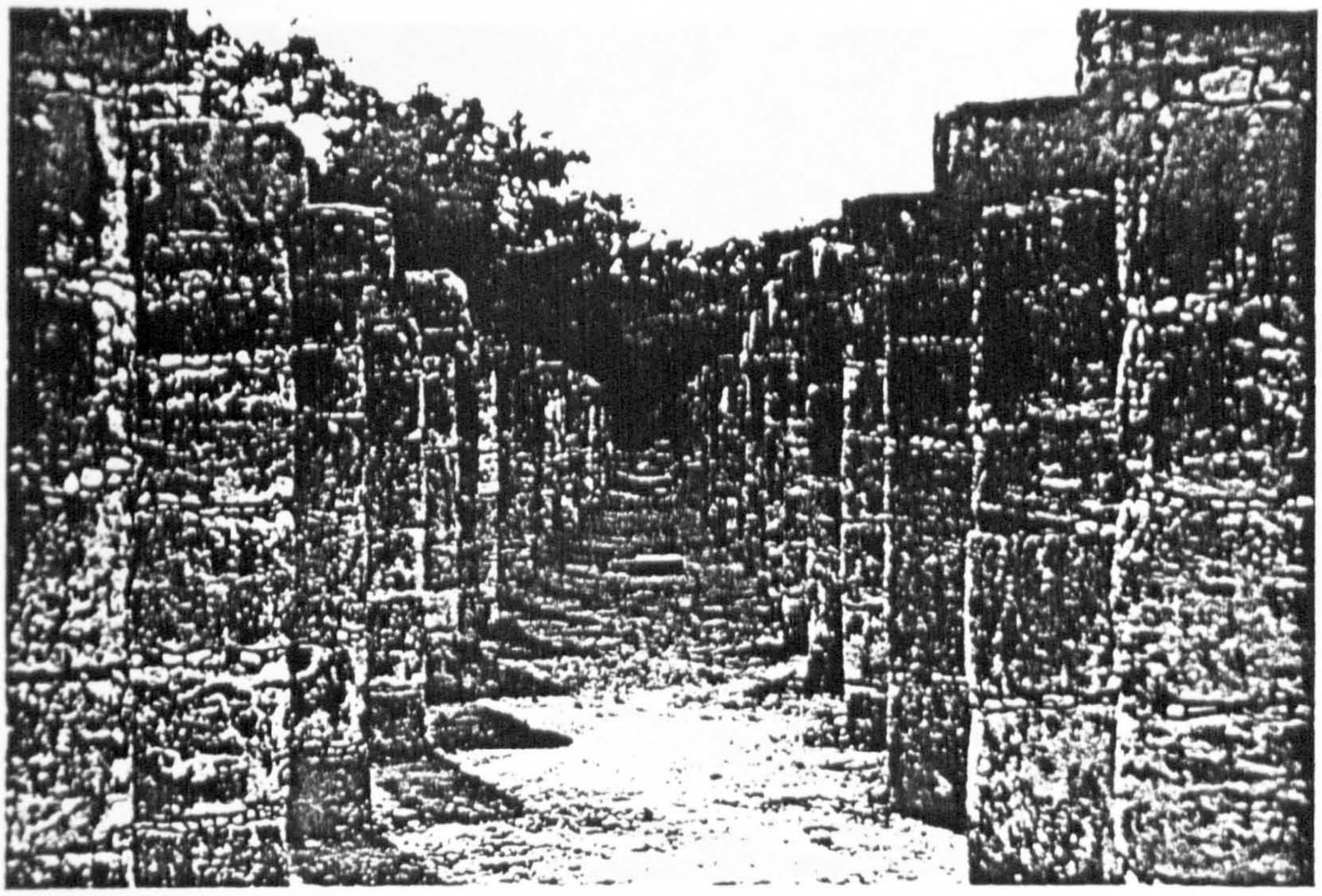

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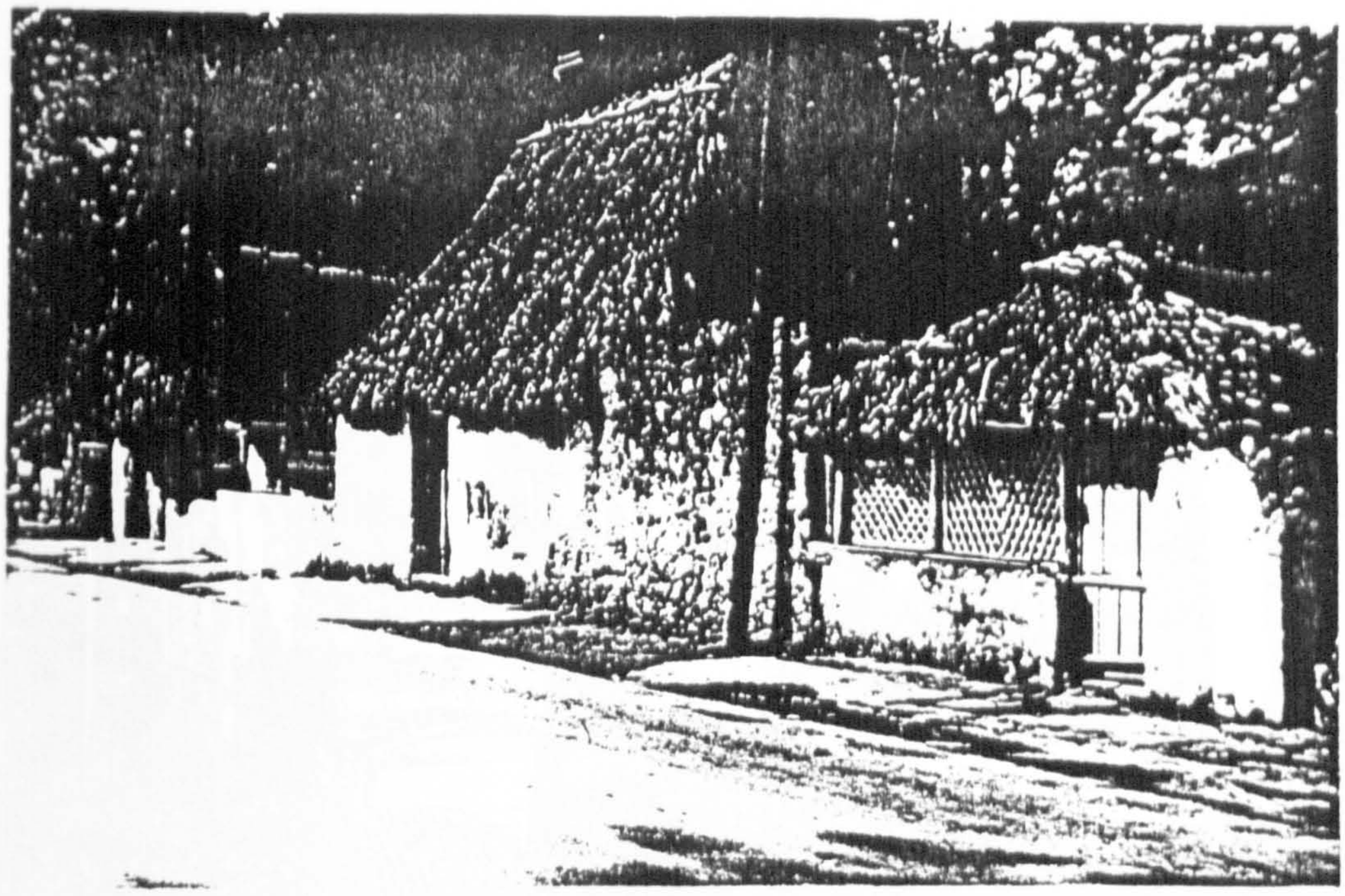

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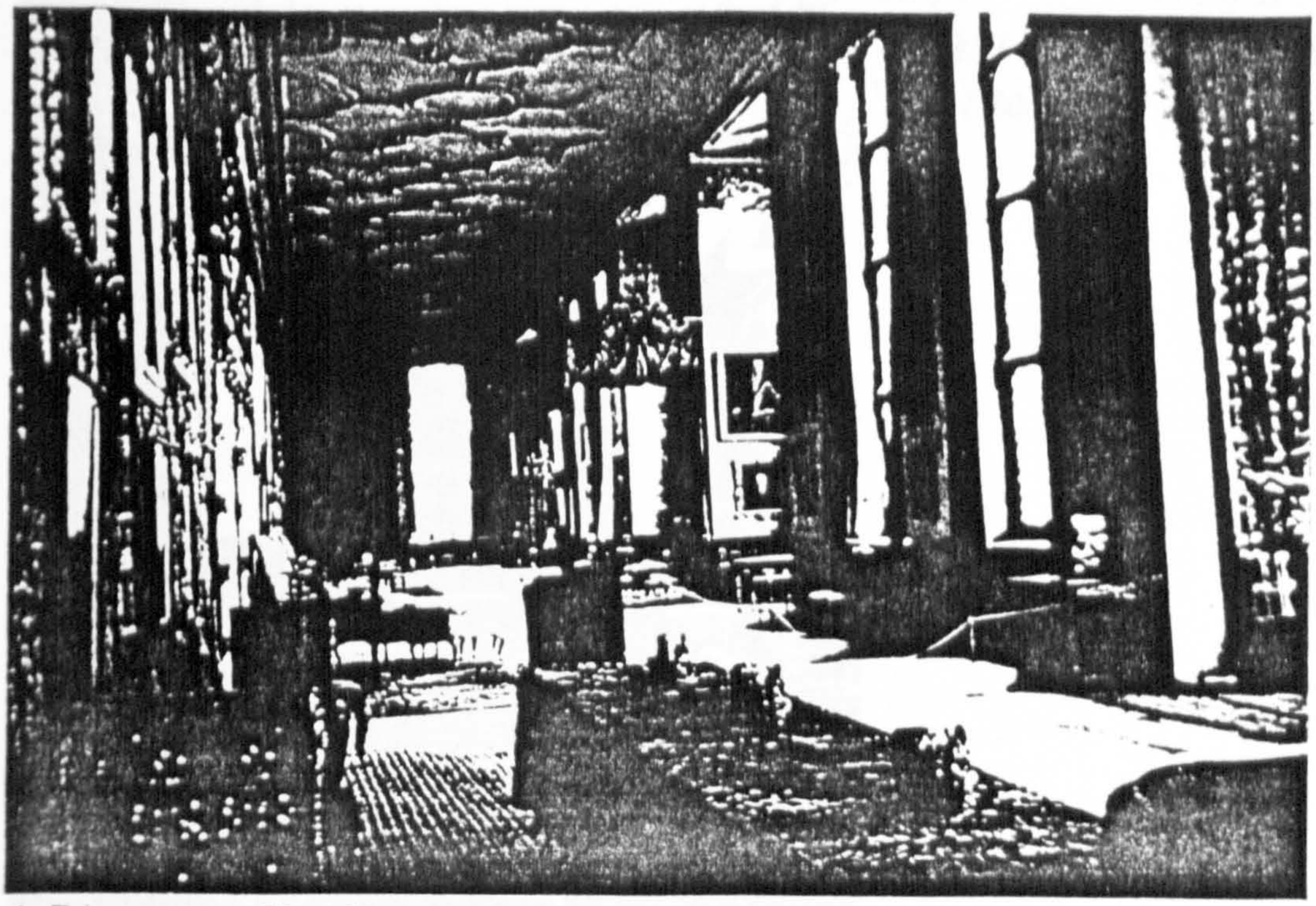
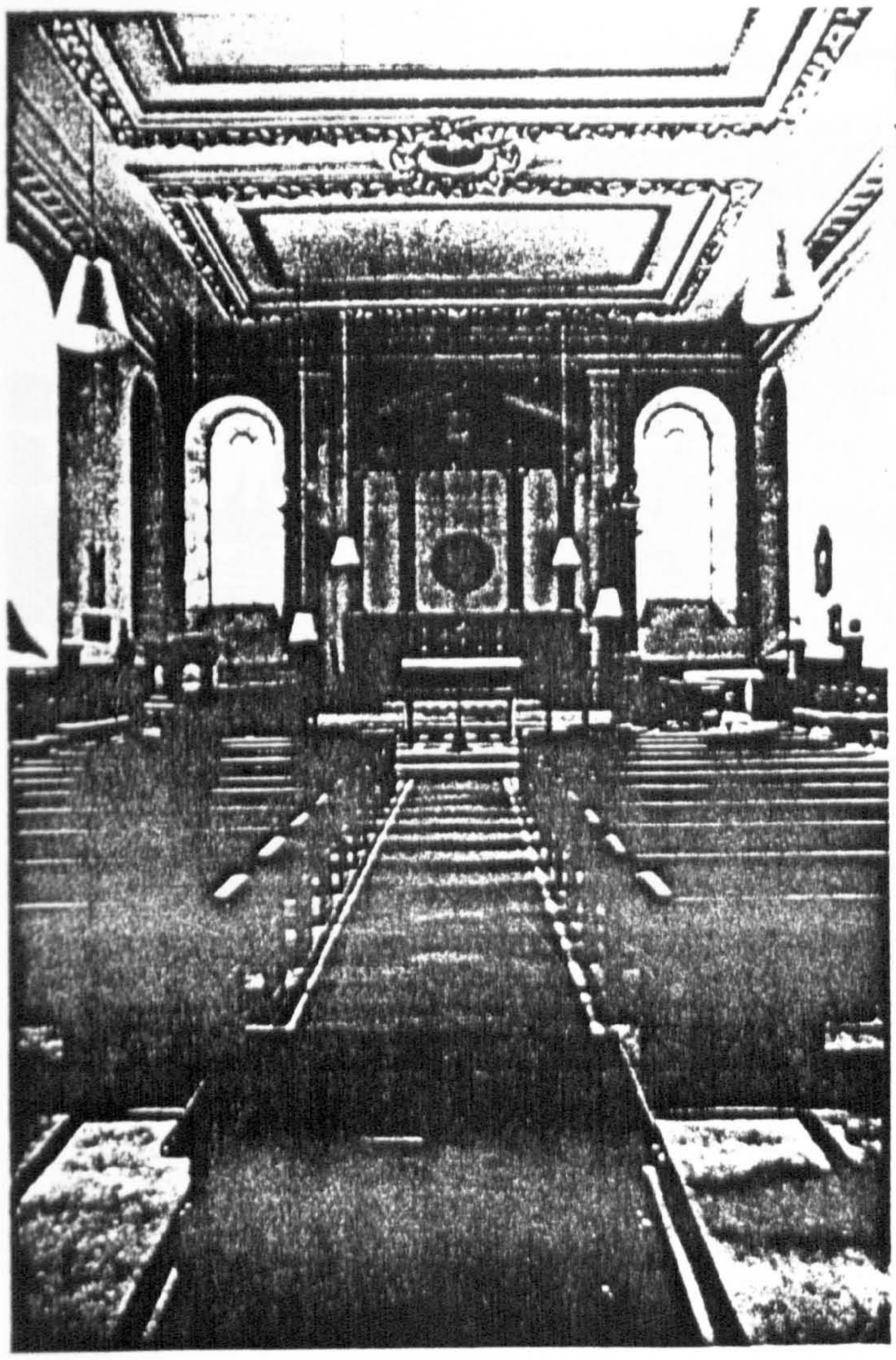
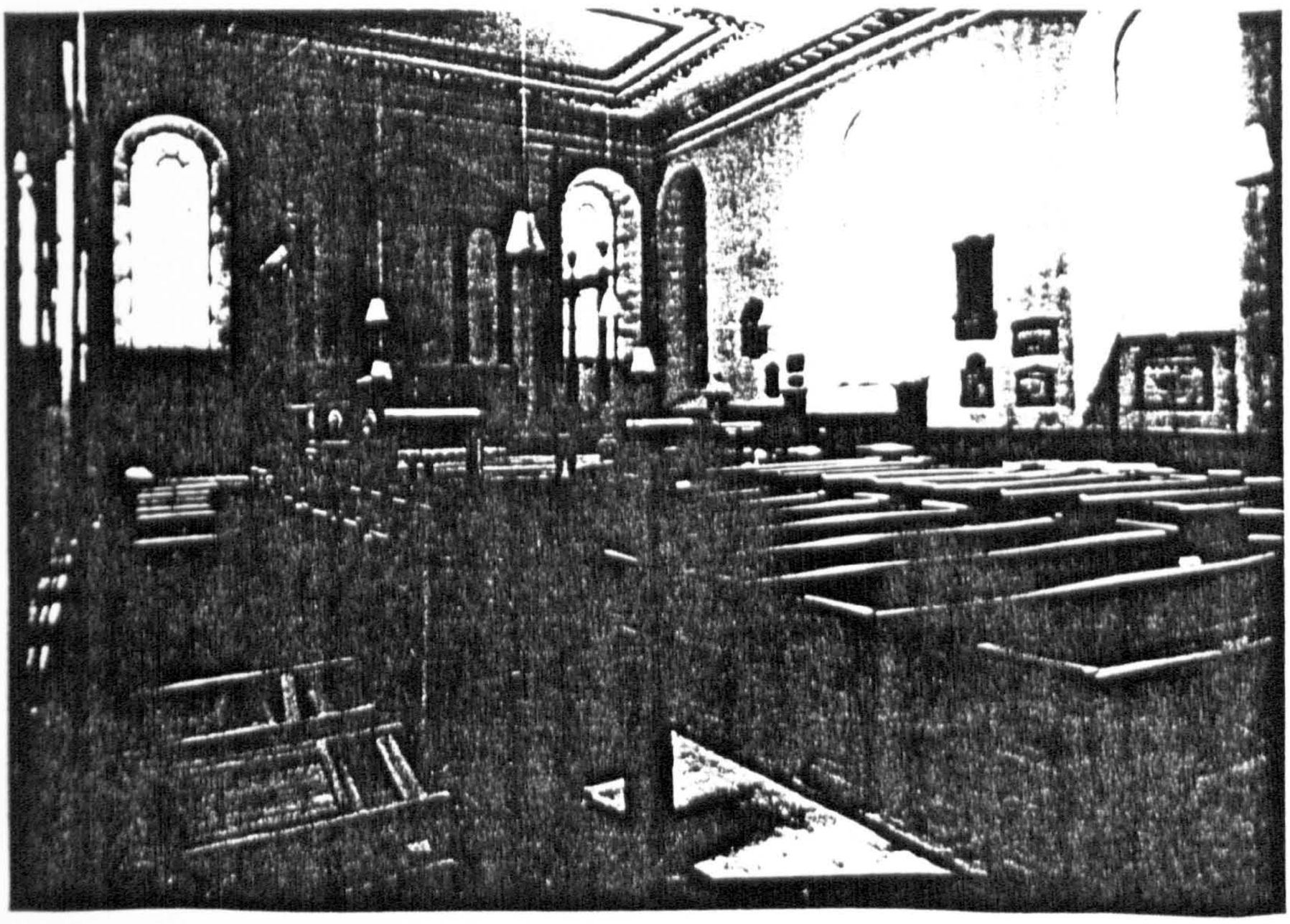


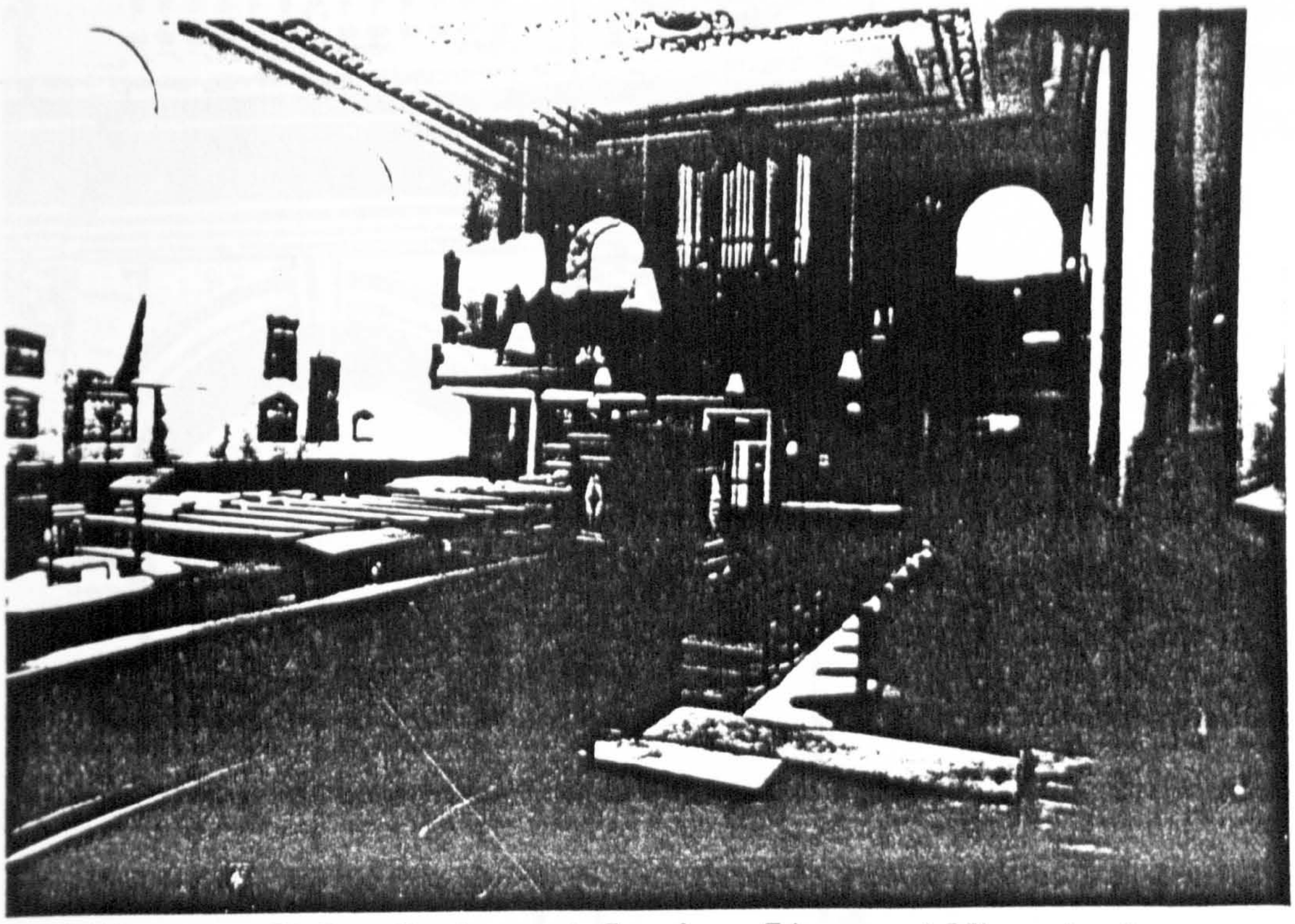
A.7.i Hardwick Hall, View along Long Gallery



A.8.i St Paul's Covent Garden, Central View to Altar



A.8.ii St Paul's Covent Garden, Diagonal View to Altar



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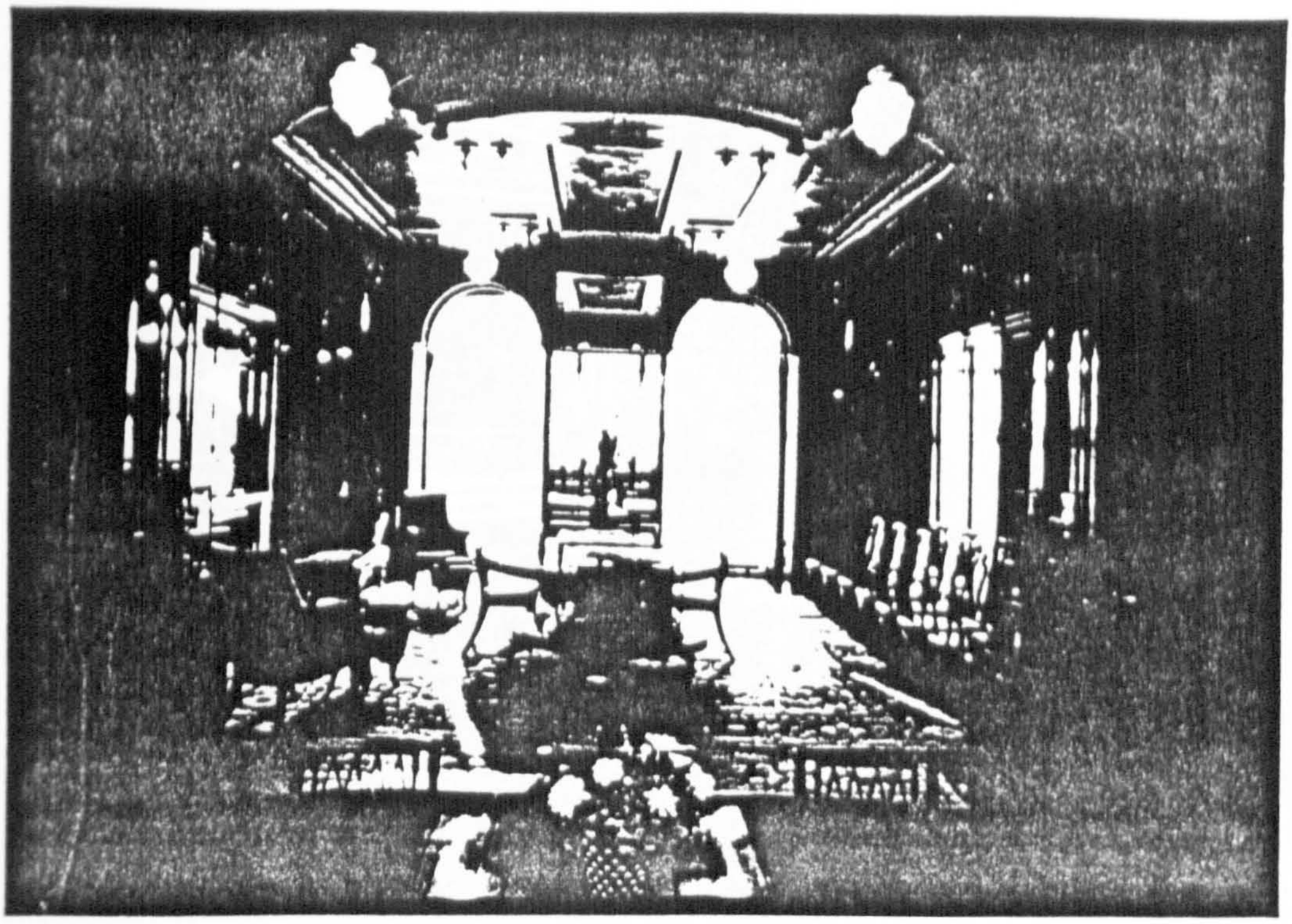
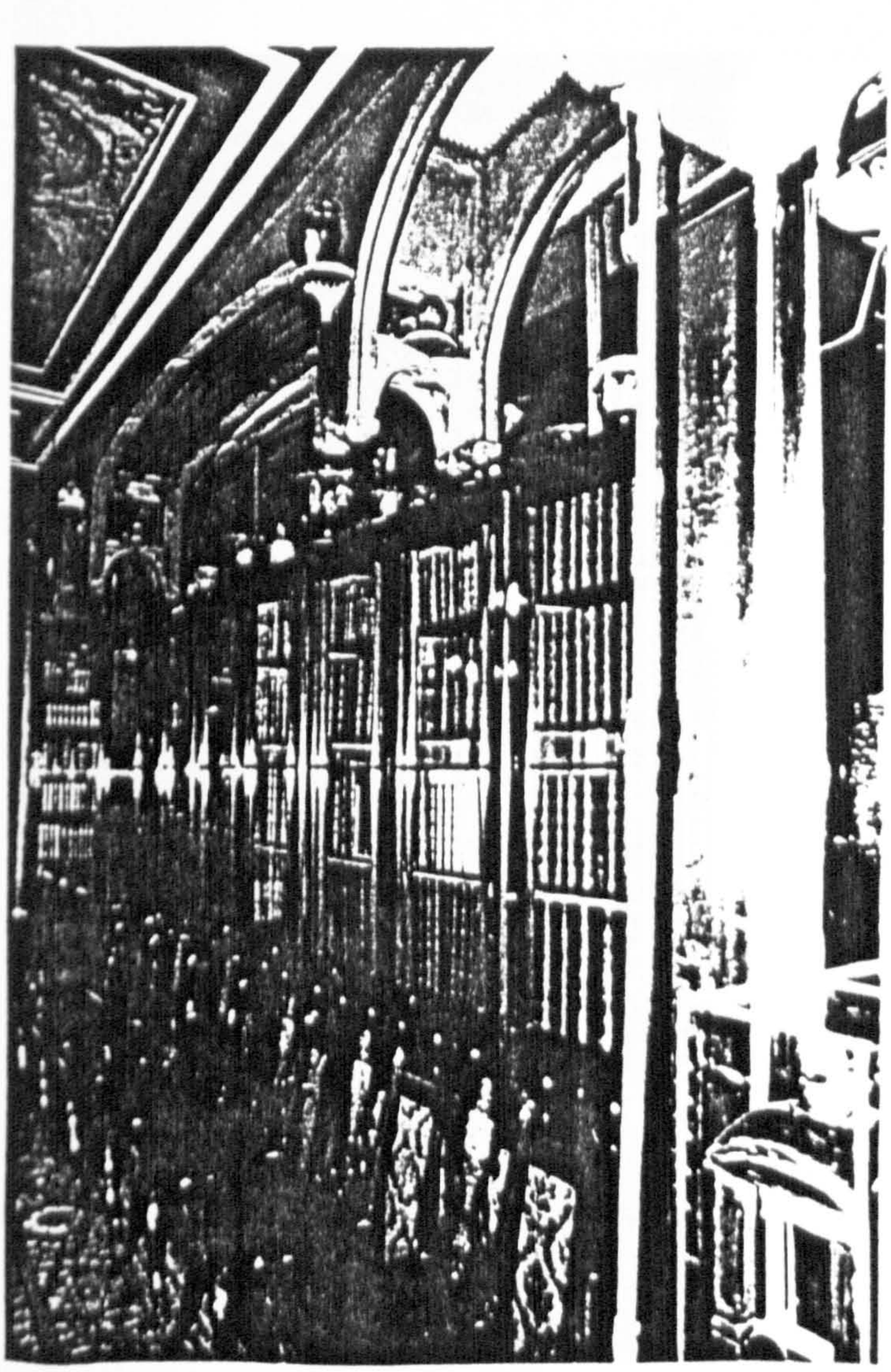
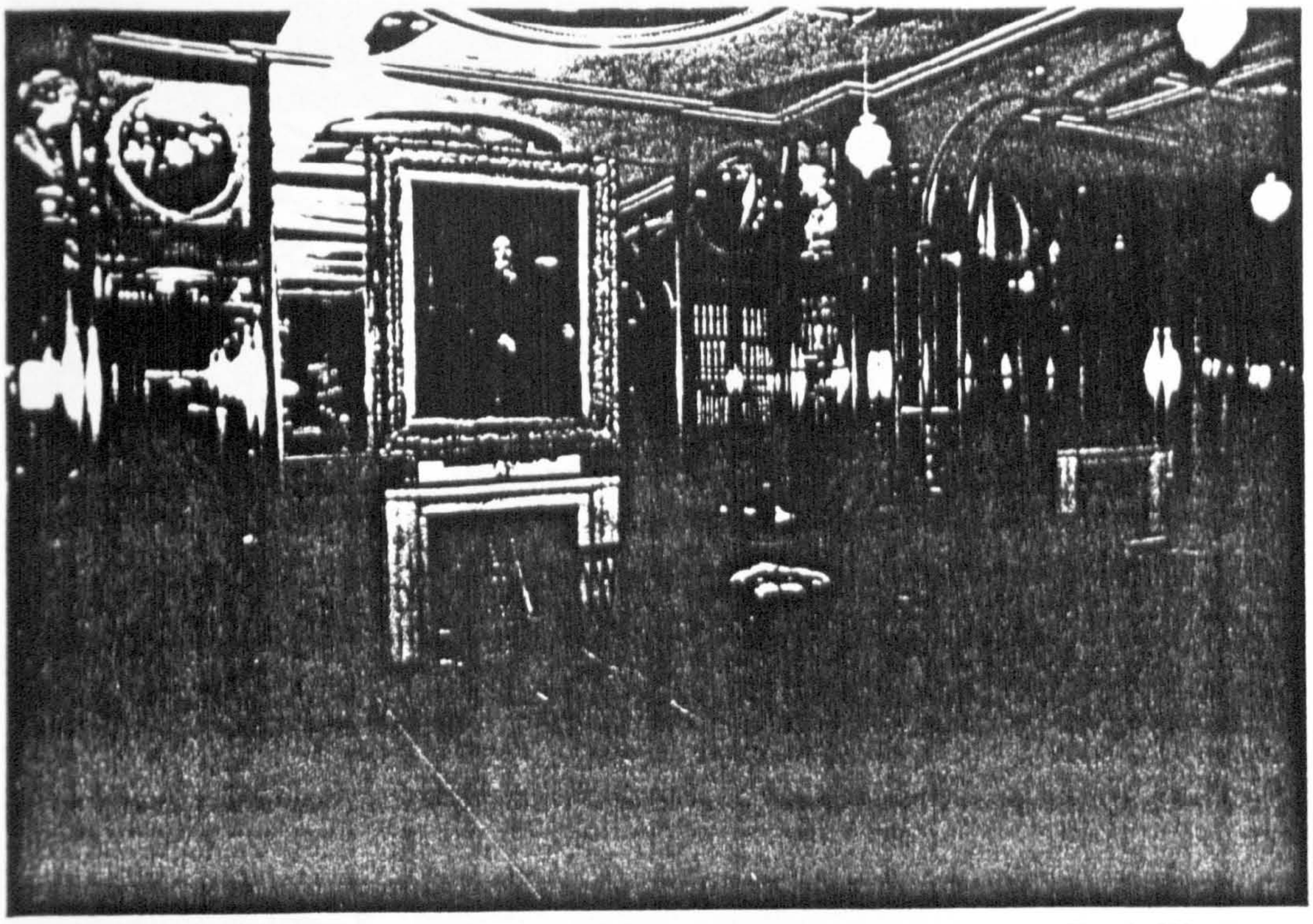
View of House through Main
Gate, with Pond Obscurred



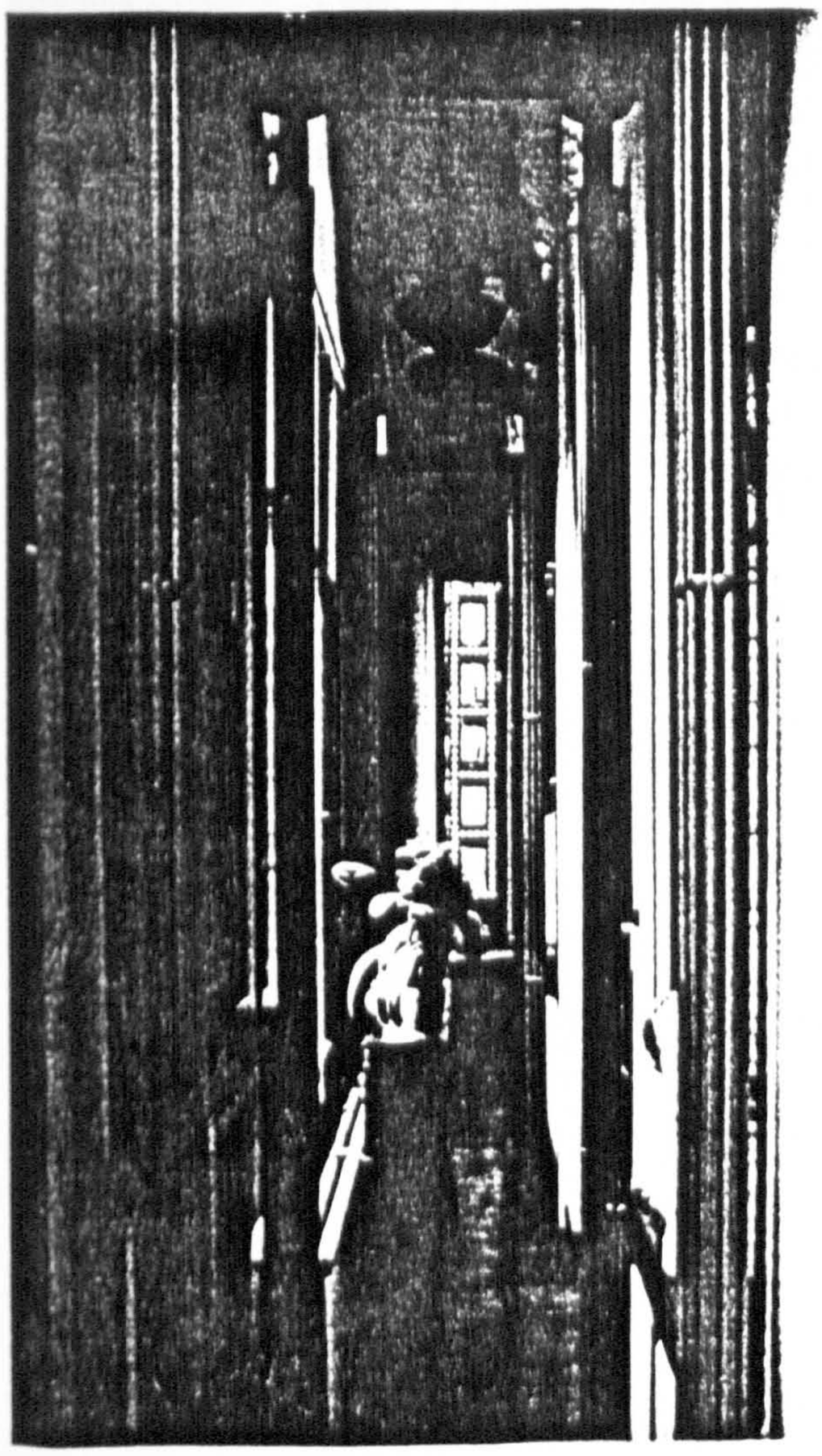
A.10.i Sir John Soane's Museum, View from Dining Room through Library: Windows face Lincoln's Inn Fields



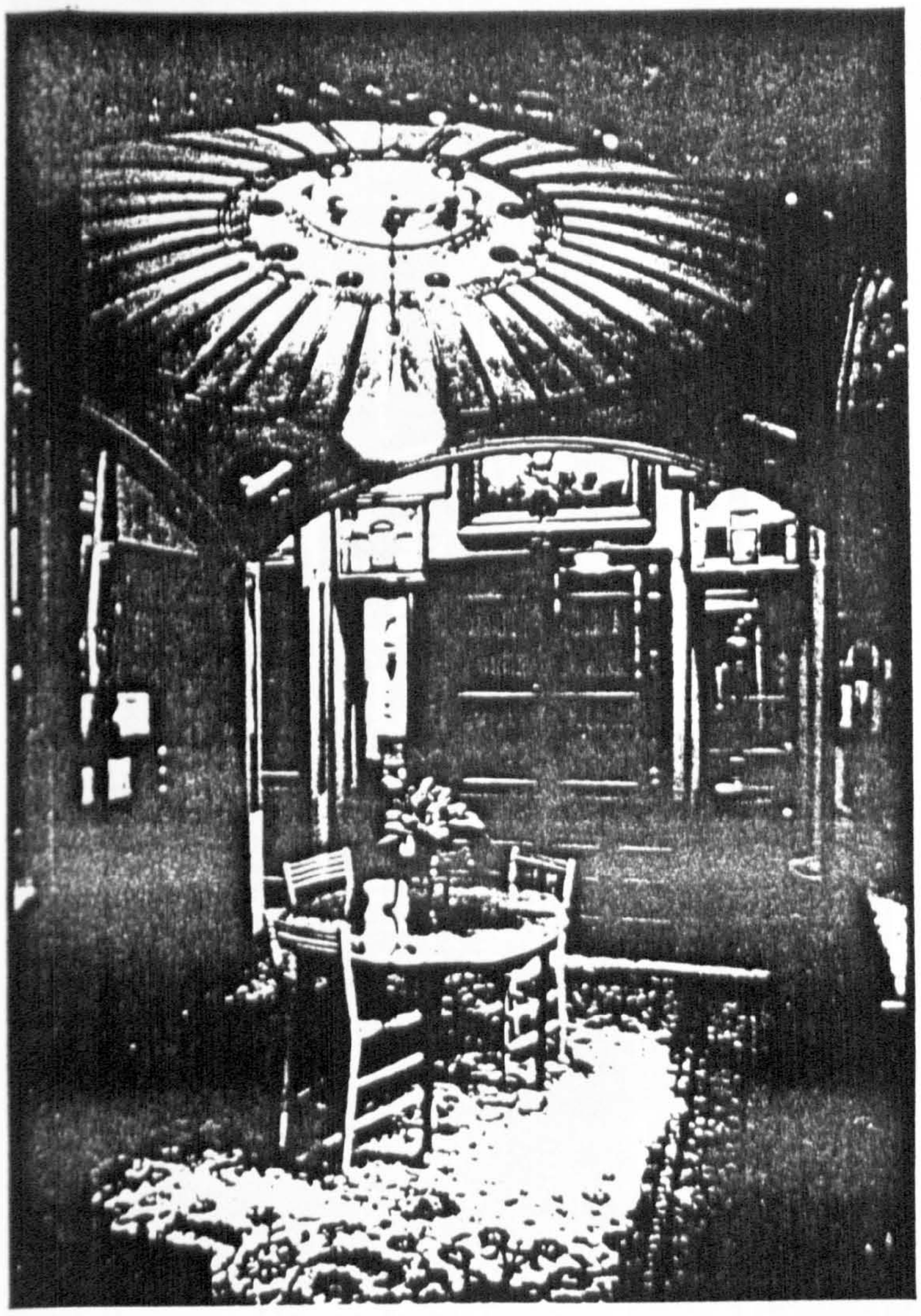
A.10.ii Sir John Soane's Museum, Library Side Wall from Dining Room, with Bookcases



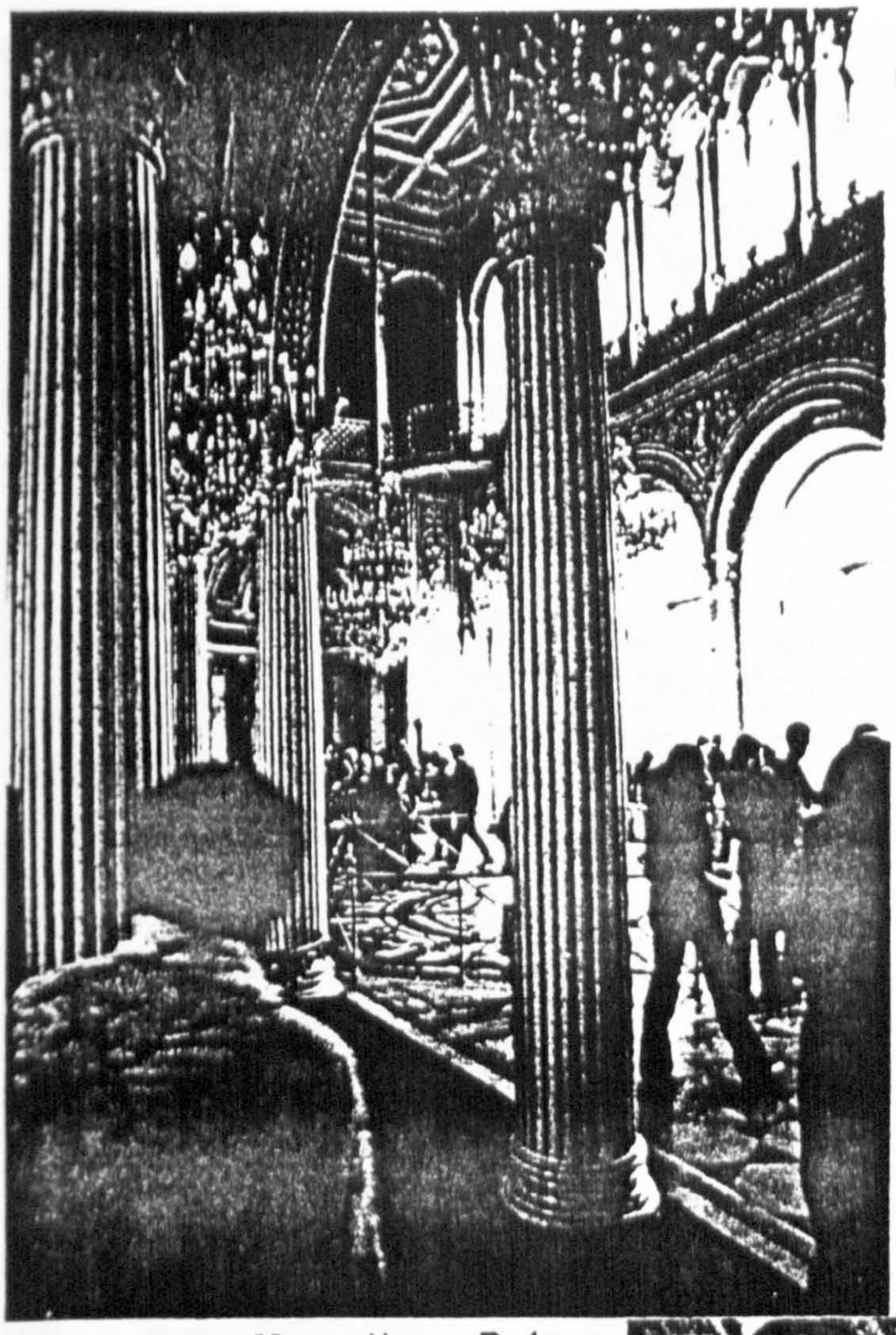
A..10.iii Sir John Soane's Museum, Dining Room End Wall



A.10.iv Sir John Soane's Museum, South Drawing Room, Window Arcade

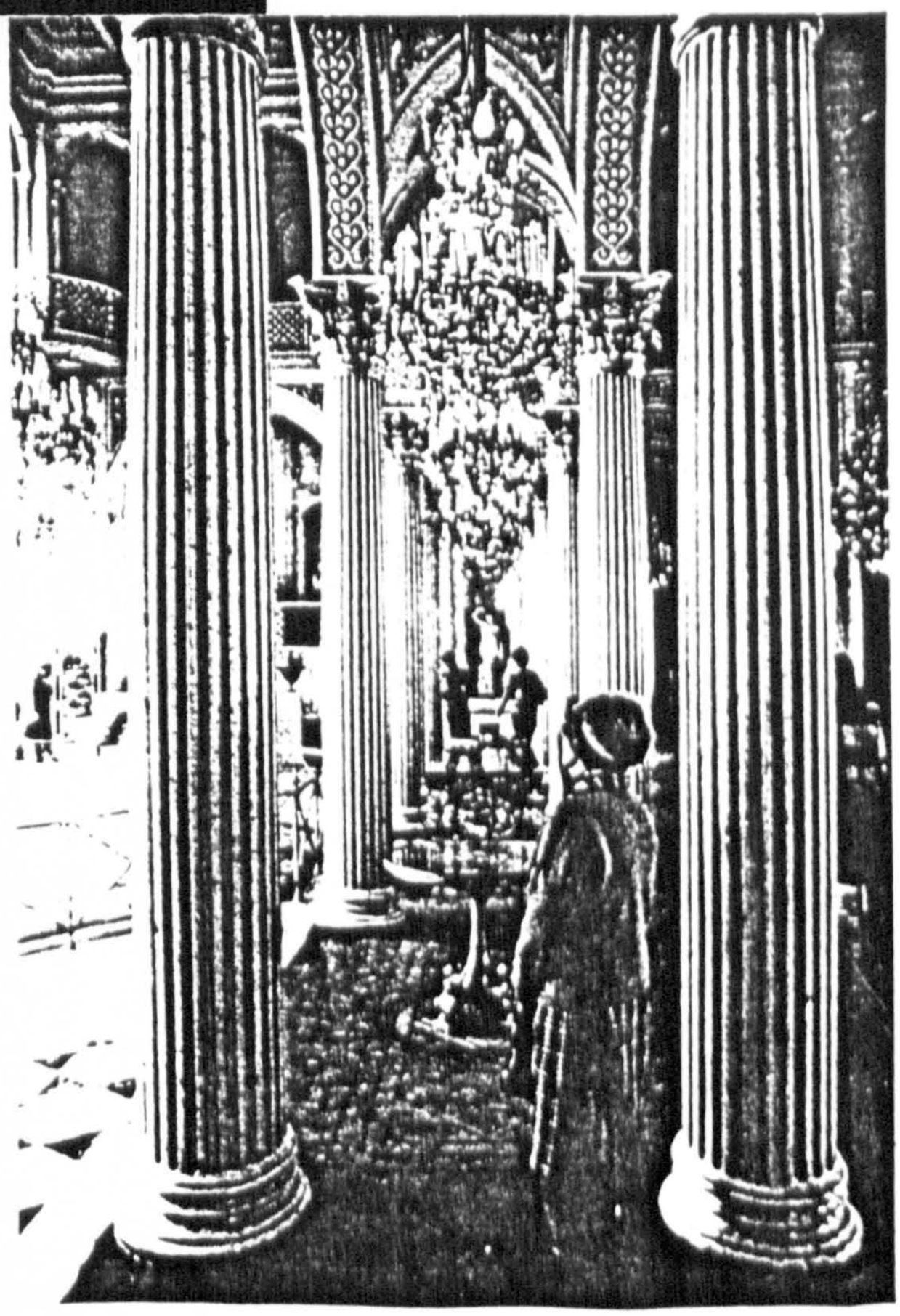


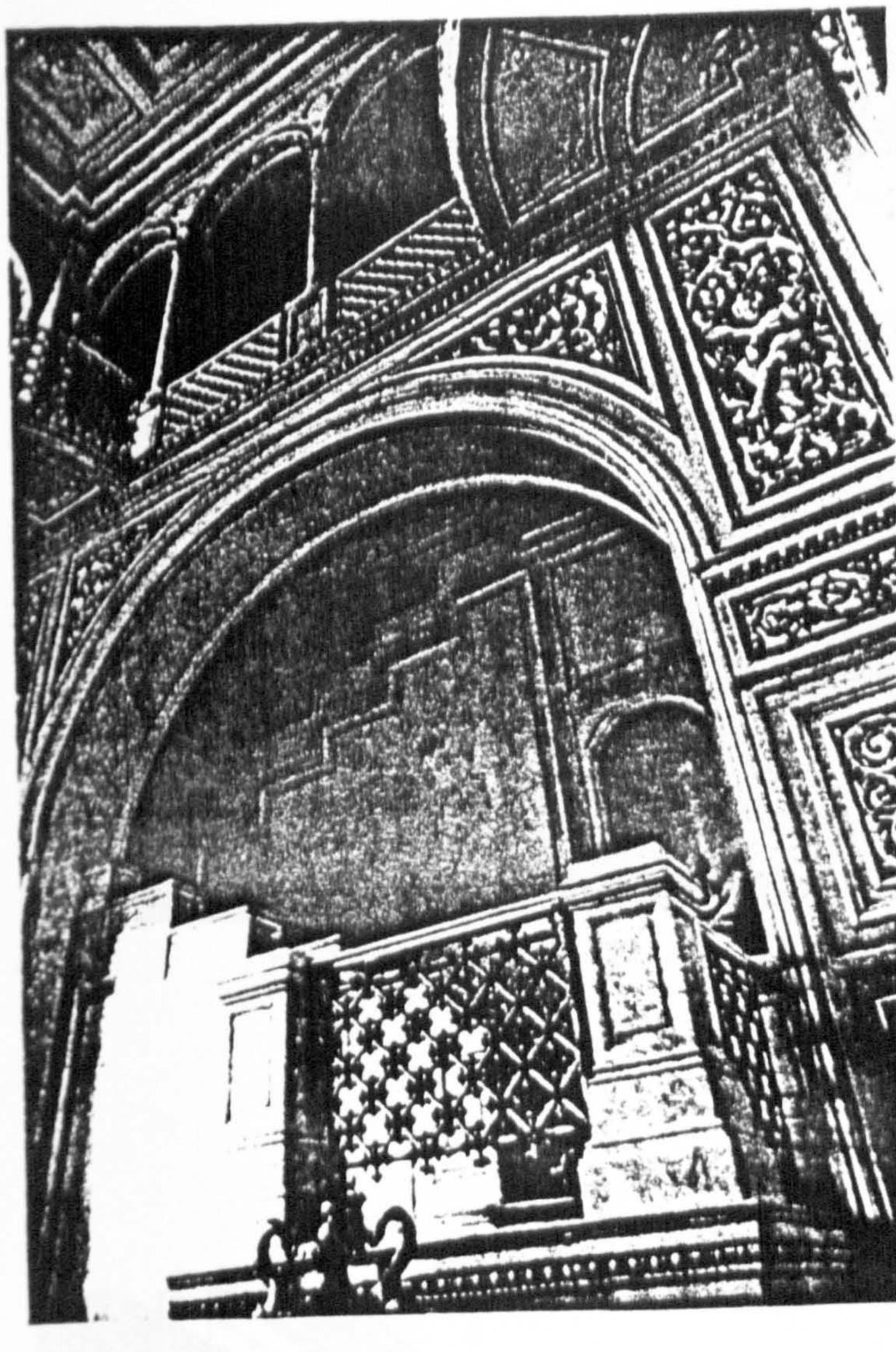
A.10.v Sir John Soane's Museum, Breakfast Room



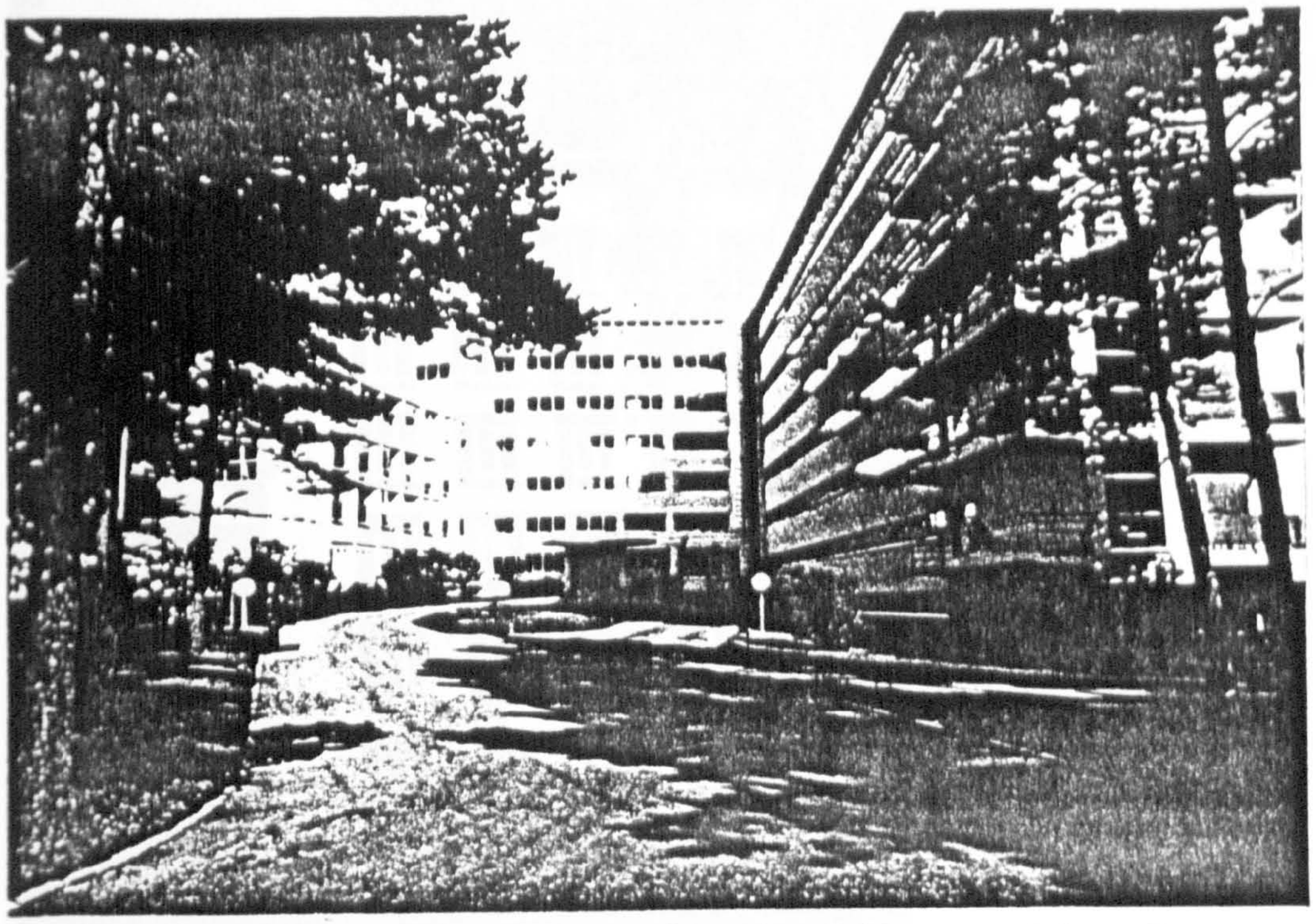
A.11.i Hermitage Palace,
Colonnade Room, General View

A.11.ii Hermitage Palace,
Colonnade Room,
View along Colonnade

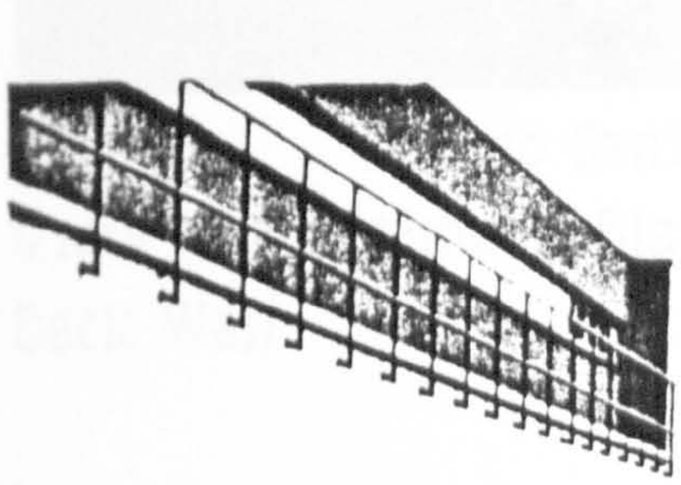




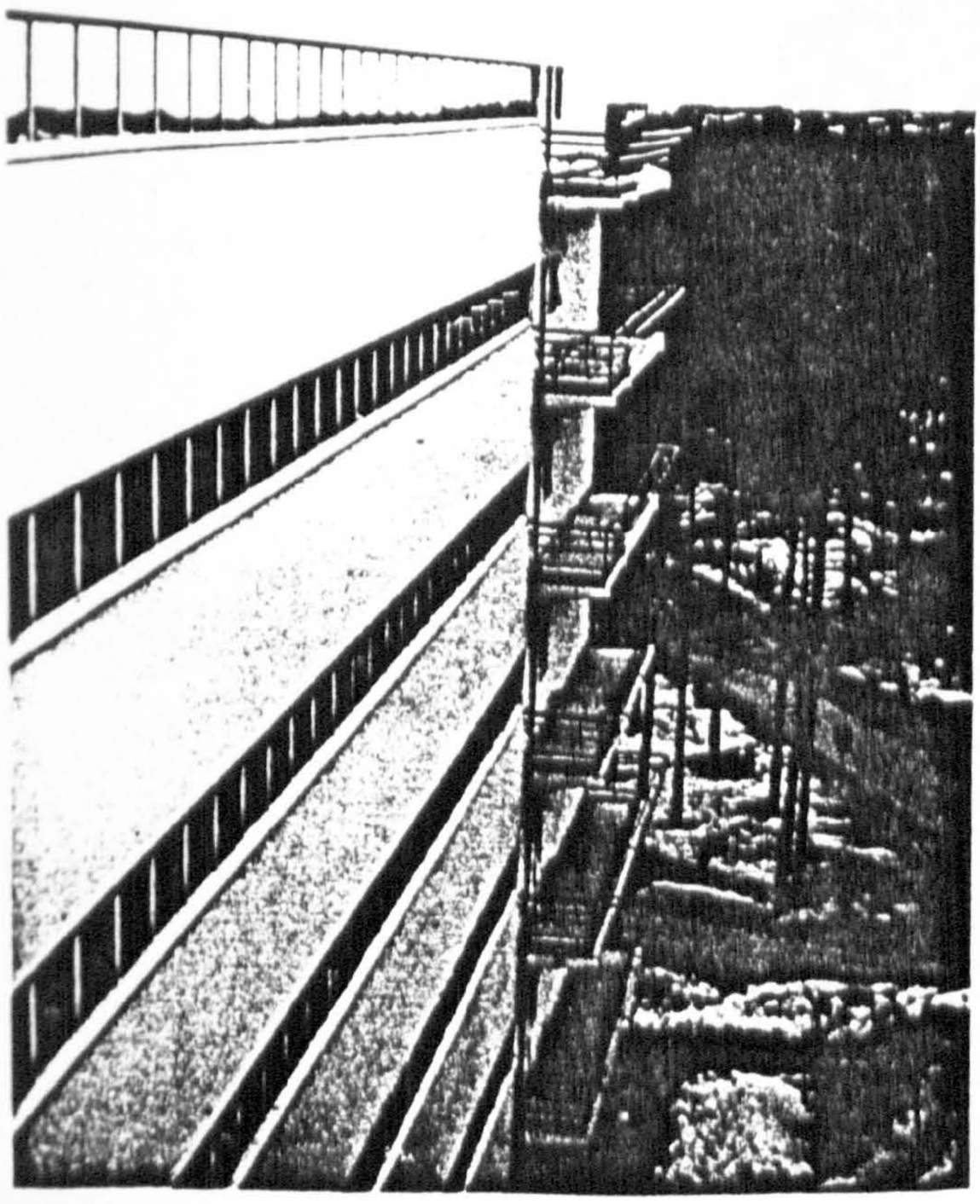
A.11.iii Hermitage Palace, Colonnade Room, Wall with Staircase Built in

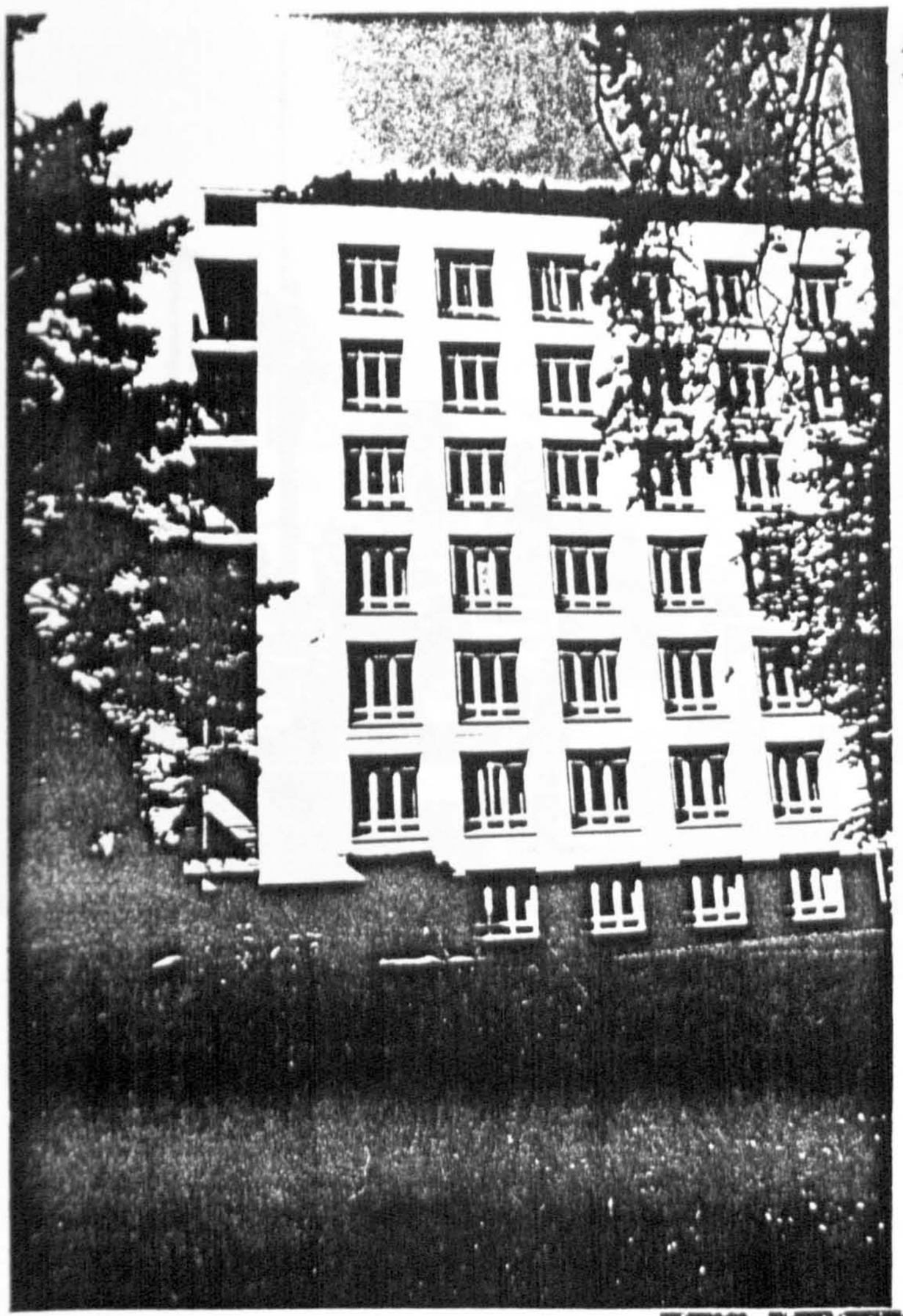


A.12.i Paimio Sanitorium, Standard View of Main Entrance "Courtyard"

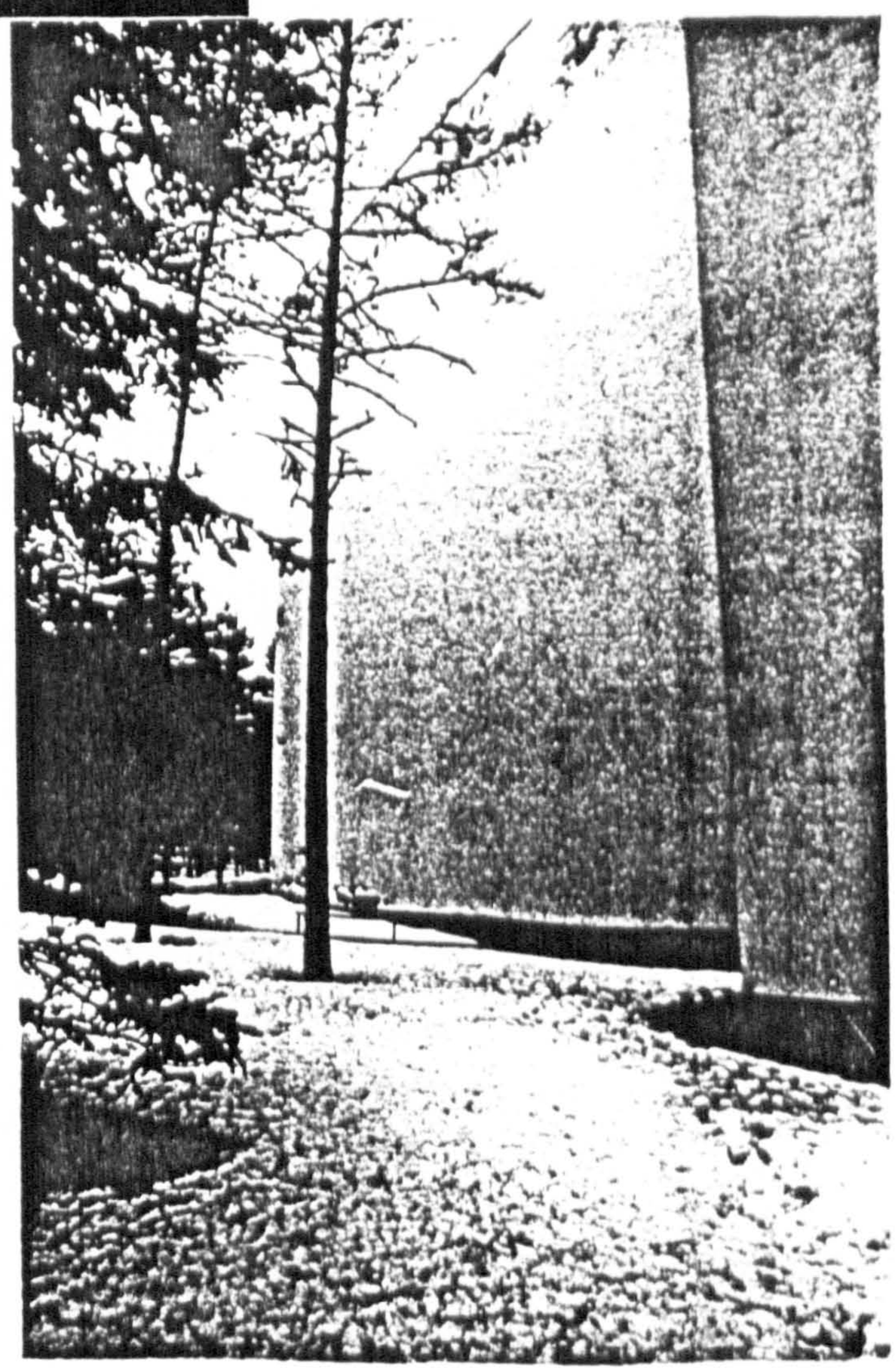


A.12.ii Paimio Sanitorium, View along Outside of Corridors to Wards

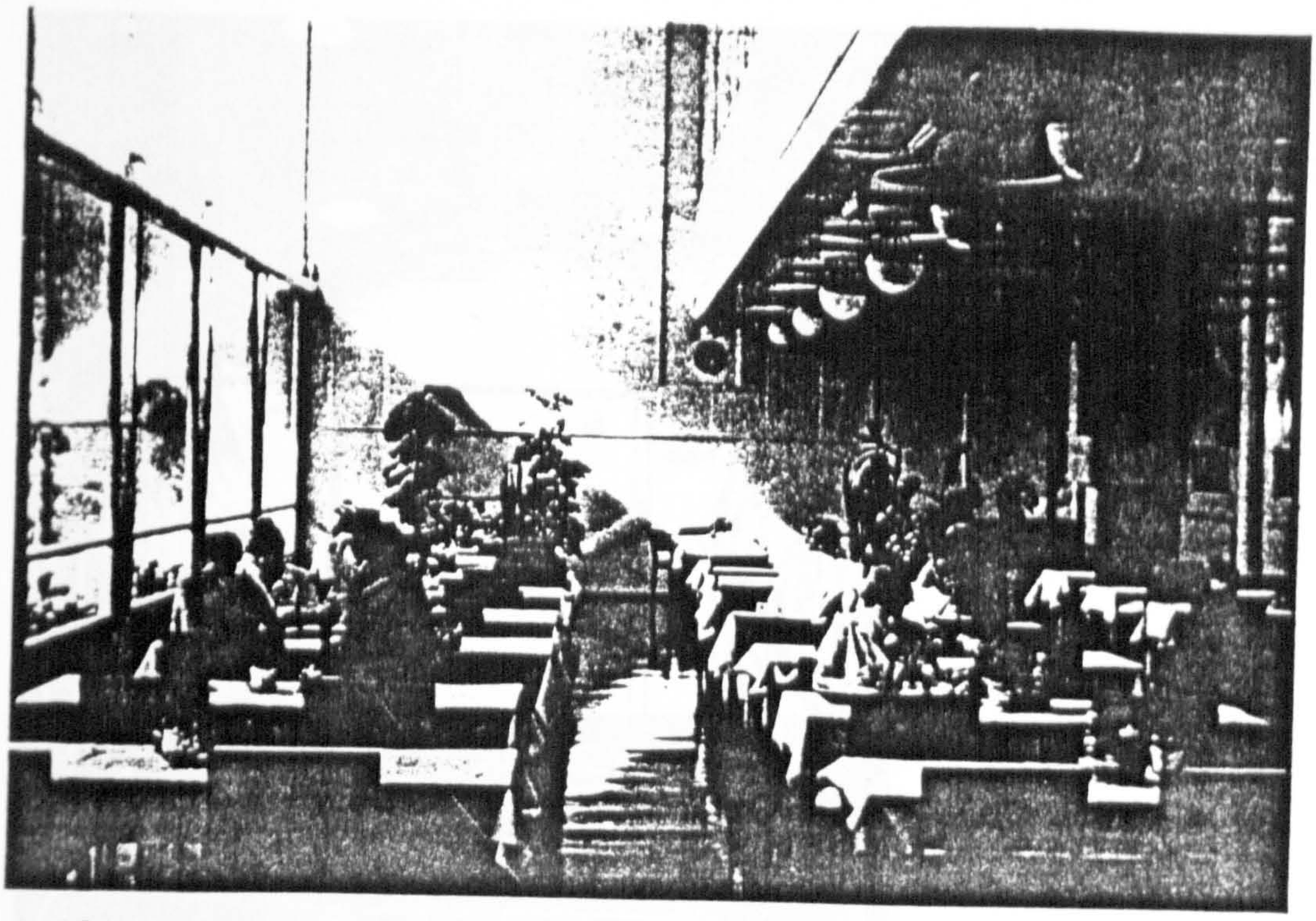




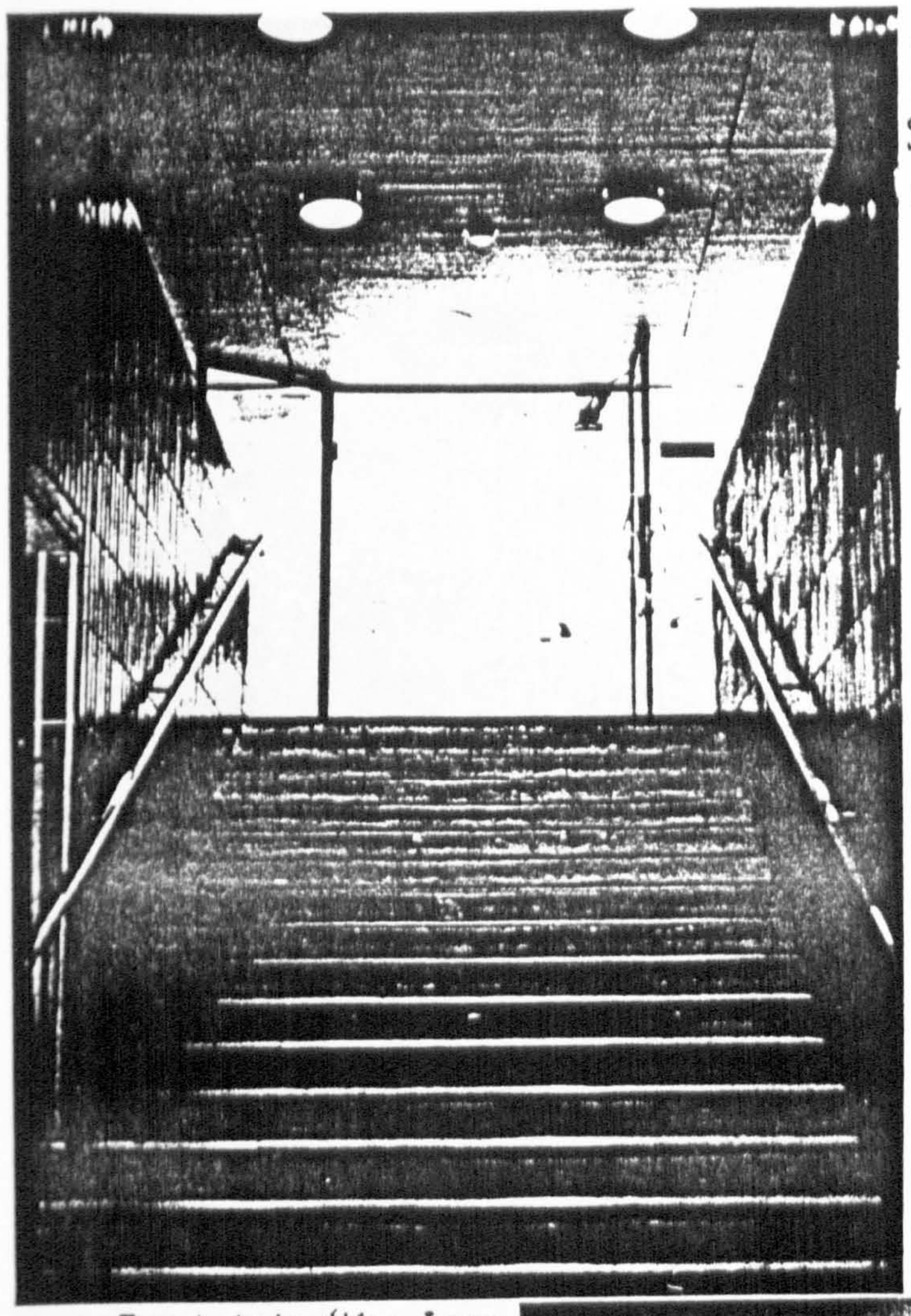
A.12.iii Paimio Sanitorium,
View of Ward "Cells"



A.12.iv Paimio Sanitorium,
View of the (almost) Blank
Back Wall

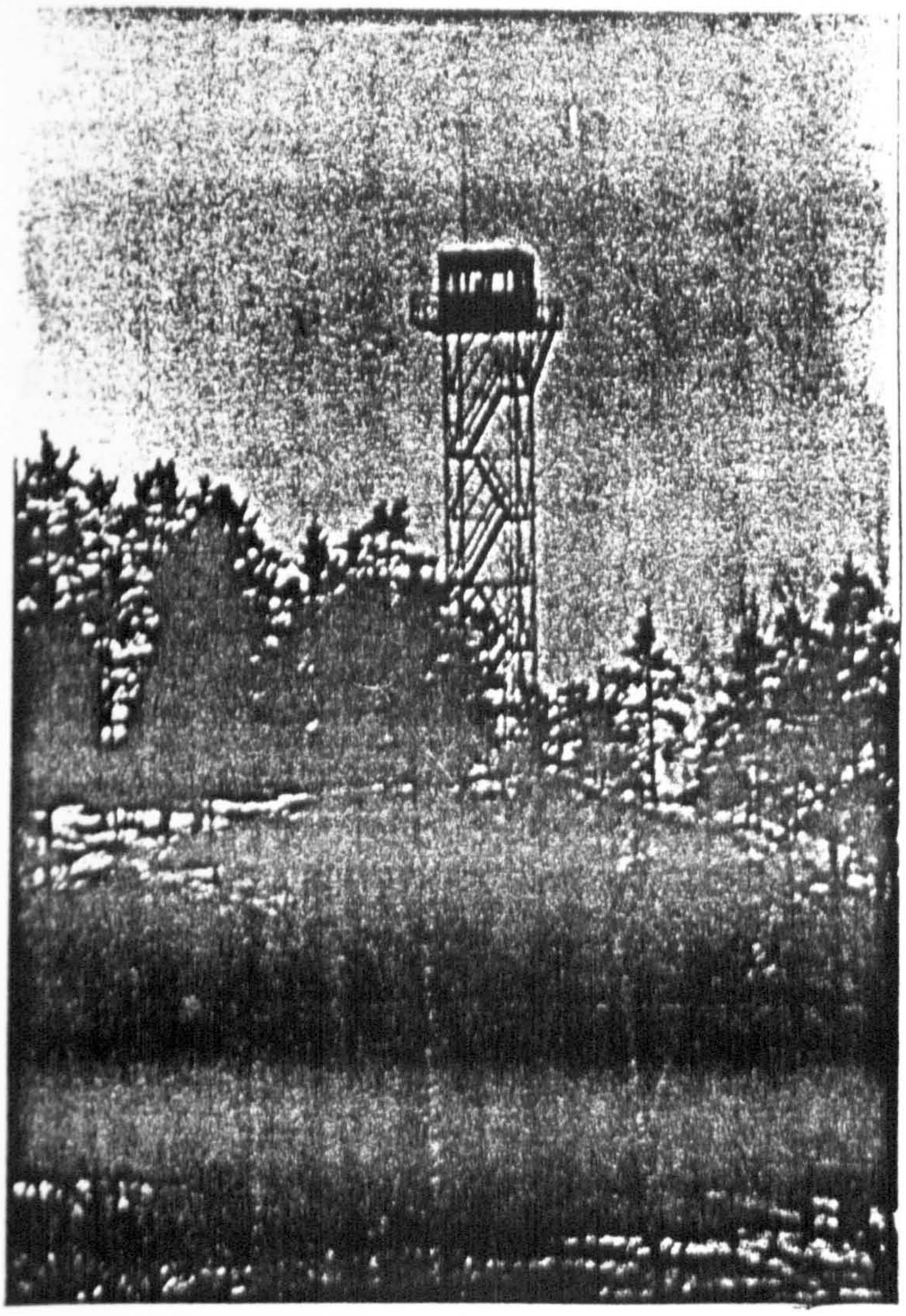


A.12.w Paimio Sanitorium, Dining and Social Room with Library Mezzanine



A.13.i Rautatalo (the Iron Federation Building), View up Stairs from Street to Internal Courtyard

A.13.ii Rautatalo (the Iron Federation Building), Internal Courtyard



A.14.i Invisible Non-Physical Border, Watch Tower on Finno-Soviet Border (Also Known as the Iron Curtain)

ARCHITECTURE AND SPACE FOR THOUGHT

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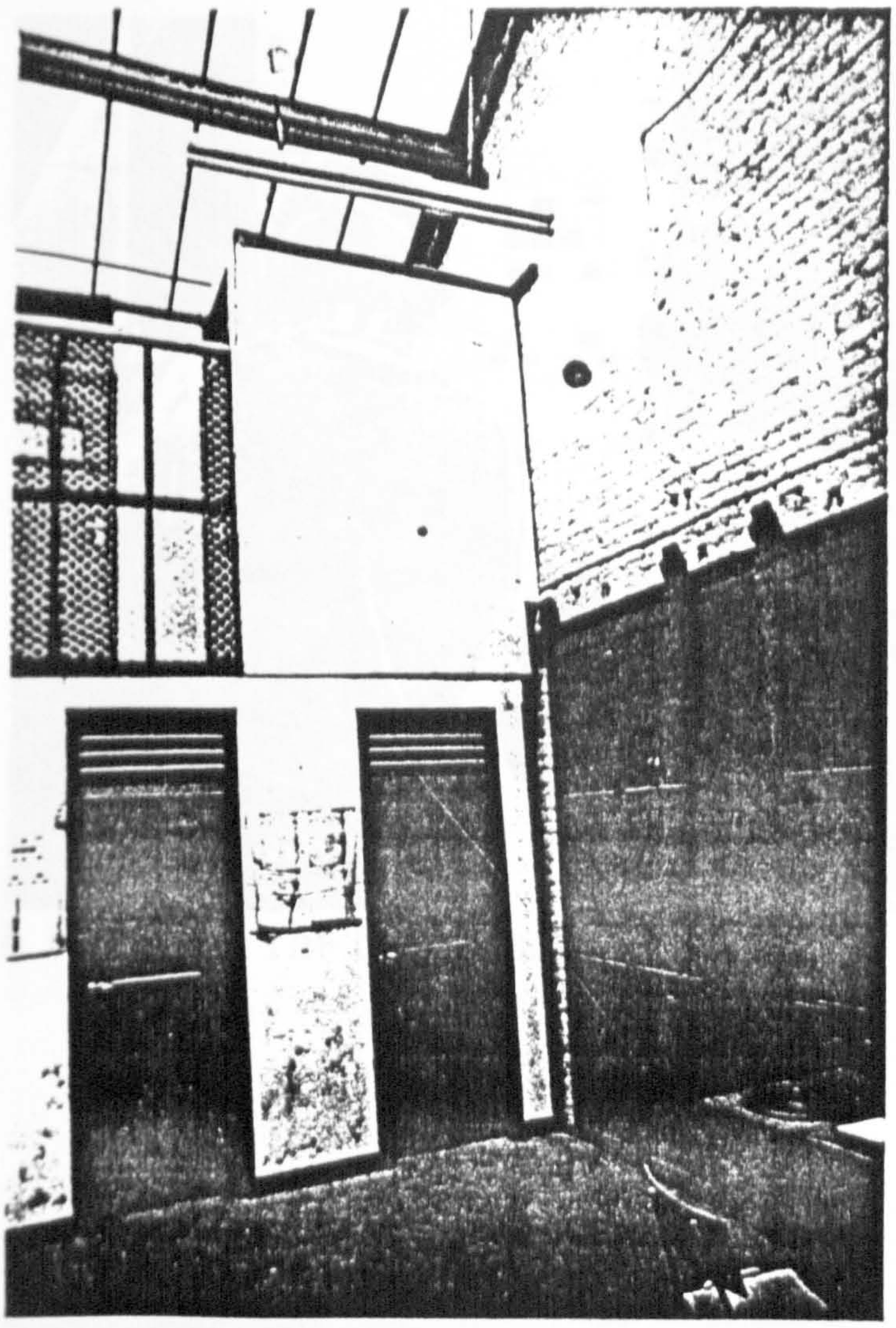
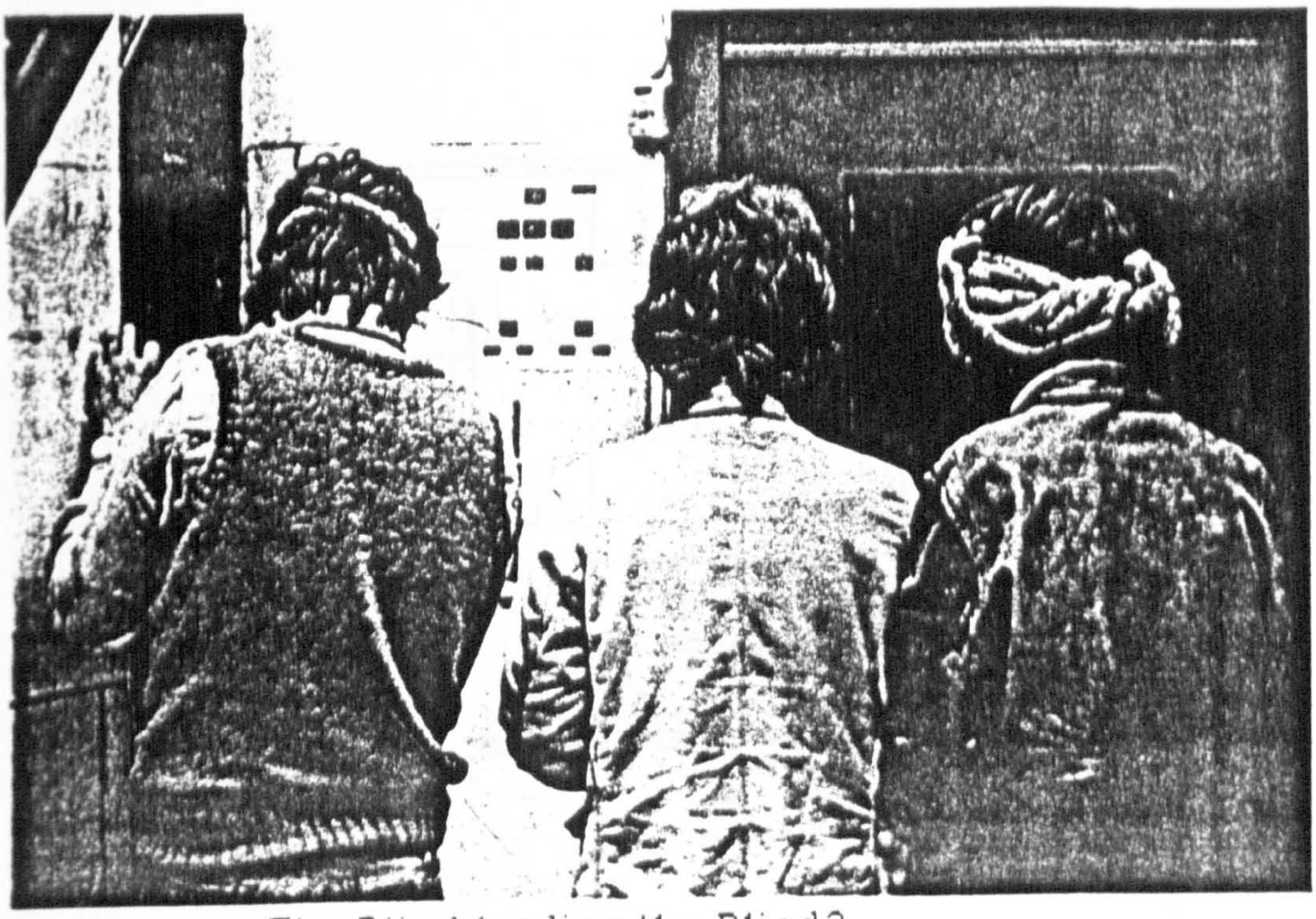
SECTION B

Blindfold Surveys

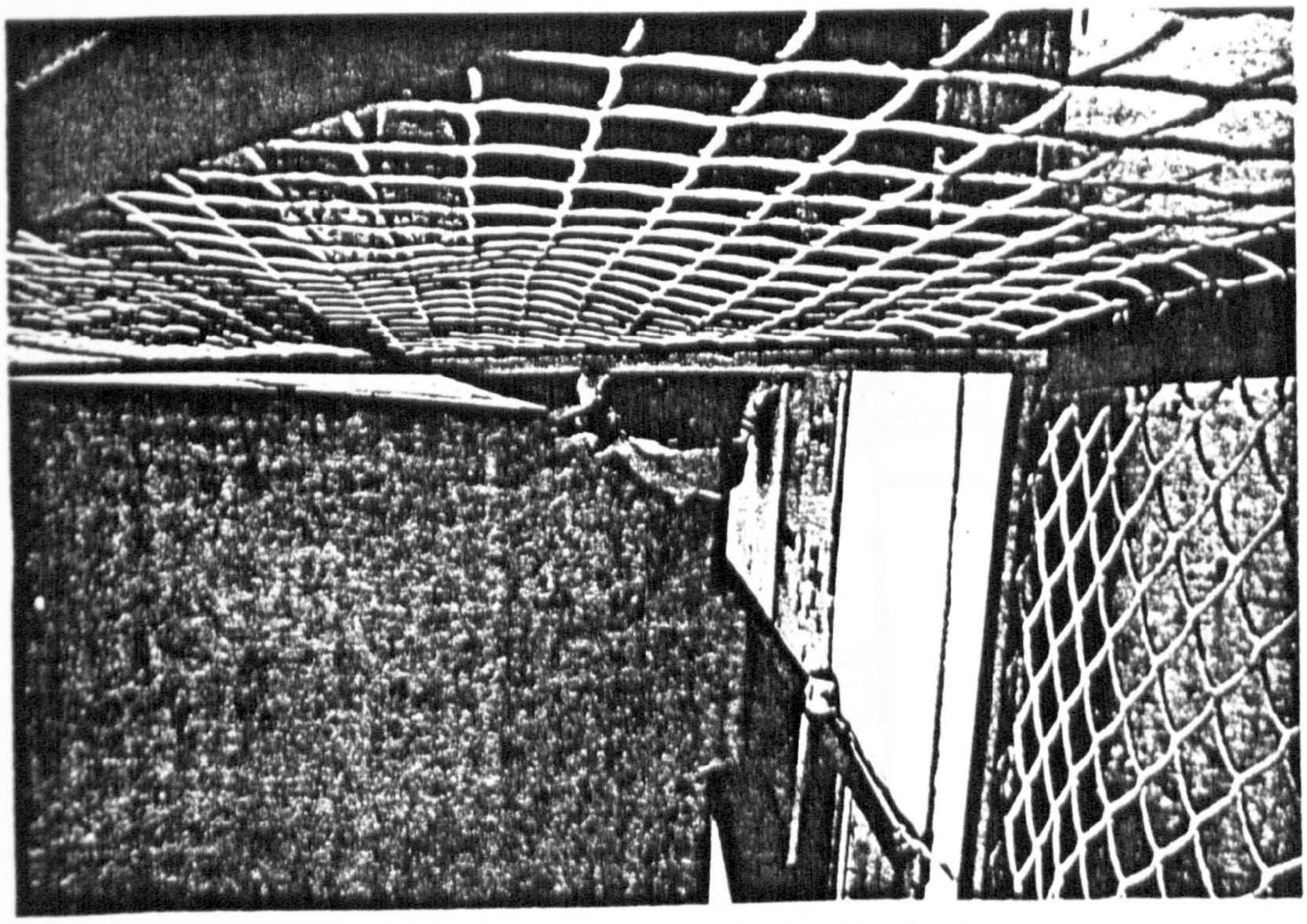


B.1.i The London Film School, Central Editing Hall

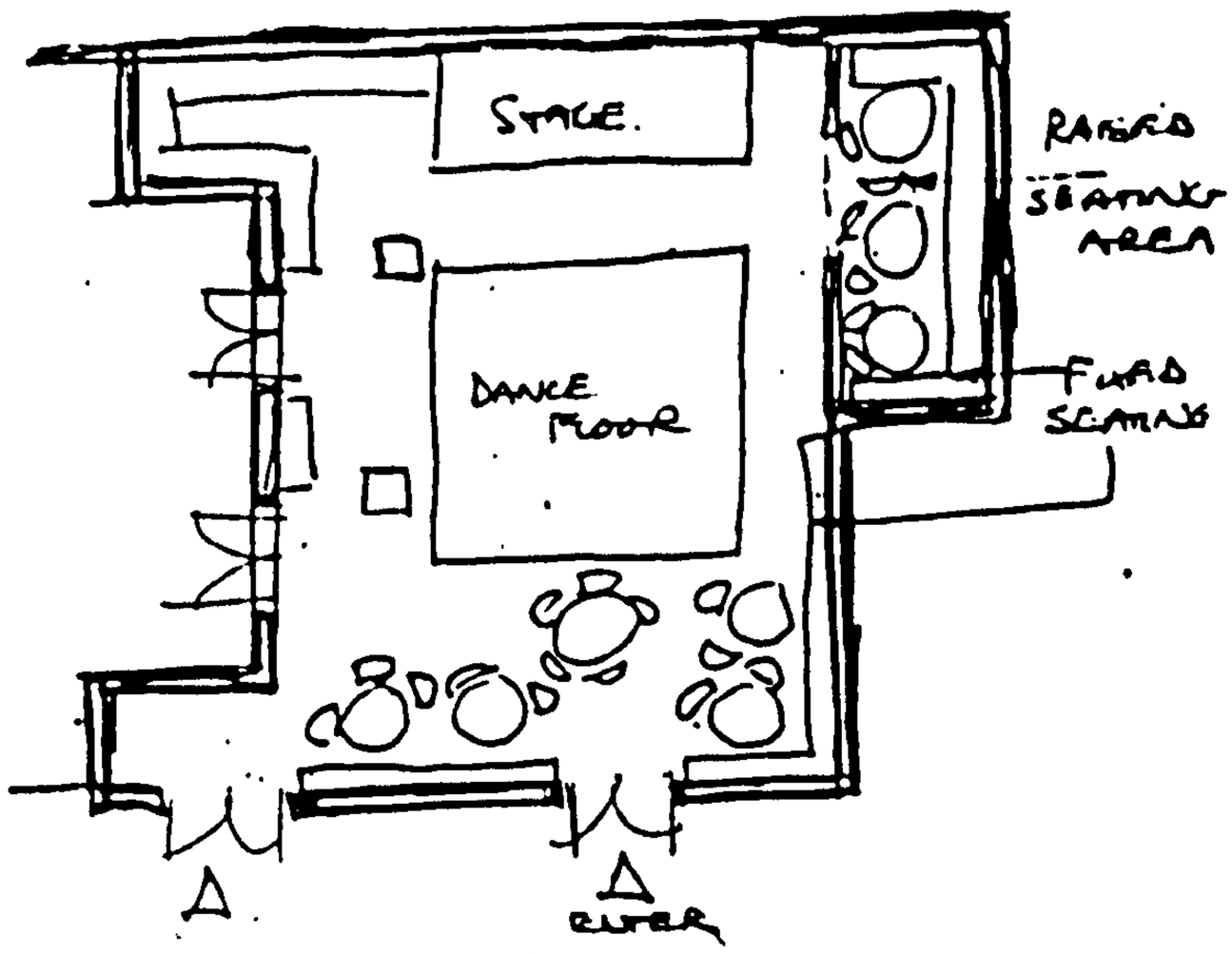
B.1.ii Blindfold Surveyors at Work



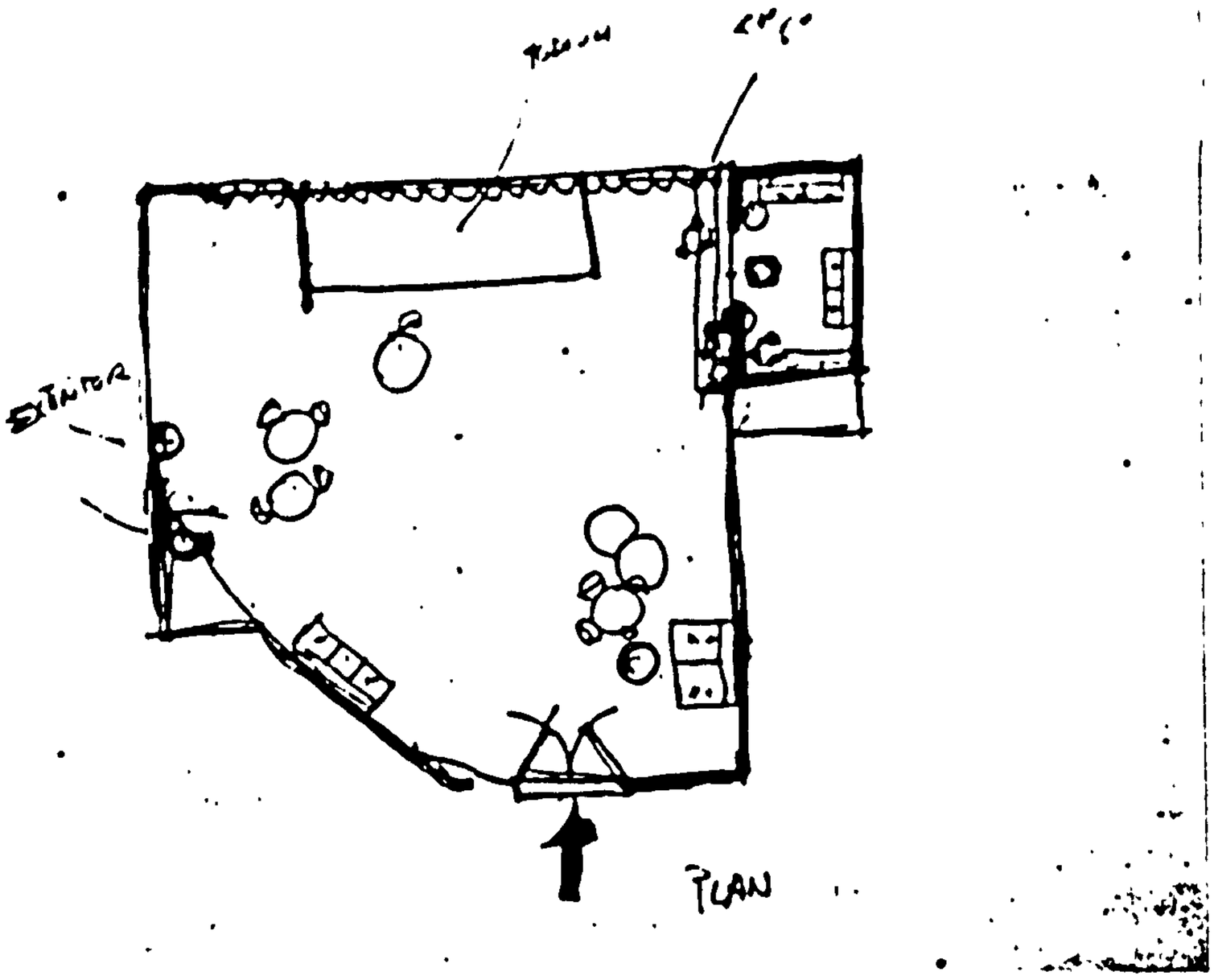
B.1.iii The Blind leading the Blind?



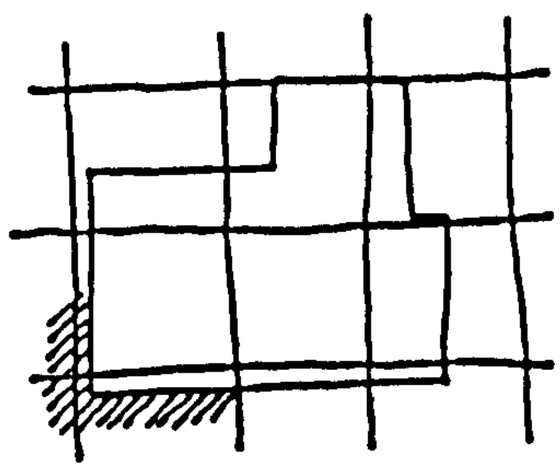
B.1.iv Disapearing Gingerly at the End of a Blindfold Survey



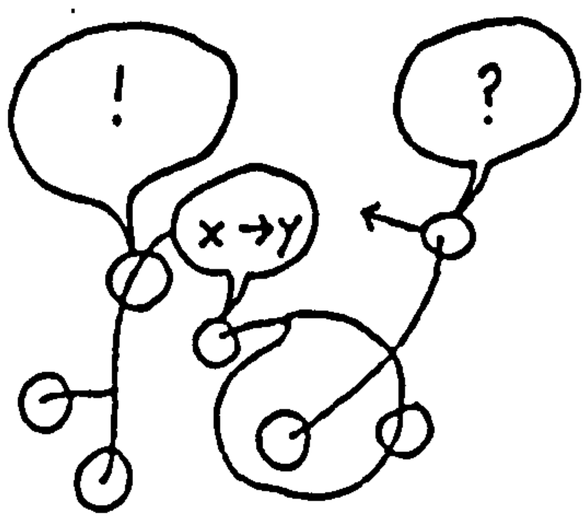
B.2.i Blindfold Survey: Drawing of Disco, Bedford Hotel



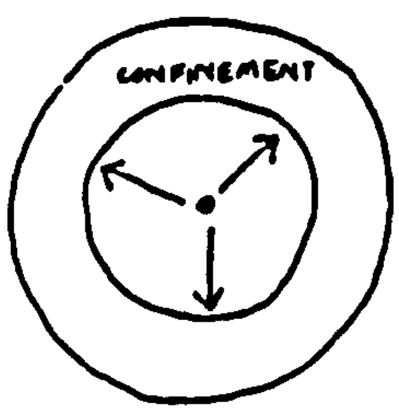
B.2.ii Blindfold Survey: Another Drawing of Disco, Bedford Hotel



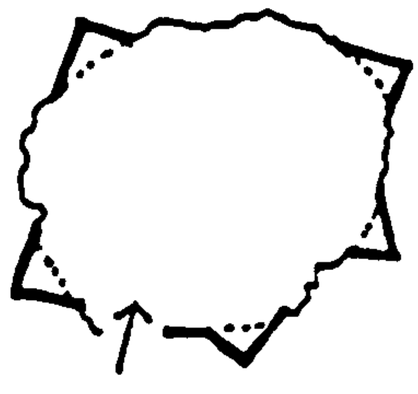
B.3.i Blindfold Survey, Tactics: Imaginary Grid with Walls overlaid



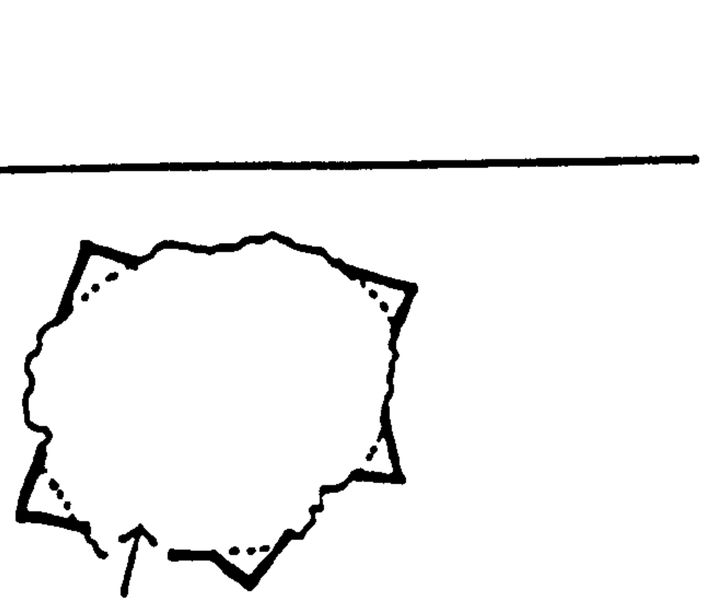
B.3.ii Blindfold Survey, Tactics: Incomprehensible Private Device



B.3.iii Blindfold Survey, Tactics: Balloon Being Blown up to Fill Space



B.3.iv Blindfold Survey, Tactics: Forming Corners from Ill-defined Cloud



B.3.v Blindfold Survey, Tactics: Bending the Straight Line Round

ARCHITECTURE AND SPACE FOR THOUGHT

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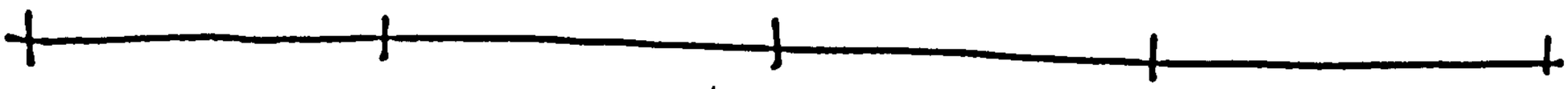
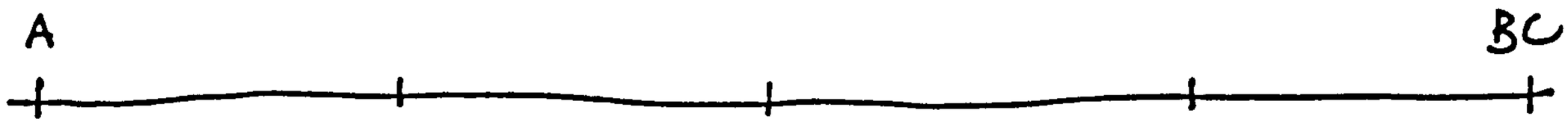
SECTION C

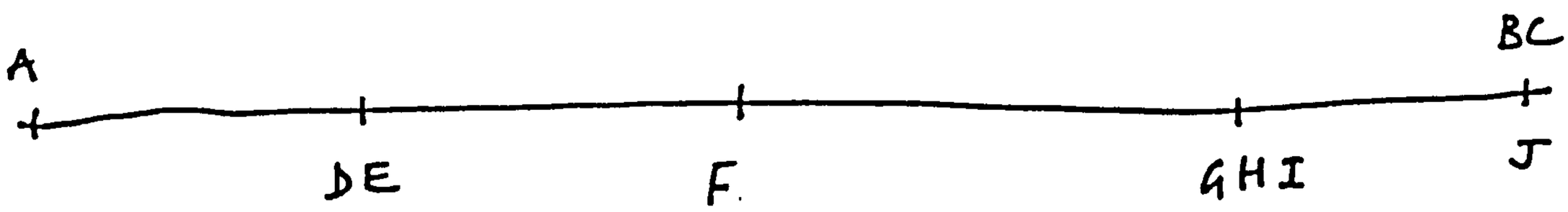
Constructs



C.1.i Construct Ranking Line



C.1.ii Construct Ranking Line: Poles Established



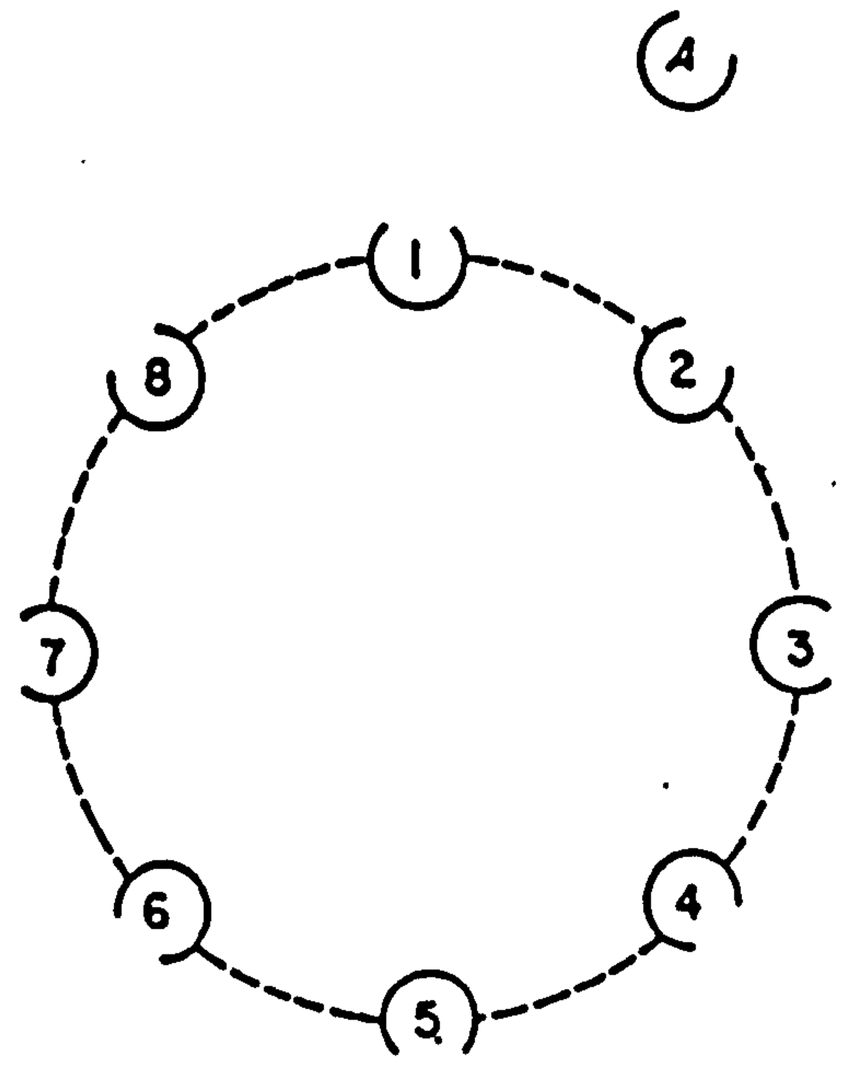
C.1.iii Construct Ranking Line: Fully Laid Out

C.2.i Group Construing: Beginning

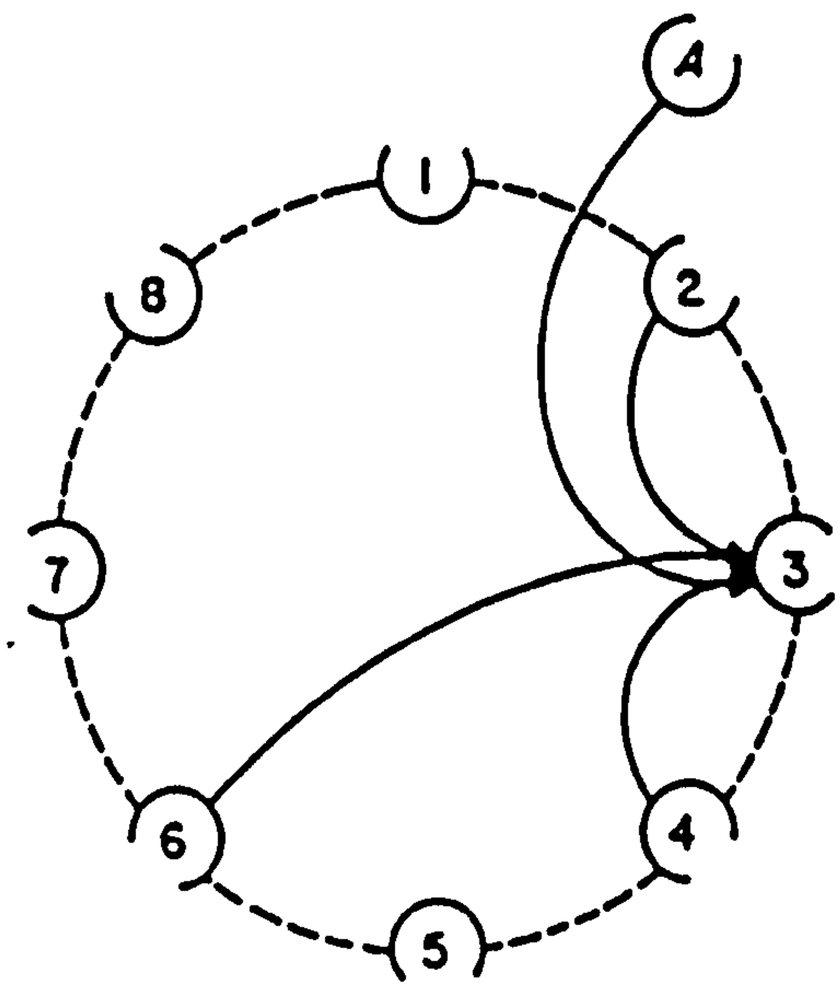
C.2.ii Group Construing: Setting out the Original Construct Poles

C.2.iii Group Construing:
Negociations under Way

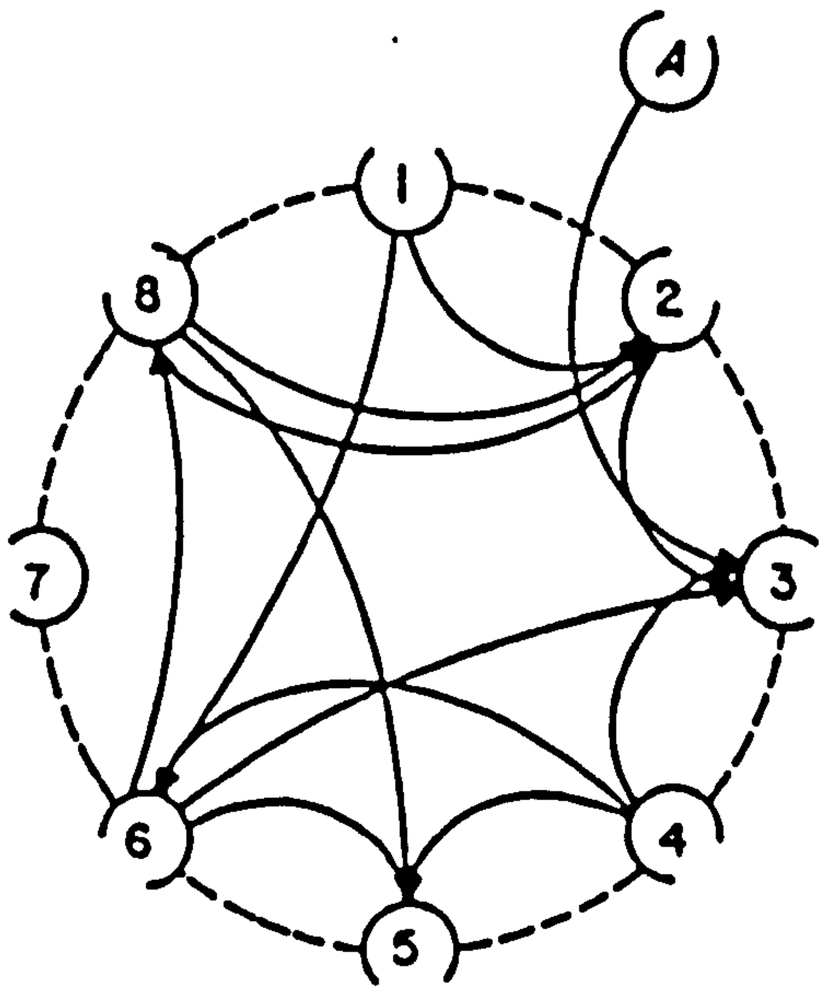
C.2.iv Group Construing:
A Final Solution



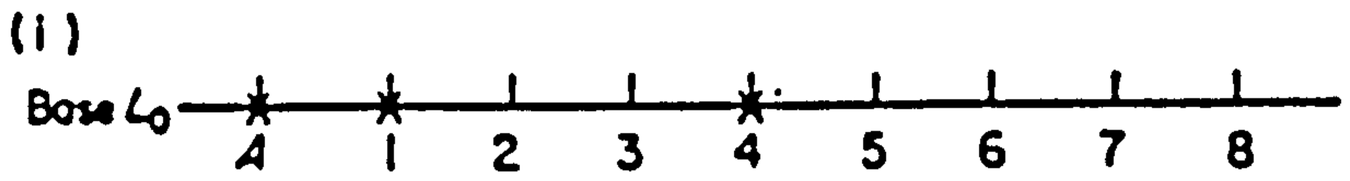
C.3.i Creating Construct Heterarchies: An Original, Empty Circle



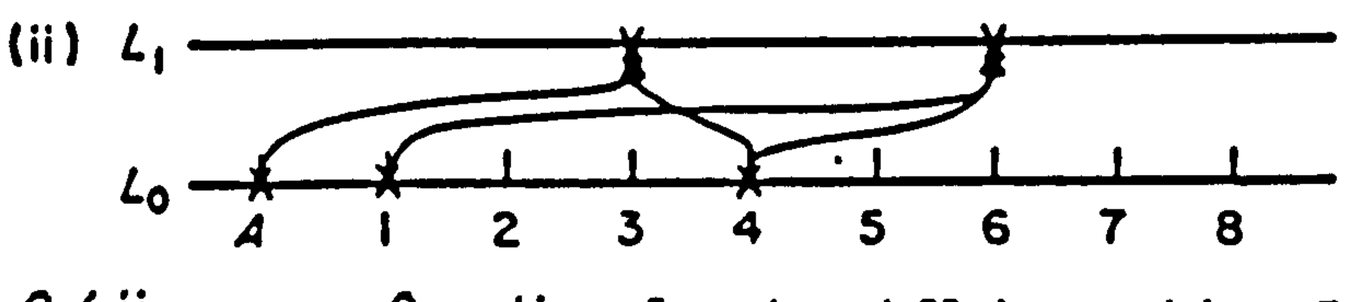
C.3.ii Creating Construct Heterarchies: Beginning to Fill in the Circle



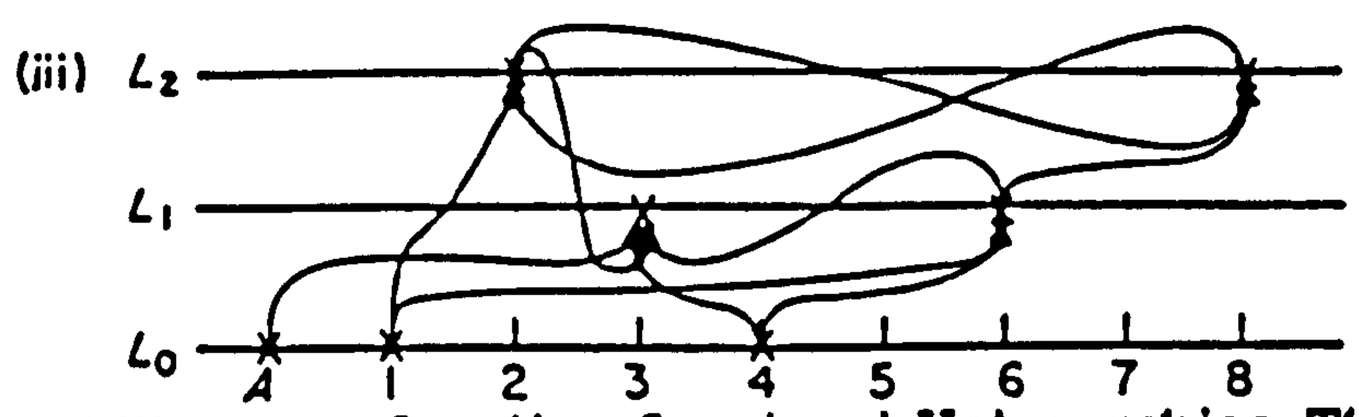
C.3.iii Creating Construct Heterarchies: A Completed Form



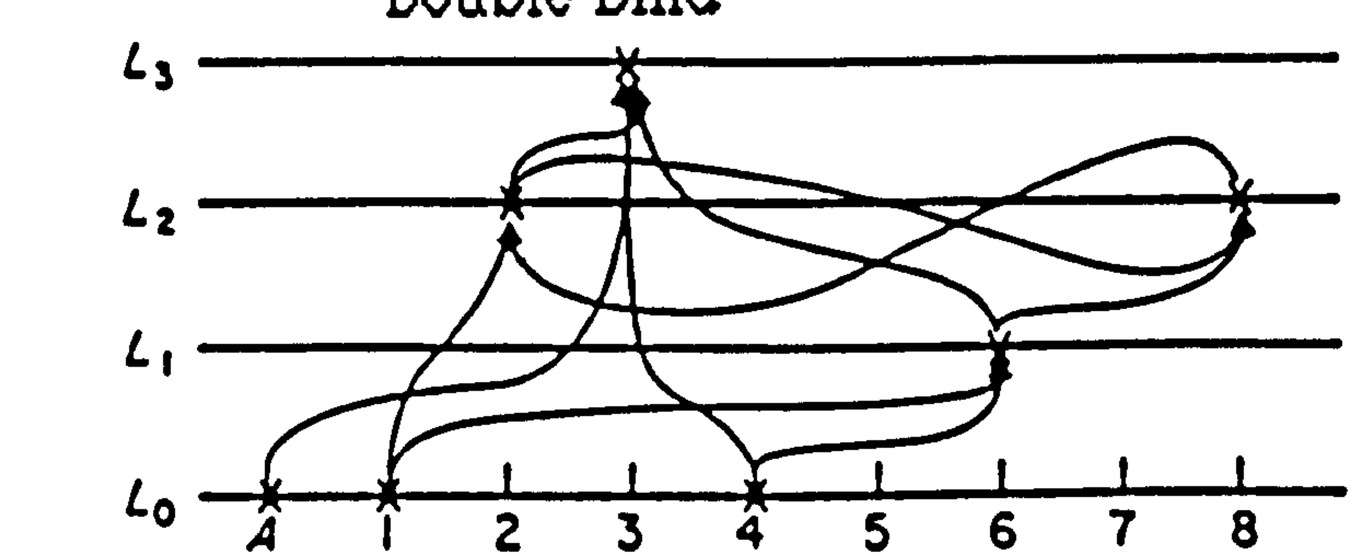
C.4.i Creating Construct Heterarchies: Base Line and Base Elements



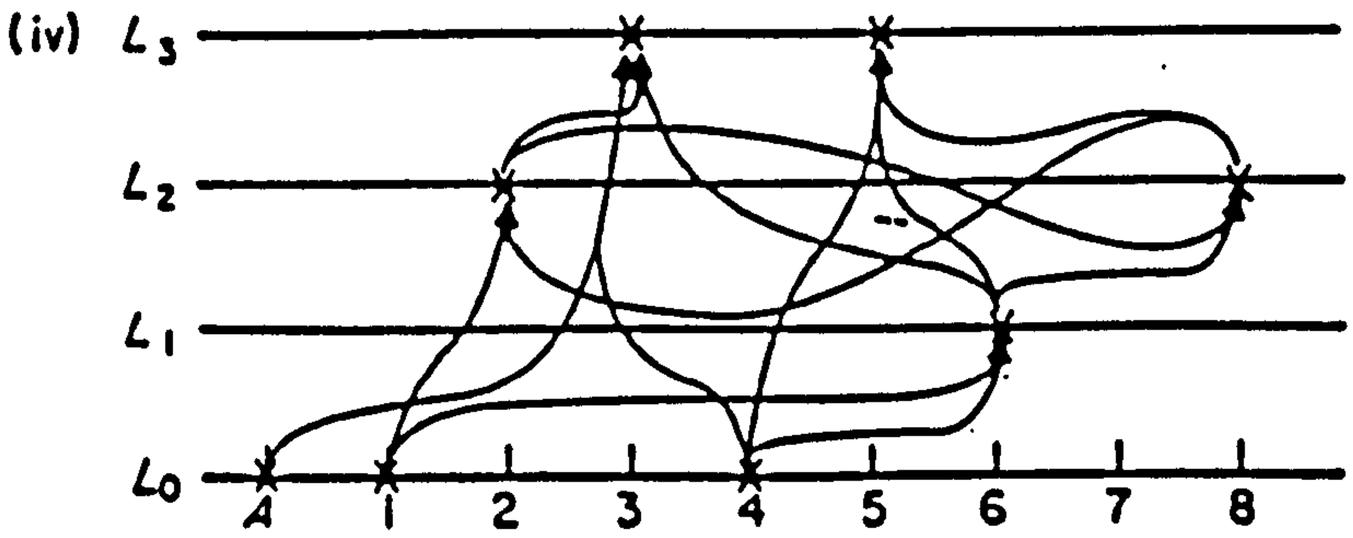
C.4.ii Creating Construct Heterarchies: Setting up the First Level



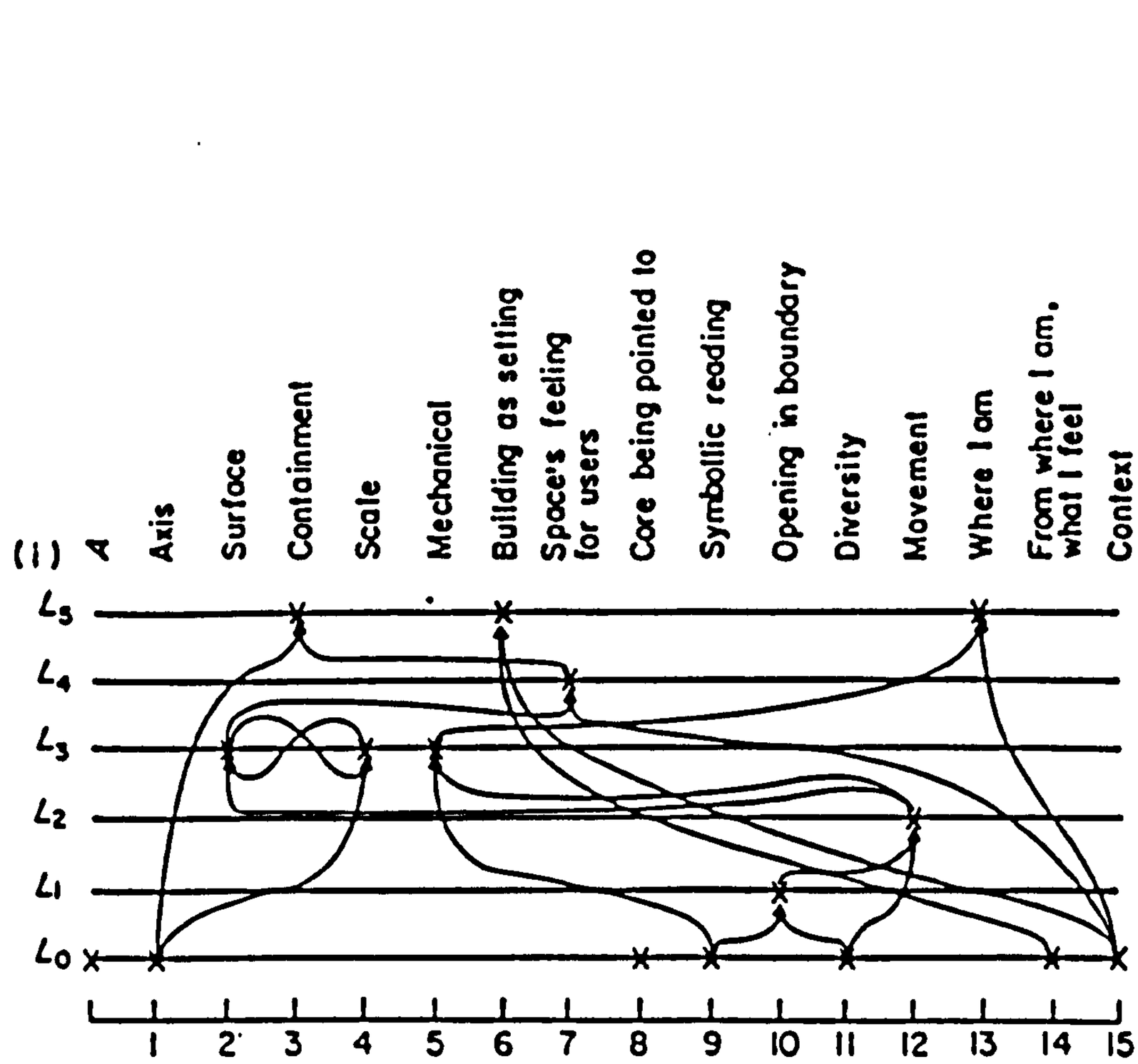
C.4.iii Creating Construct Heterarchies: The Second Level, with a Double Bind



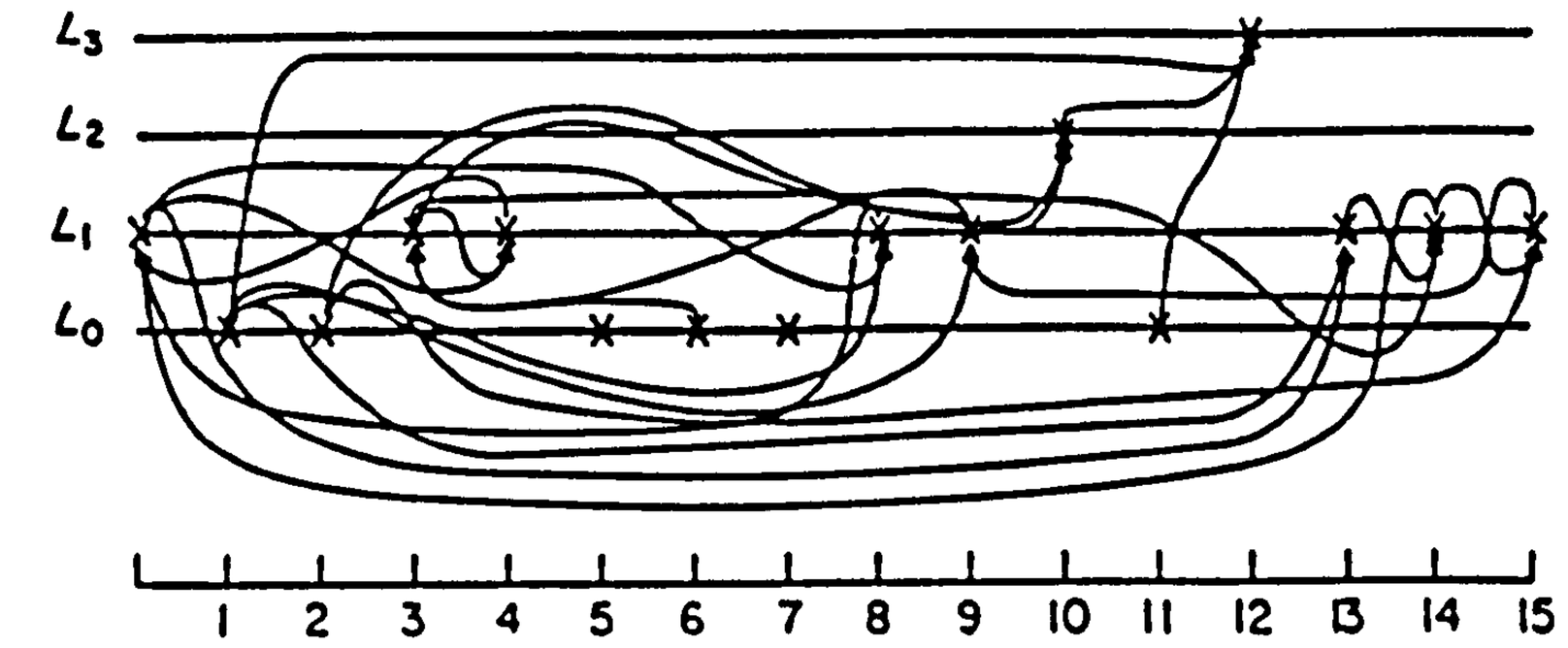
C.4.iv Creating Construct Heterarchies: Using the Double Bind to Create Another Level



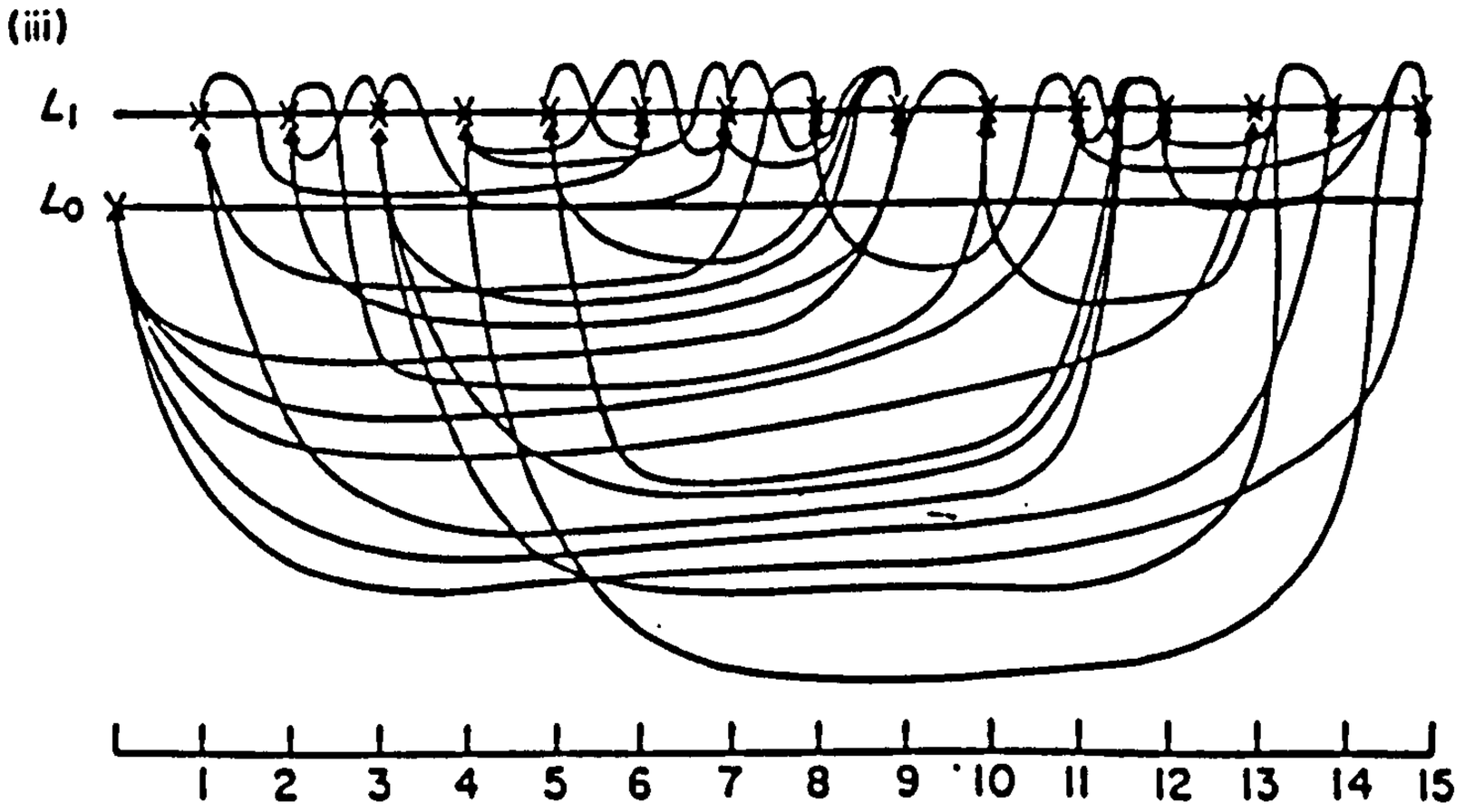
C.4.v Creating Construct Heterarchies: The Final Heterarchy devived from the Completed Form in C.3.iii



C.5.i Student Construct Heterarchies: Too Many Goals (People) to be Satisfied



C.5.ii Student Construct Heterarchies: Gets Lost in the Middle of a Task



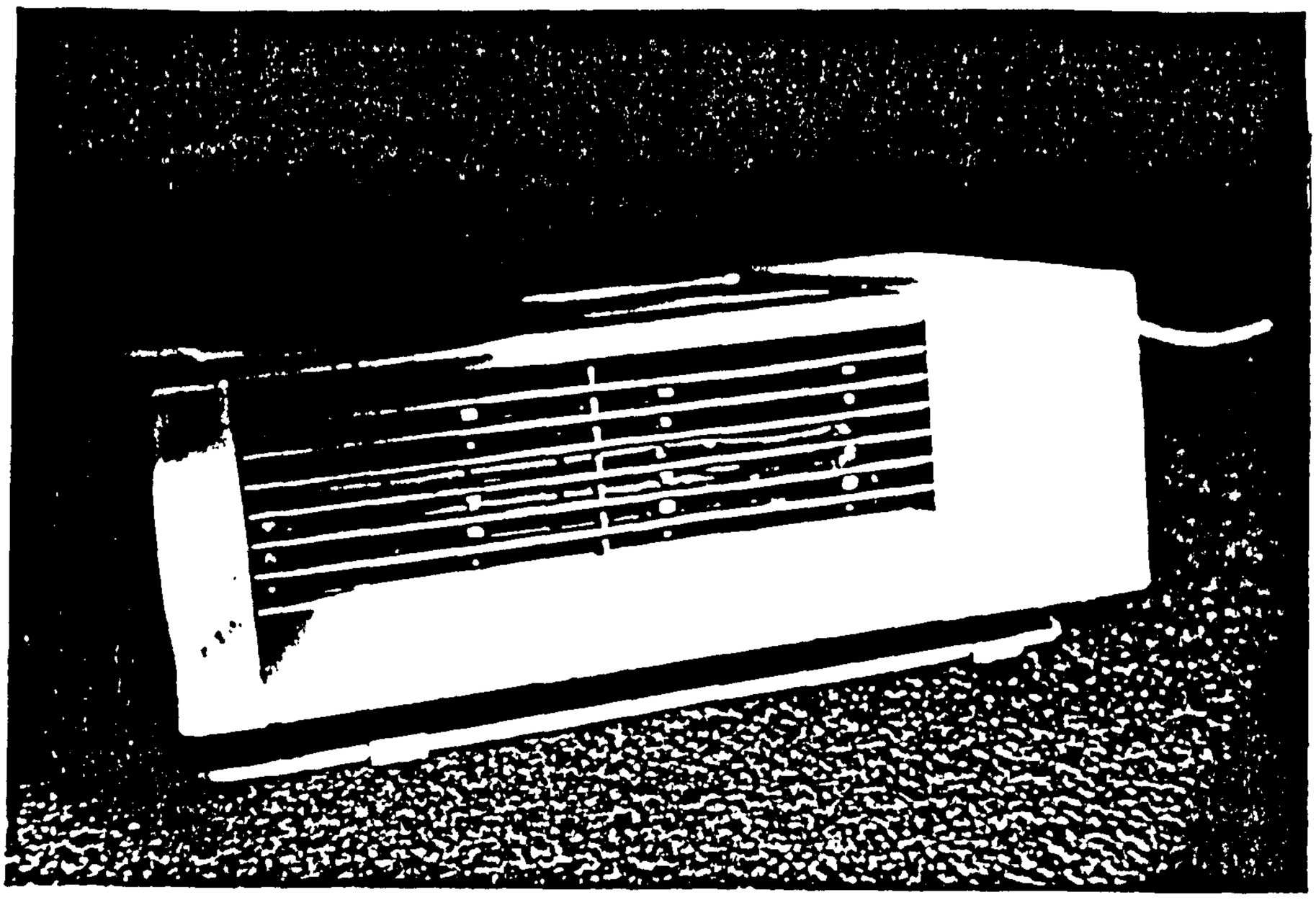
C.5.iii Student Construct Heterarchies: No Matter where You Start....

ARCHITECTURE AND SPACE FOR THOUGHT

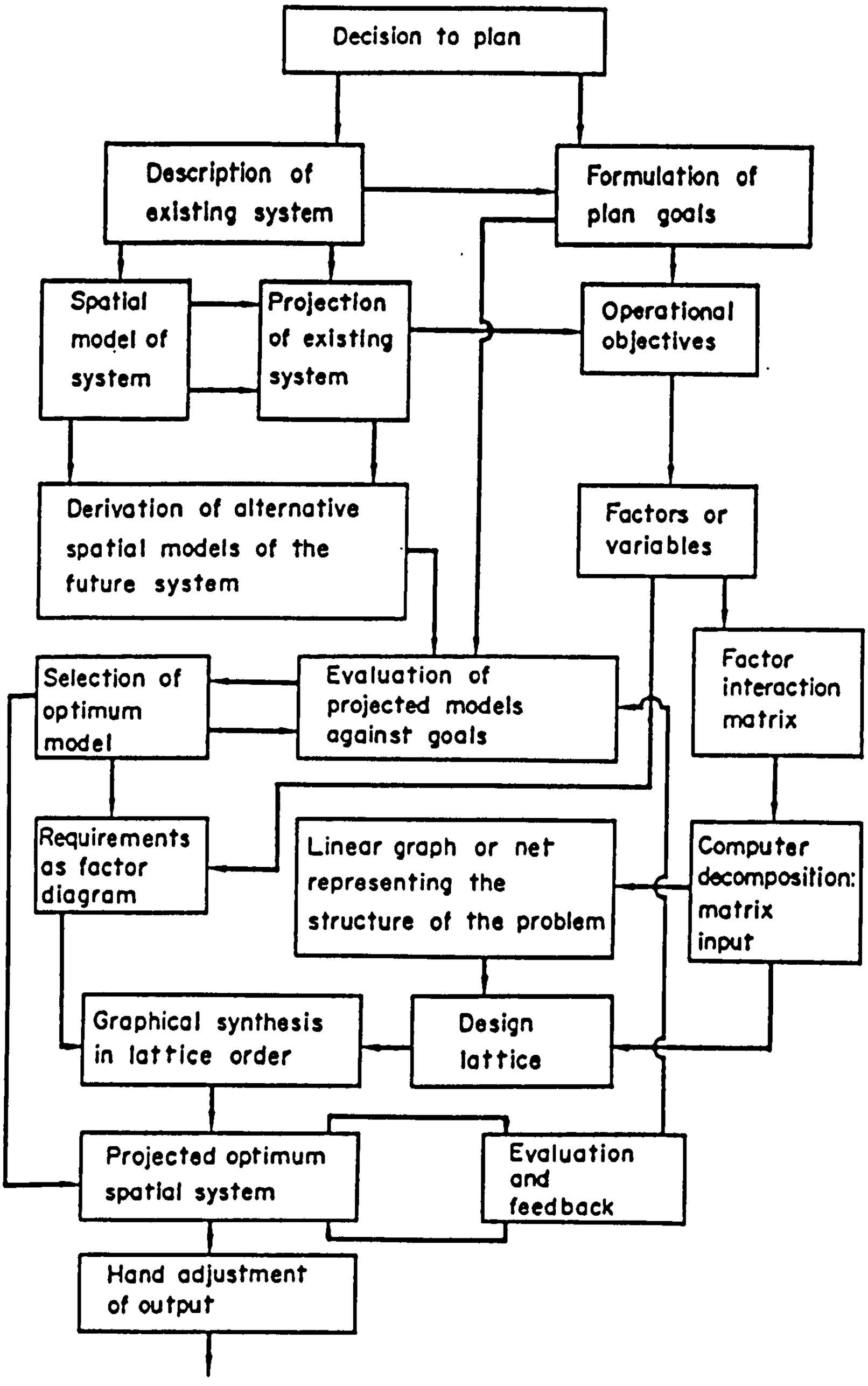
Ranulph Glanville

SECTION D

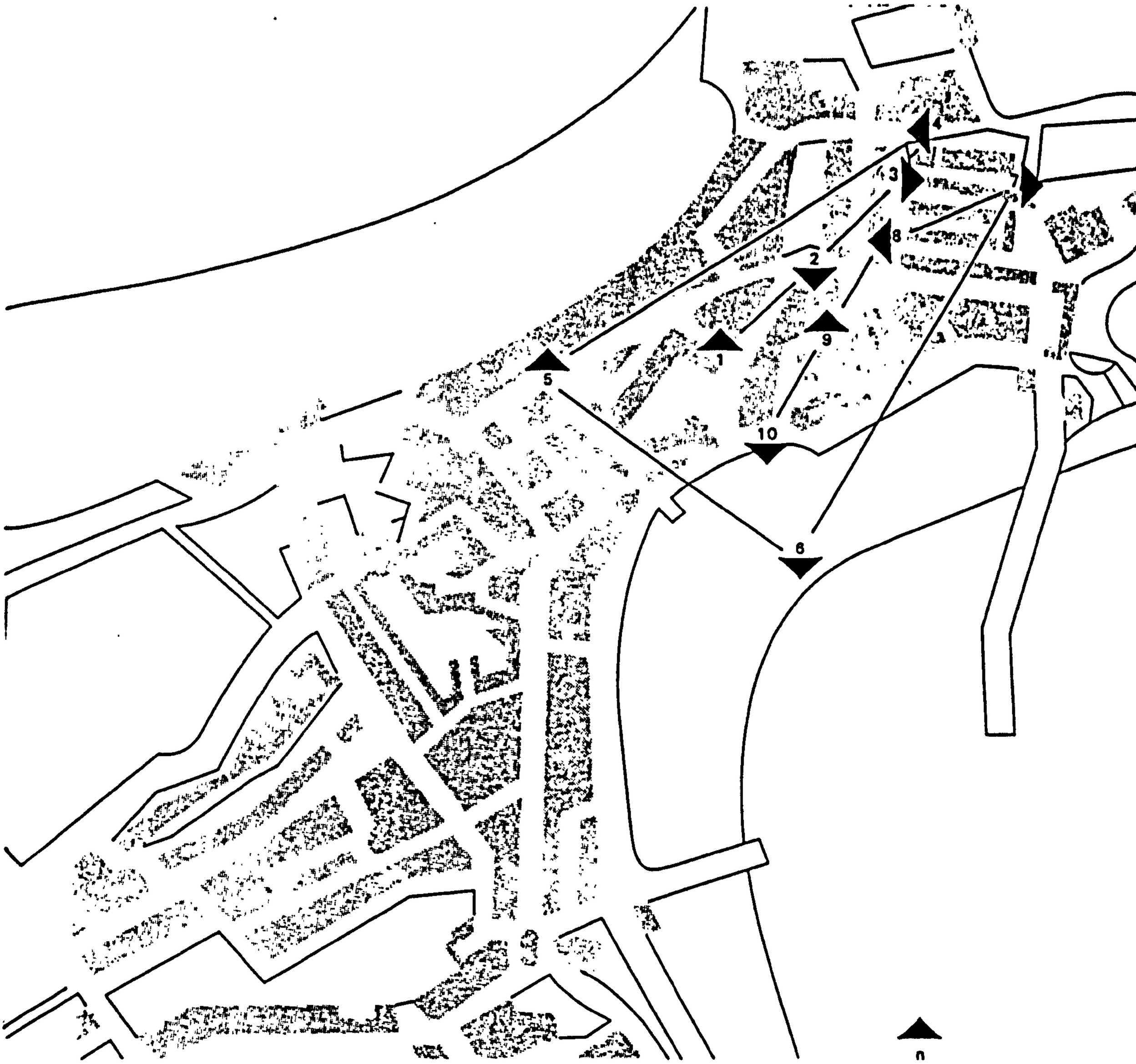
Design Research



D.1.i Braun Electrical Fan Heater: This One Caught Fire!

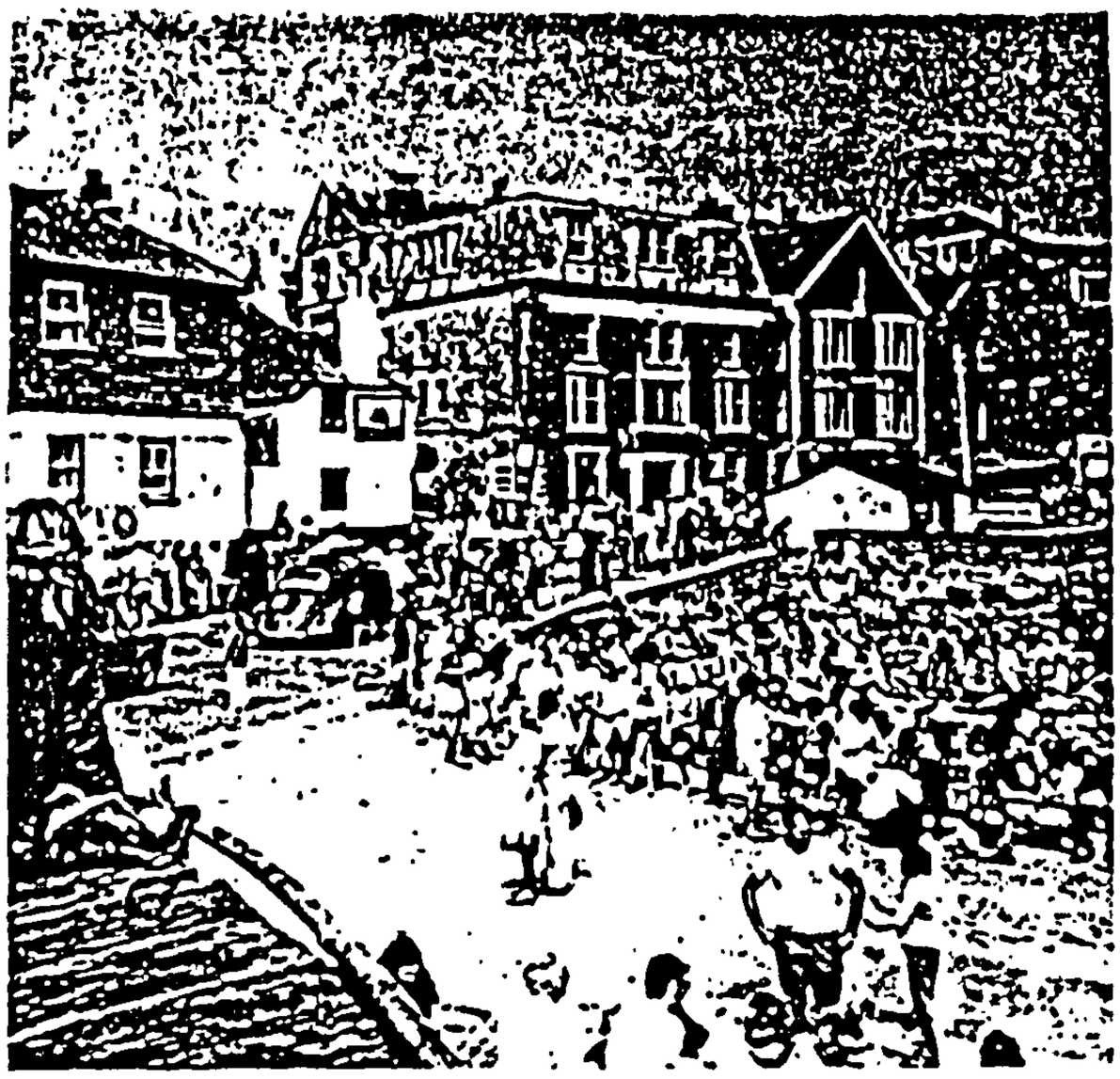


D.2.i A Typical "Systems Theory" Planning Chart (of Interconnections)



A map of St Ives, showing camera positions and the direction from which each photograph was taken

D.3.i Jones's Random Photography of St Ives: Map of Locations



photograph 0
Taken before the chance photographs to show the area of St Ives where they were to be taken, and as an example of a 'typical' holiday view

D.3.ii Jones's Random Photography of St Ives: Conventional Photo

photograph 1
For this and the other chance photographs, I was obliged to be seen photographing obviously 'odd' views and experienced, for the first time, the slight embarrassment of so doing. This turf accountant's shop, which does not correspond to my notion of such a place, or to my notion of 'St Ives', is perhaps the one that reveals most of that mass of experience we ignore, or cannot assimilate consciously for want of any 'idea' or 'stereotype' capable of including it

D.3.iii Jones's Random Photography of St Ives: Random Photo 1

photograph 2
The first of several photographs, in which I had to stand ignoring 'prettier' views behind me, to take what looked like ridiculously close-up shots of seemingly dull walls etc

D.3.iv Jones's Random Photography of St Ives: Random Photo 2

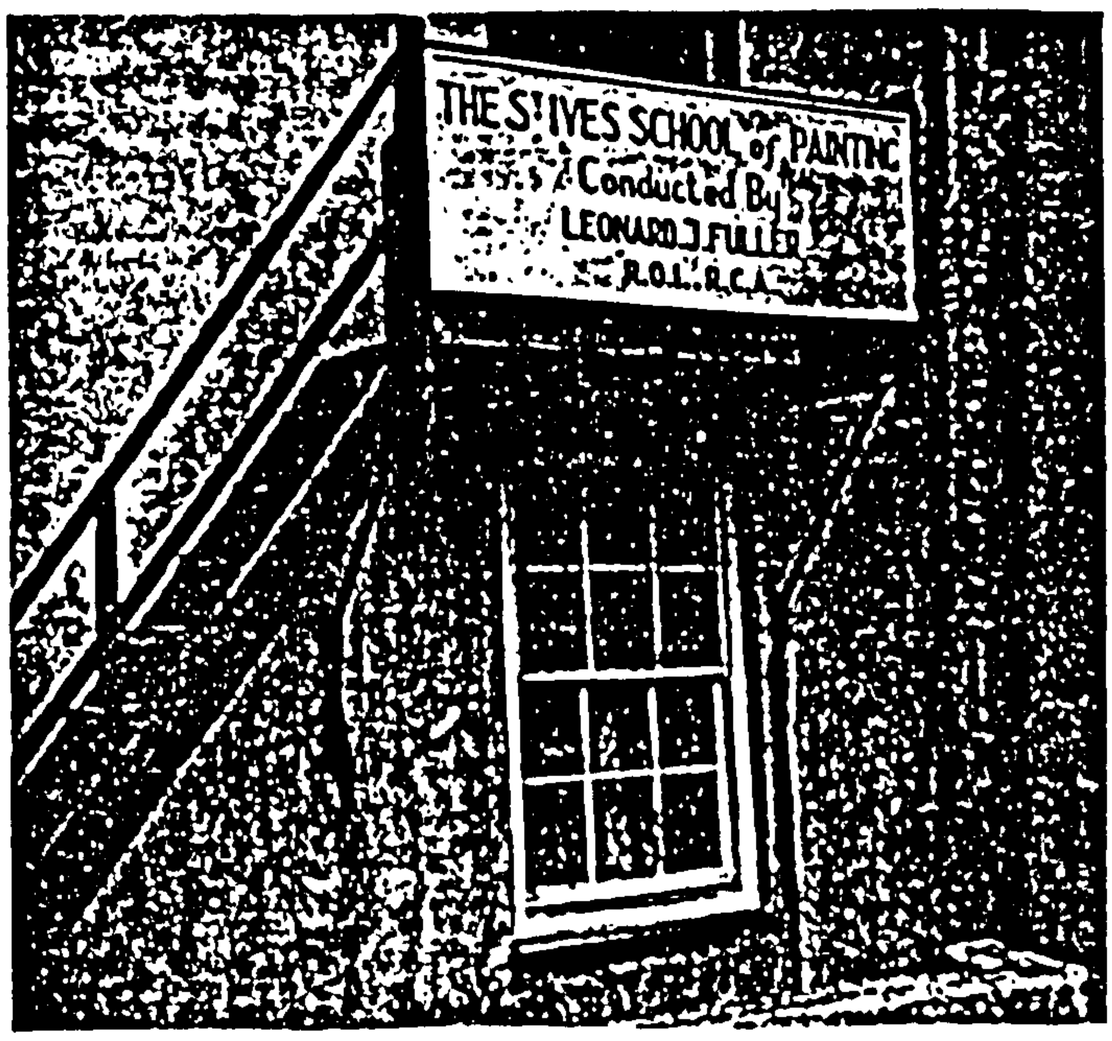
photograph 3
The chopping of the windows, and the slightly provocative arrangement of rectangular areas in this photograph, would suggest to me now that it was done deliberately like this, to hold attention, if I did not know it was done adhering to the chance process as closely as possible

D.3,v Jones's Random Photography of St Ives: Random Photo 3

photograph 4
While taking this one, I was beginning to feel the experiment was a mistake. I'd have preferred the envisaged adventure of having to knock on a door to say that I was obliged to take a photograph of, say, the inside of a house, because the chance process had led me to that spot. (That accident did not occur.) To take this photograph, for which I had to stand alongside someone's house and direct the camera along a wall instead of at it, felt like something too trivial to be tolerated. Its amazingly difficult, for me at least, to do something that is so bereft of any purpose that is self-evident, or easily explainable to bystanders. Although the camera did not show it, some of the photographs were taken with other holiday-makers at my elbow: for others, like this one, there was nobody in sight and I was almost trespassing

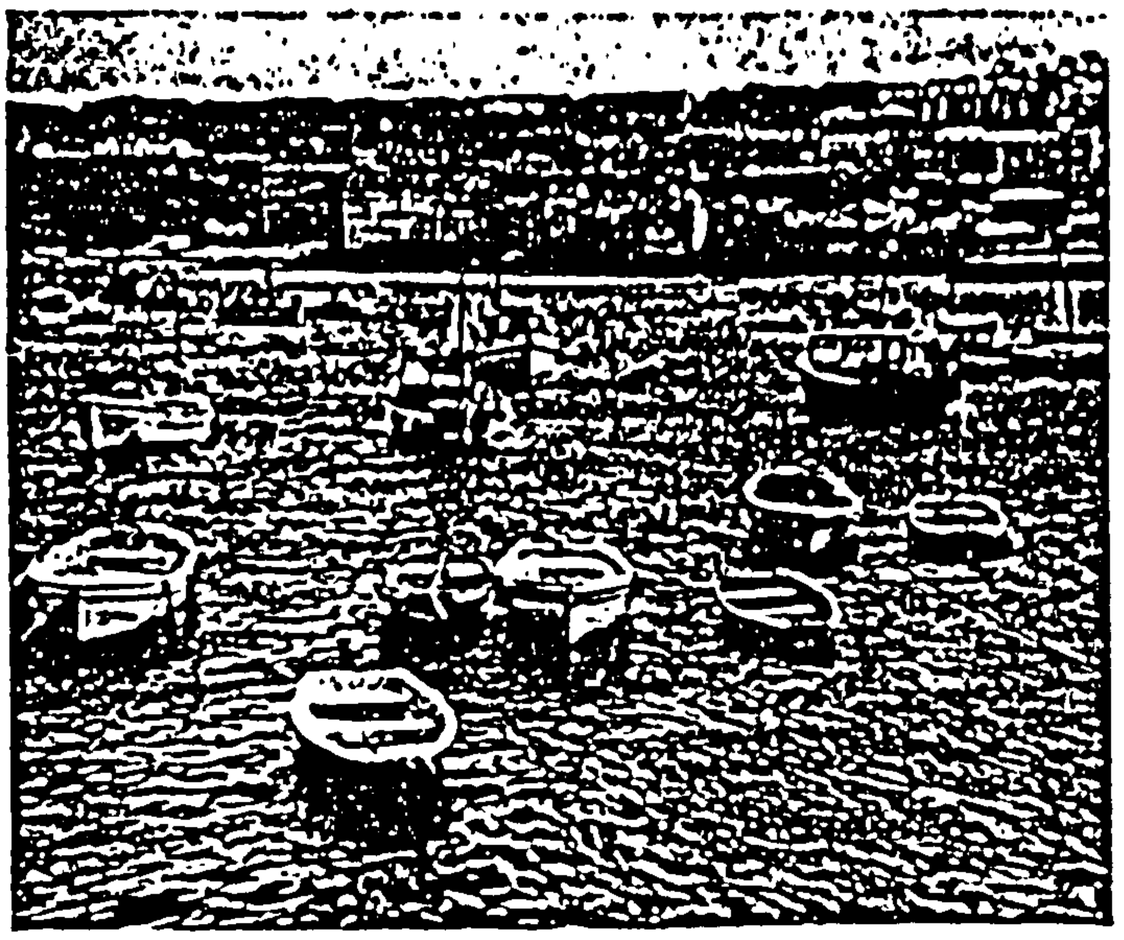
D.3.vi Jones's Random Photography of St Ives: Random Photo 4

photograph 5
I'd looked at this signboard several times before as it was near to where we were staying. It is something of an intended 'sight' in itself: a 'recognisable point of interest' such as a guide might point out



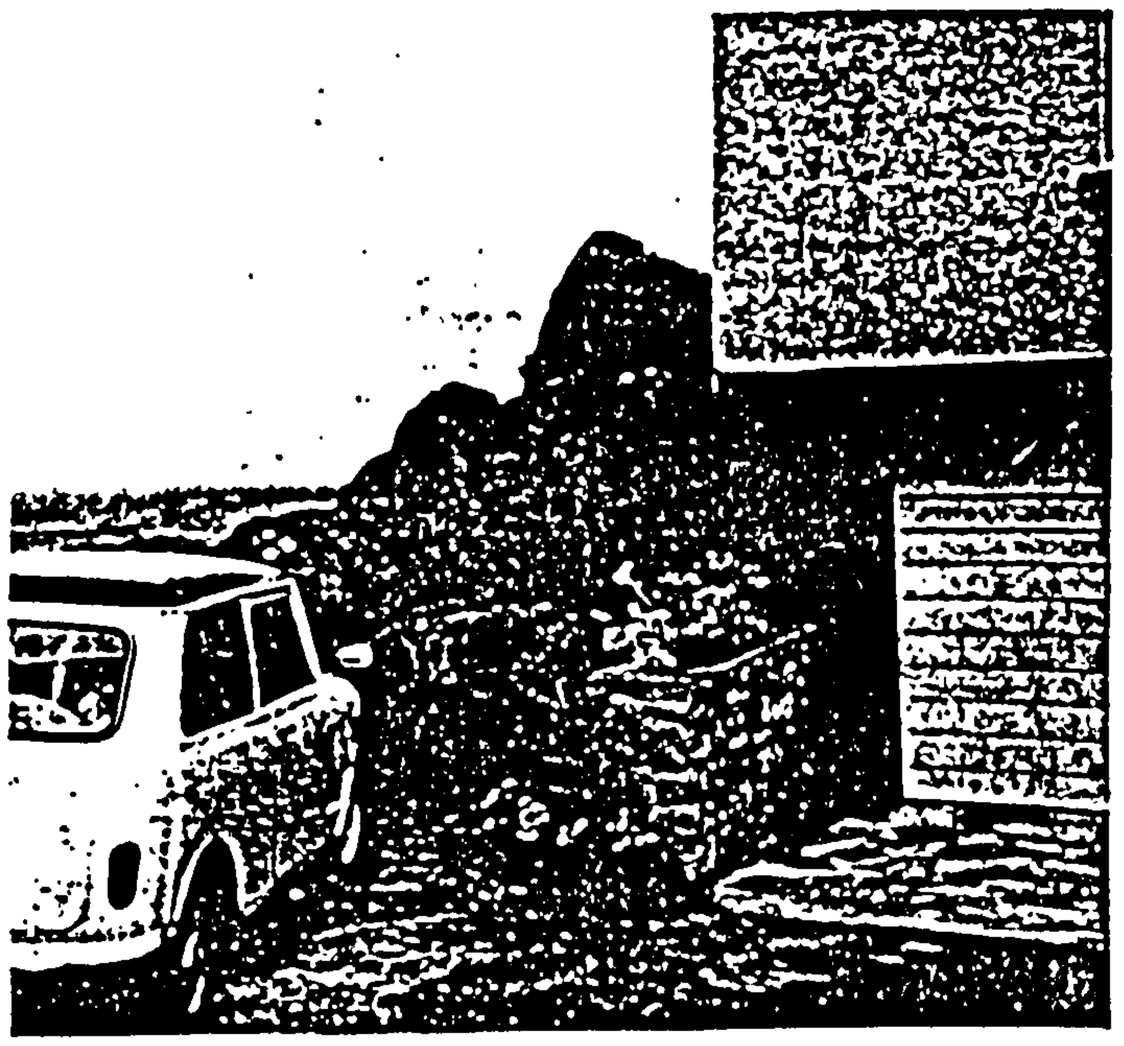
D.3.vii Jones's Random Photography of St Ives: Random Photo 5

photograph 6
For this photograph, the chance process put a point on the water in the harbour. I should have obeyed it and swam out with the camera, or hired a boat. As I was short of time (the points being quite far apart and the whole process taking longer than I'd expected), I compromised by directing the camera at the chosen point from the nearest spot on the quay. This seems to have resulted in what is very close to a 'composed' holiday snap. I'm always impressed by the way in which, given a thing to photograph, it is so very difficult to stop oneself conforming to some preconceived notion of composition (eg eighteenth-century landscapes or Dutch interior paintings) every time one aligns the viewfinder. The *view*finder! A view, it seems, is not what's there, what one's eye is capable of looking at and noting; but a *memory* of what others have done in composing what they saw?



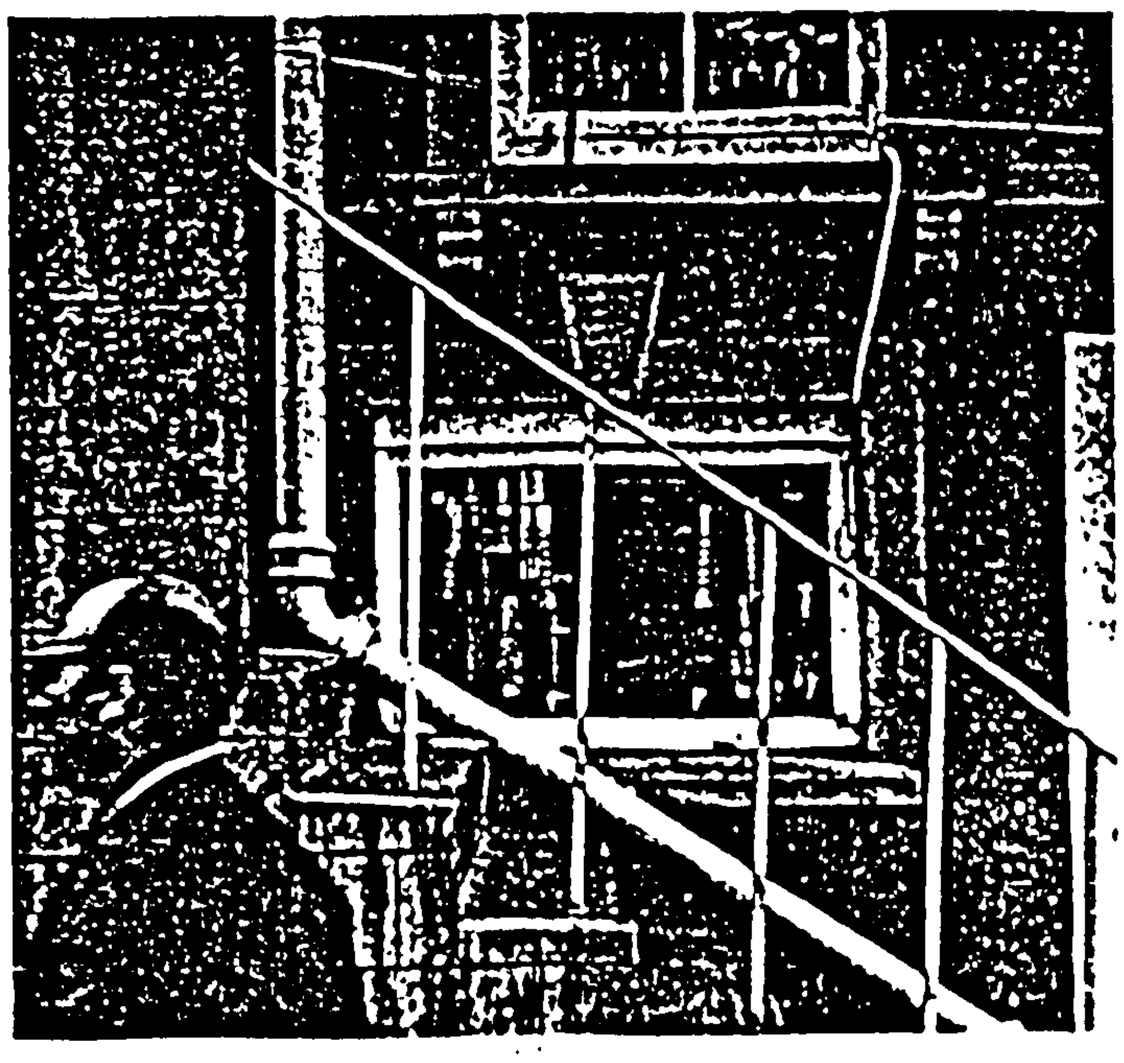
D.3.viii Jones's Random Photography of St Ives: Random Photo 6

photograph 7
Perhaps the oddest photograph in itself: half a car and a bit of a house. Who would ever take such a picture? Some years later, my sister saw these slides and recognised this house as the one her family had rented when they went to stay at St Ives. After many such seemingly spooky coincidences, arising from chance processes, I have begun to be surprised not at their occurrence but if, by chance, they do not occur. It seems to me now that such unexpected connections exist between many of the features of life we thought to be unconnected. Our everyday perceptions are so narrowed by immediate purpose and intention as to hide from us most of the 'connectiveness' of life. Deliberate chance processes break out of this a little by obliging us to pay attention to what we are normally incapable of noticing. Is that it?



D.3.ix Jones's Random Photography of St Ives: Random Photo 7

photograph 8
Another close-up of a wall which, had I not known its origin, I'd say was the work of an artist-photographer intent on drawing attention by deliberate disregard of a recent convention in 'how to compose a picture'



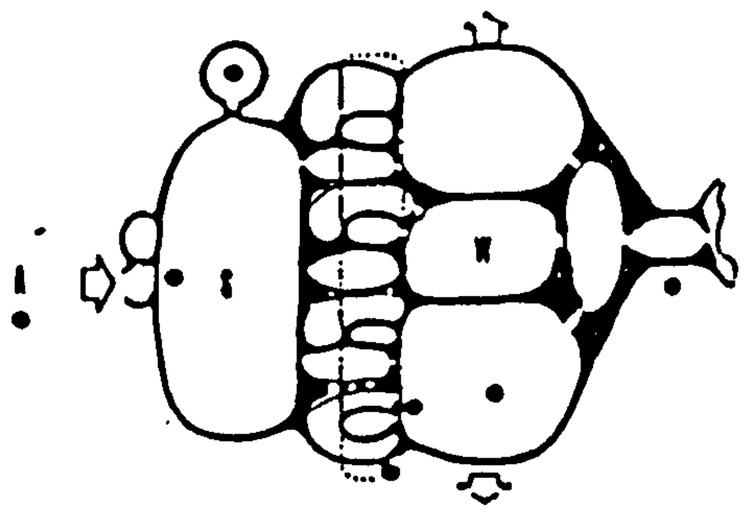
D.3.x Jones's Random Photography of St Ives: Random Photo 8

photograph 9
Again, though not a tourist's view of things, the chance process seems to have led to the kind of composition reminiscent of what some artists might well contrive

D.3.xi Jones's Random Photography of St Ives: Random Photo 9

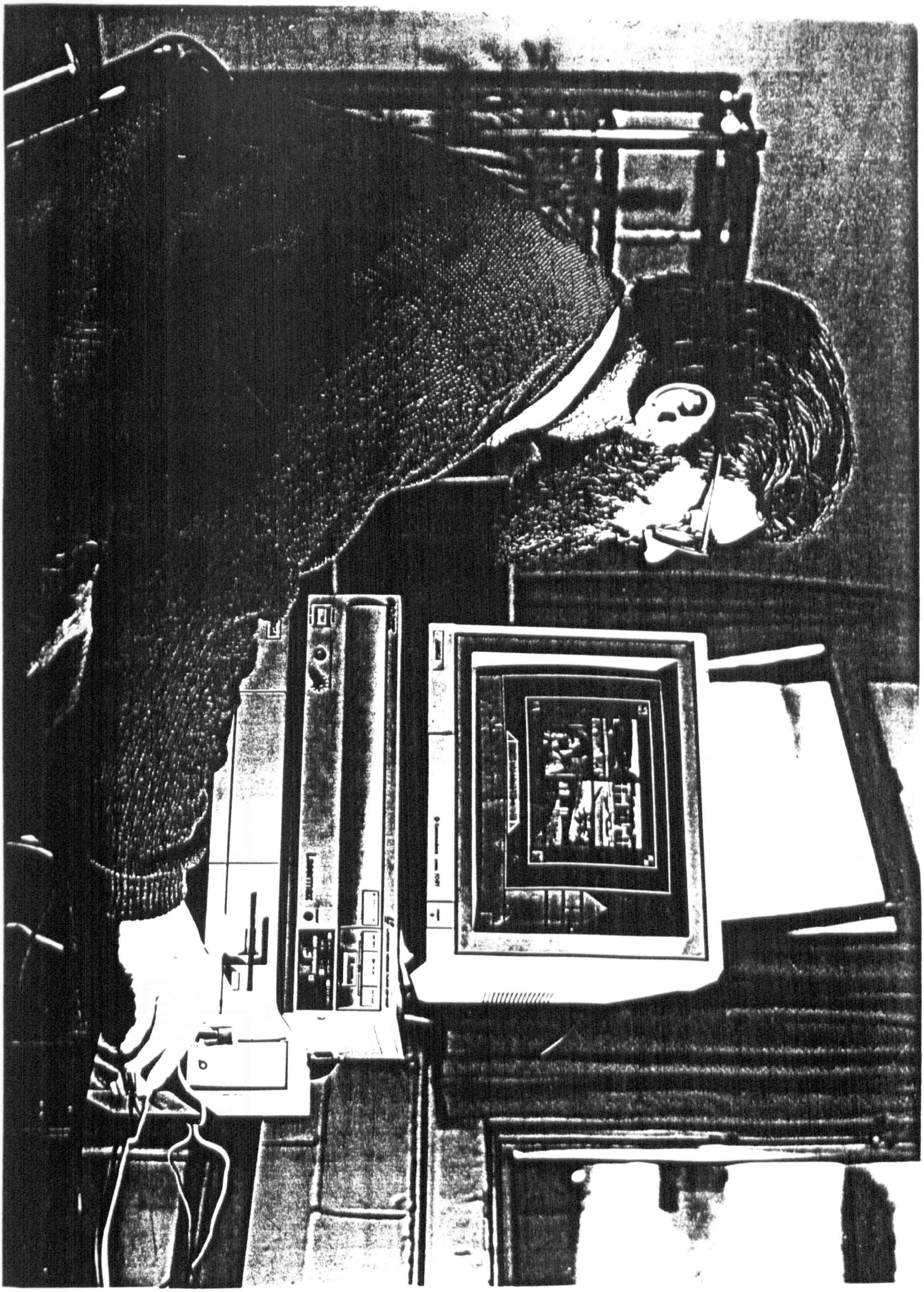
photograph 10
This last chance photograph is missing. The accident of losing it gives us the opportunity of looking at something I did not expect at all while taking the photographs: an image of St Ives that leaves everything to the imagination; or else an image of the frame, or idea, of 'a photograph' free of content

D.3.xii Jones's Random Photography of St Ives: Random Photo 10 - the Dud Photo

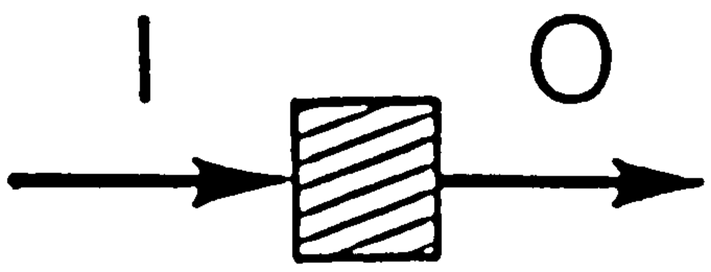


Prison Workshop—Relational Synthesis, by Anthony Ward. This is an application of Christopher Alexander's Method, in which the various Relations of a prison workshop are indicated diagrammatically and then fused to form a complete diagram of the workshop as a geometrical abstraction. The Relations themselves are based upon observations of what people are seen to do in existing prison workshops (observed user-behaviour patterns or Tendencies)

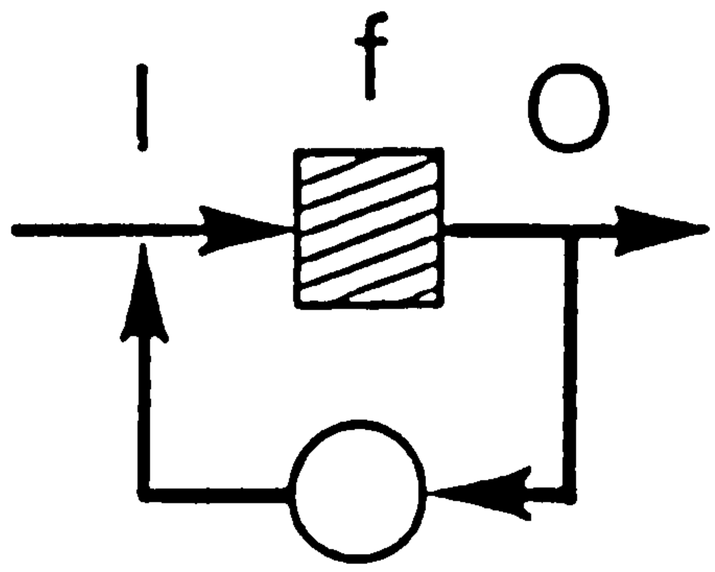
D.4.i Application of Alexander's Method from "Notes on the Synthesis of Form", by Anthony Ward



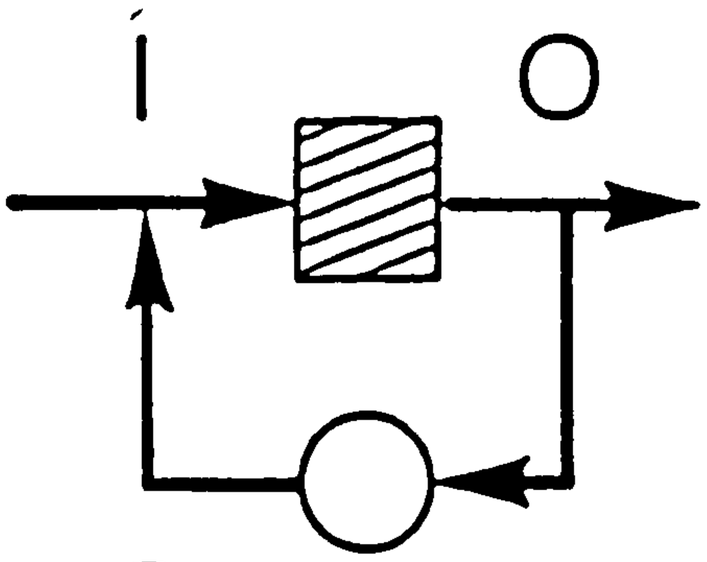
D.51 James Powell at his Video Disc Installation



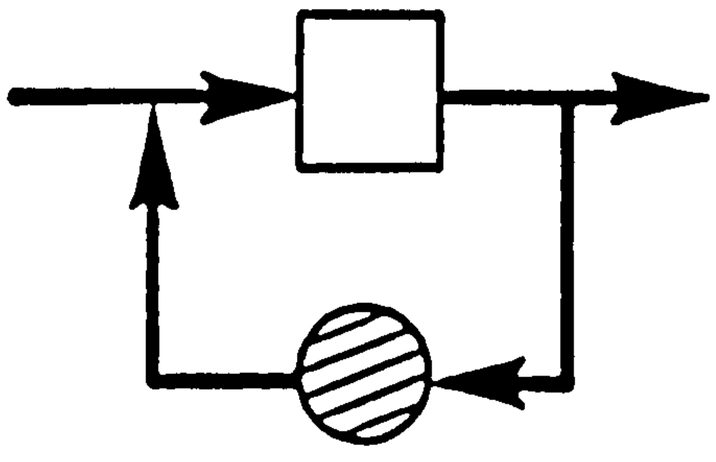
D.6.i The Black Box Model Developing: Input (I) and Output (O)



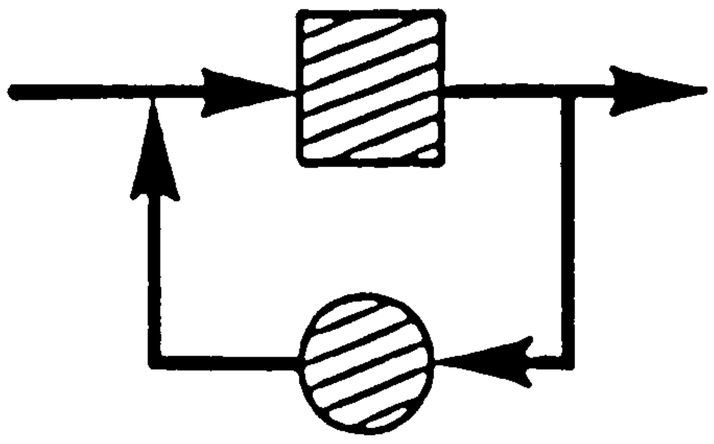
D.6.ii The Black Box Model Developing: Difference (f) observed by Observer



D.6.iii The Black Box Model Developing: Output for the Box is Input (I') for the Observer, and Vice Versa



D.6.iv The Black Box Model Developing: The Observer Appears Black to the Box



D.6.v The Black Box Model Developing: Thus, Blackness is Reciprocal

ARCHITECTURE AND SPACE FOR THOUGHT

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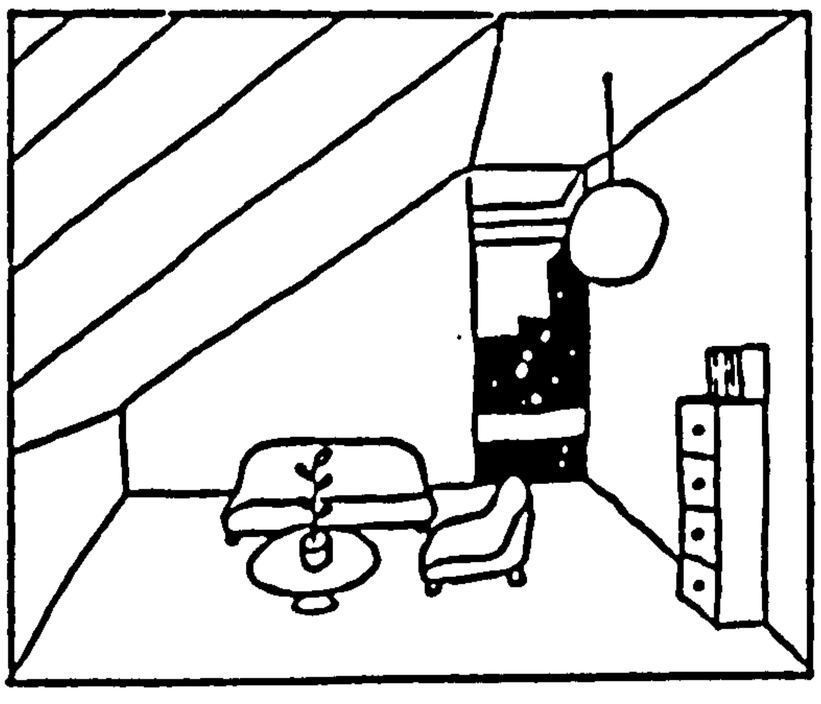
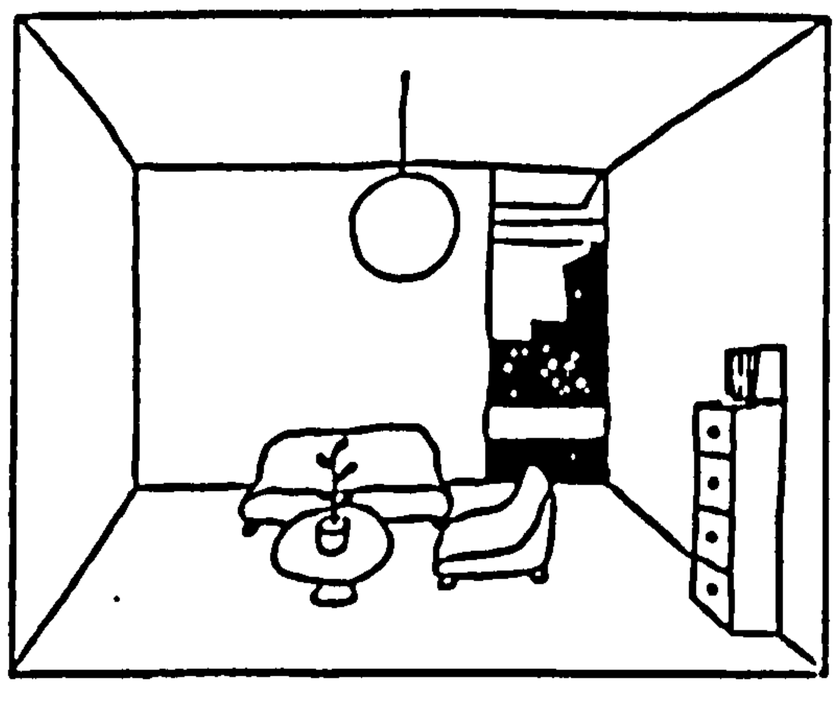
SECTION E

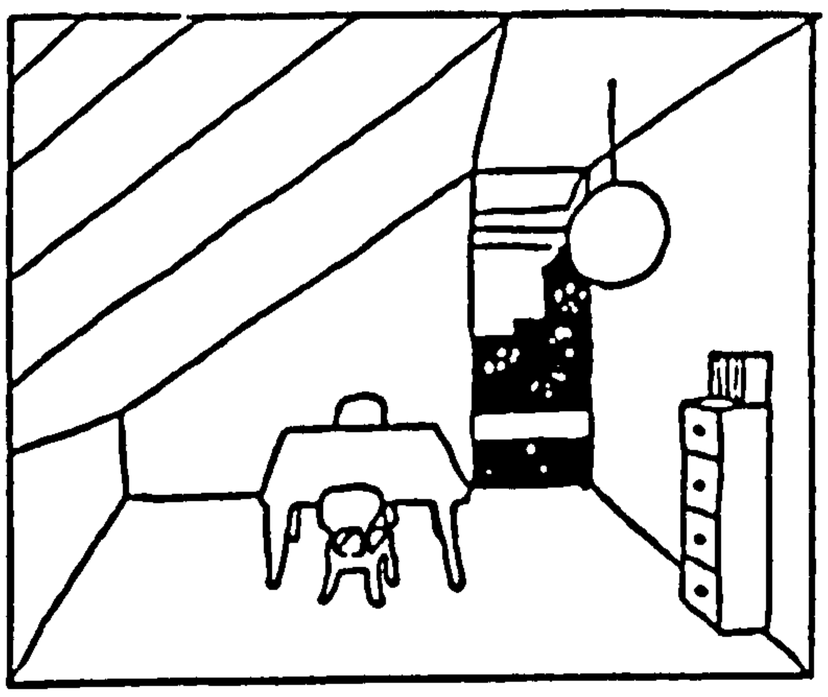
Environmental Psychology



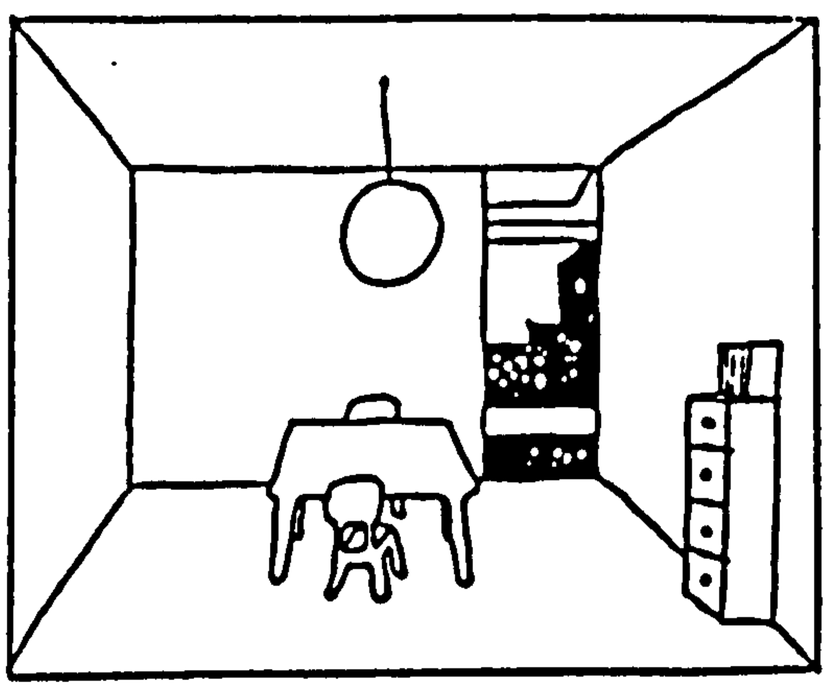
E.1.i Living Room, Pitched Ceiling



E.1.ii Living Room, Flat Ceiling



E.1.iii Interview Room, Pitched Ceiling



E.1.iv Interview Room, Flat Ceiling:
Which Do You Prefer?

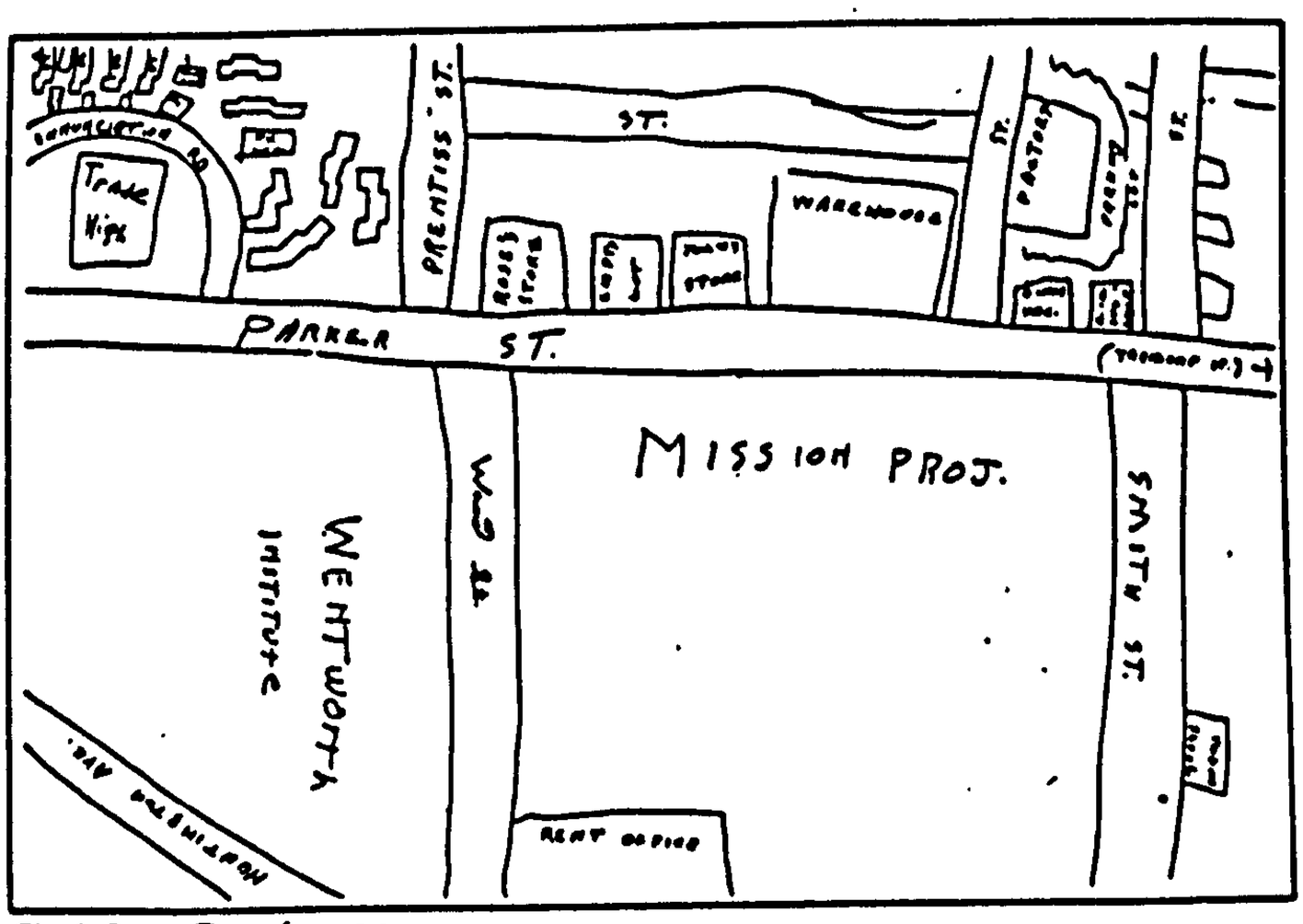
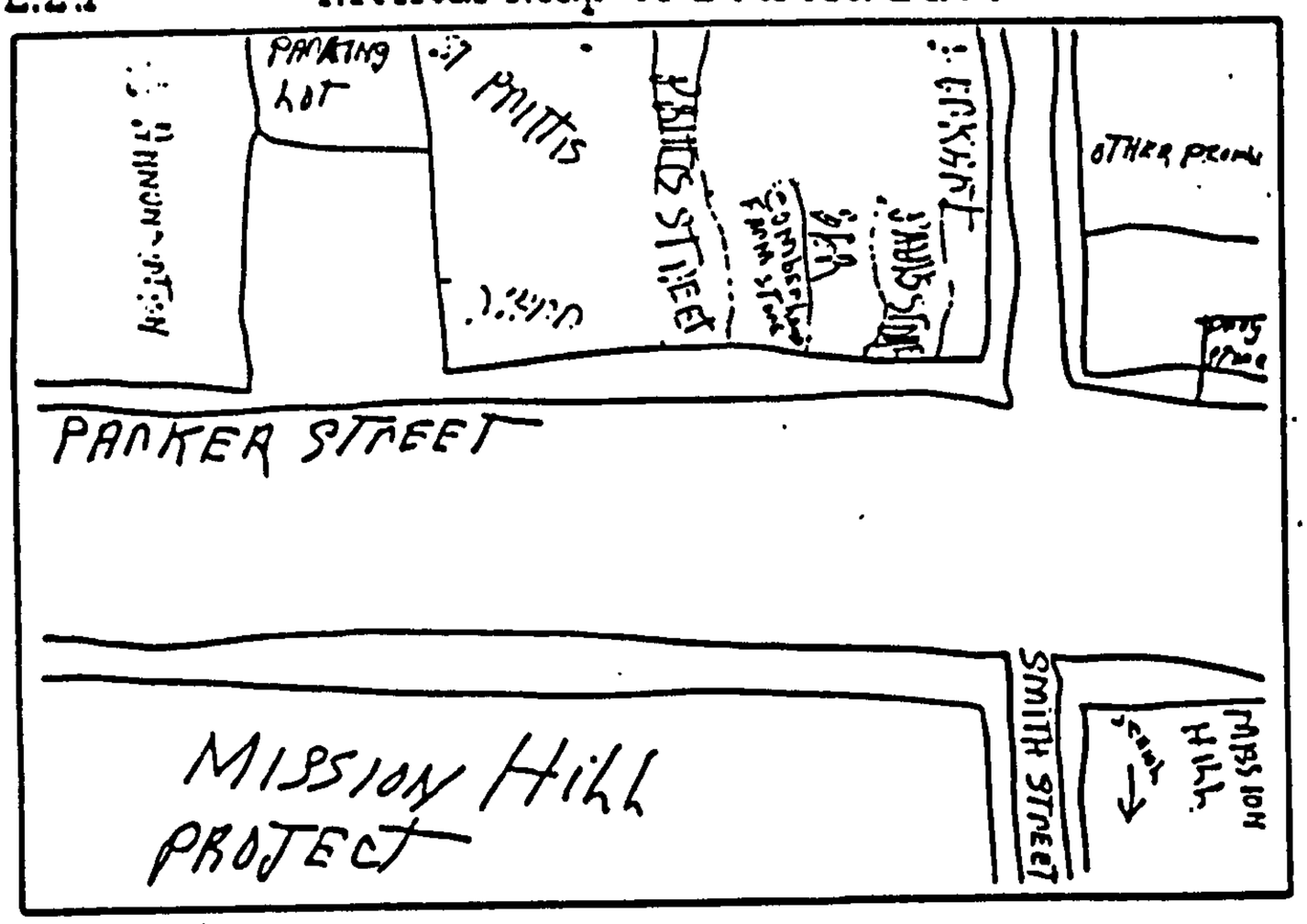


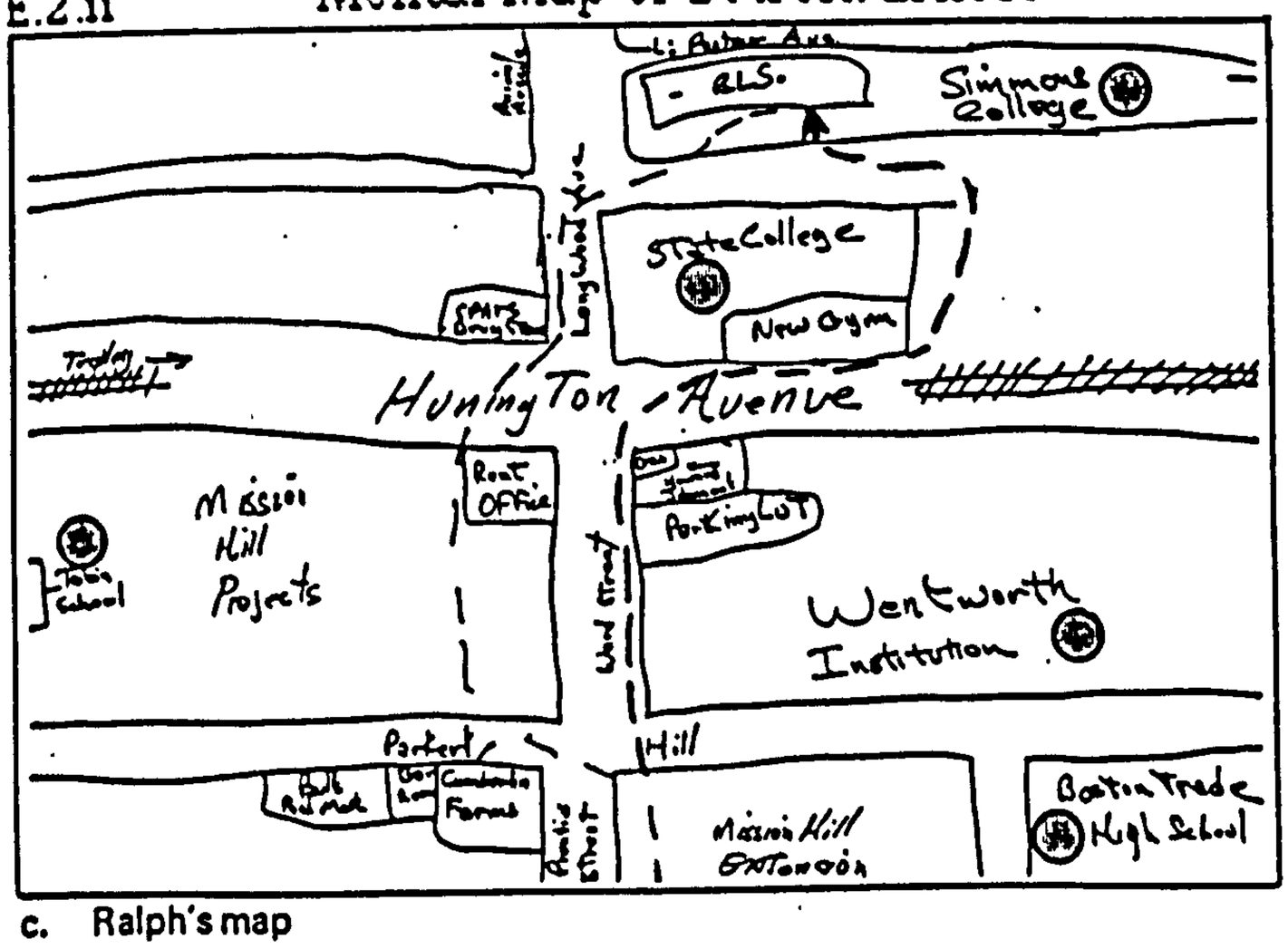
Fig 1.6 a. Dave's map

E.2.i Mental Map of Detroit: Dave



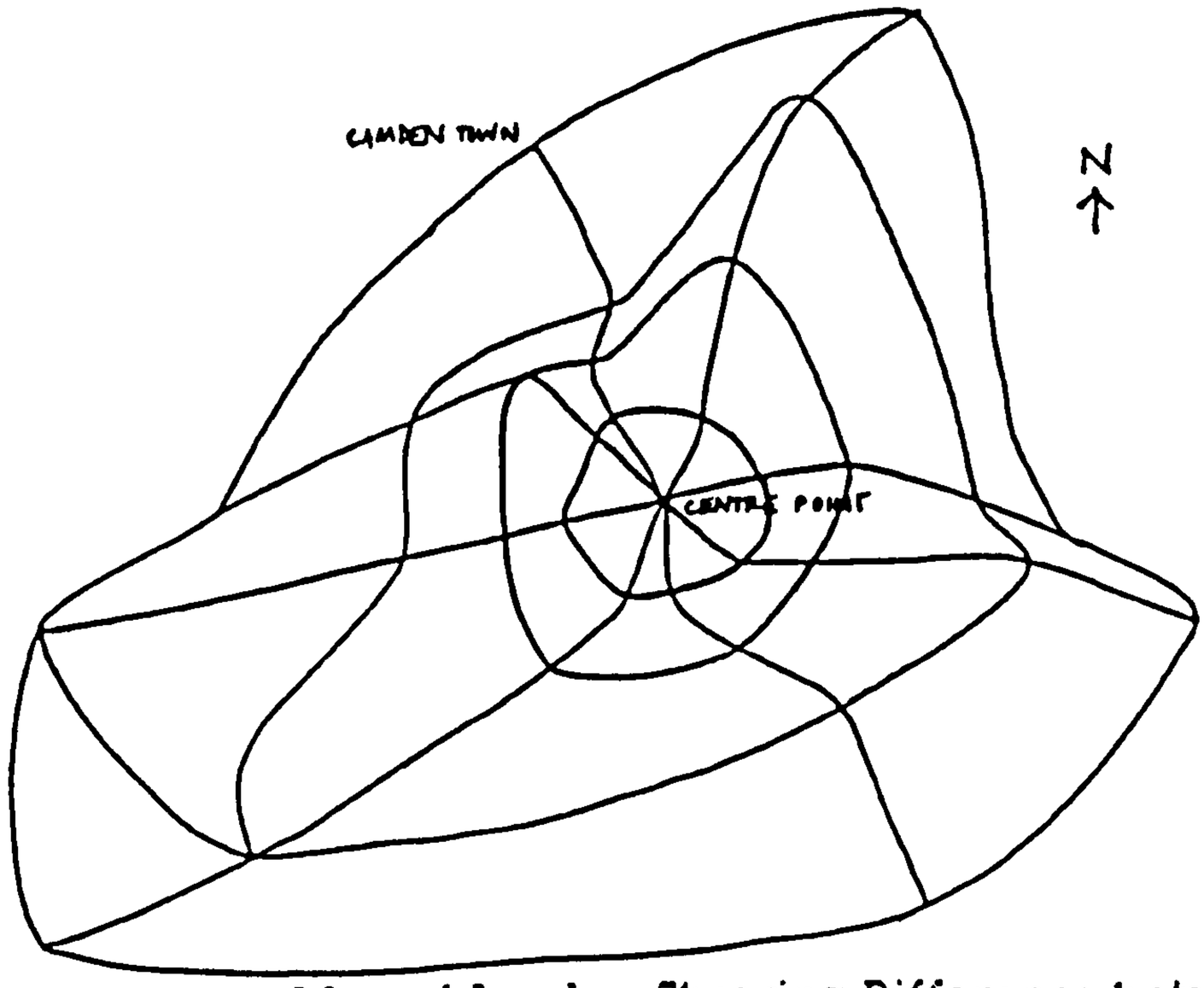
b. Ernest's map

E.2.ii Mental Map of Detroit: Ernest

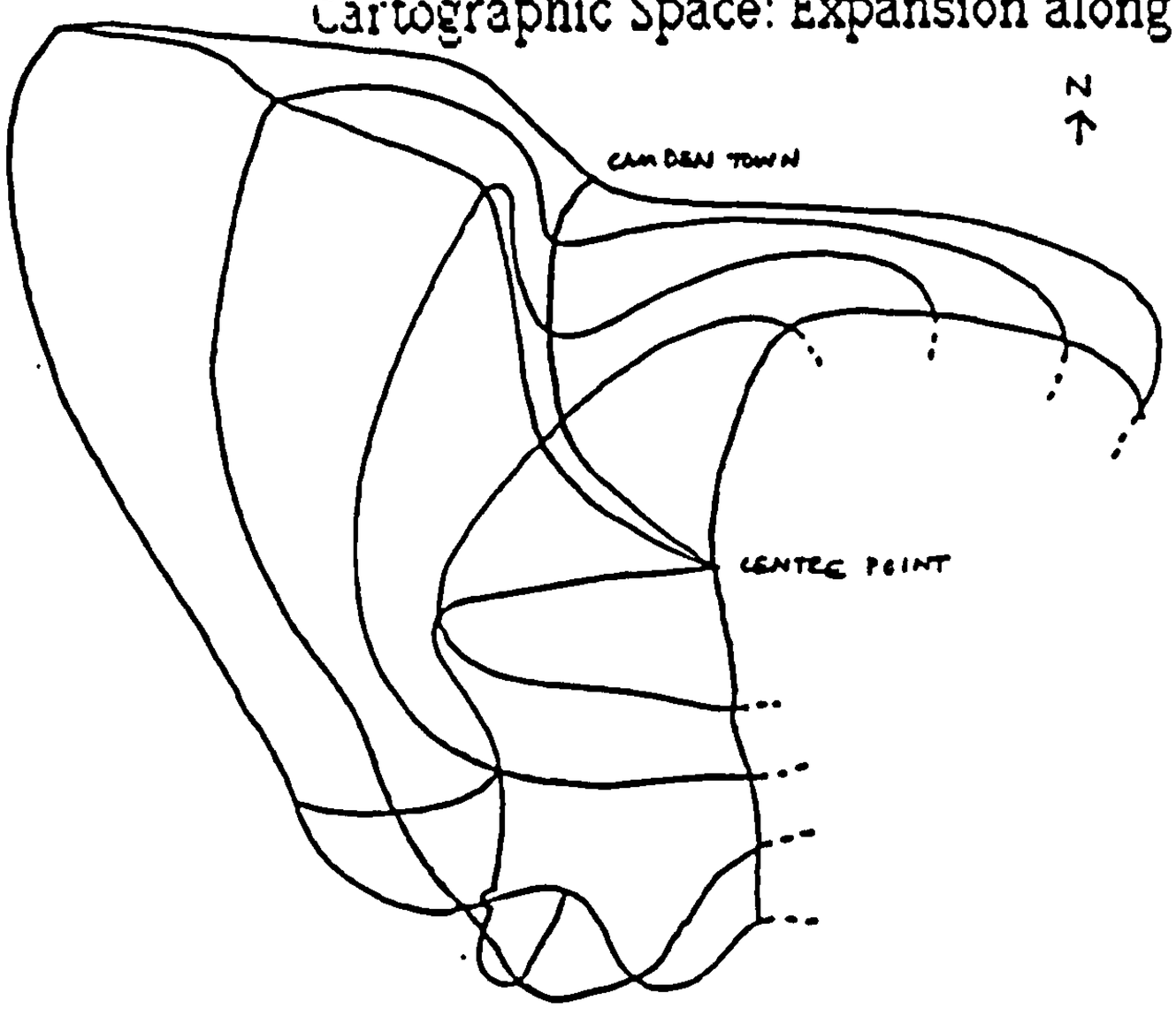


c. Ralph's map

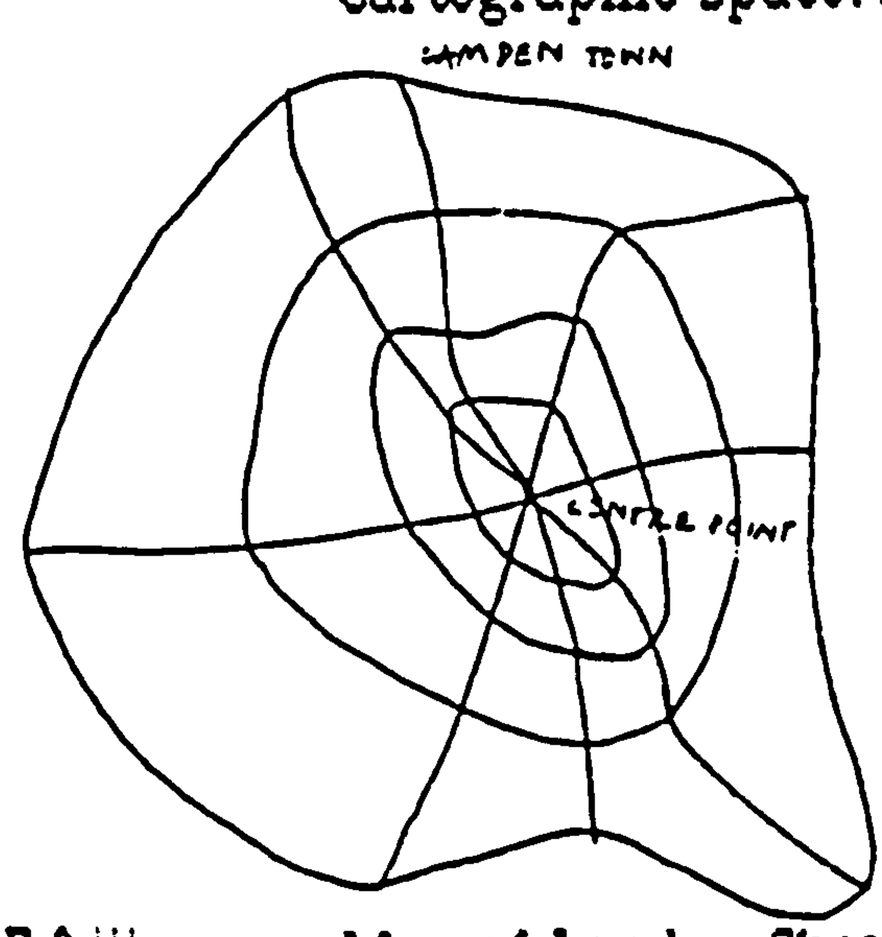
E.2.iii Mental Map of Detroit: Ralph



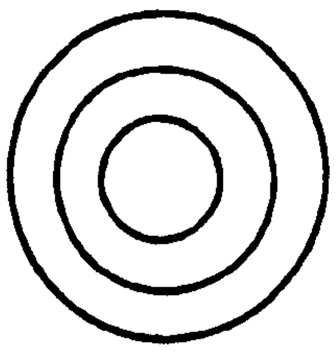
E3.i Map of London Showing Difference between Personal and Cartographic Space: Expansion along the Central Tube Line

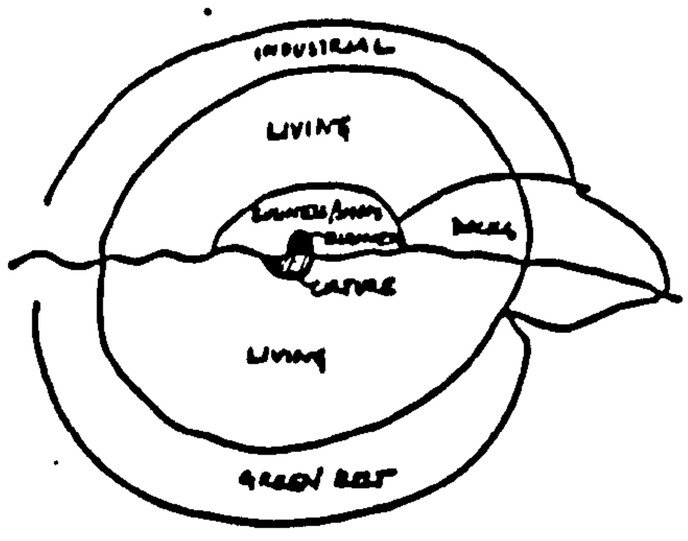


E.3.ii Map of London Showing Difference between Personal and Cartographic Space: No Knowledge of the City or East End



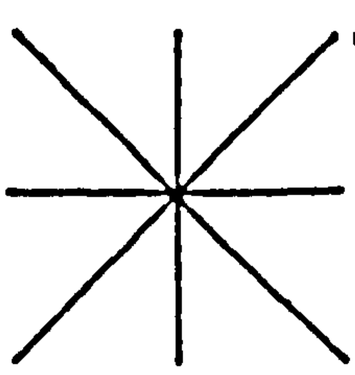
E.3.iii Map of London Showing Difference between Personal and Cartographic Space: An Expert's View is still Distorted

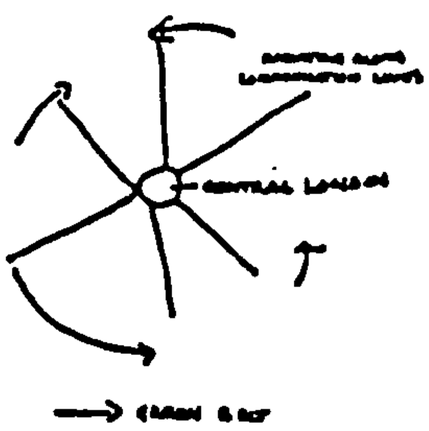




concentric

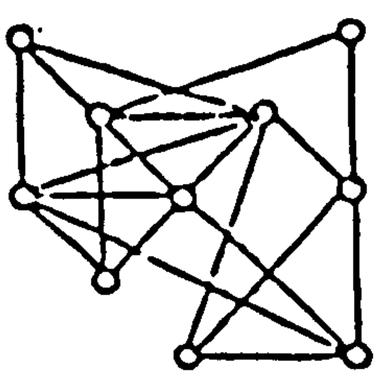
E.4.i Conceptions of London's Structure: Concentric (with idealised diagram)

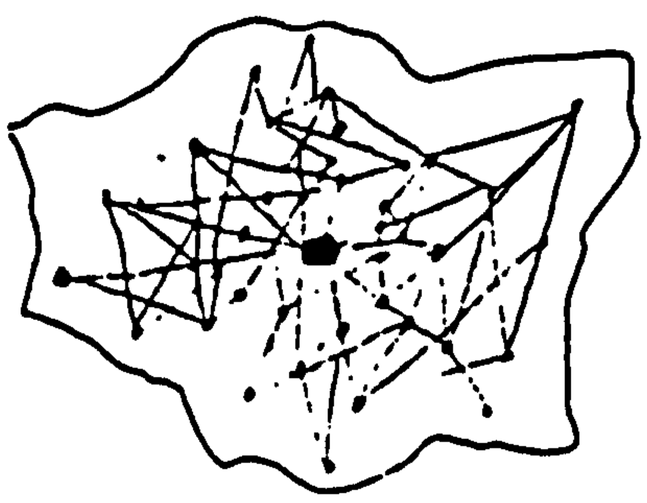




radial

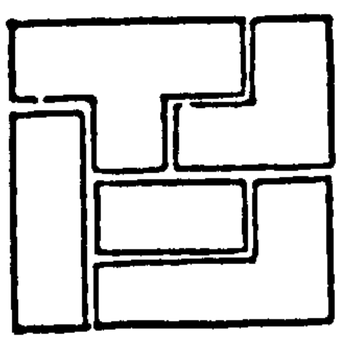
E.4.ii Conceptions of London's Structure: Radial (with idealised diagram)





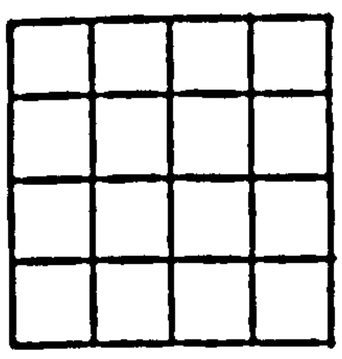
lattice

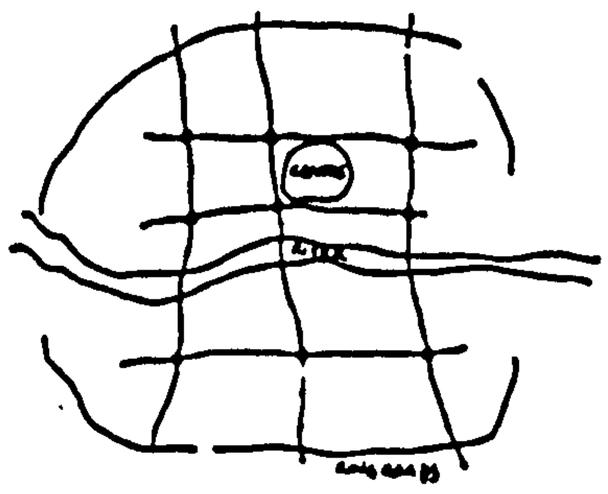
E.4.iii Conceptions of London's Structure: Semi-lattice - ie, village - (with idealised diagram)



zone

E.4.iv Conceptions of London's Structure: Zones (with idealised diagram)





grid

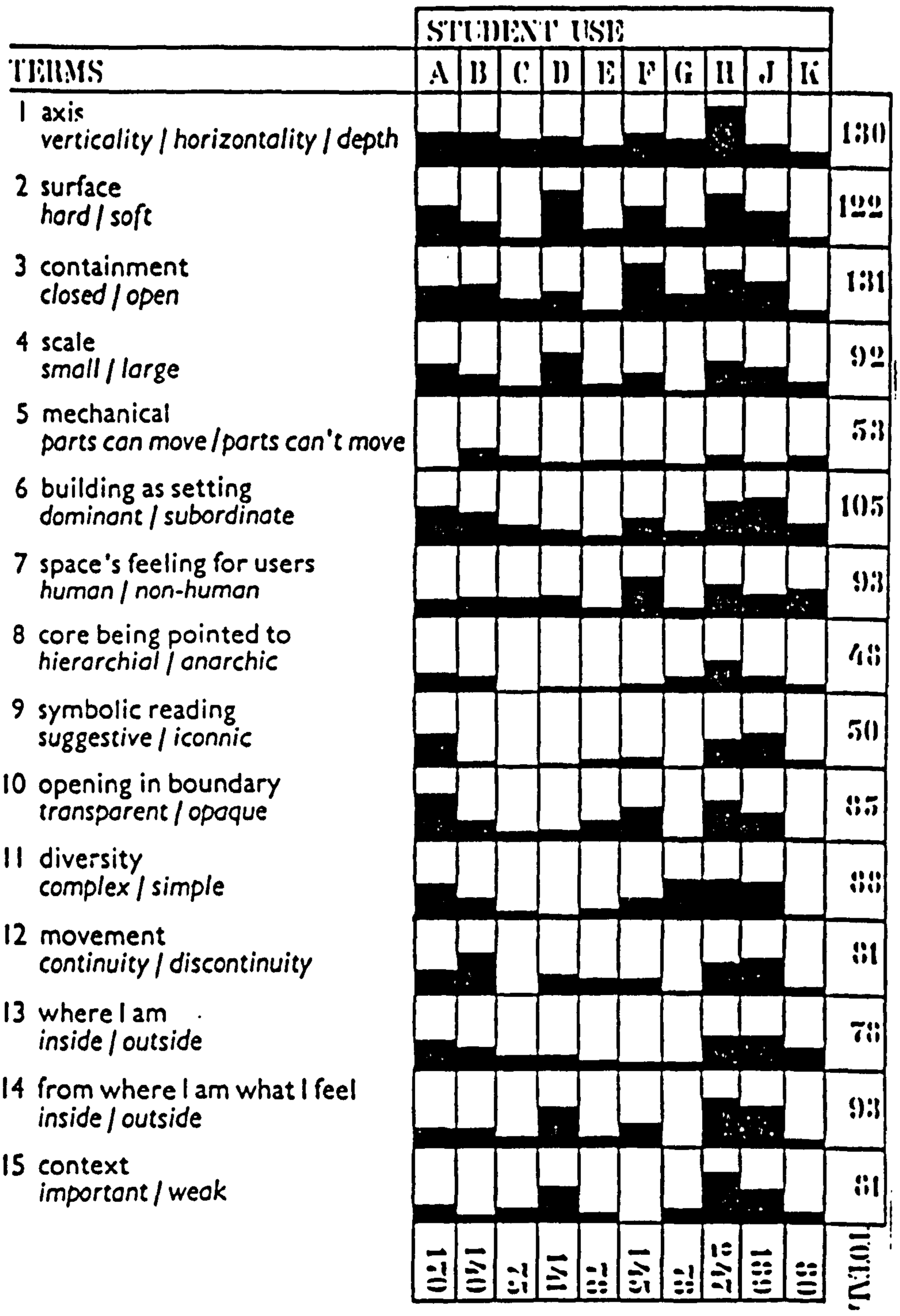
E.4.v Conceptions of London's Structure: Grid (with idealised diagram)

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

SECTION F

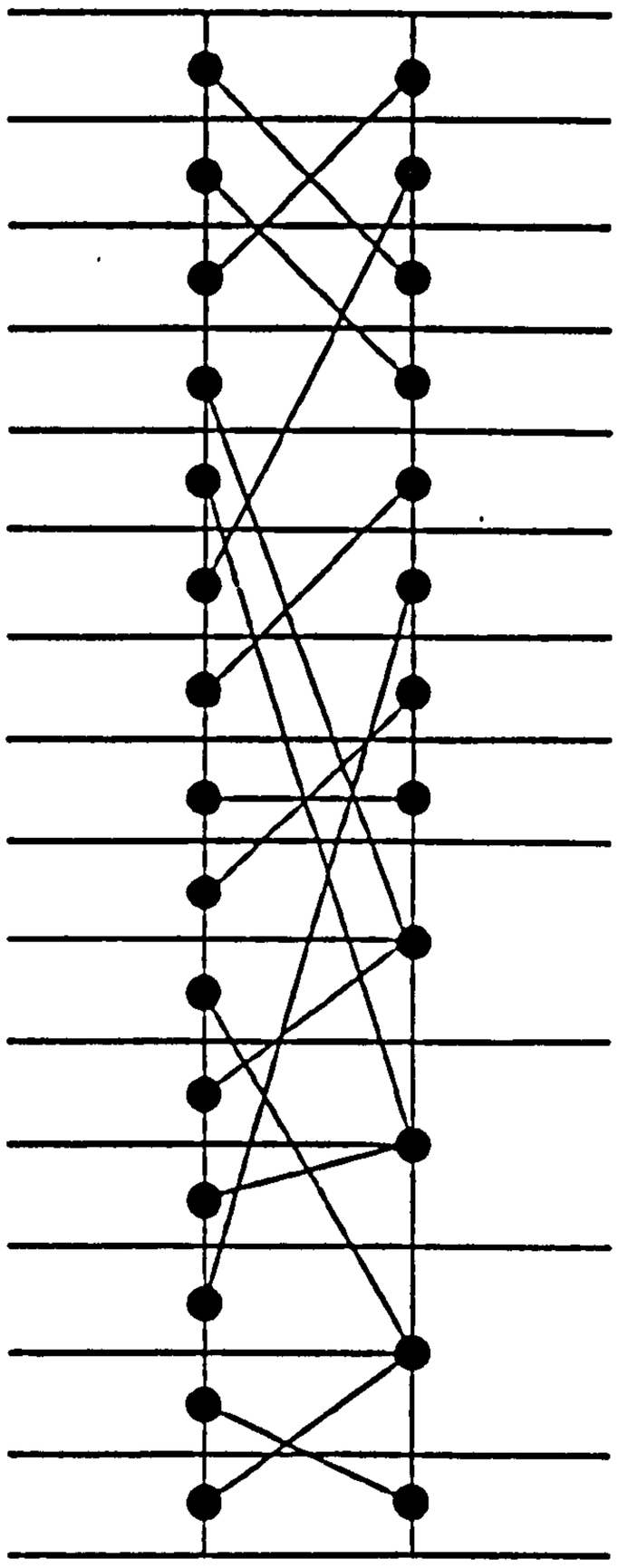
Terms and Statistics



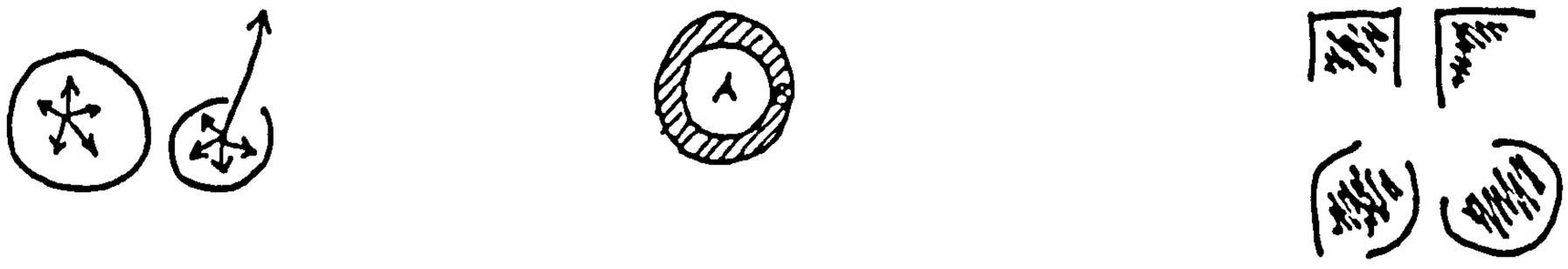
F.1.1 Descriptive Terms Chosen, in Which to Discuss Architectural Space

F.2.1 Terms Arrived at for the Discussion of Architectural Space: and Their General Usage by Each Student (Indicated by Letter) over the Range of Slides Used

rank	believed term	actual term
1	*where I am*	surface
2	*from where I am what I feel*	scale
3	*surface*	where I am
4	*building as a setting*	from where I am what I feel
5	*context*	axis
6	*scale*	containment
7	*axis*	space's feeling for users
8	*diversity*	diversity
9	*space's feeling for users*	movement / building as setting
10	*core being pointed to*	
11	*movement*	mechanical / context
12	*mechanical*	
13	*containment*	core being pointed to / opening in boundary
14	*symbolic reading*	
15	*opening in boundary*	symbolic reading



F.3.i Use of Terms: Belief Compared to Actuality



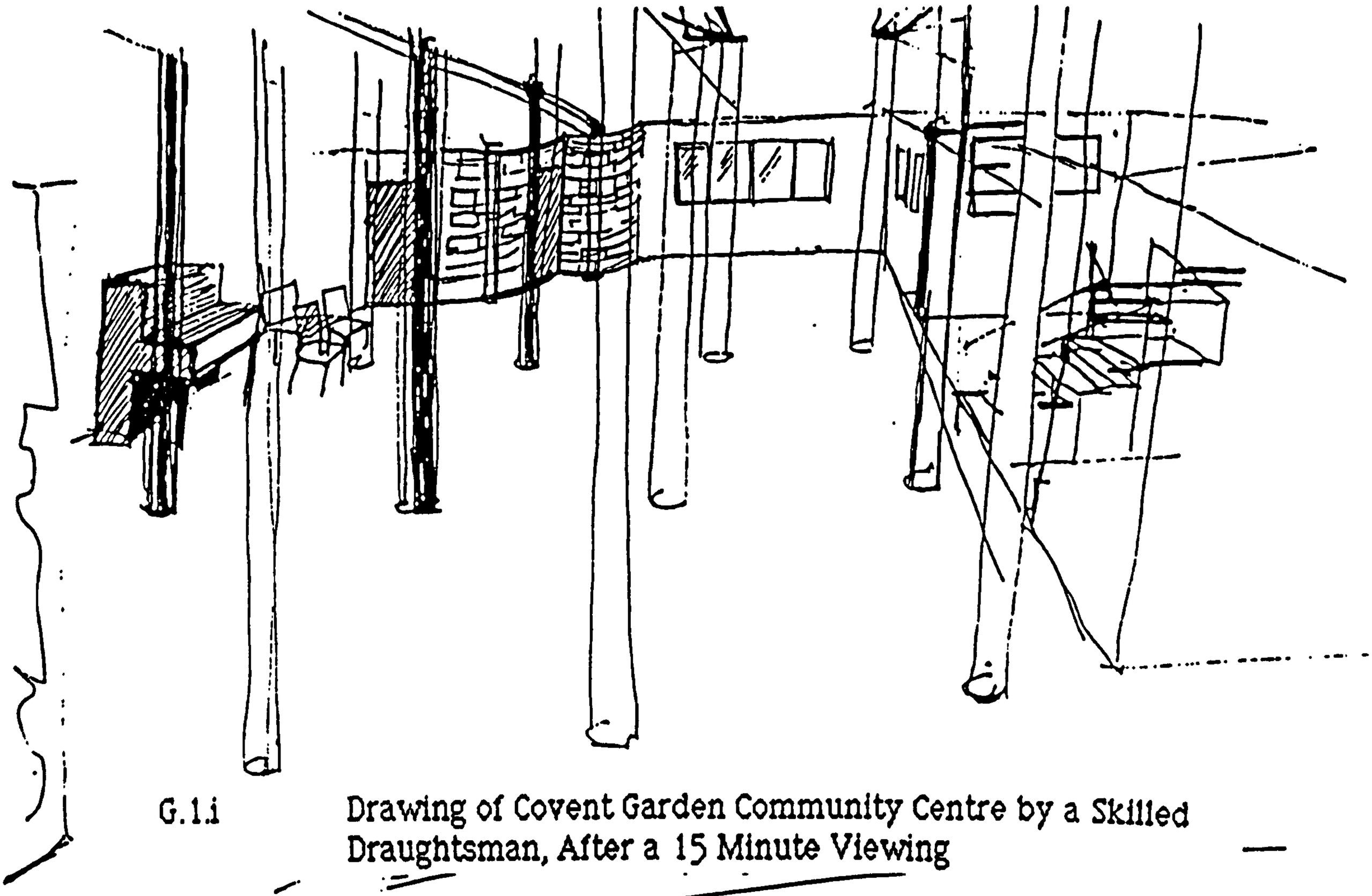
F.4.i Graphic Illustration of One Term (Containment) by Several Students Involved in Project

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

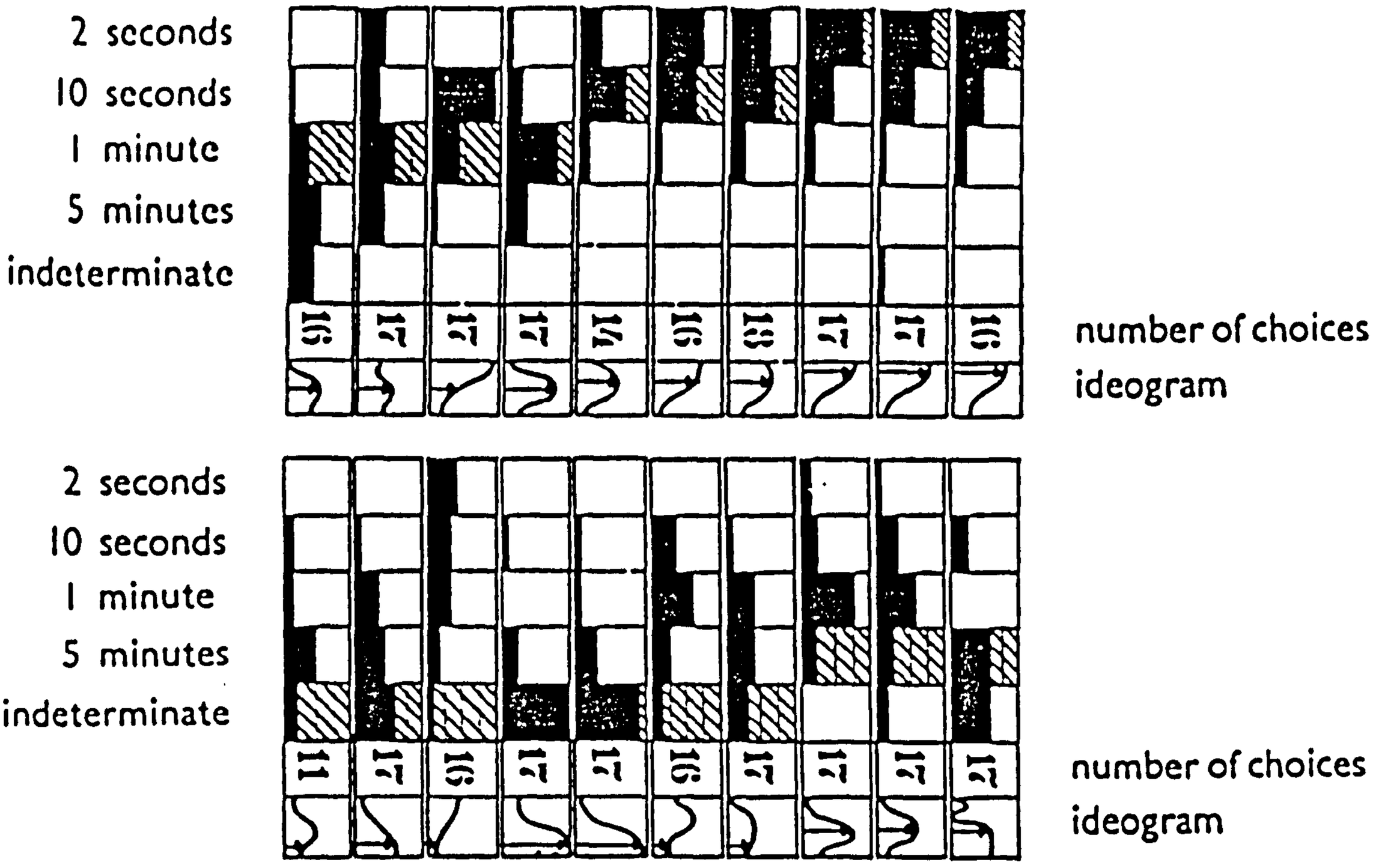
SECTION G

Controlled Viewing and MOTIF 8

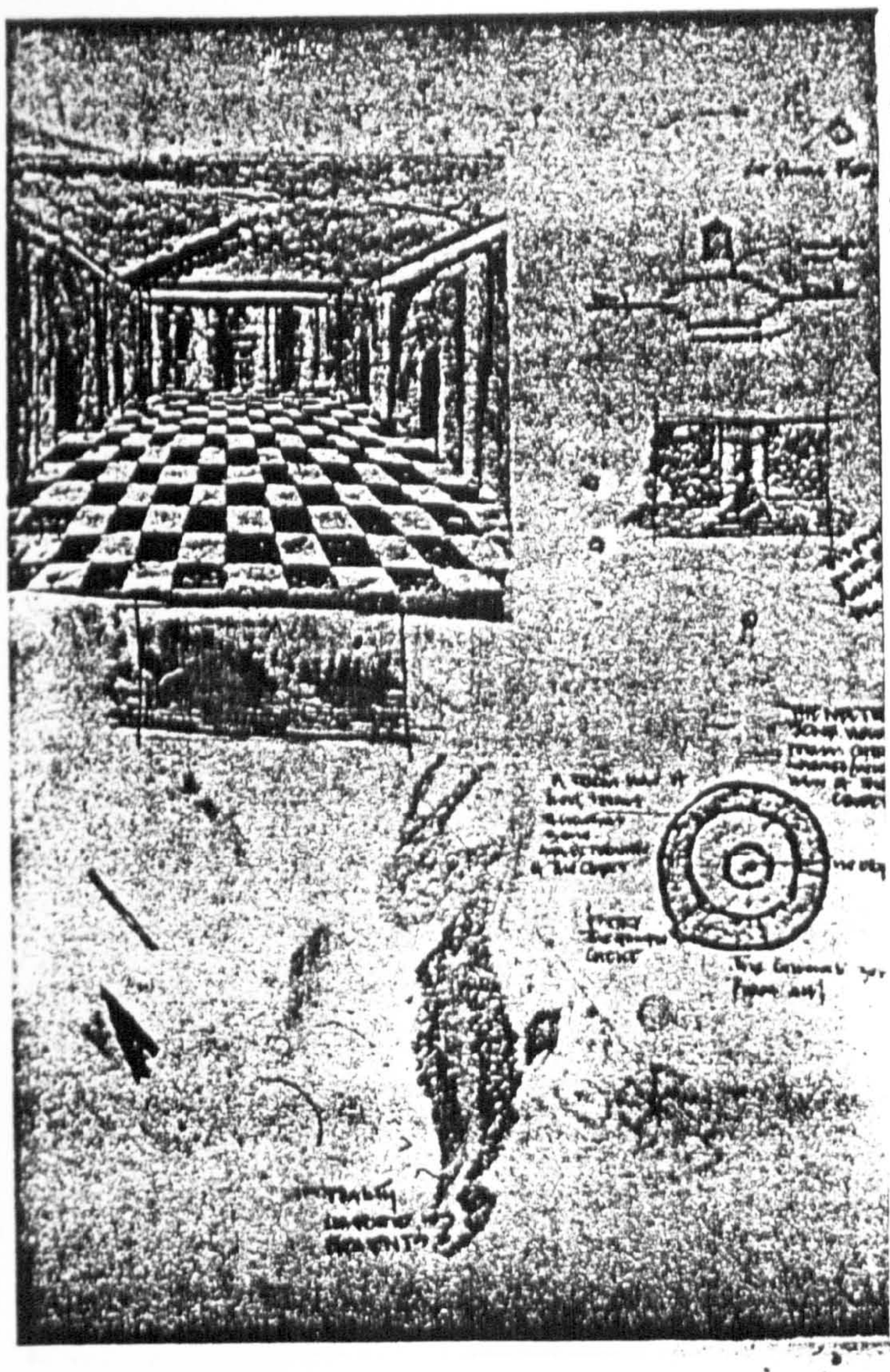


G.1.i Drawing of Covent Garden Community Centre by a Skilled Draughtsman, After a 15 Minute Viewing

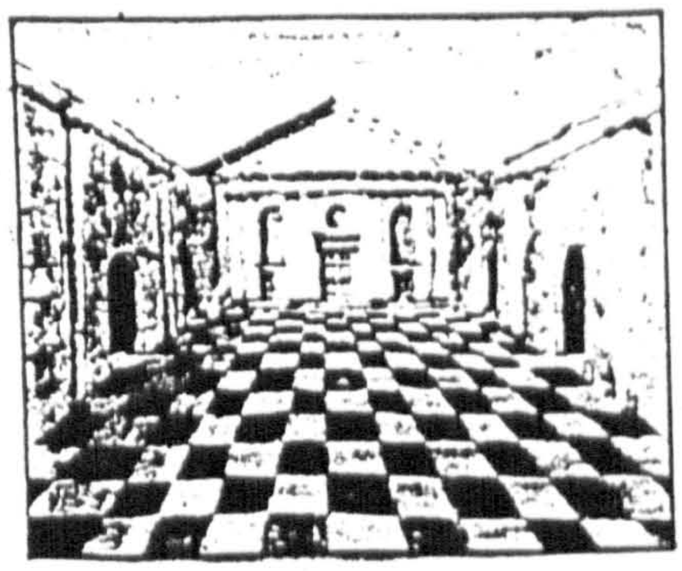
G.1.ii Drawing of Covent Garden Community Centre by a Relatively Unskilled Draughtsman, After a 2 Second Viewing



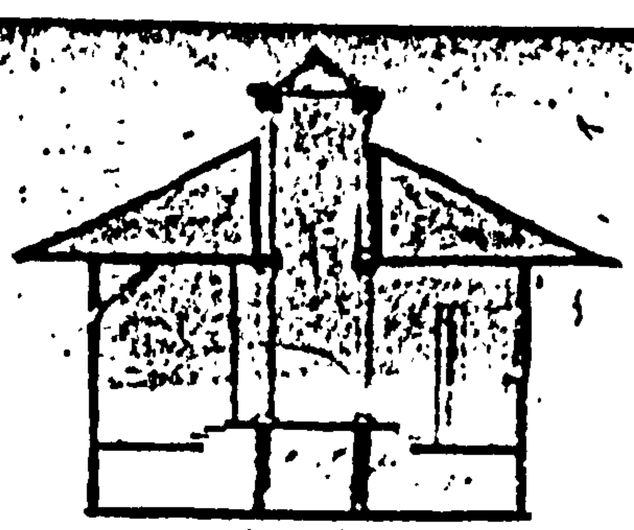
G.2.i Table of Presumed Time of Viewing Represented in Drawings of Covent Garden Community Centre, Made by Participants



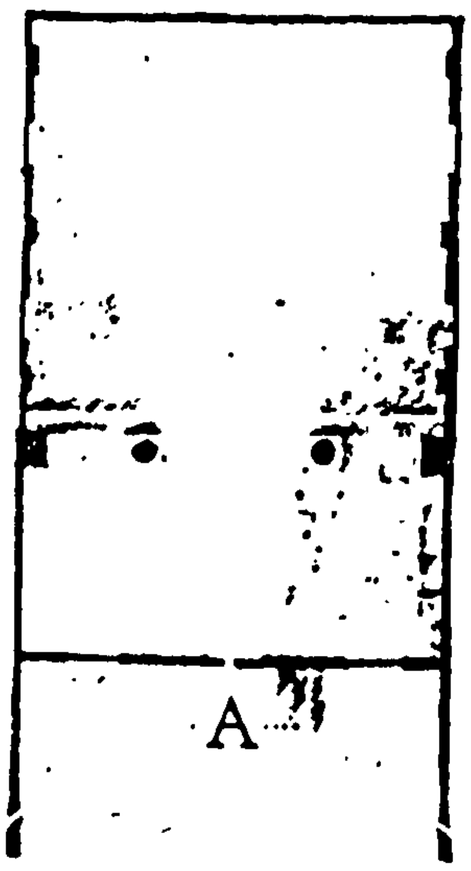
G.3.i MOTIF 8 Design, Based on Controlled Viewing of St Paul's Church, Covent Garden, by Charlie Dunnett: Developmental Sketches



VIEW FROM 'A'



SECTION X-X



PLAN(cont)

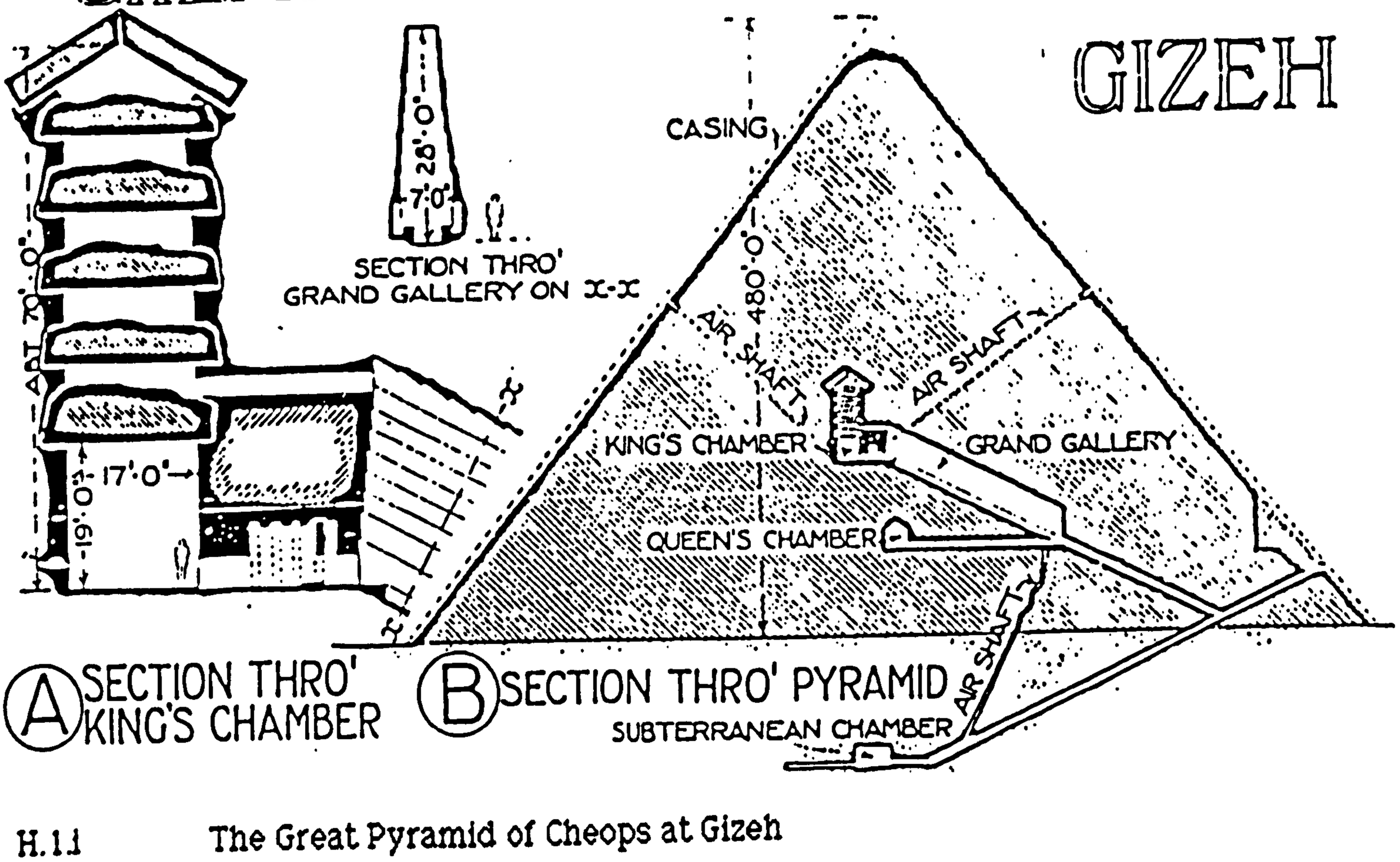
ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

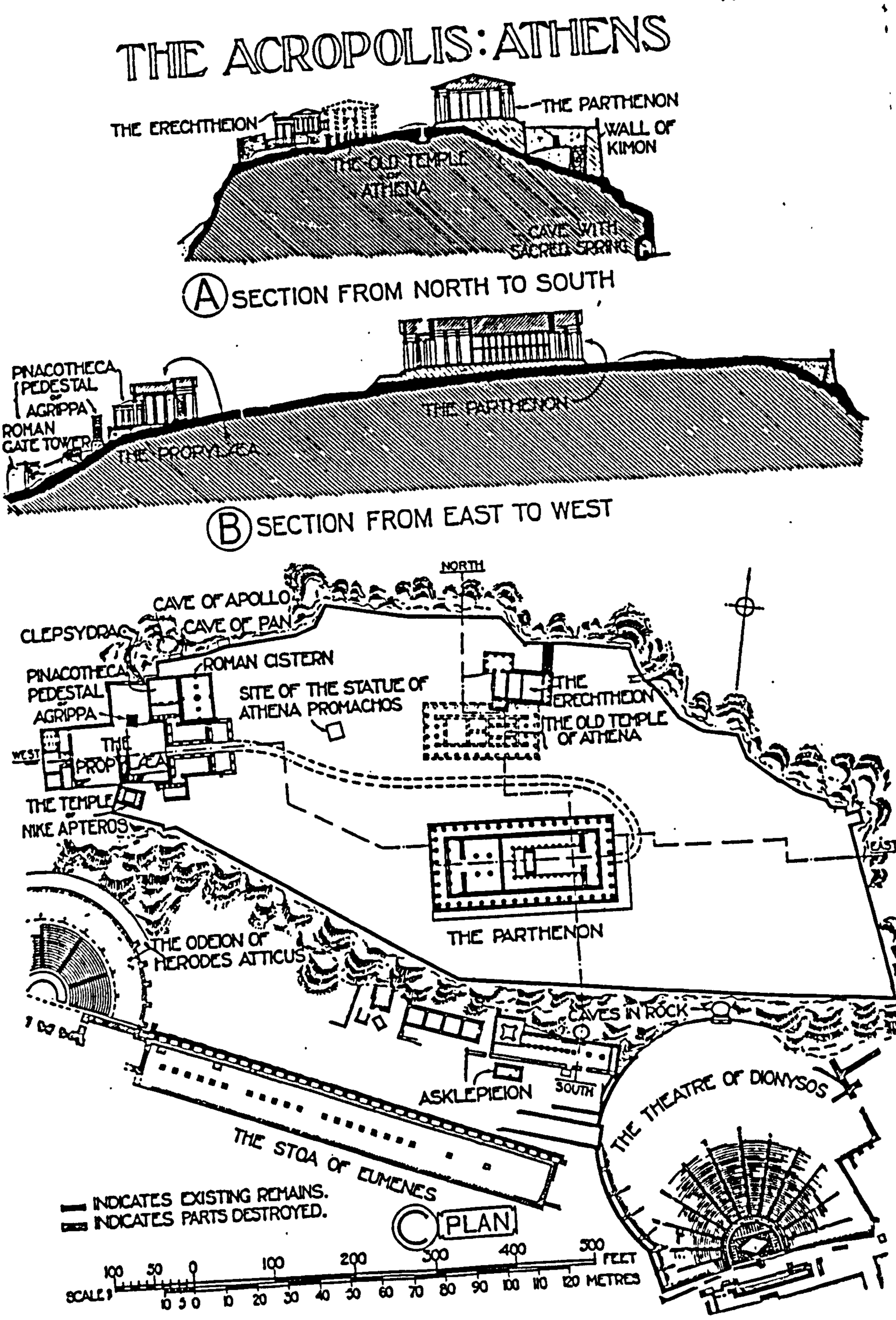
SECTION H

Architectural Drawings

GREAT PYRAMID OF CHEOPS : GIZEH

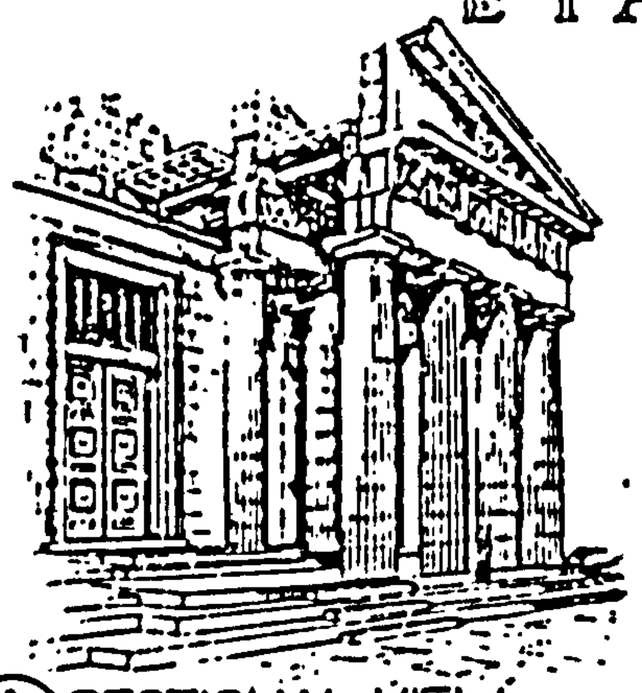


H.11 The Great Pyramid of Cheops at Gizeh

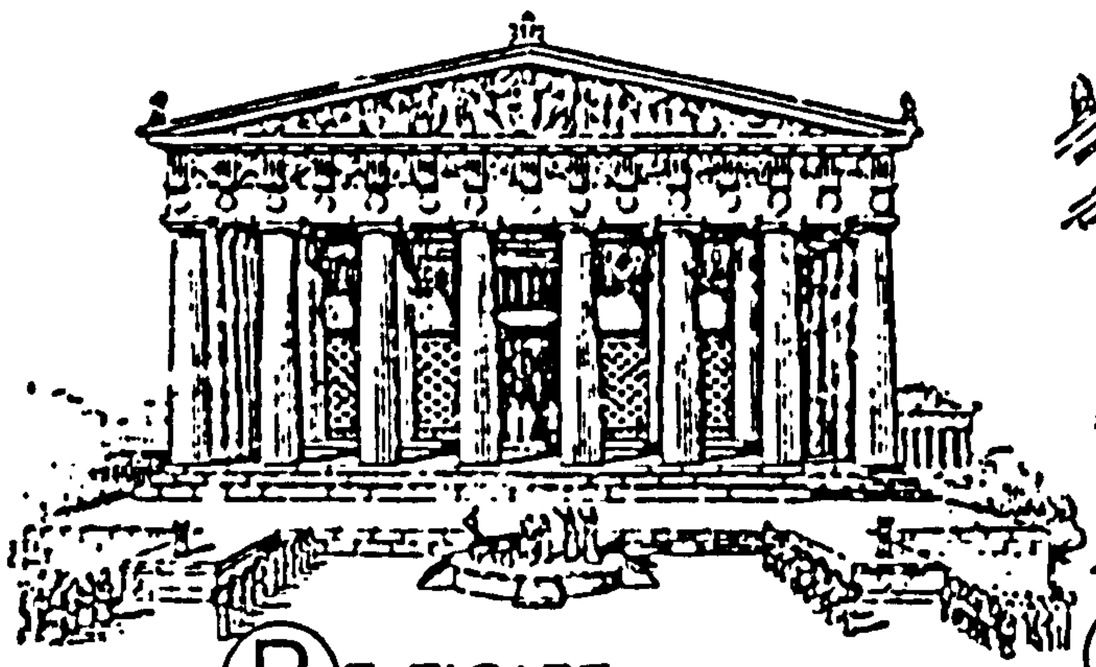


H.2 i Local Section and Site Plan of the Acropolis (with the Parthenon)

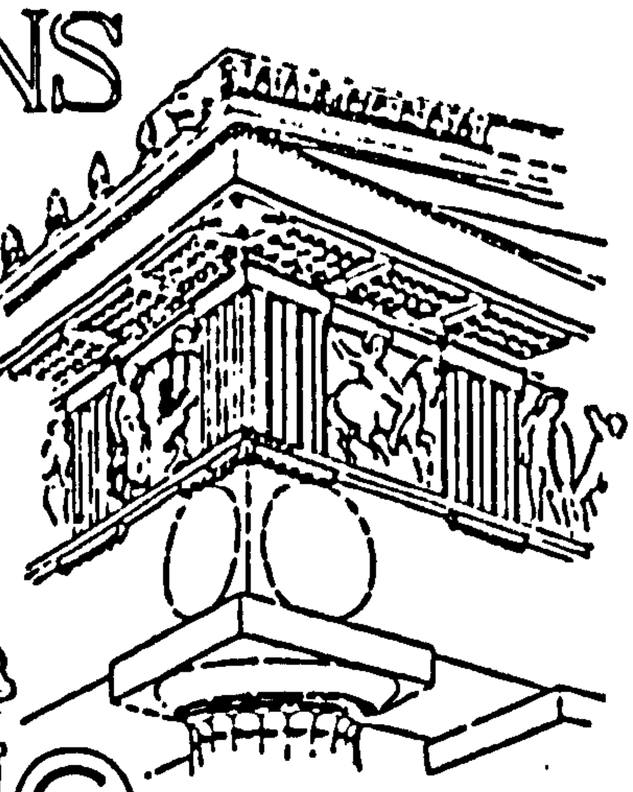
THE PARTHENON: ATHENS



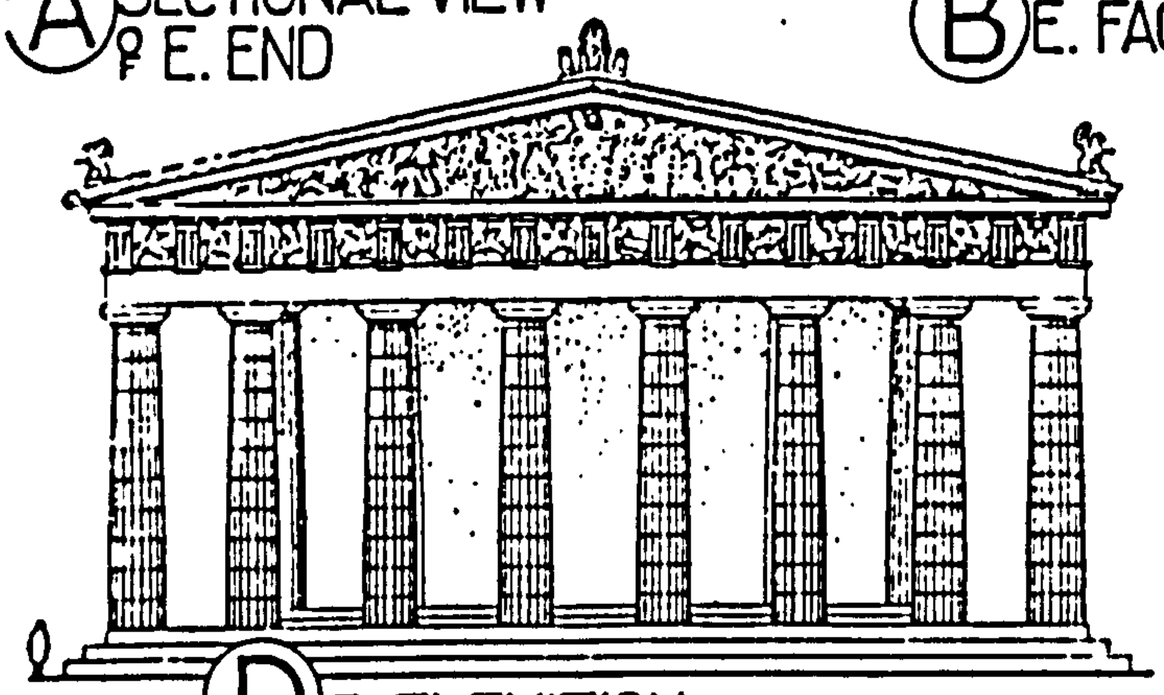
A SECTIONAL VIEW & E. END



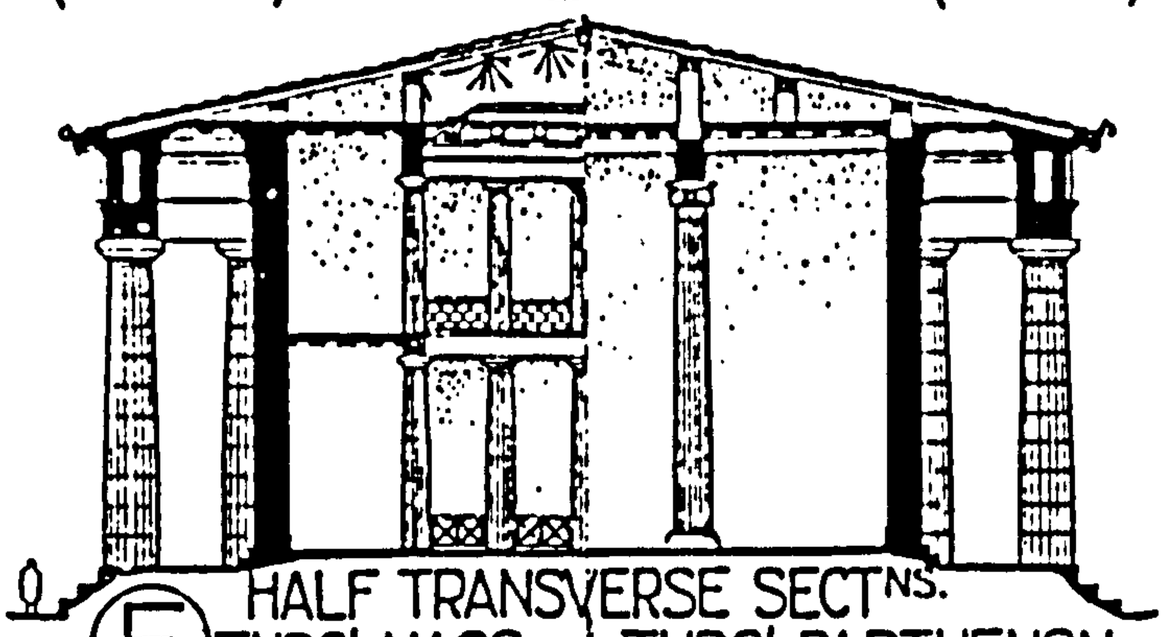
B E. FACADE (RESTORED)



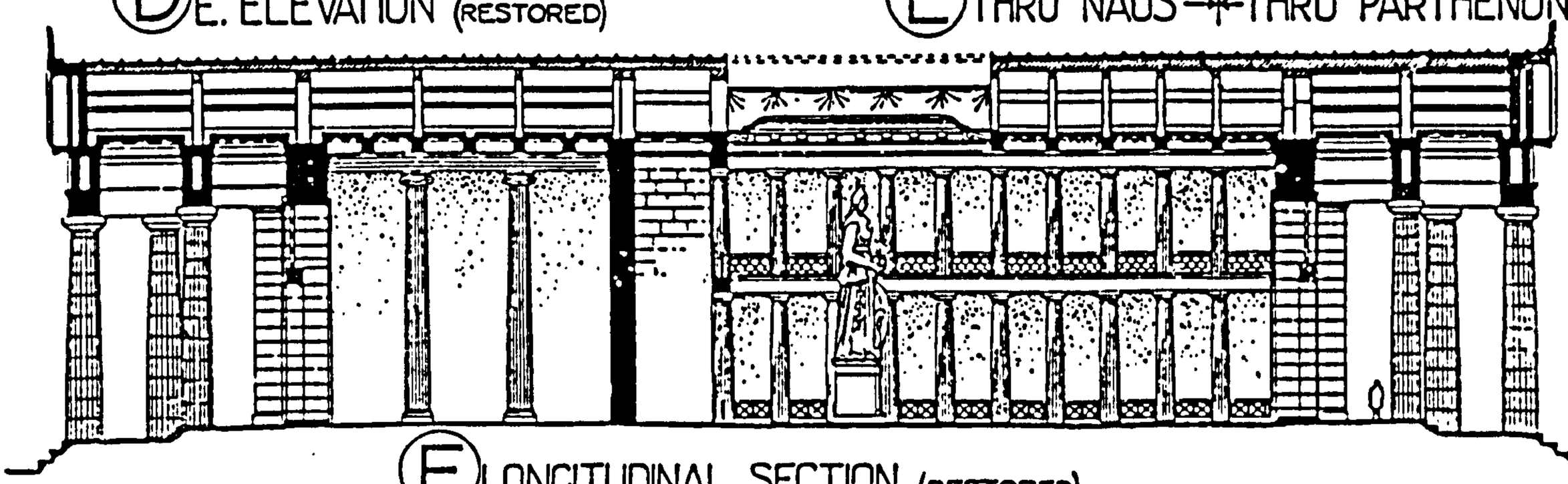
C N.W. ANGLE (RESTORED)



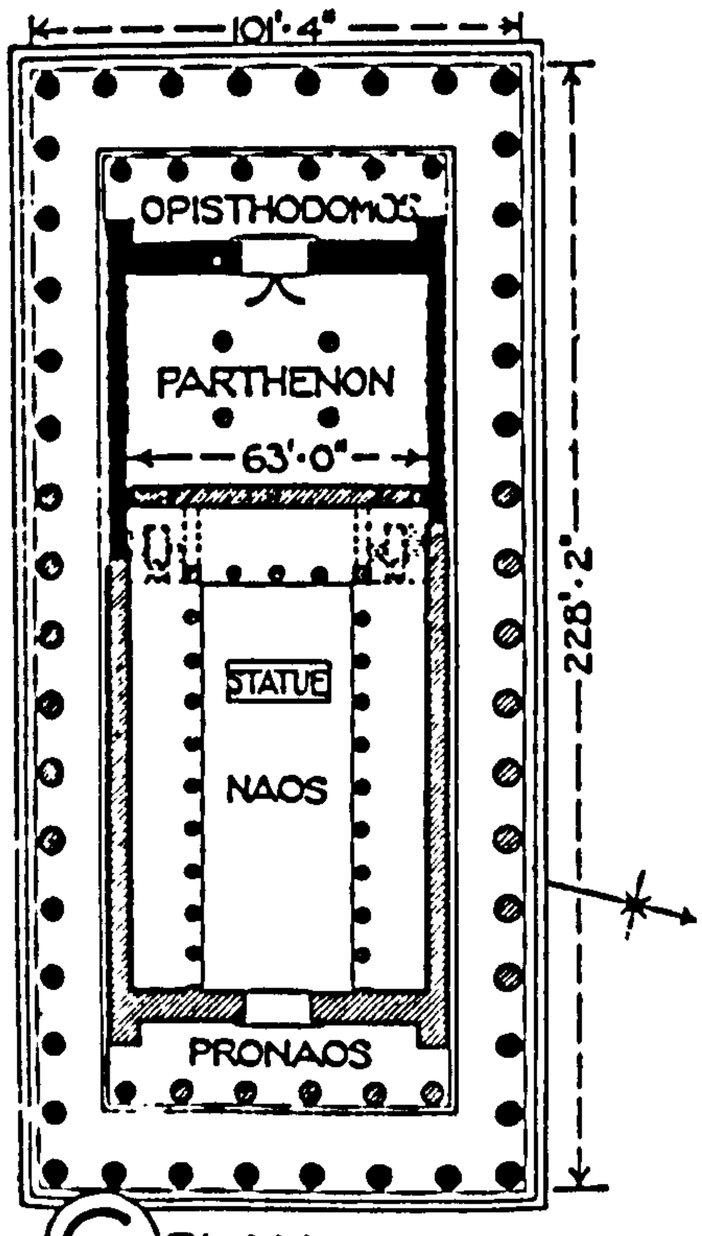
D E. ELEVATION (RESTORED)



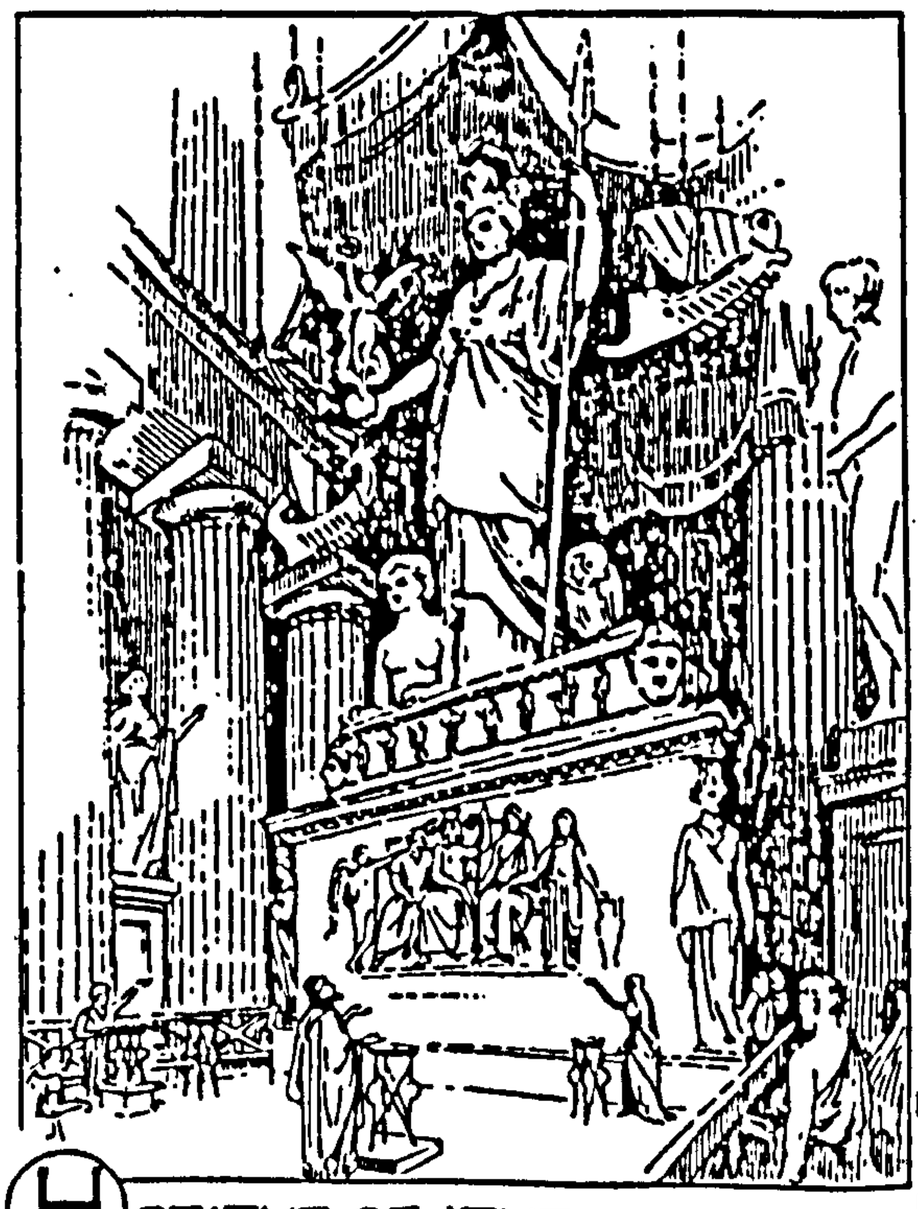
E HALF TRANSVERSE SECTNS. THRO' NAOS + THRO' PARTHENON



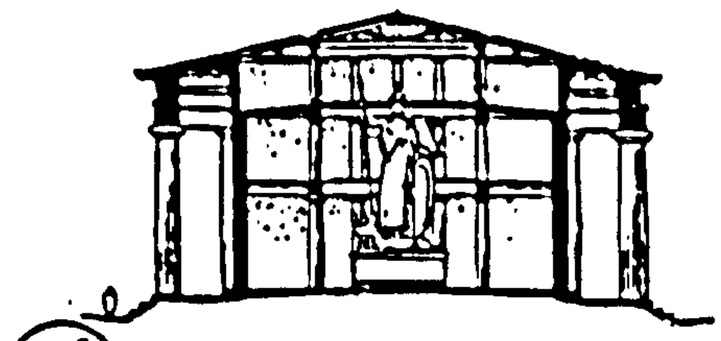
F LONGITUDINAL SECTION (RESTORED)



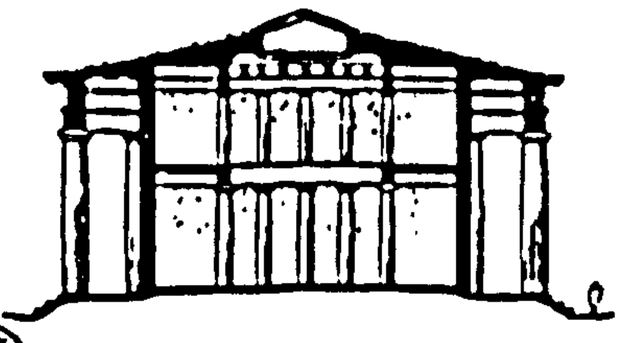
G PLAN (RESTORED)



H STATUE OF ATHENA (RESTORED)



J METHOD OF LIGHTING BY CLEARSTORY (FERGUSSON)



K METHOD OF LIGHTING BY SKYLIGHT (BÖTTICHER)

SCALE FOR ELEVATIONS & SECTIONS

10·FT·0 10 20 30 40 50 60

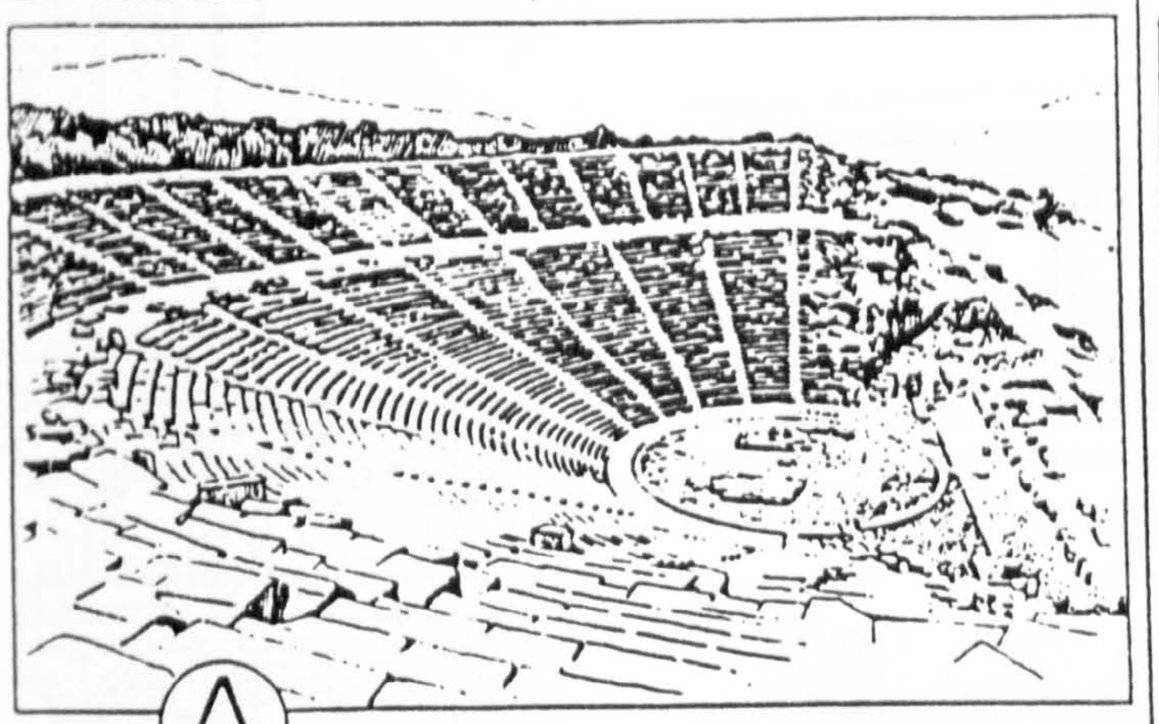
MTRS. 1·0 5 10 15

SCALE FOR PLAN & LIGHTING SECTNS.

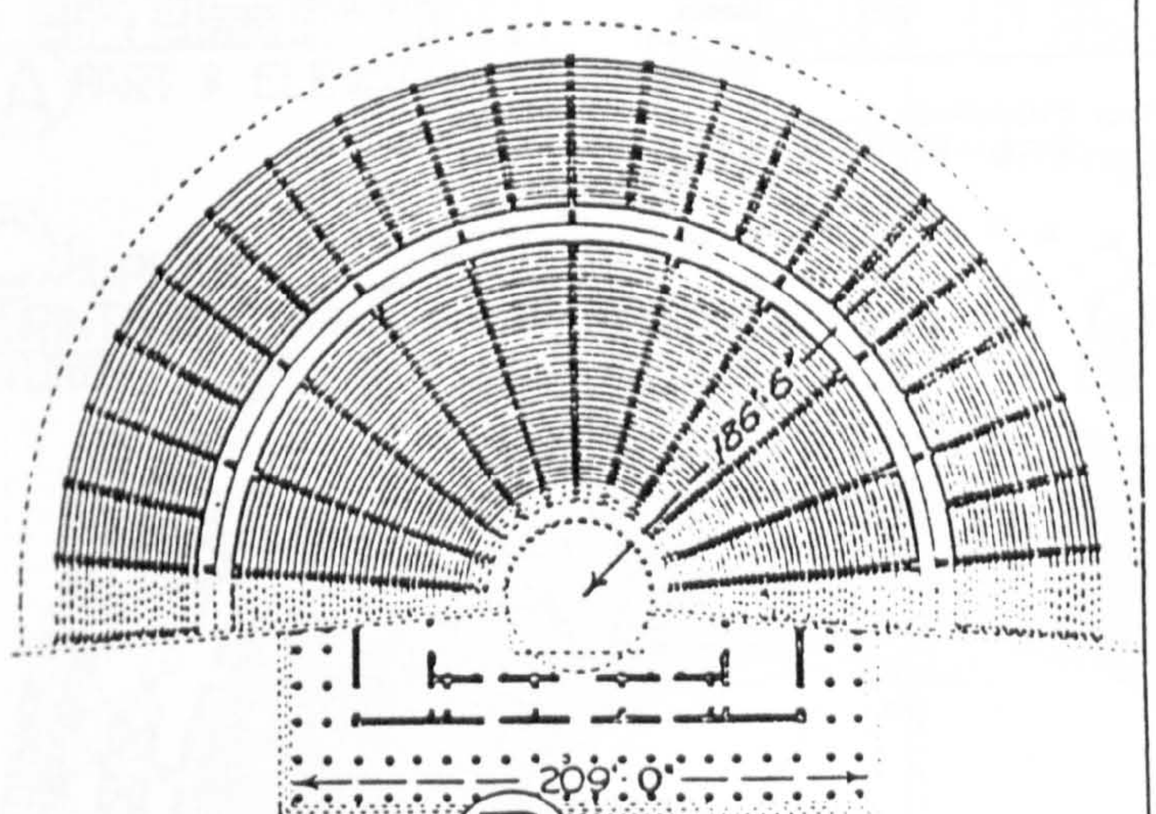
FT. 10 0 50 100

METRES 0 5 10 15 20 25 30

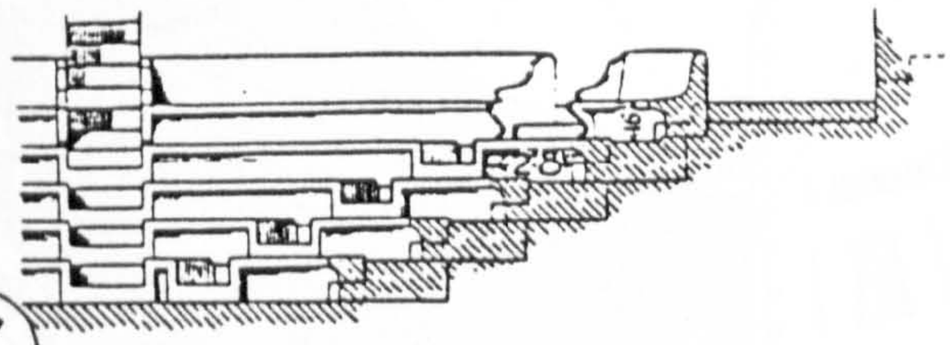
THE THEATRE, EPIDAURUS



A THE THEATRE (AS EXISTING)

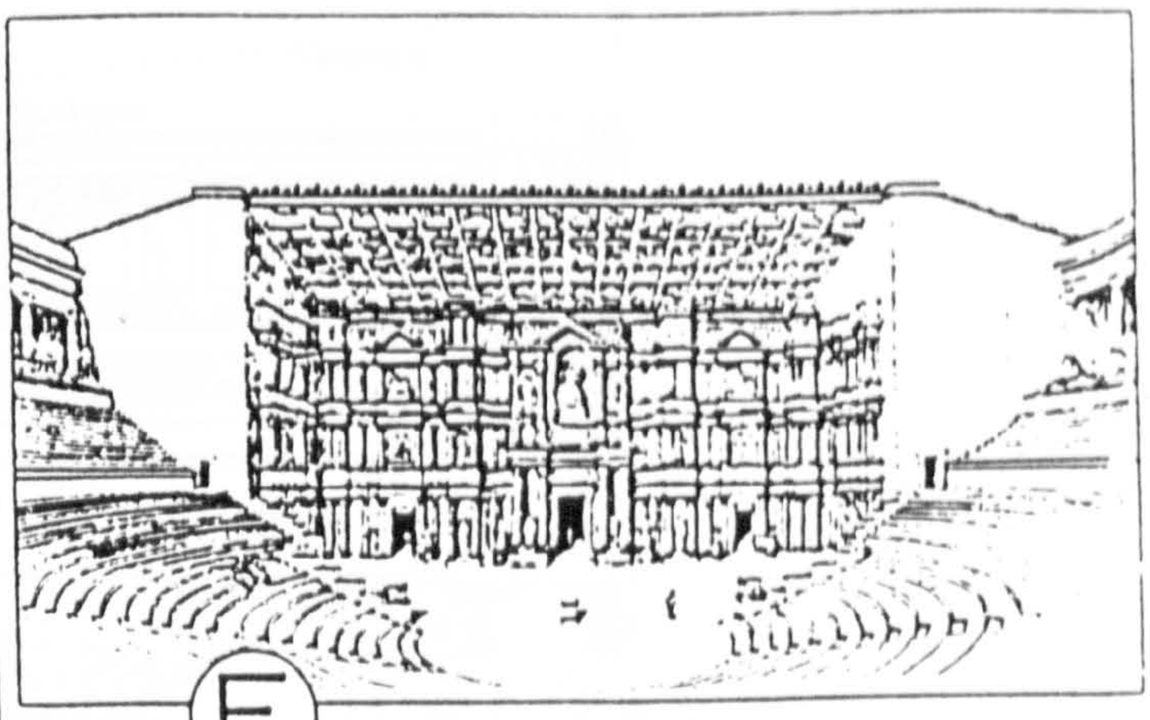


B PLAN

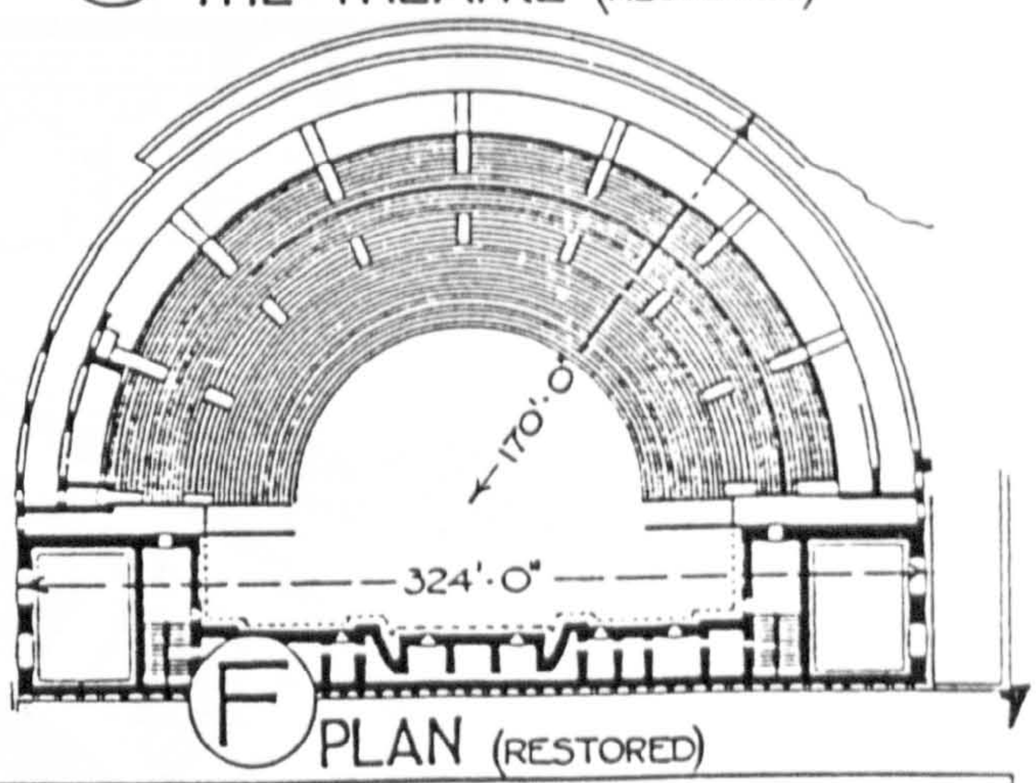


C DETAIL OF SEATING

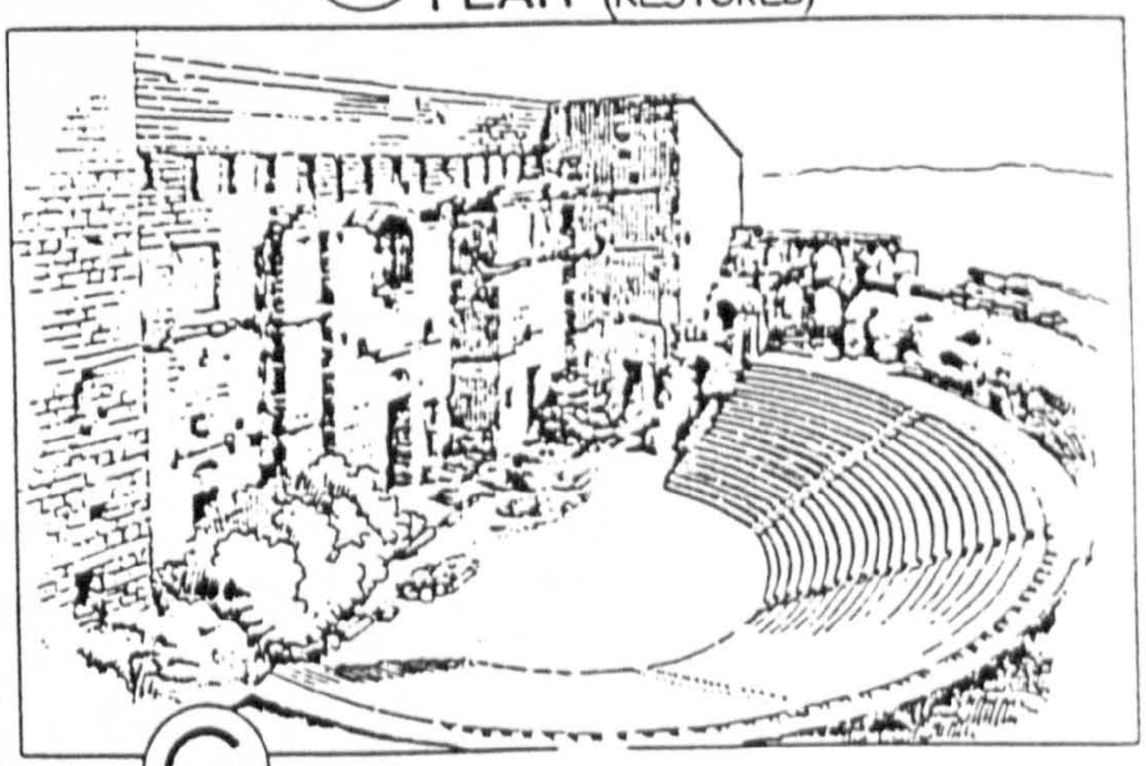
THE THEATRE, ORANGE



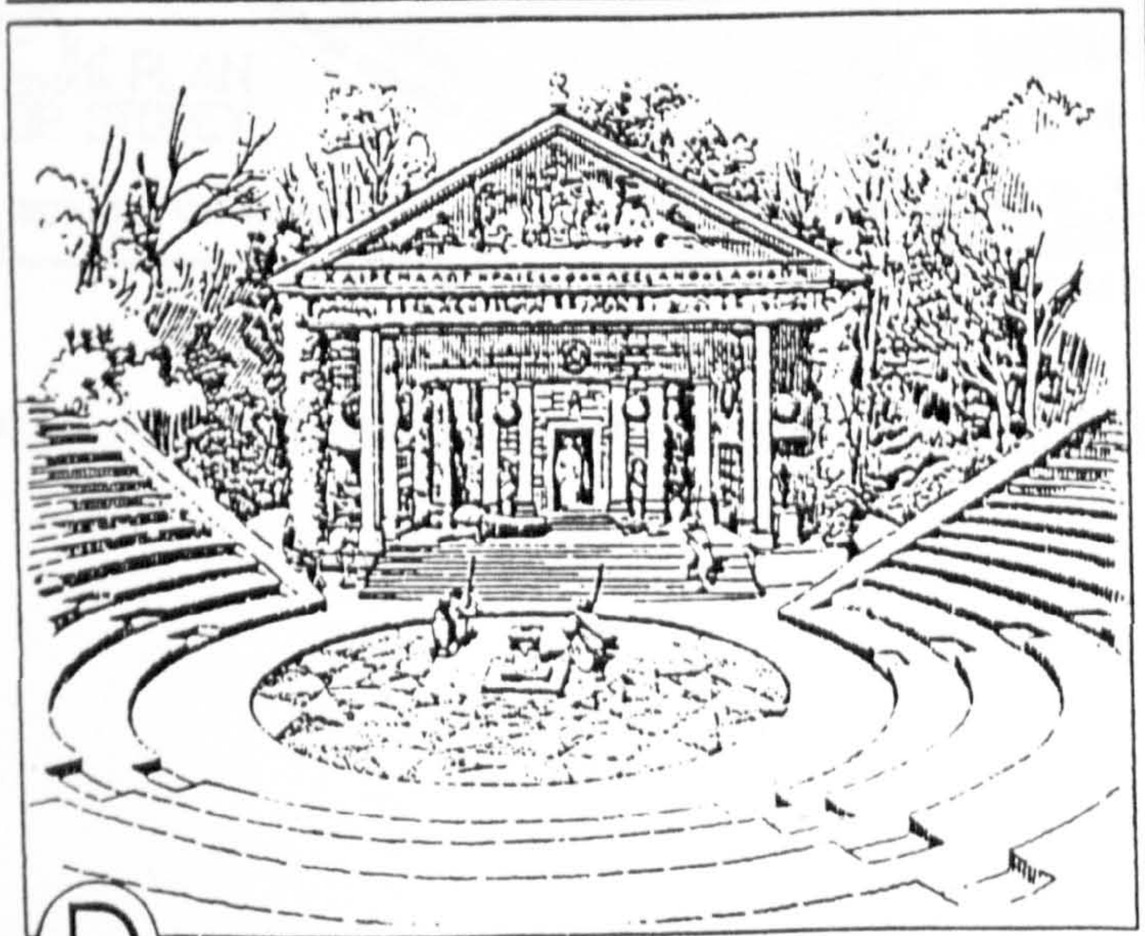
E THE THEATRE (RESTORED)



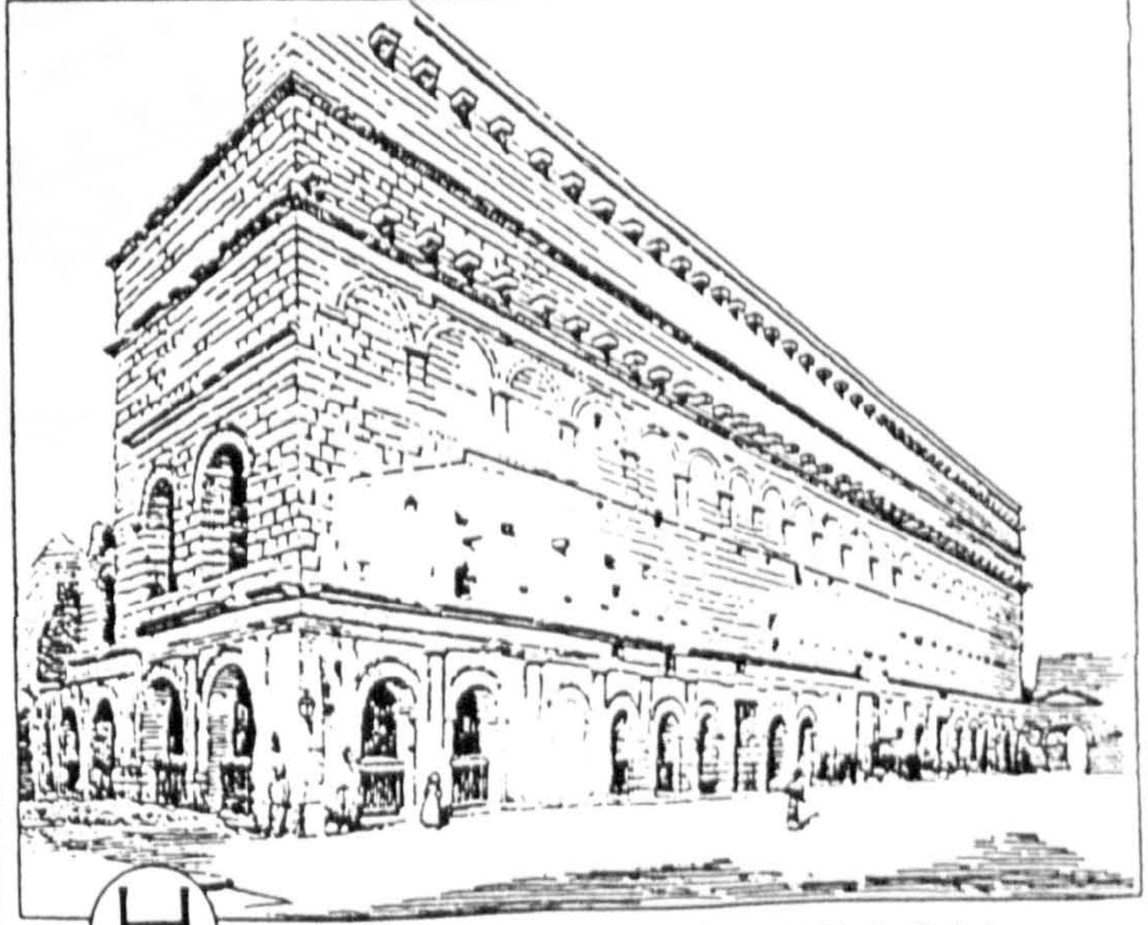
F PLAN (RESTORED)



G AUDITORIUM (AS EXISTING)



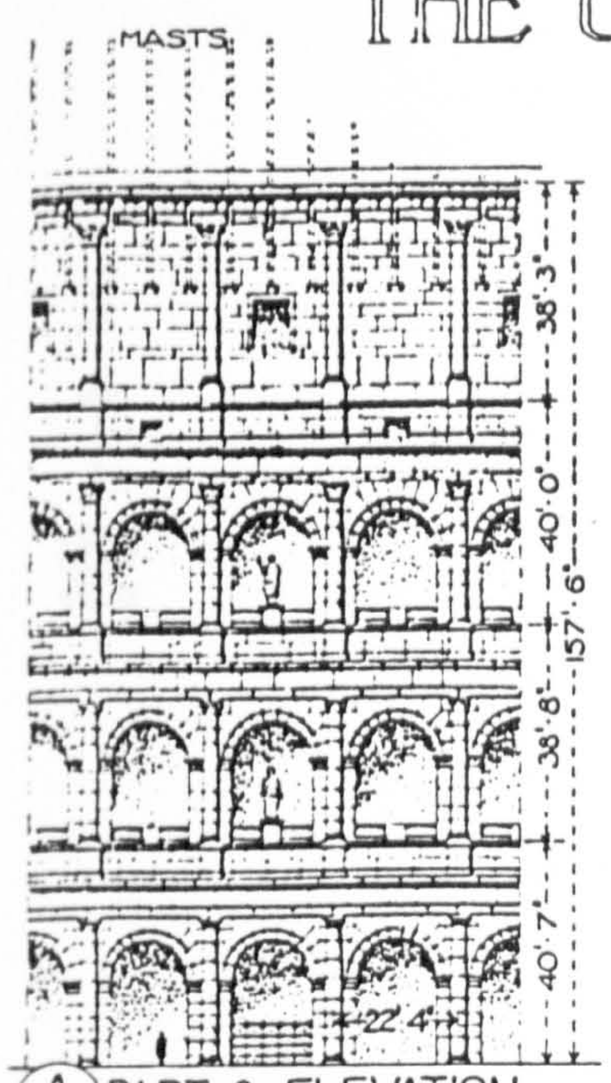
D THE THEATRE: BRADFIELD COLLEGE



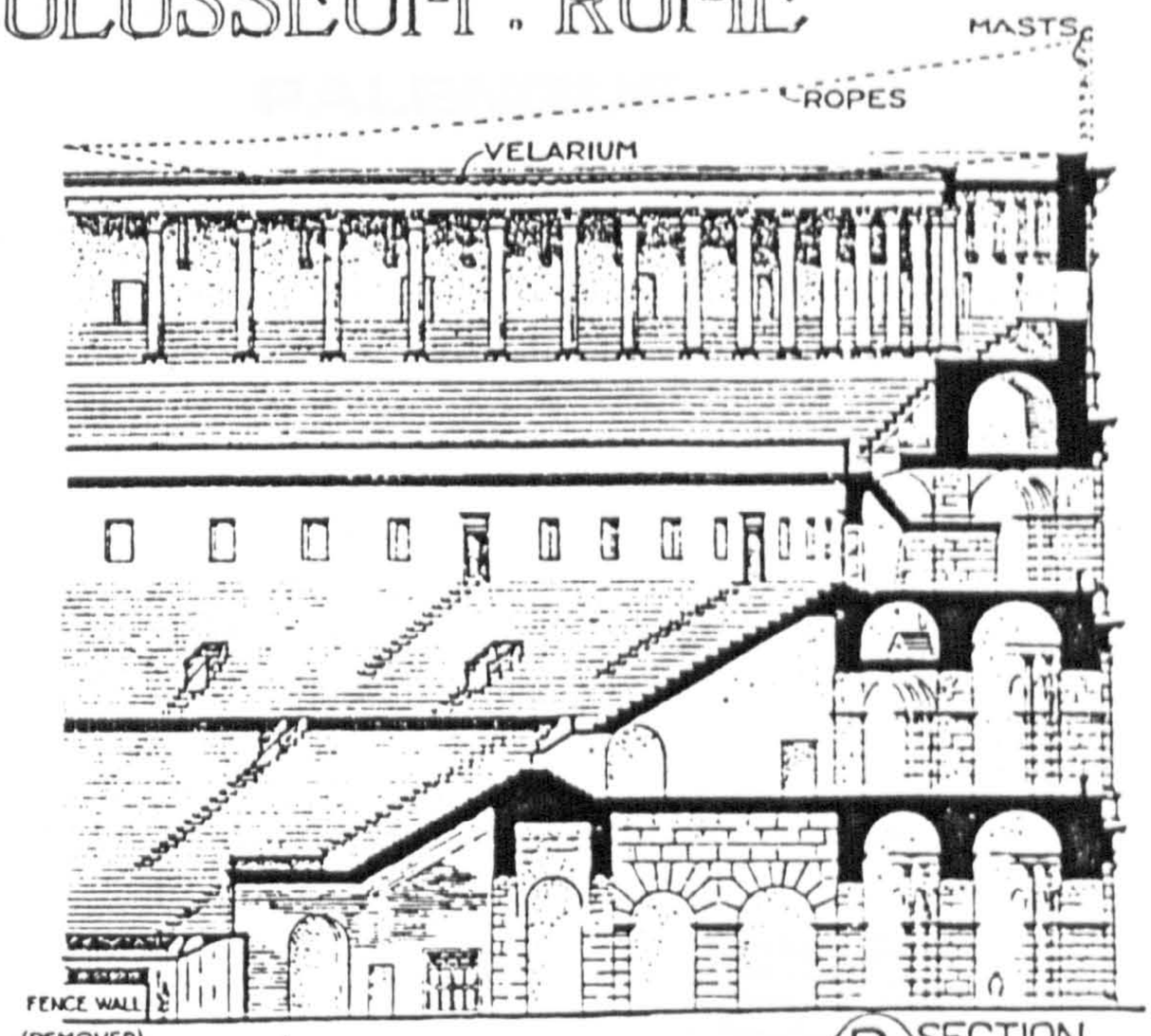
H EXTERIOR SHOWING STAGE WALL

H.3.i Re-constructions of Greek Theatres

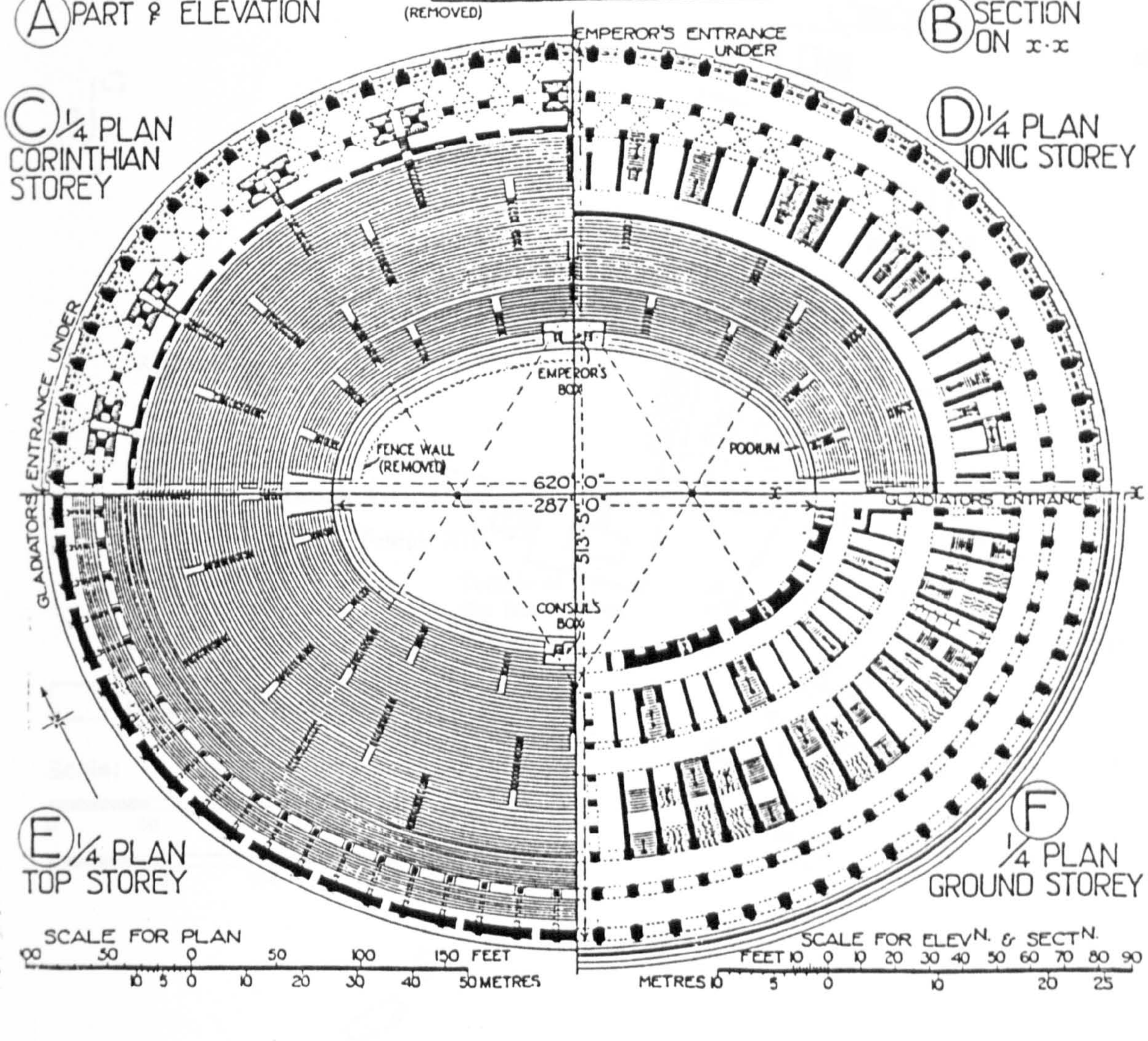
THE COLOSSEUM : ROME



A PART & ELEVATION



B SECTION ON x-x



C 1/4 PLAN CORINTHIAN STOREY

D 1/4 PLAN IONIC STOREY

E 1/4 PLAN TOP STOREY

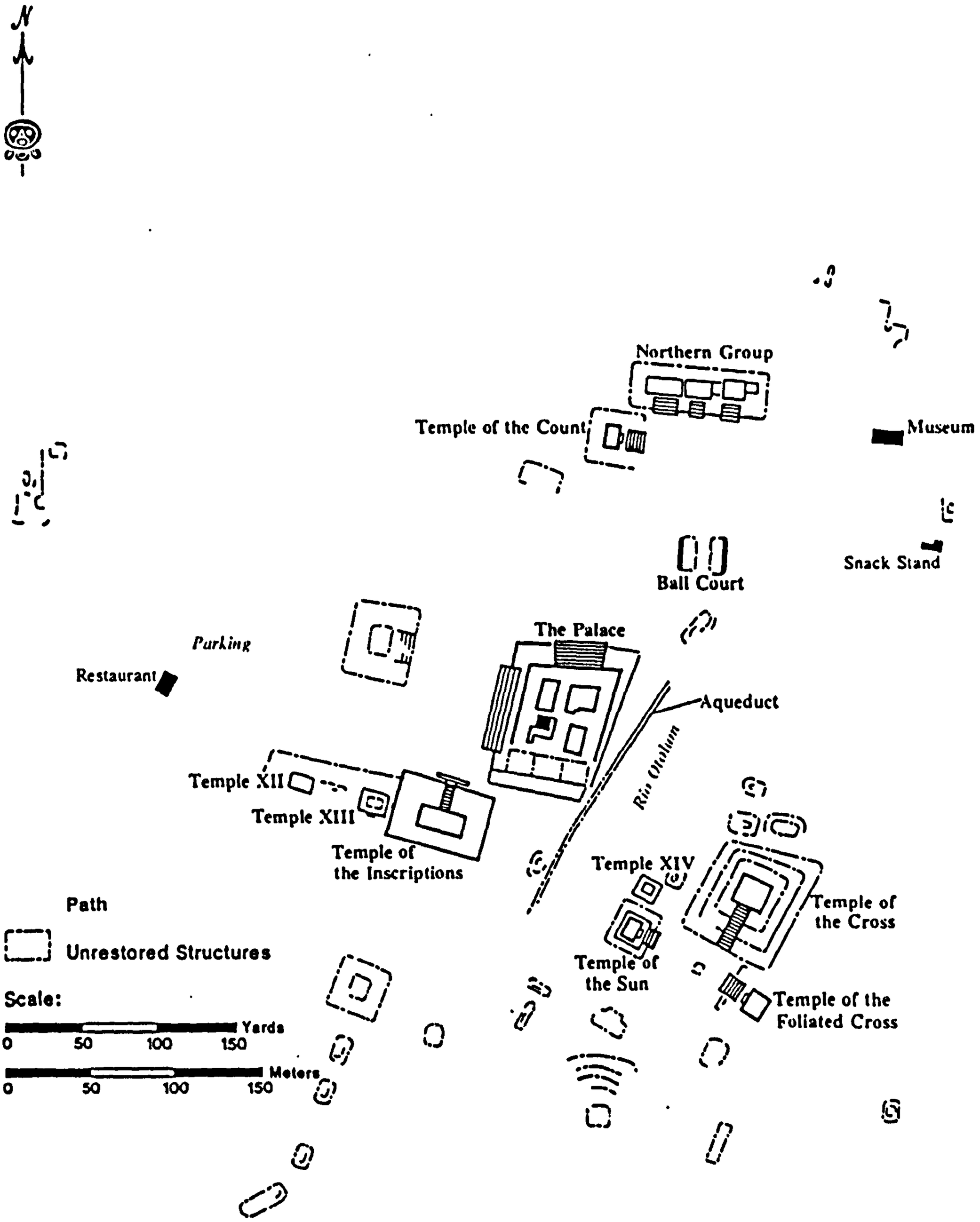
F 1/4 PLAN GROUND STOREY

SCALE FOR PLAN
100 50 0 50 100 150 FEET
10 5 0 10 20 30 40 50 METRES

SCALE FOR ELEVN. & SECTN.
FEET 10 0 10 20 30 40 50 60 70 80 90
METRES 10 5 0 10 20 25

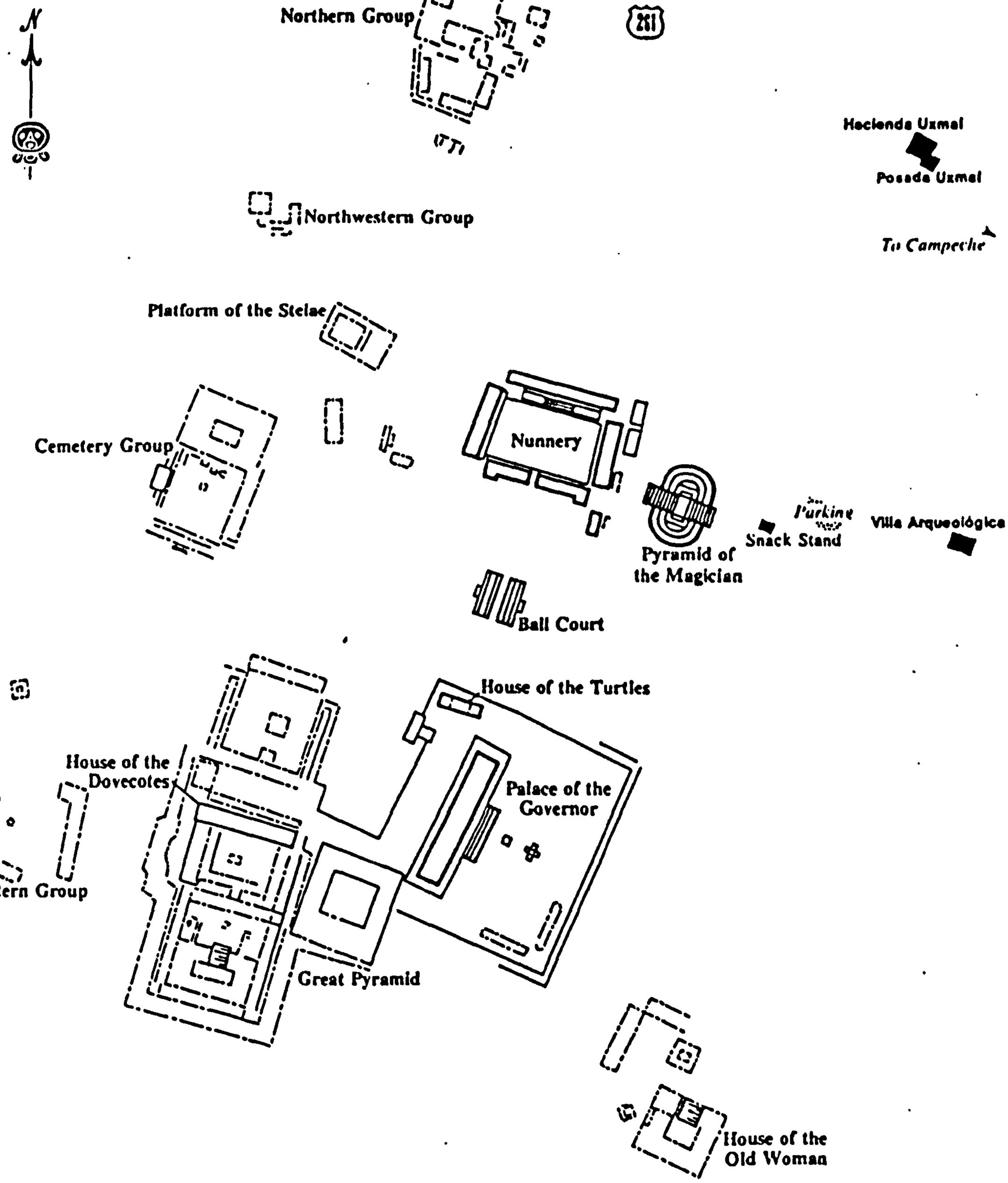
H.4.i The Colloseum, Rome: Note the Inwardness of the Space

PALENQUE

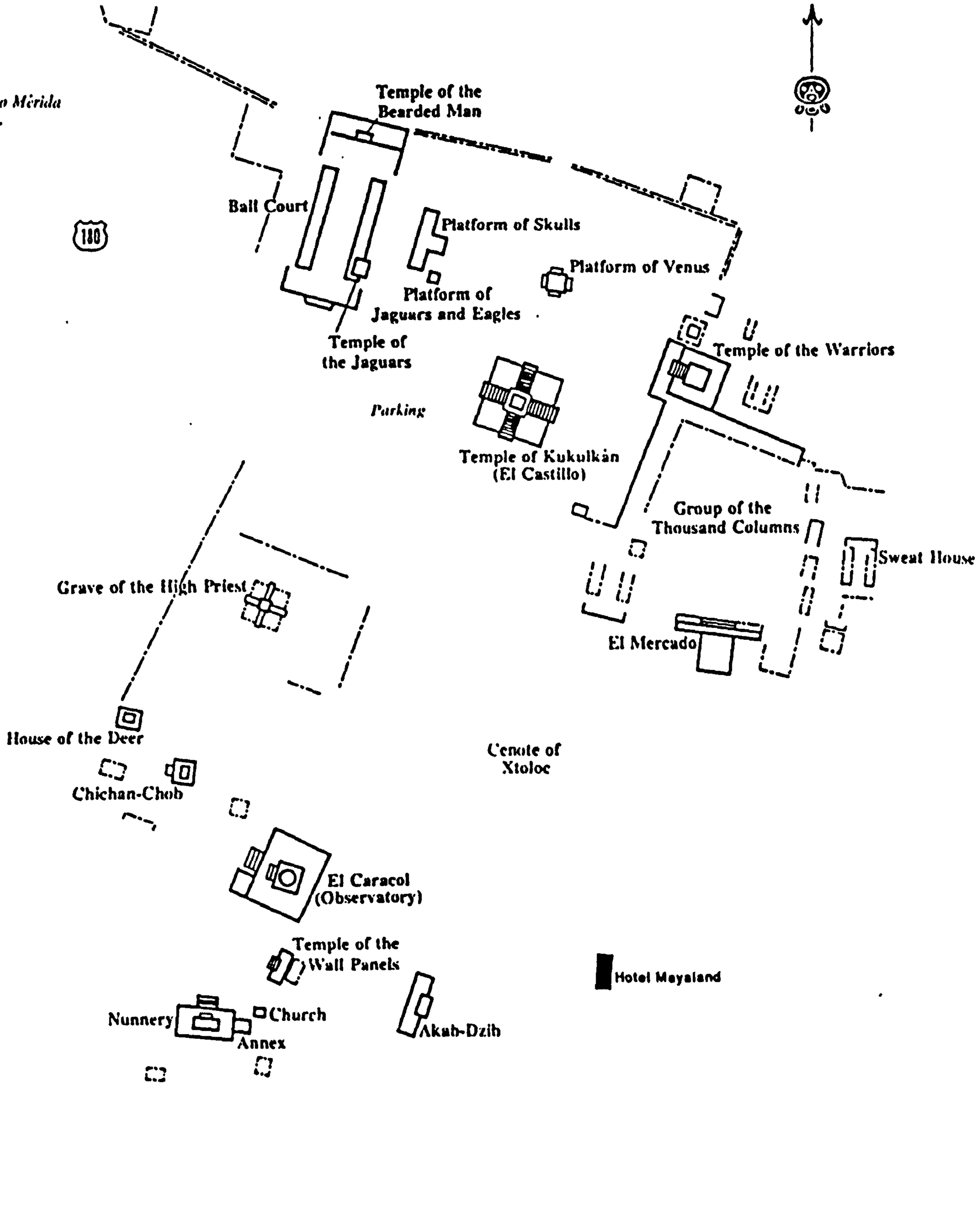


H.5.i Site Plan, Palenque

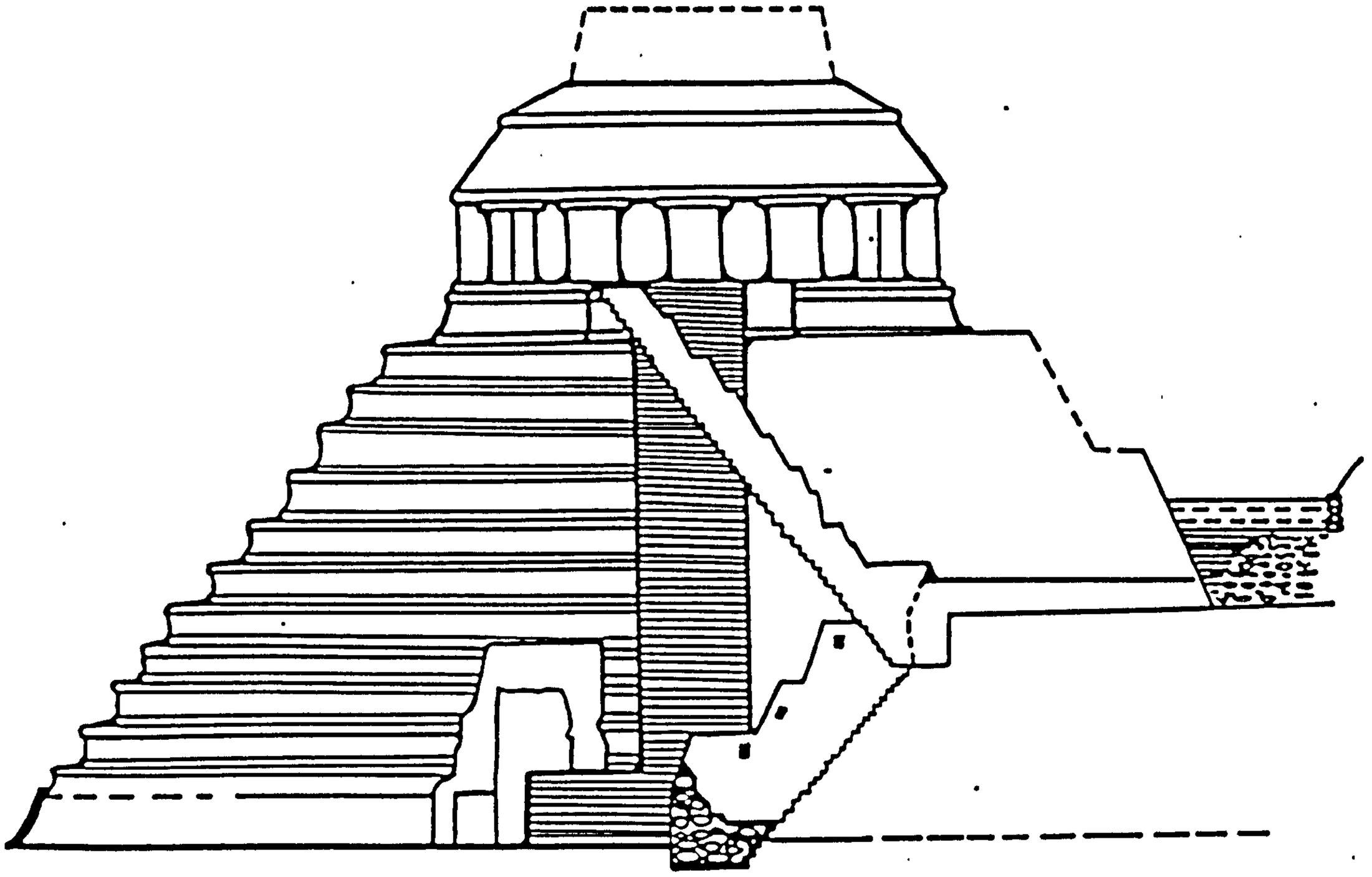
UXMAL



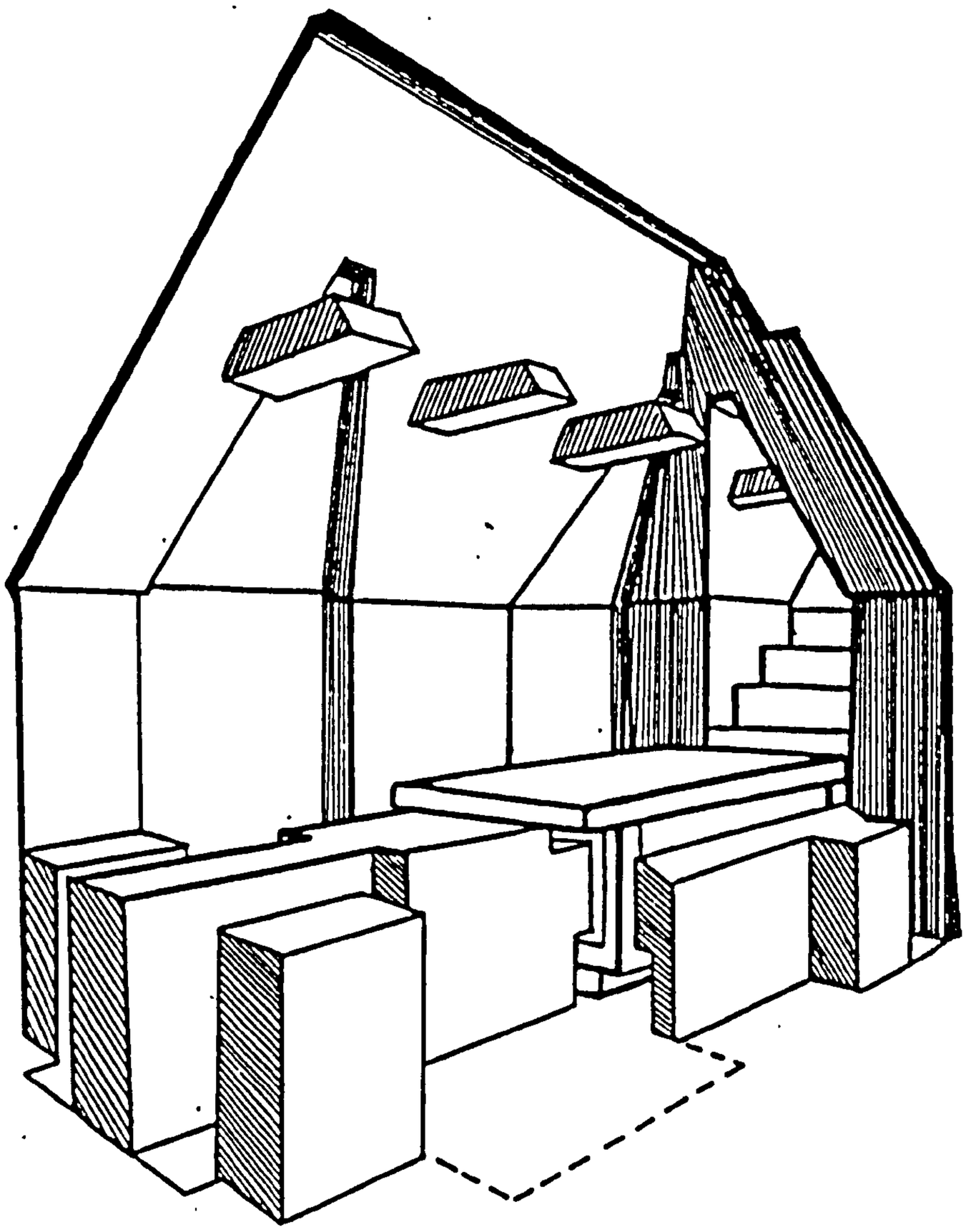
H.5.ii Site Plan, Uxmal



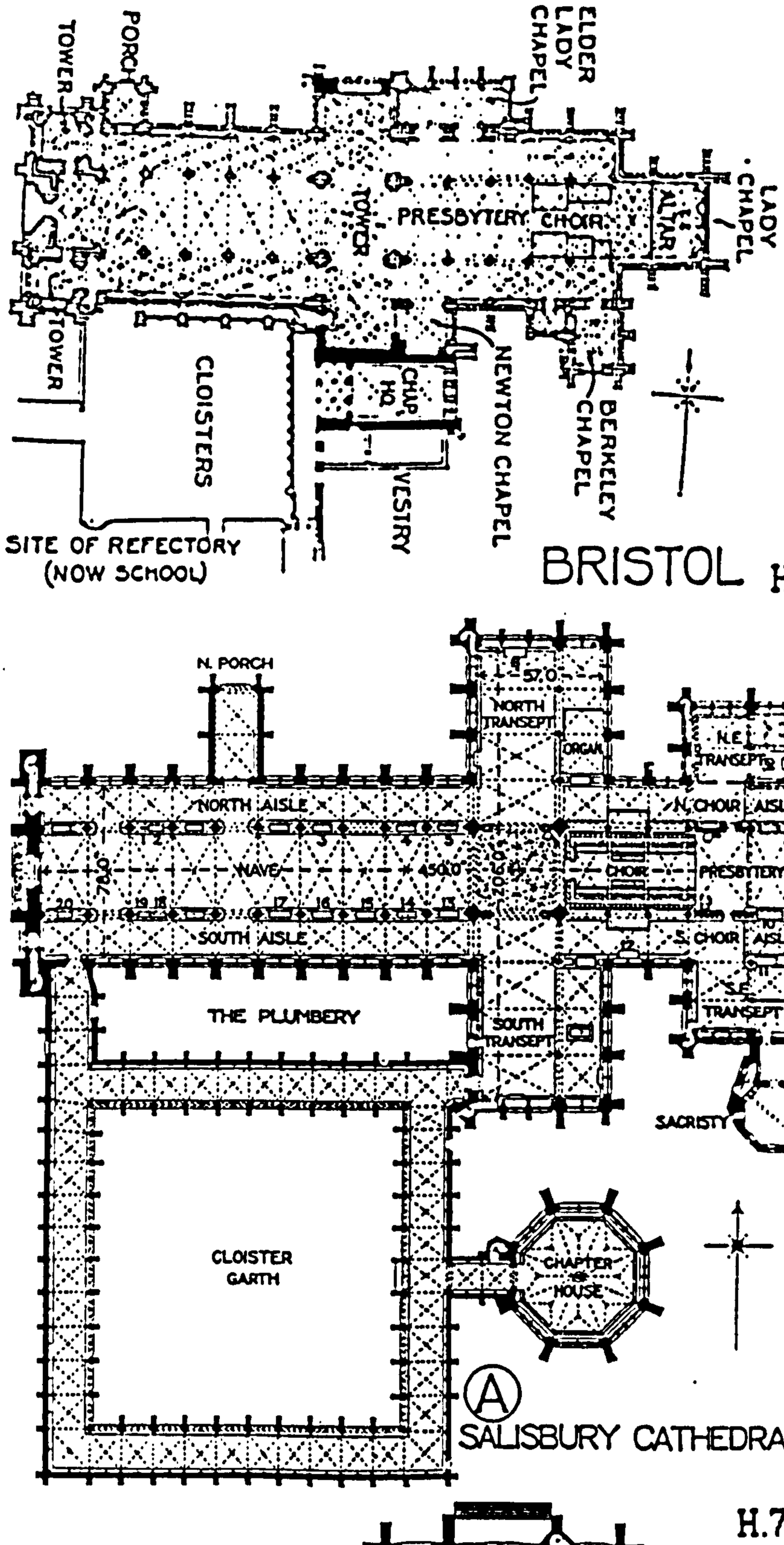
H.5.iii Site Plan, Chichen Itza



H.6.i Elevation and Section of the Temple of the Inscriptions, Palenque



H.6.ii The Burial Chamber with Sarcophagus, Palenque



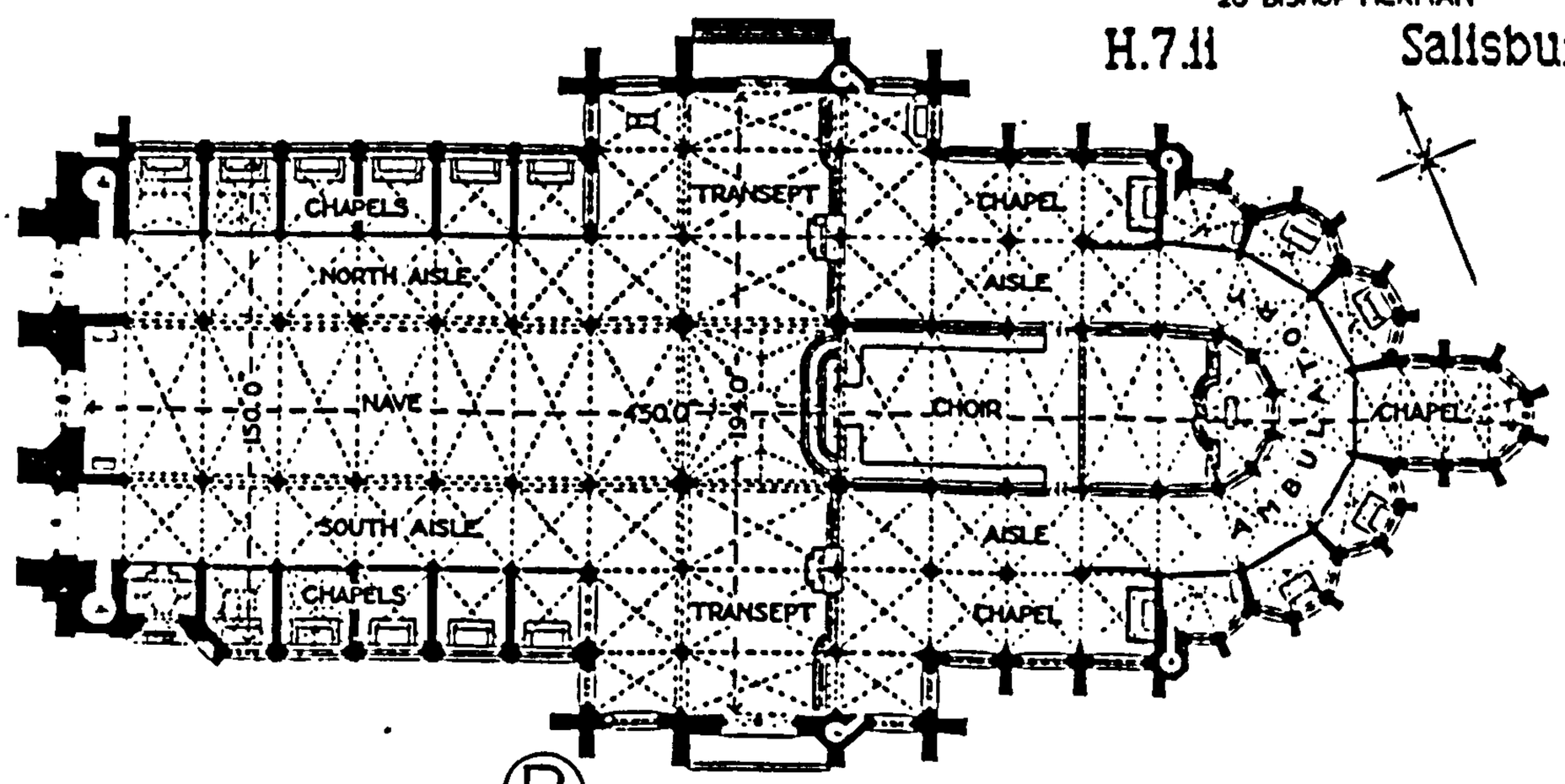
BRISTOL H.7.i

Bristol Cathedral

A SALISBURY CATHEDRAL

H.7.ii

Salisbury Cathedral

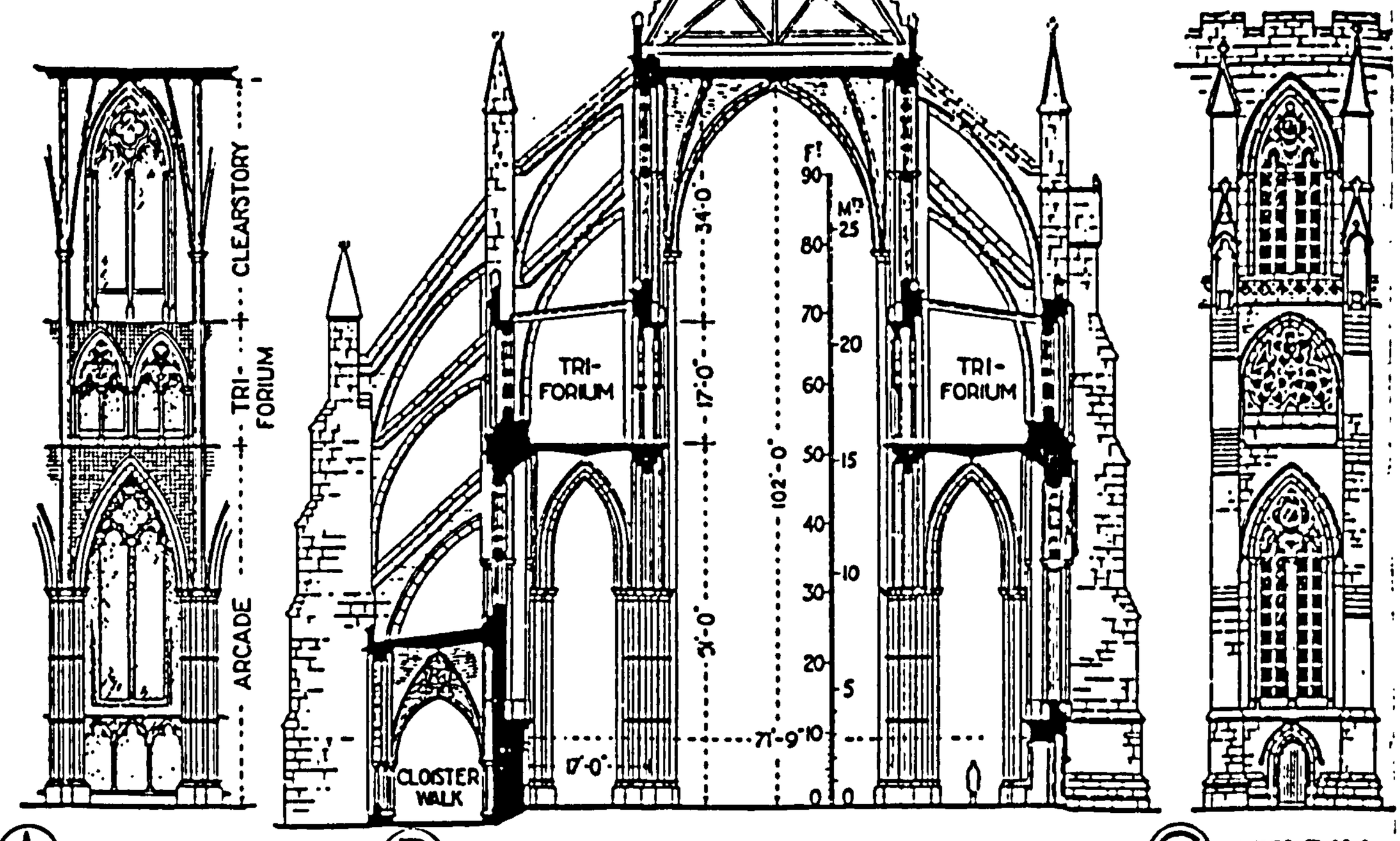


B AMIENS CATHEDRAL

H.7.iii

Amiens Cathedral

WESTMINSTER ABBEY



A INT: BAY.

B TRANSVERSE SECTION THRO' NAVE Y-Y

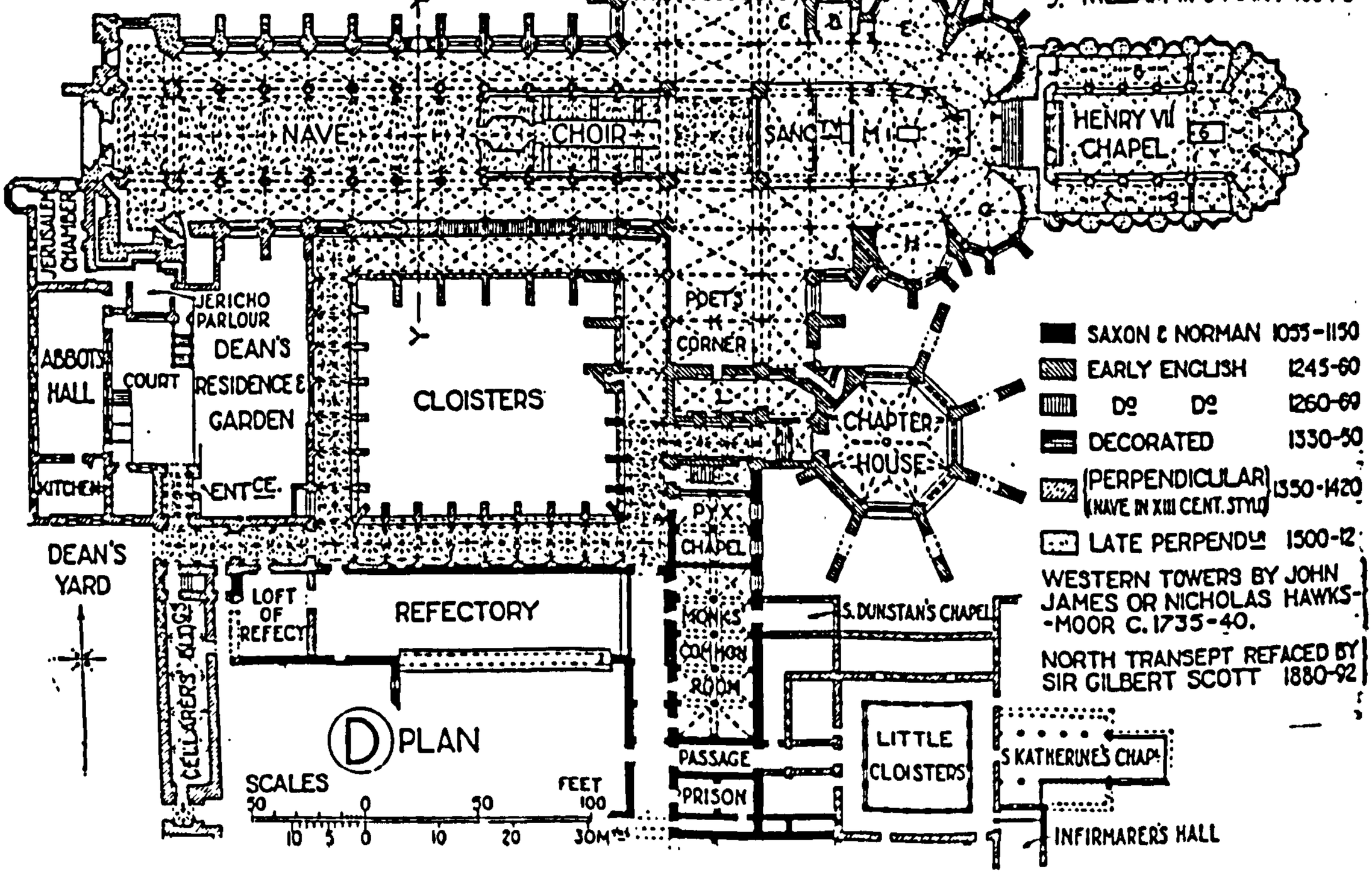
C EXT: BAY

CHAPELS

A. St ANDREW
B. St MICHAEL
C. St JOHN EVANGLST
D. ISLIPS CHAPEL
E. St JOHN BAPTIST
F. St PAUL
G. St NICHOLAS
H. St EDMUND
J. St BENEDICT
K. St BLAIZE
L. St FAITH
M. St EDWARD

MONUMENTS

1. THE CONFESSOR'S SHRINE 1066
2. HENRY III 1272
3. QUEEN ELEANOR 1290
4. EDWD I 1307
5. EDWARD III 1377
6. HENRY VII & QUEEN 1509
7. MARY QN of SCOTS 1587
8. QN ELIZABETH 1603
9. WILLIAM III & MARY 1694-5



D PLAN

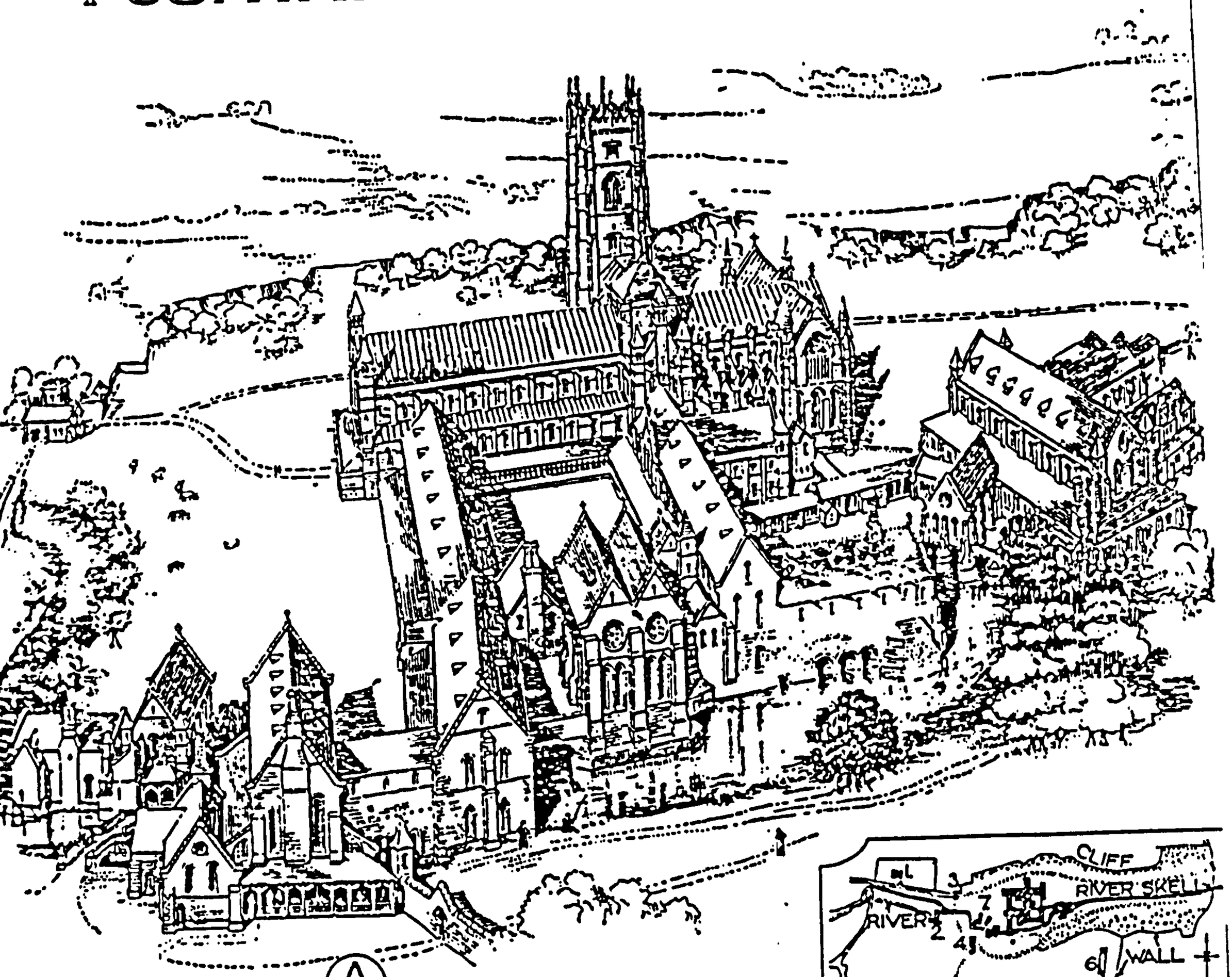
- SAXON & NORMAN 1055-1130
- EARLY ENGLISH 1245-60
- Do Do 1260-69
- DECORATED 1330-50
- PERPENDICULAR (NAVE IN XIII CENT. STYLE) 1350-1420
- LATE PERPENDLR 1500-12

WESTERN TOWERS BY JOHN JAMES OR NICHOLAS HAWKSMOOR C. 1735-40.

NORTH TRANSEPT REFACED BY SIR GILBERT SCOTT 1880-92

H.8.1 Westminster Abbey: Gothic Structure

FOUNTAINS ABBEY: YORKSHIRE



A VIEW FROM S. (RESTORED)

B BLOCK PLAN

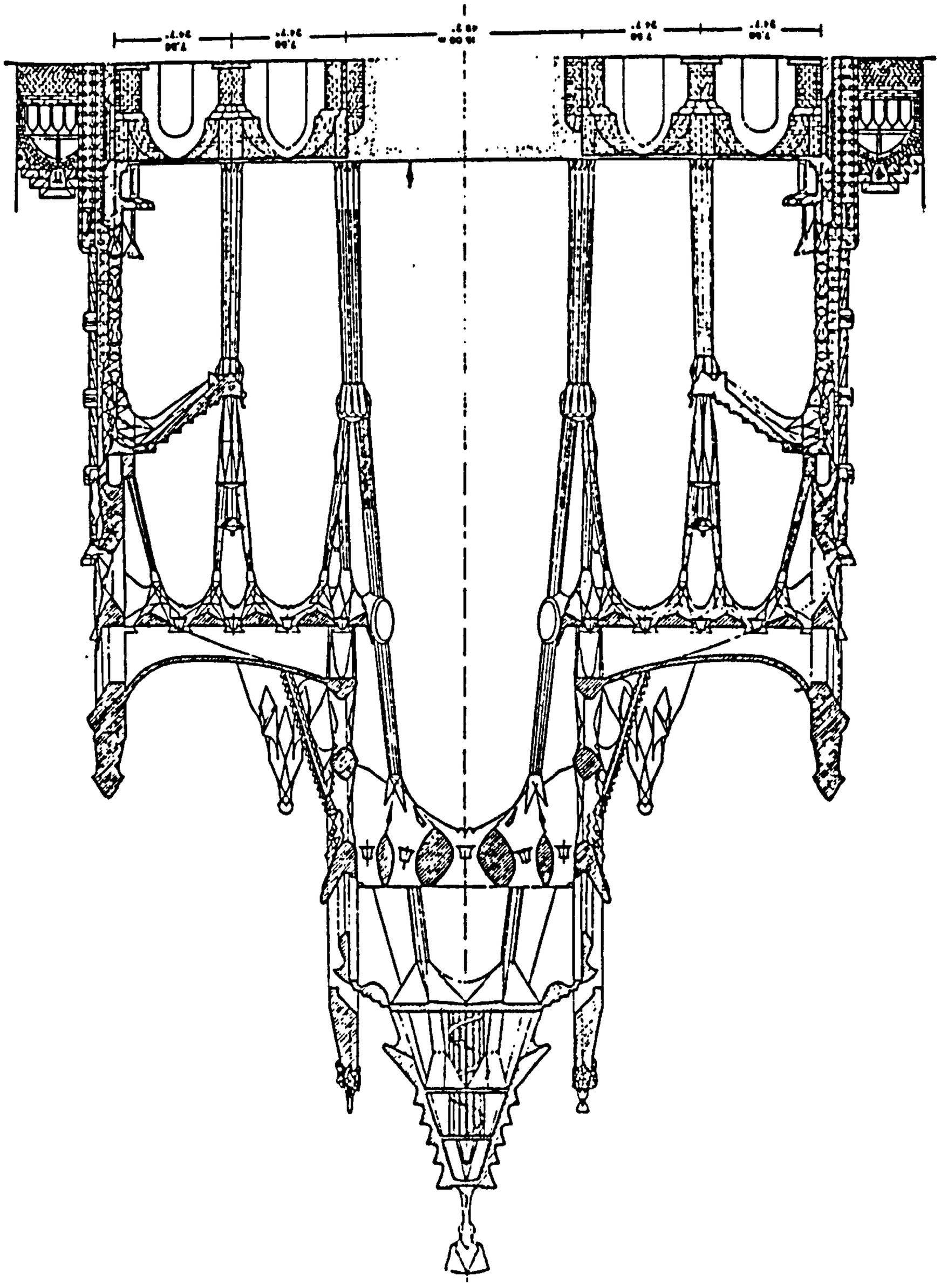
1. FOUNTAINS HALL
2. THE MILL
3. GATEHOUSE
4. BREWHOUSE
5. THE ABBEY
6. FISHPONDS
7. OUTER COURT

a. HUBY'S TOWER
b. WESTERN GUEST HOUSE
c. EASTERN GUEST HOUSE
d. INFIRMARY OF CONVERSI
e. GARDE ROBE
f. KITCHEN
g. MONKS' REFECTORY
h. CALEFACTORY
i. UNDERCROFT: MONKS' DORMITORY
j. INFIRMARY KITCHEN
k. ABBOT'S HOUSE
l. CELLS

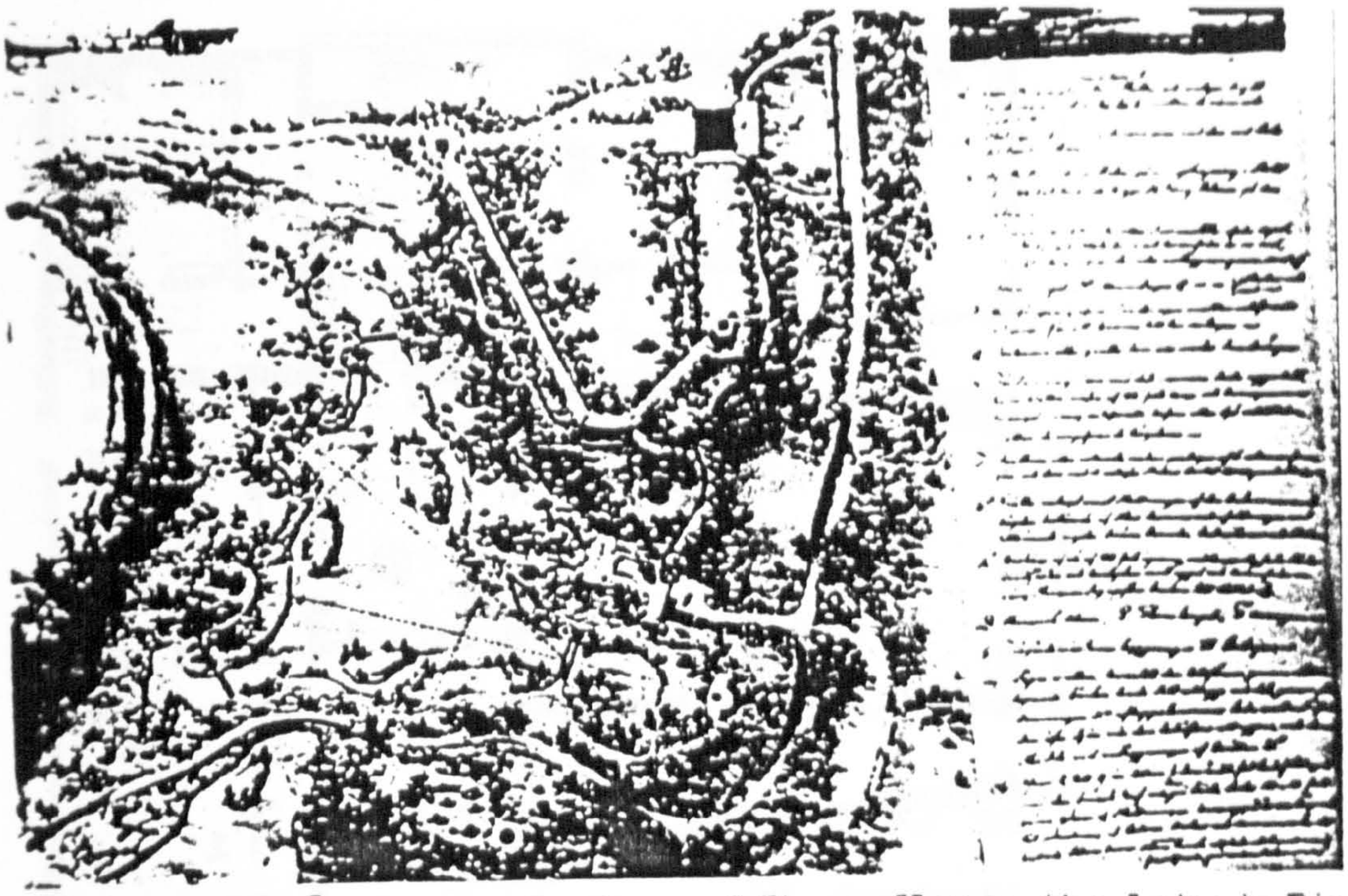
THE CHURCH
NAVE
CHOIR
CHAPEL OF 9 ALTARS
CEMETERY
CLOISTER
CHAPTER HOUSE
CORRIDOR
CELLAR
CHAPEL
INFIRMARY HALL
DORMITORY
HOSPITIUM
RIVER SKELL
PARTS EXISTING
PARTS DESTROYED
FEET 100 50 0 100 200
METRES 10 0 10 20 30 40 50 60

C PLAN

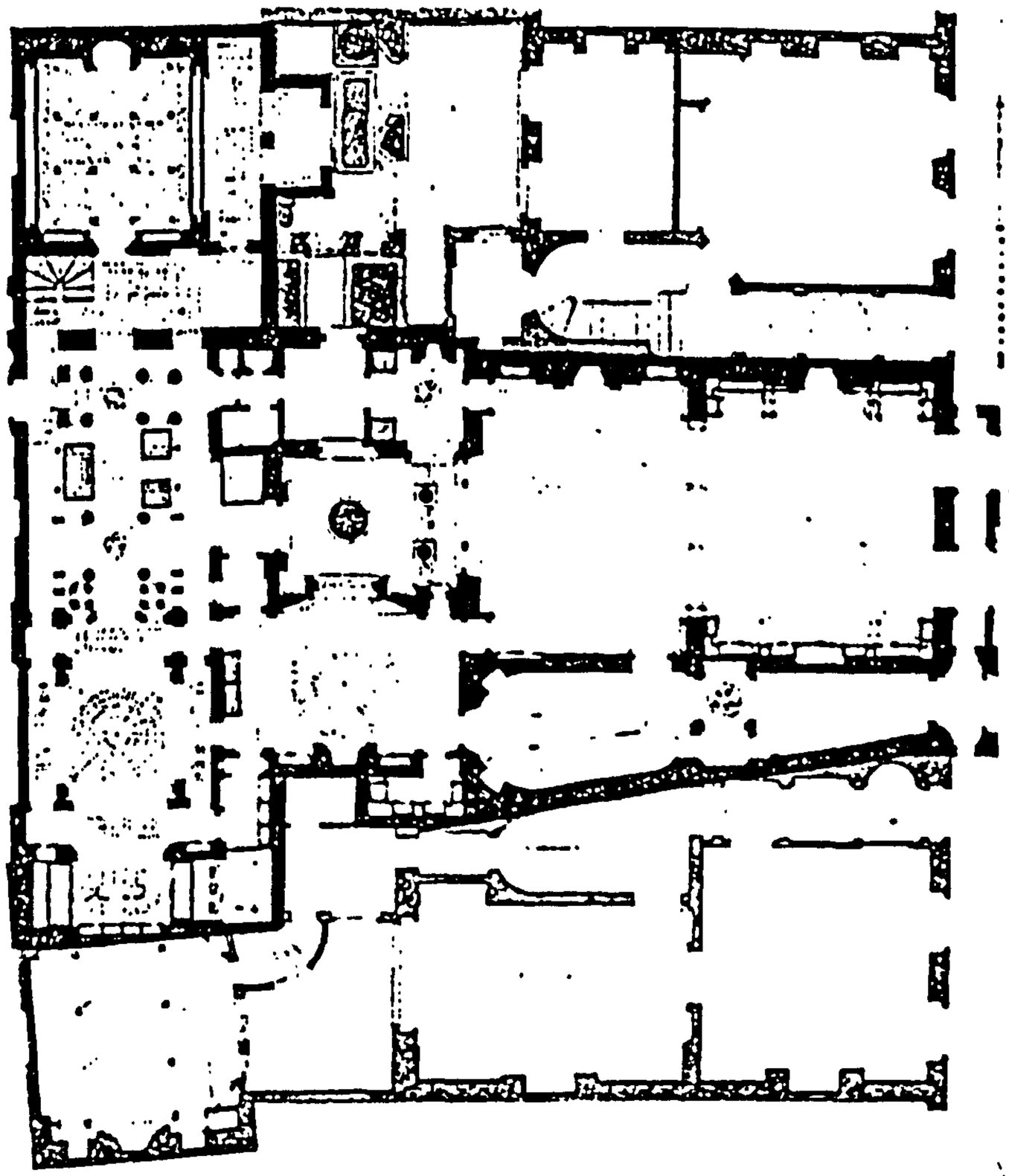
H.9i Fountains Abbey: An Indication of the Way the Gothic



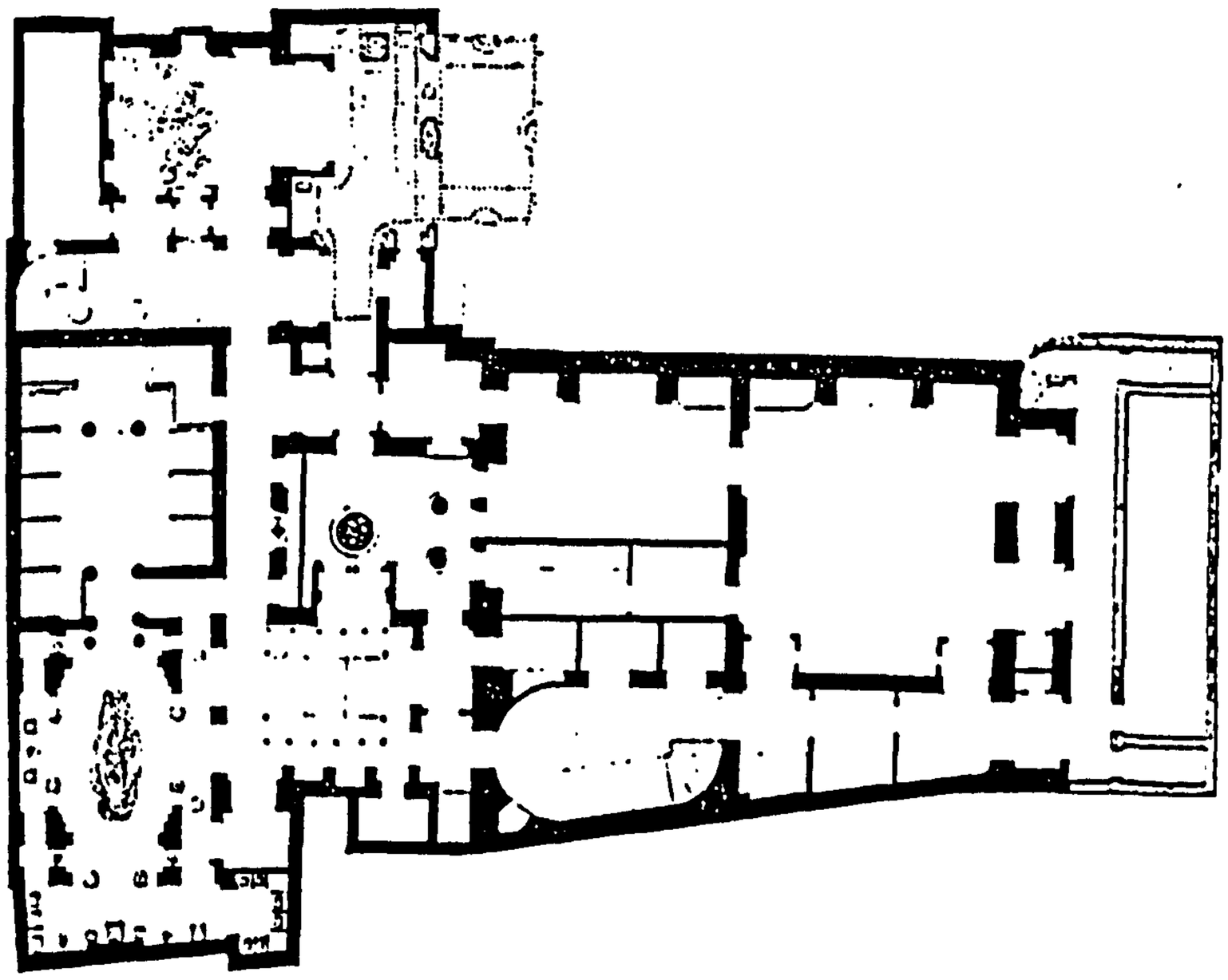
H.10.1 Gaudi's "Sagrada Familia" - Recent Gothic. The Drawing is Upside Down to Mimic the Structural Models Gaudi Made



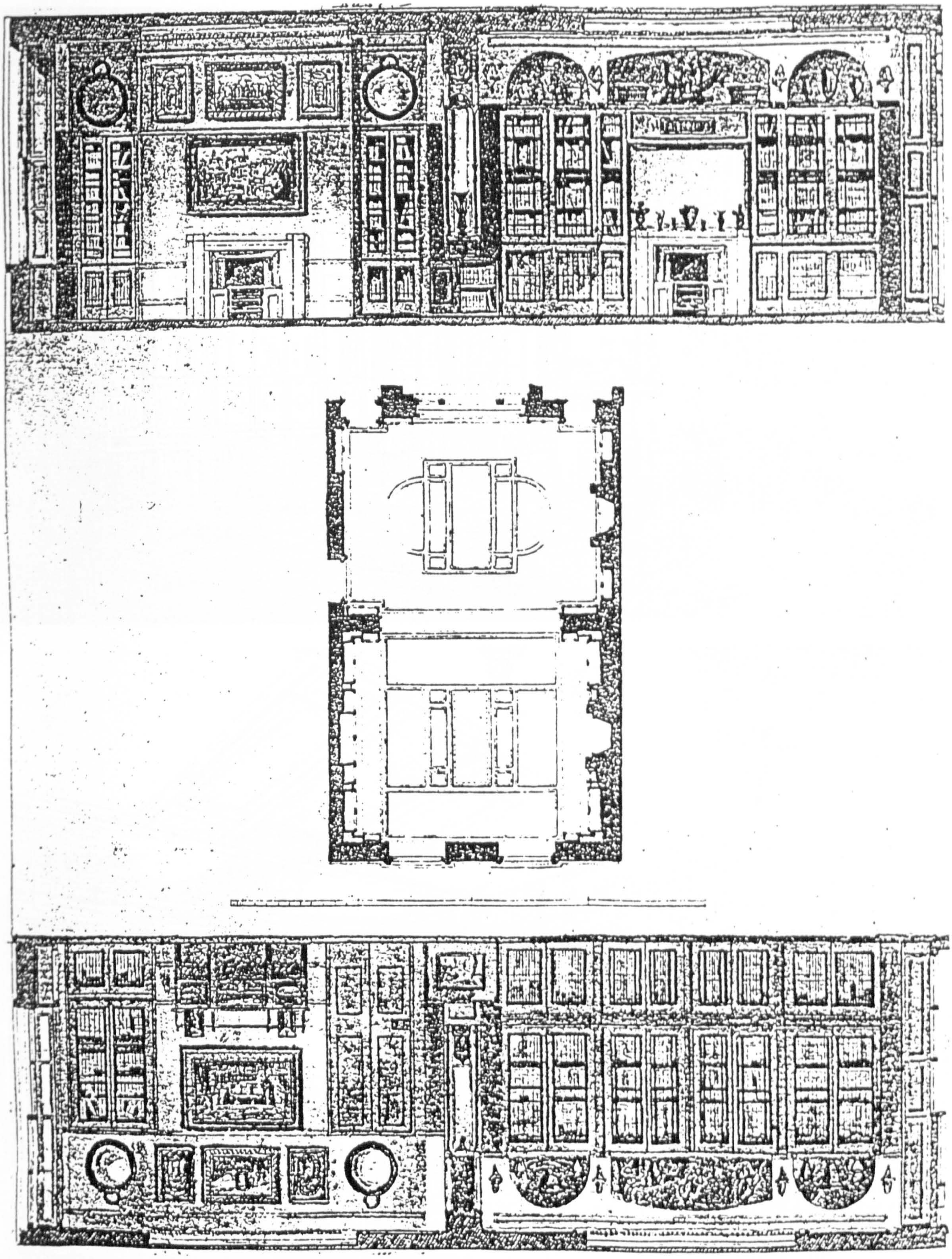
H.111 Map of the Gardens of Stowe House: the Lake is Discernible



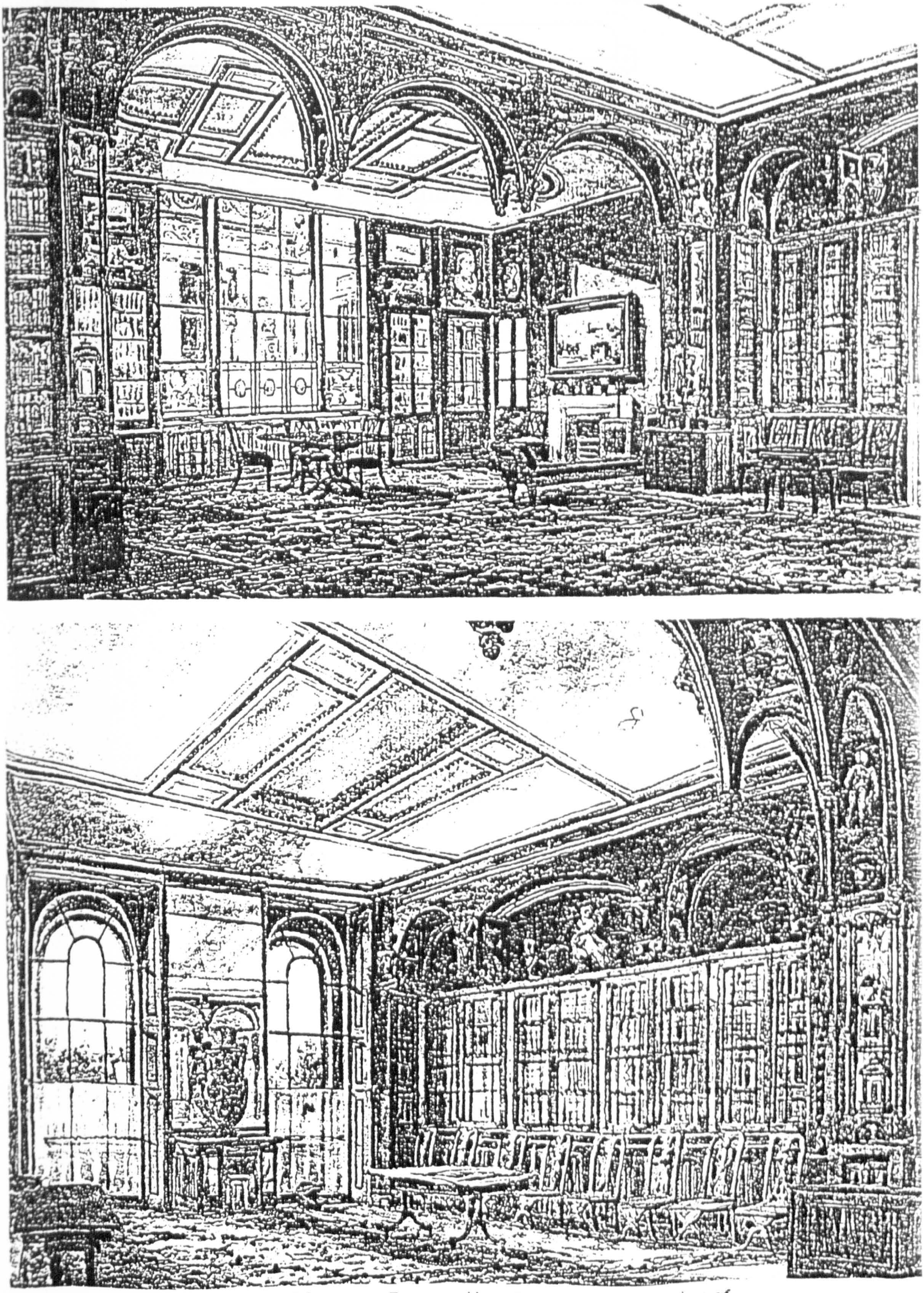
H.12.i Sir John Soane's Museum: Plan of Basement



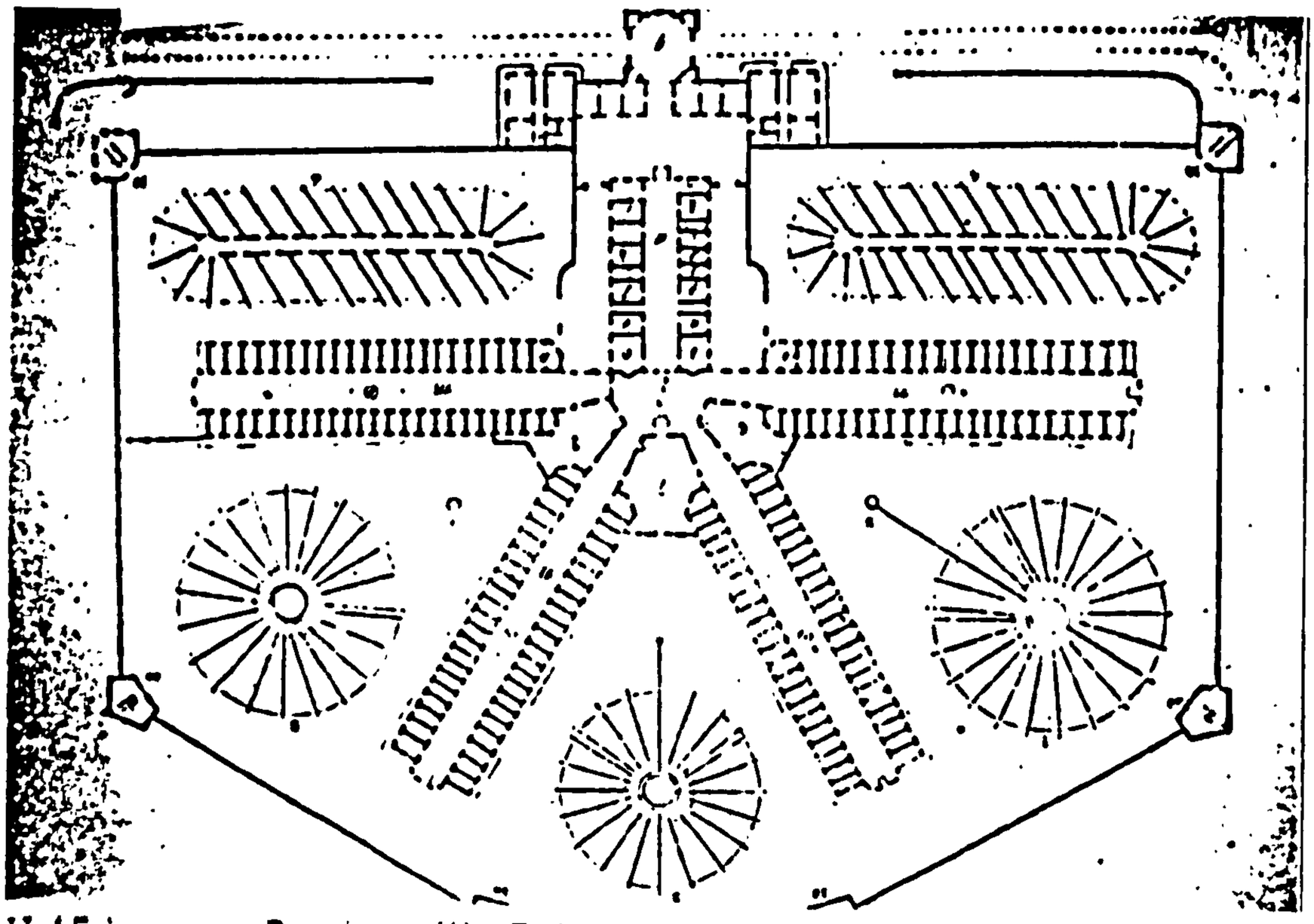
H.12.ii Sir John Soane's Museum: Plan of Ground Floor, with Library, Dining and Breakfast Rooms



H.13.1 Sir John Soane's Museum: Plan and Elevations (Drawn by Soane) of Library and Dining Room



H.14.i Sir John Soane's Museum: Perspective Sketches of Interior of Dining Room and Library



H.15.i Pentonville Prison

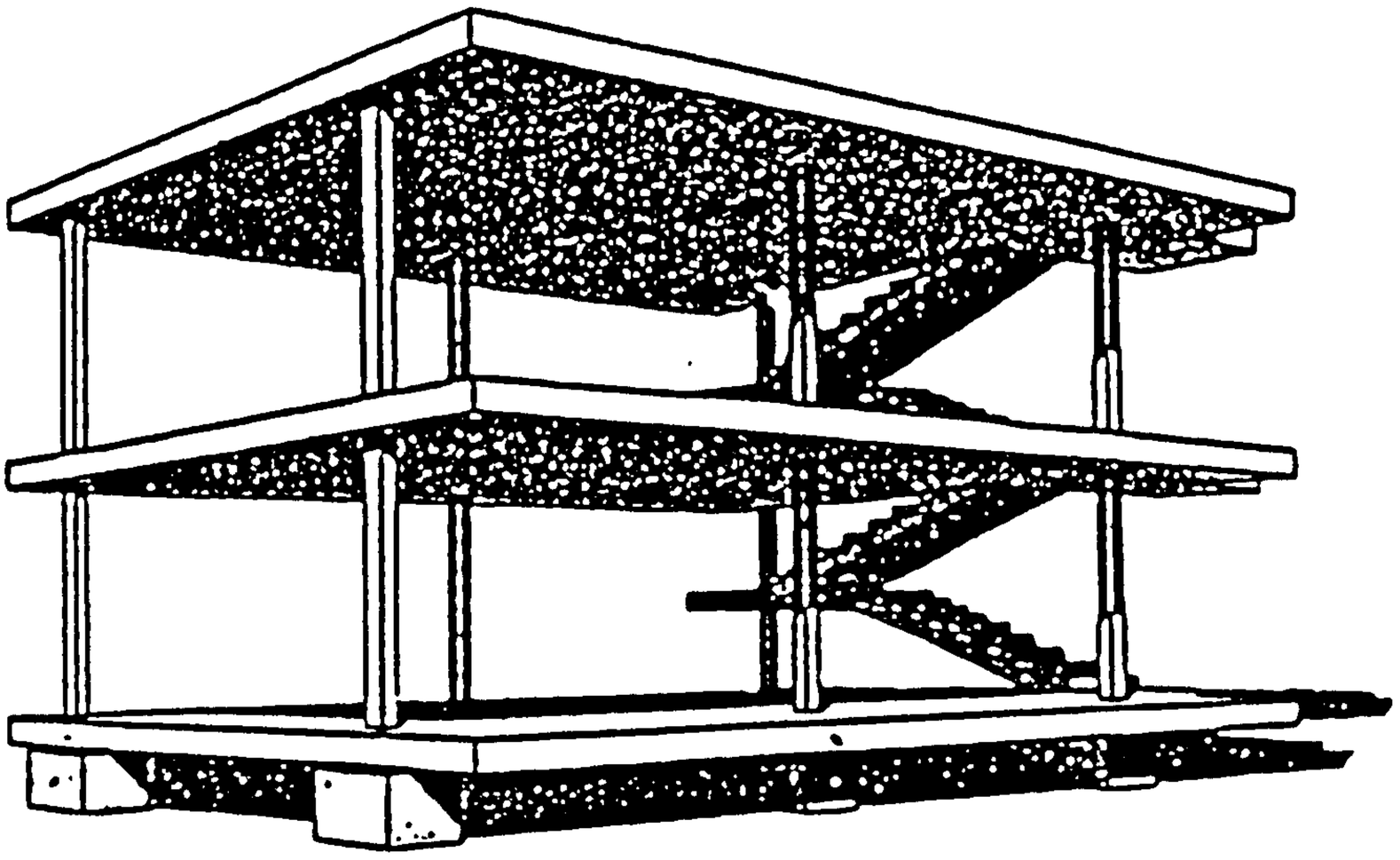


Fig.8. Charles-Edouard Jeanneret. Dom-Ino skeleton. 1914-15: the structural generator of the architect's later vocabulary.

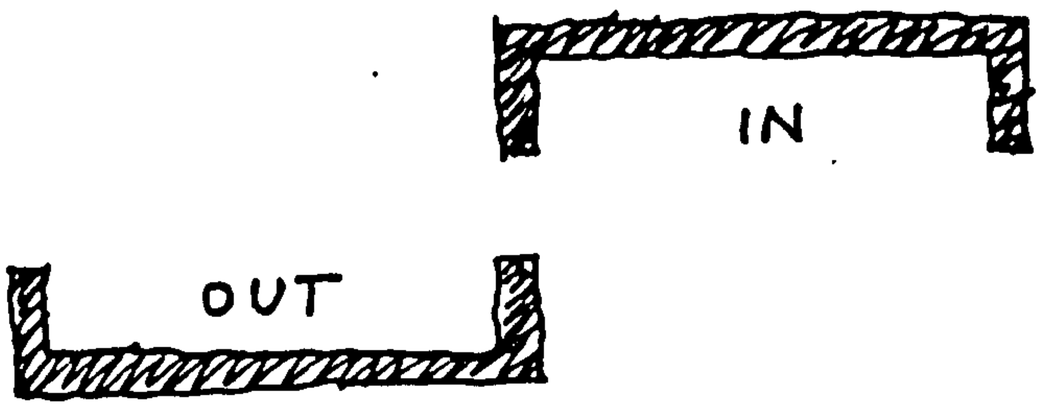
H.16.i Le Corbusier's Seminal Notional Design: The Domino House

ARCHITECTURE AND SPACE FOR THOUGHT

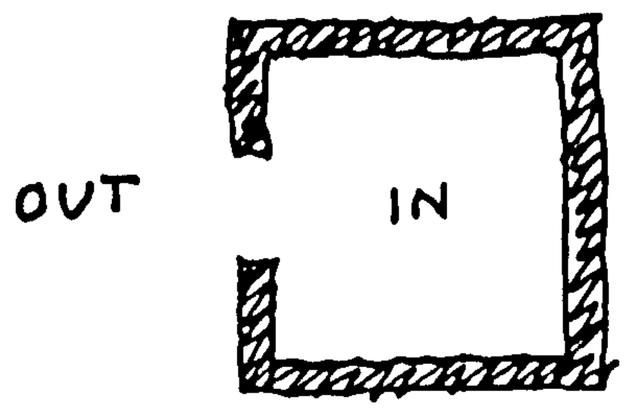
Ranulph Glanville

SECTION I

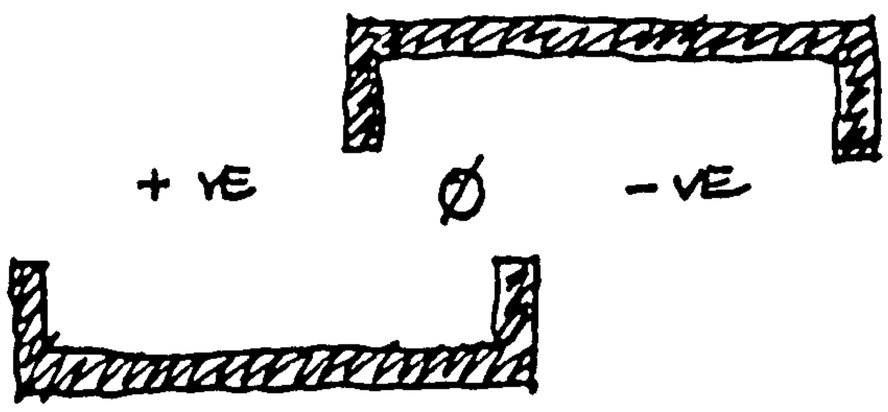
Architectural Diagrams



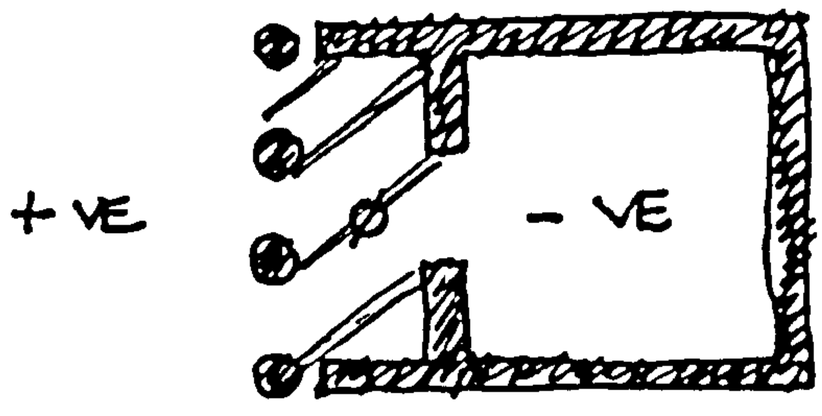
I.1.i Inside / Outside



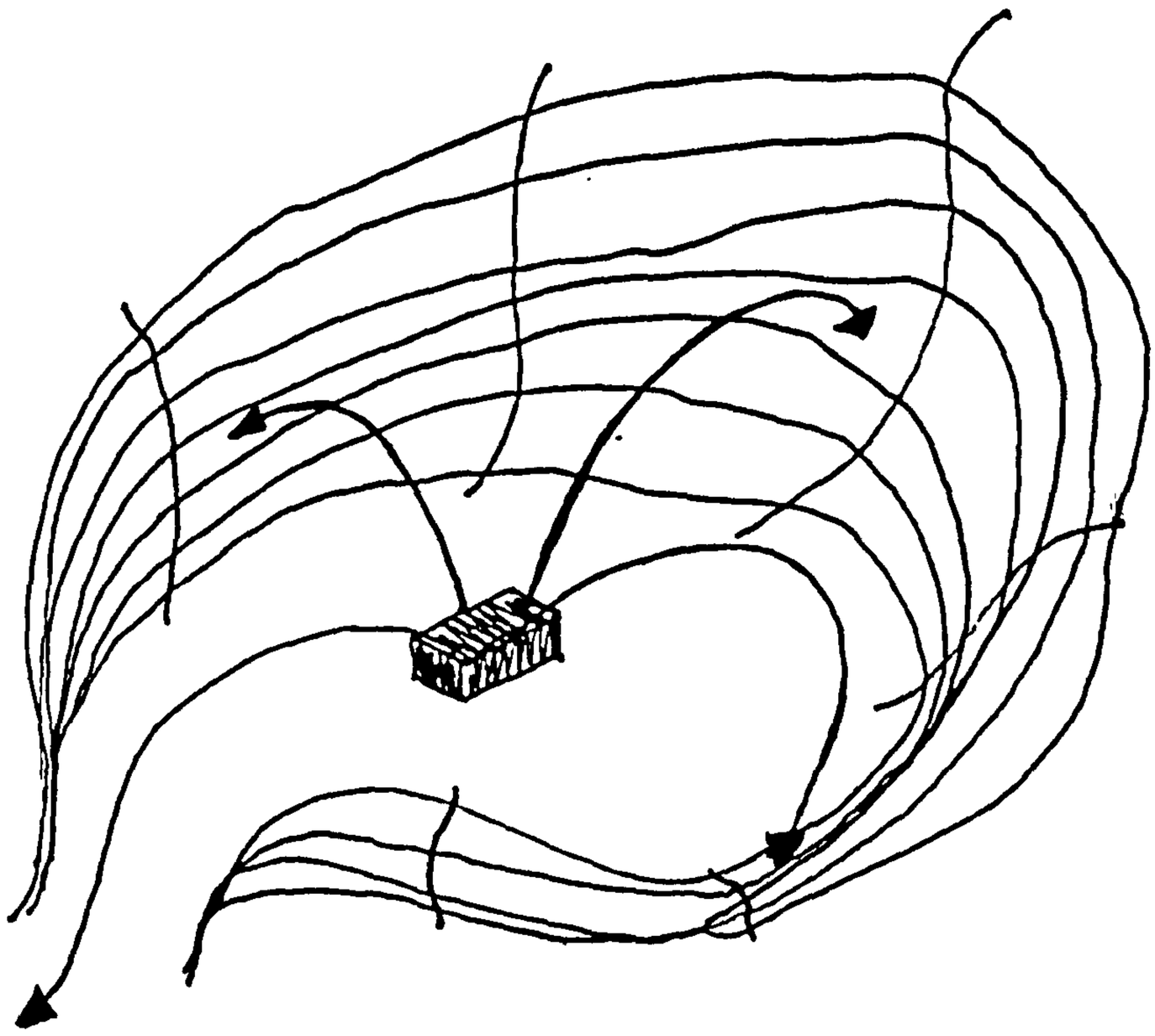
I.1.ii Inside / Outside



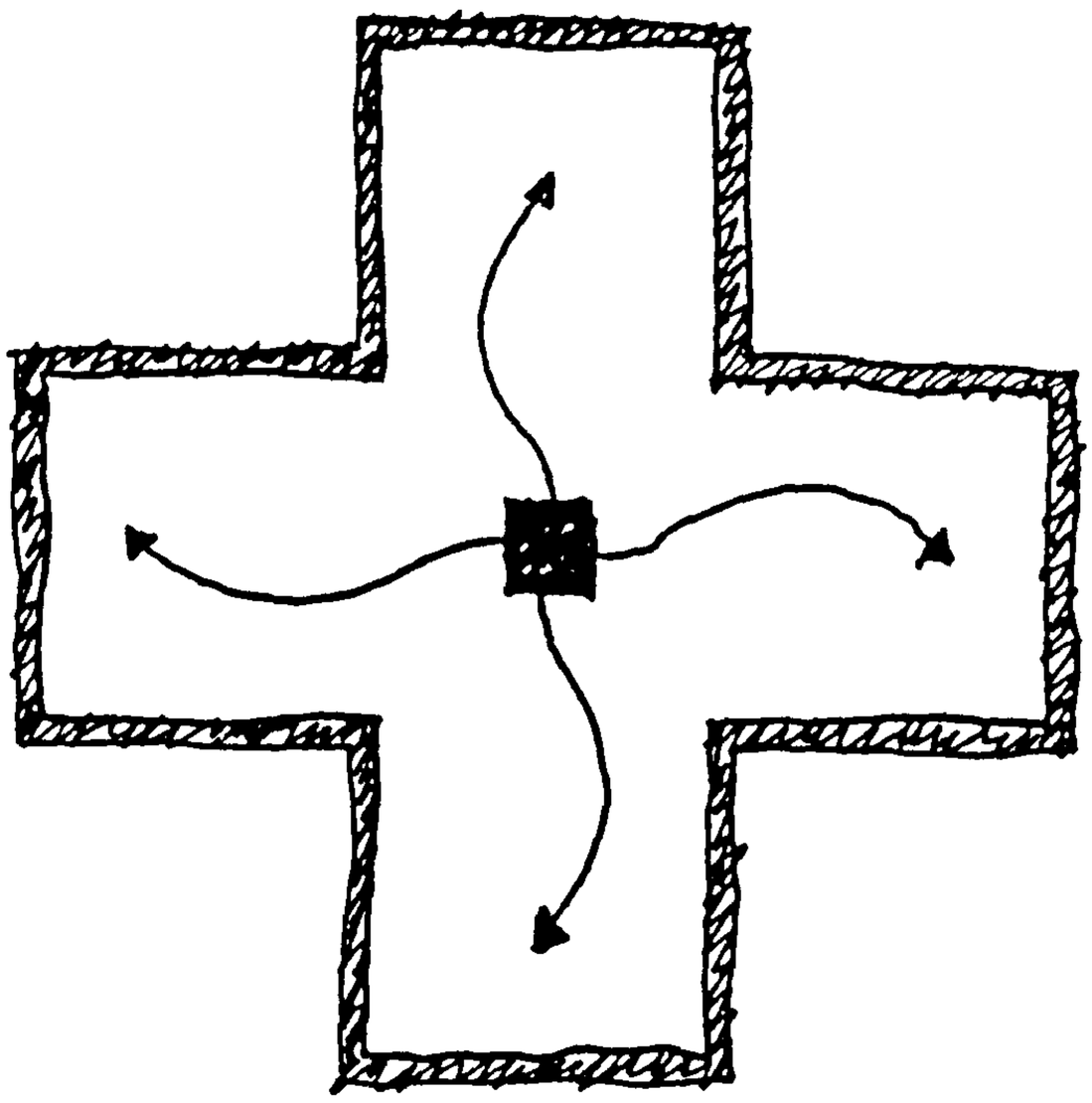
I.1.iii + ve / 0 / - ve space (0 is a Thick Wall)



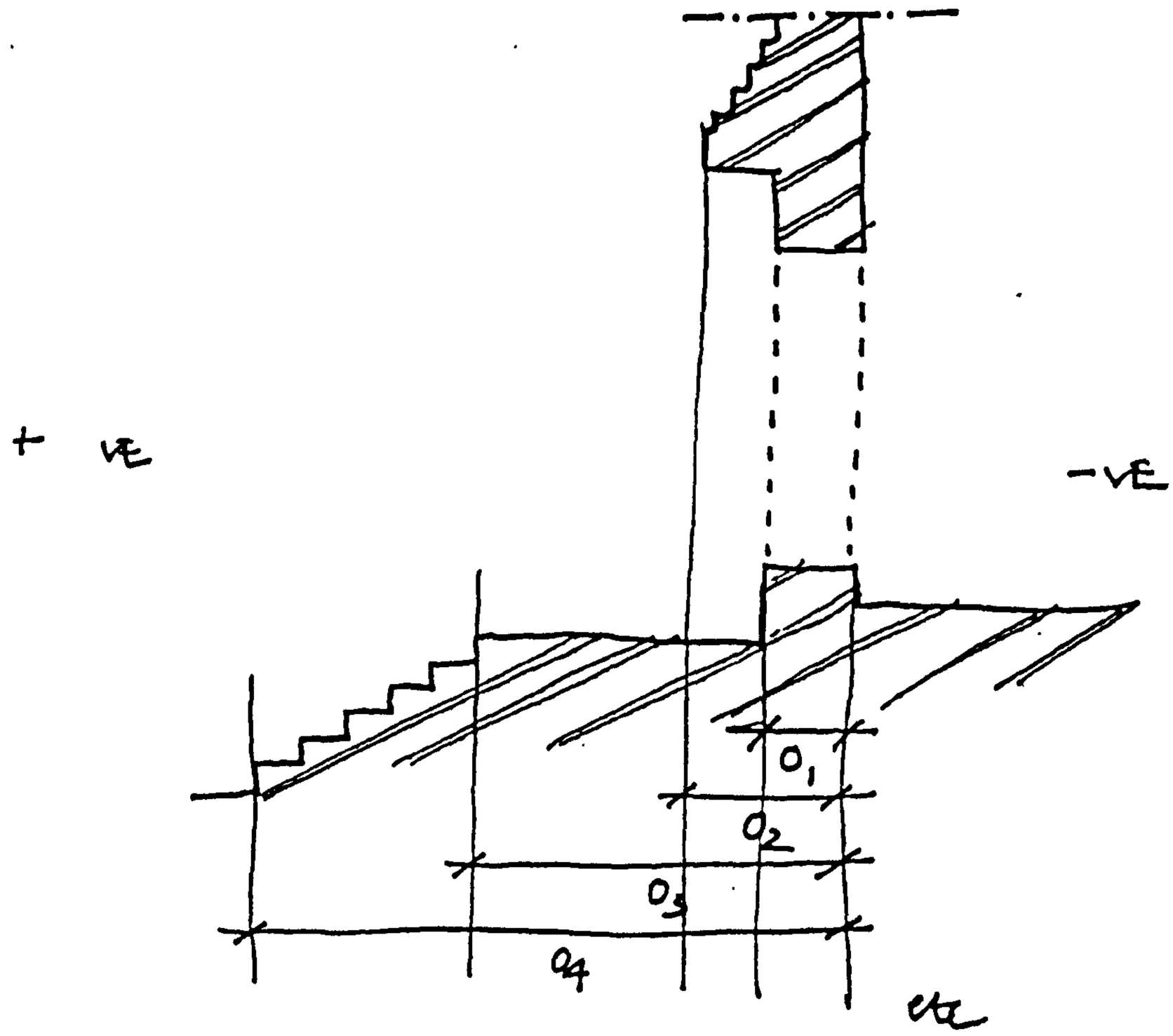
I.1.iv + ve / 0 / - ve space (0 is a Thick Wall)



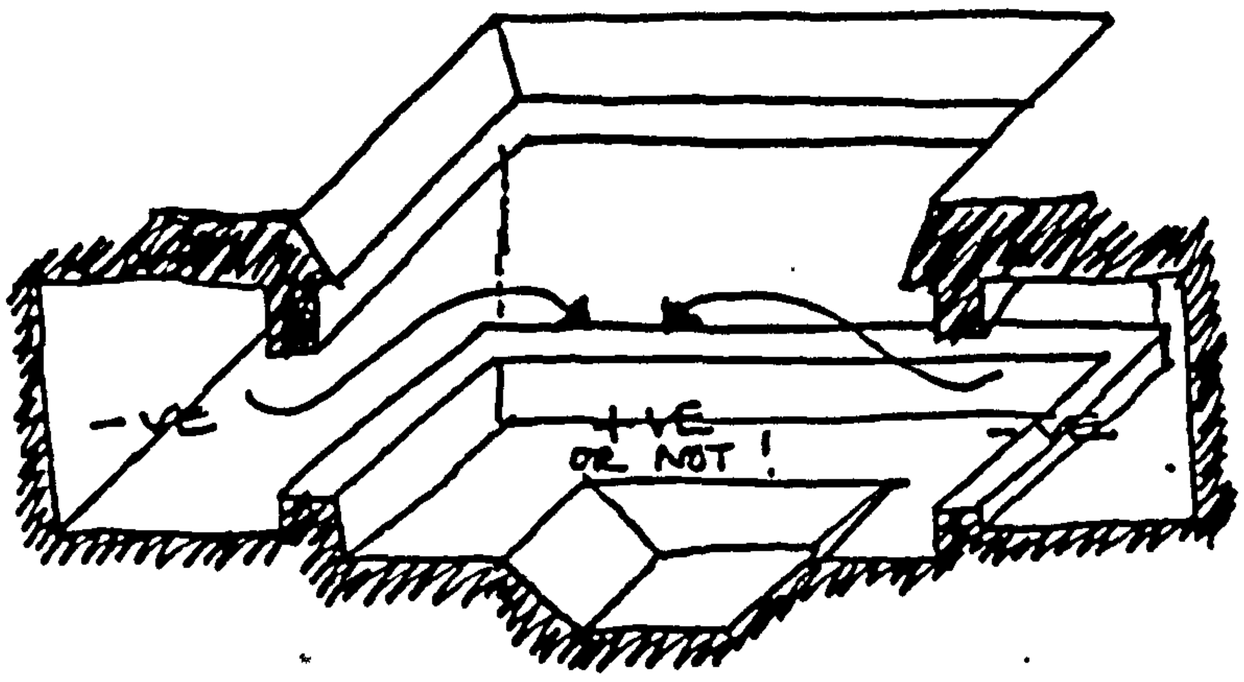
I.2.i Greek Theatre in the Landscape



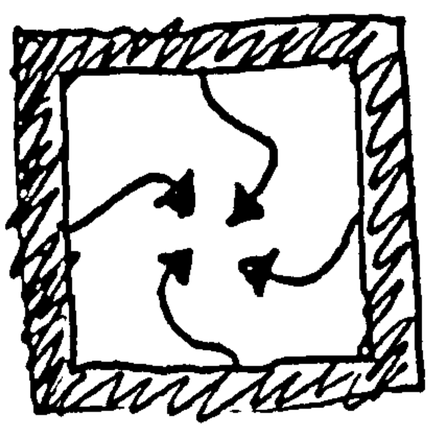
I.2.ii Altar and Greek Cross Plan



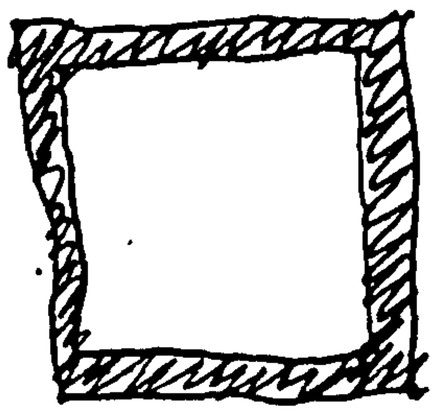
I.3.i Typical Section through Mayan Building (based on Palenque and Uxmal)



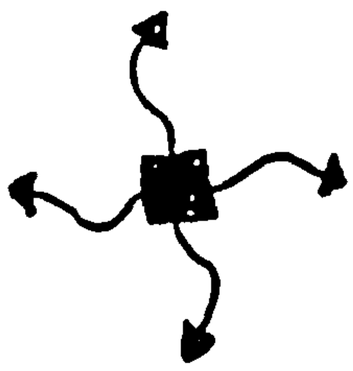
I.4.1 Courtyard Section based on the Palace, Palenque



I.5.i Inward

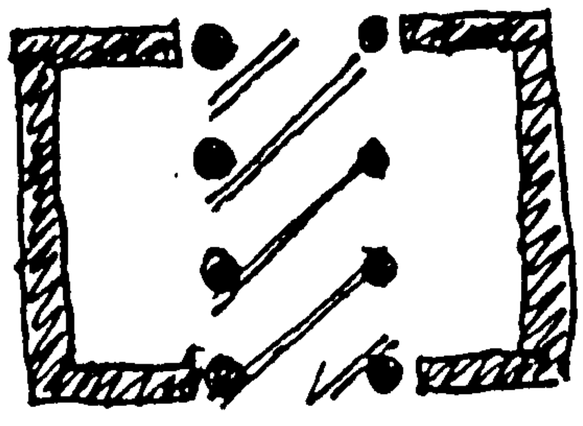


I.5.ii Static

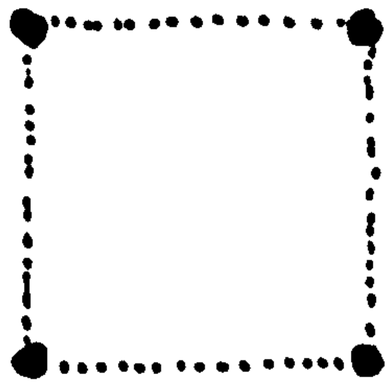


I.5.iii Outward

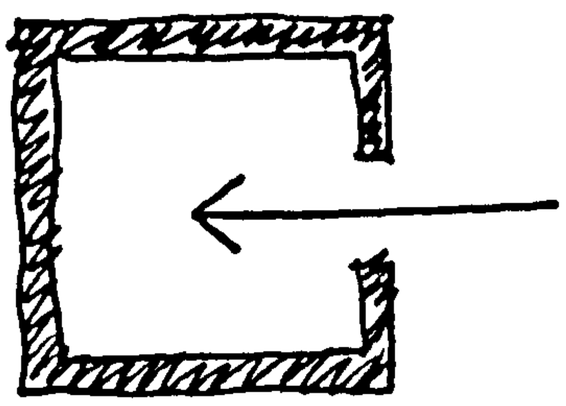
I.6.i Solid



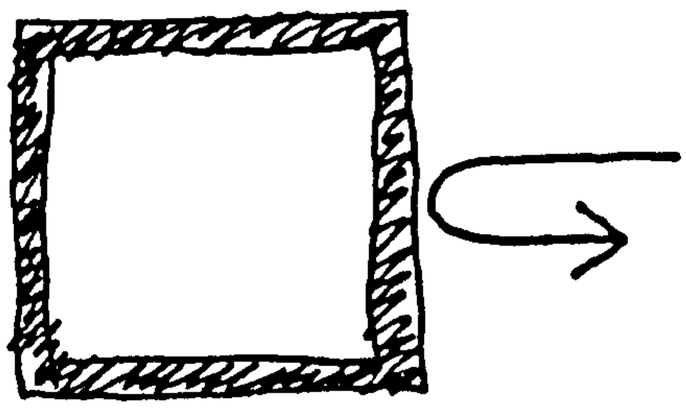
I.6.ii Intermediate
(Another Thick Wall)



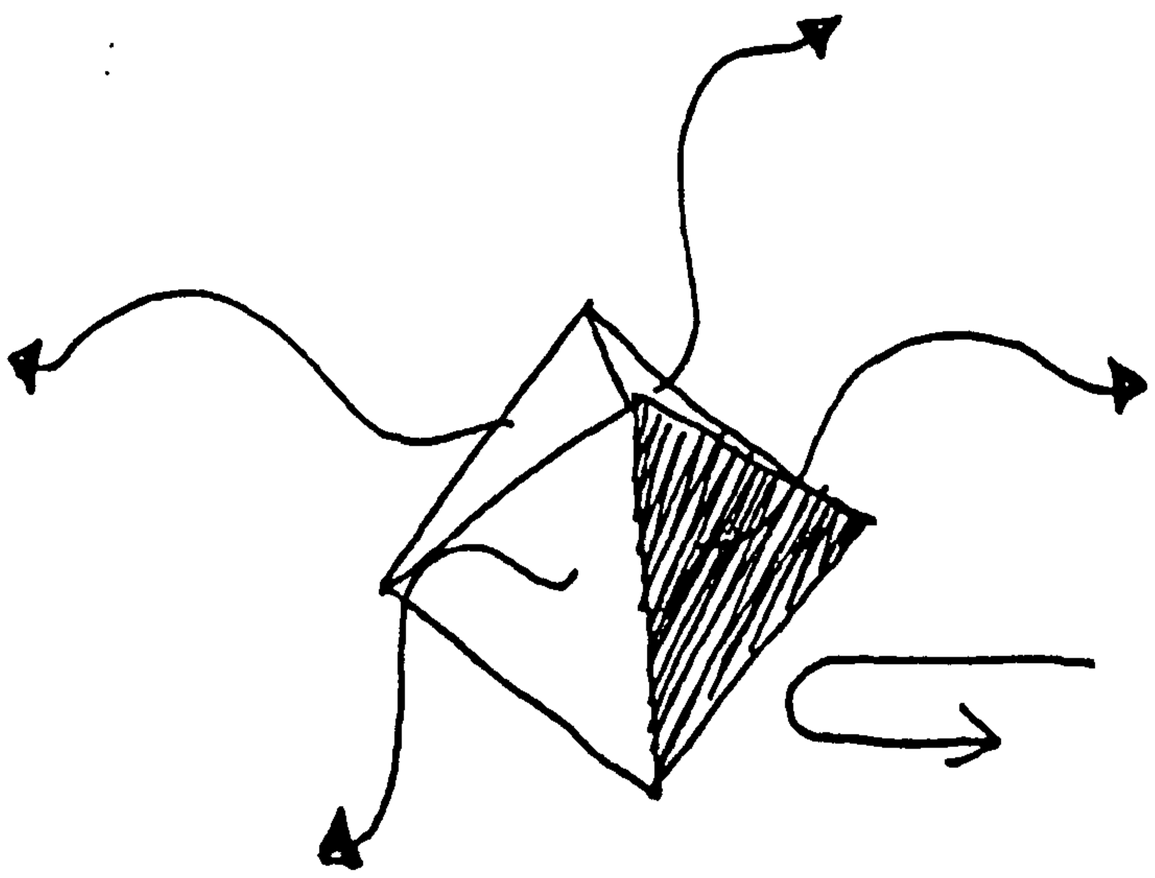
I.6.iii Void



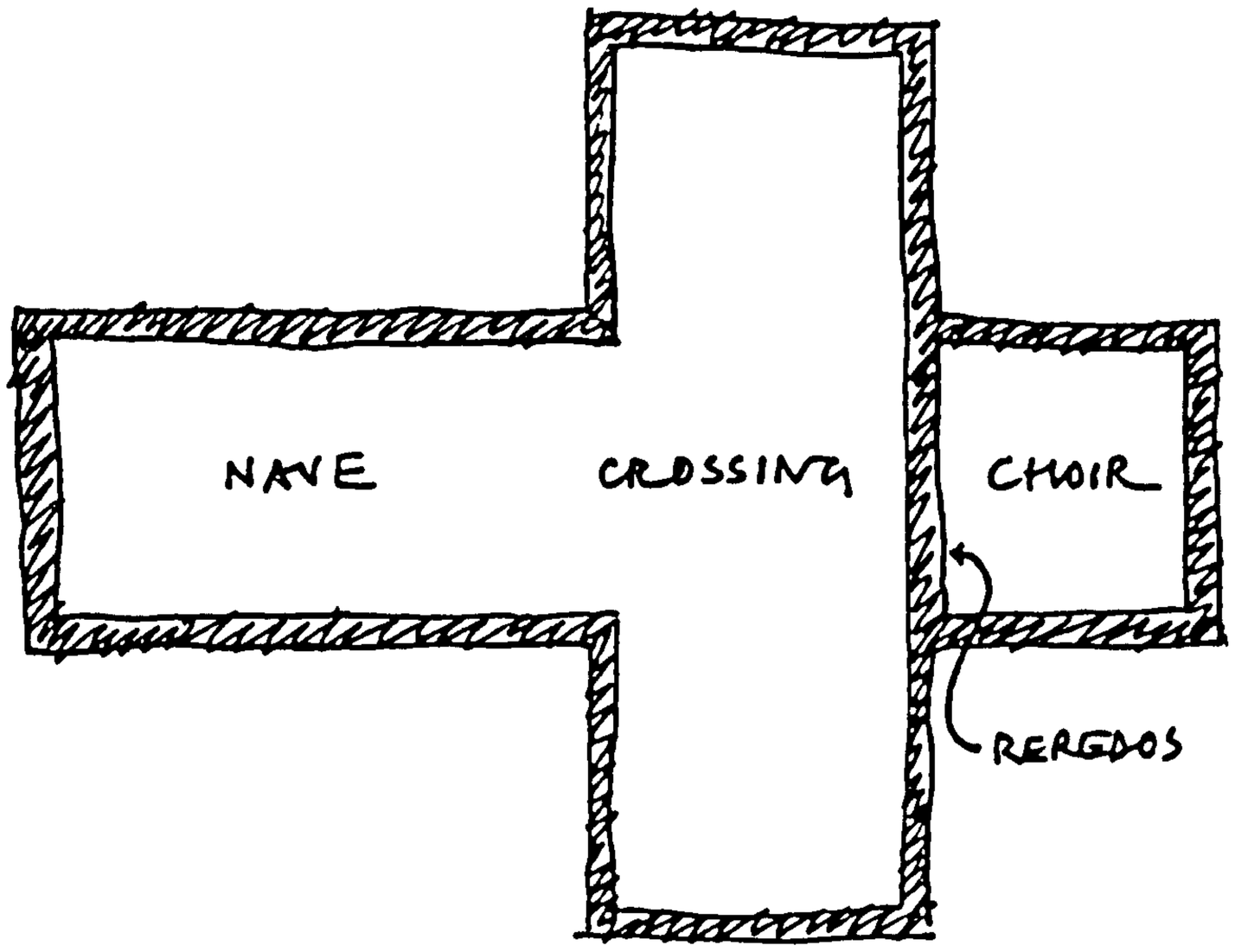
I.7.i Public



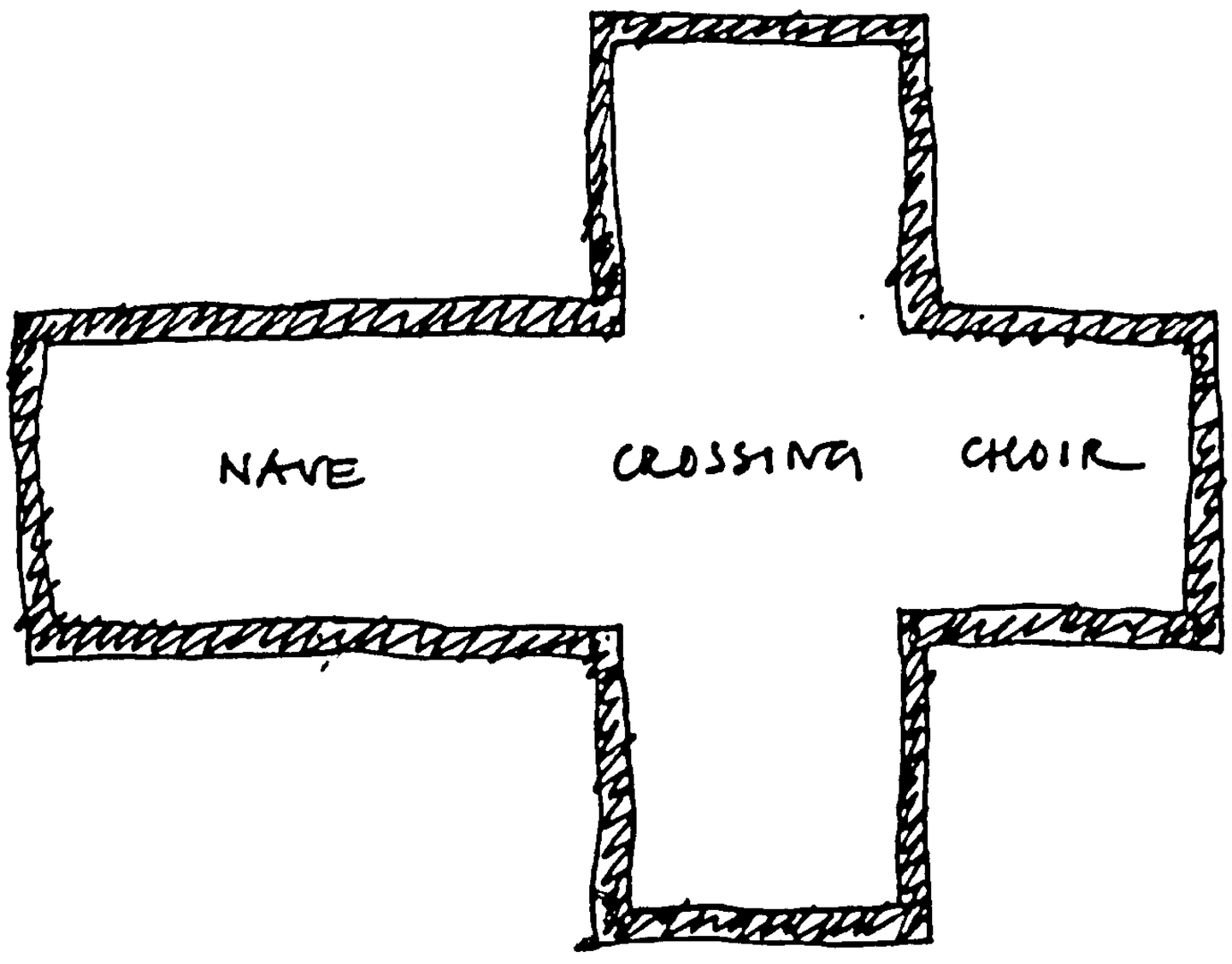
I.7.ii Private



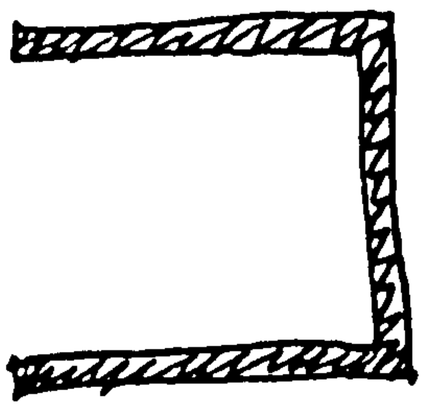
I.7.iii A Pyramid



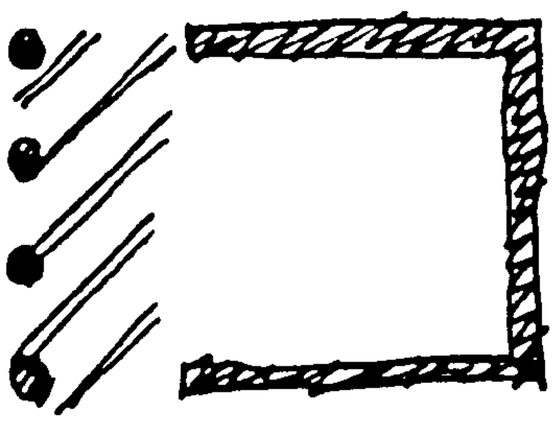
I.8.i Visually Opaque (Private Choir)



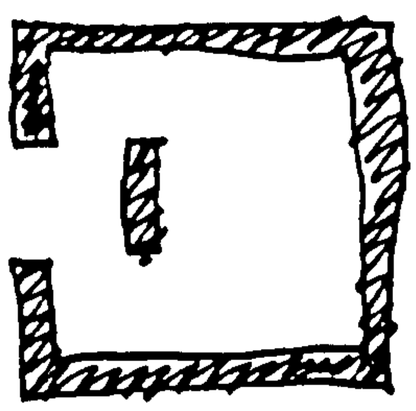
I.8.ii Acoustically Transparent (Public Choir)



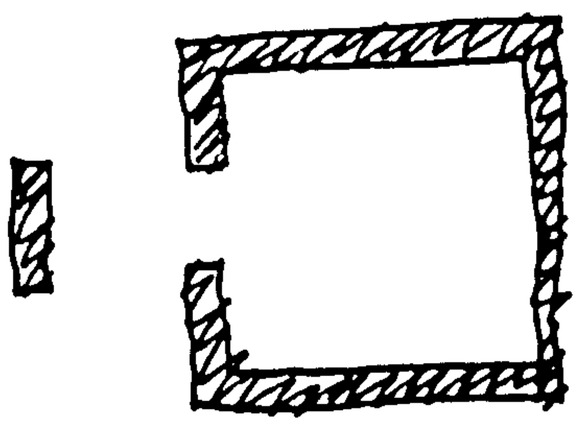
I.9.i Transparent



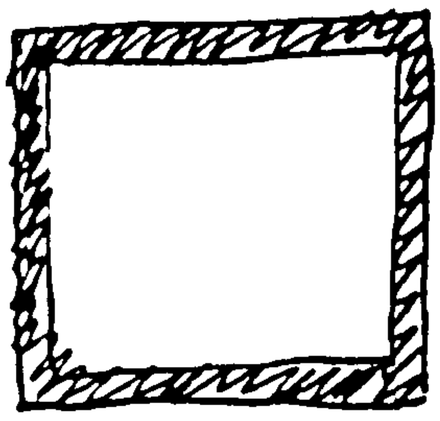
I.9.ii Translucent: a Thick Wall



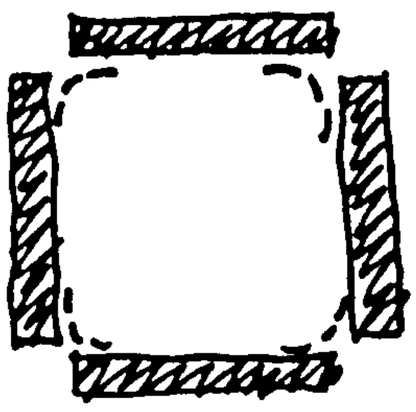
I.9.iii Translucent: Screened

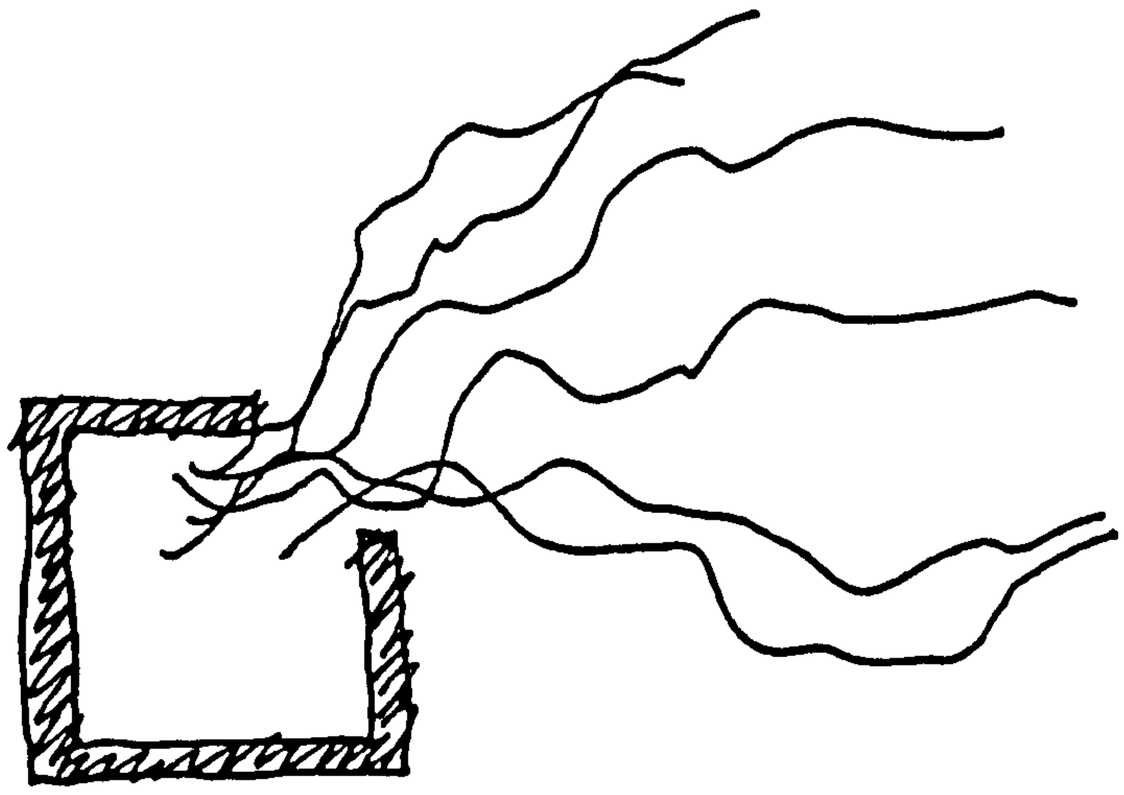


I.9.iv Translucent: Screened



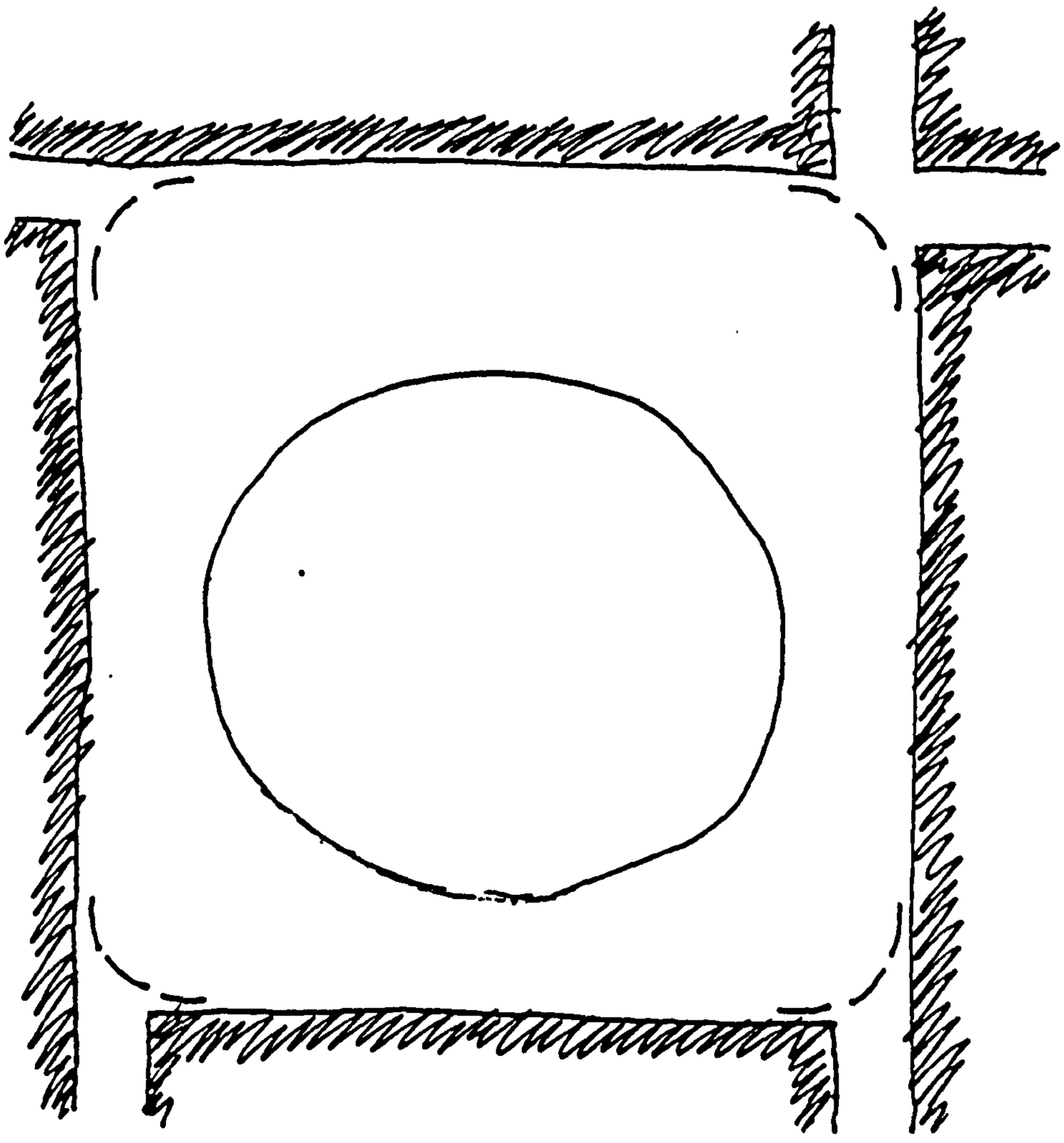
I.9.v Opaque



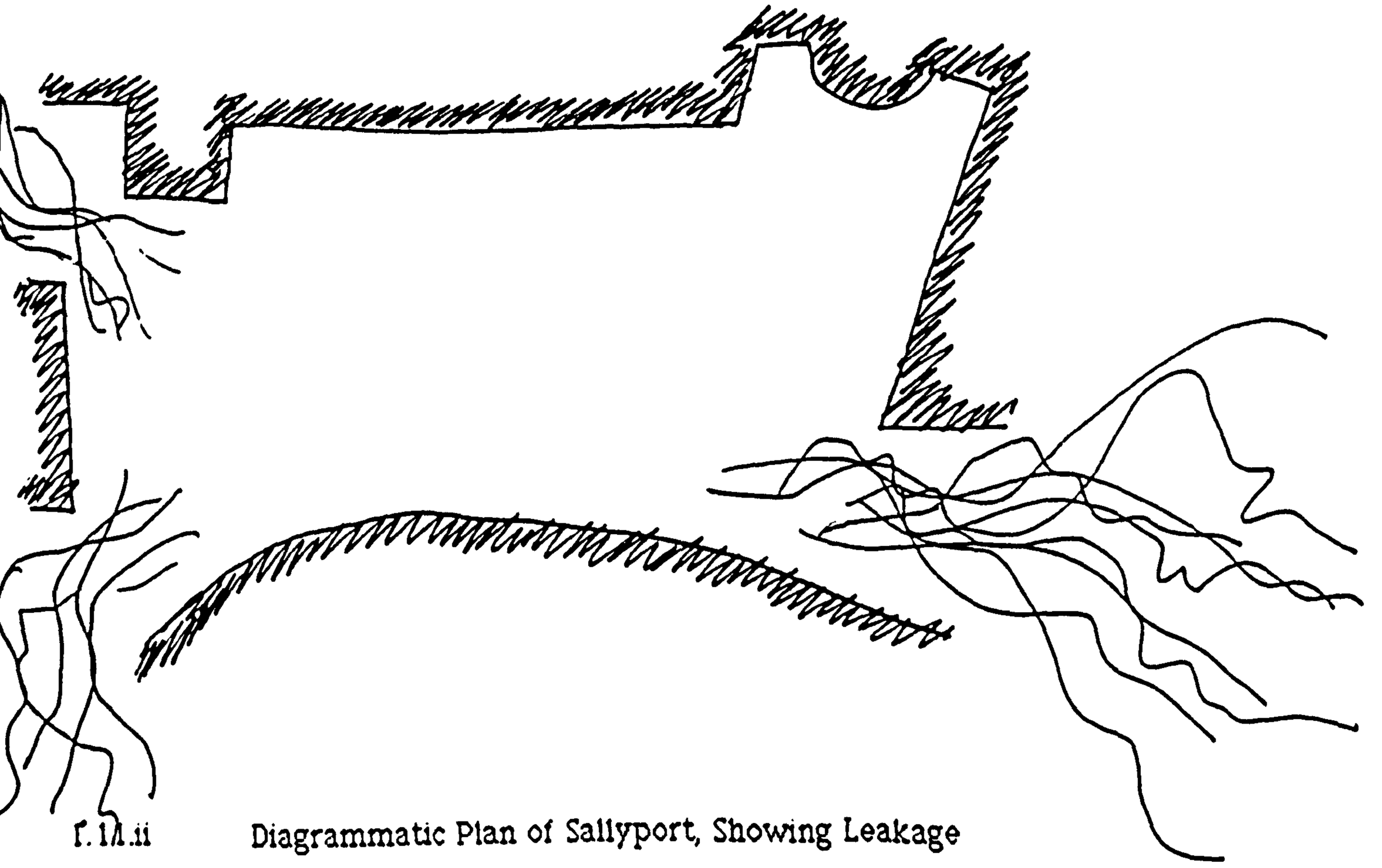


I.10.i Enclosed: I.10.ii Leaky Space

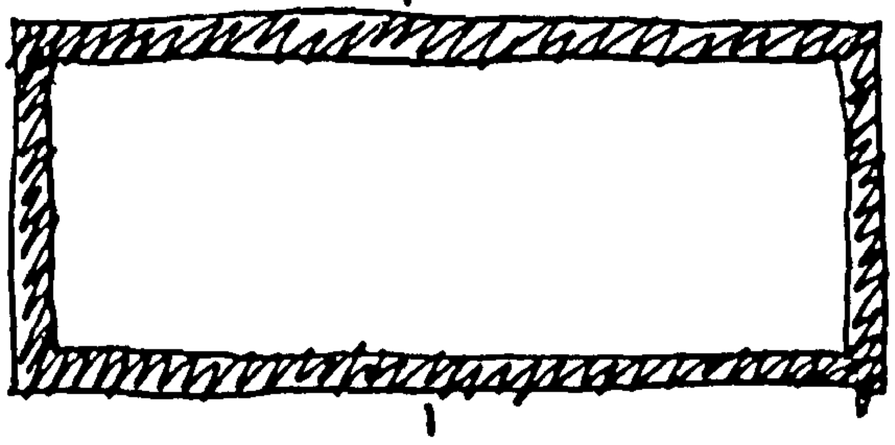
No Leakage



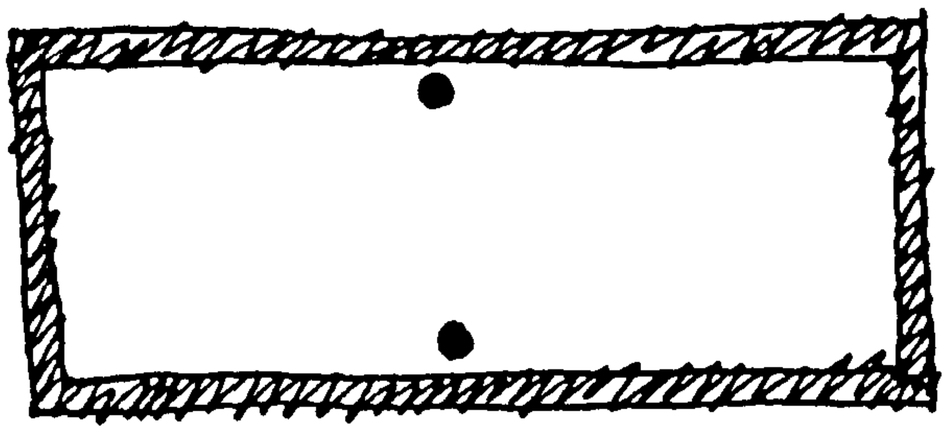
I.11.i Diagrammatic Plan of Bedford Sq, Showing Lack of Leakage



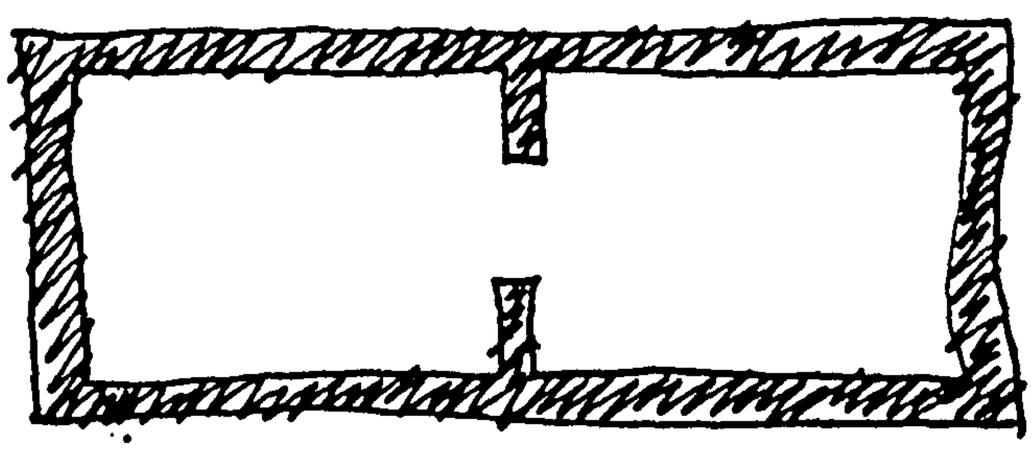
I.11.ii Diagrammatic Plan of Sallyport, Showing Leakage



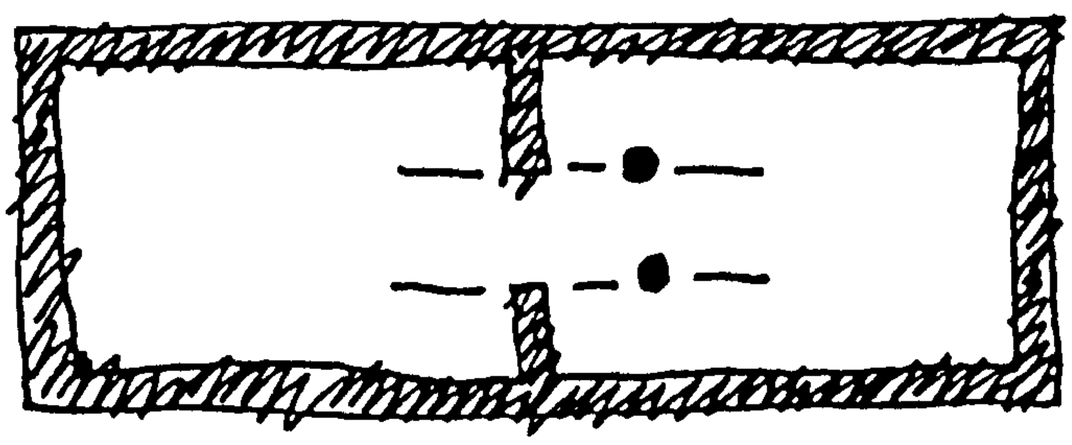
I.12.i Continuous Space



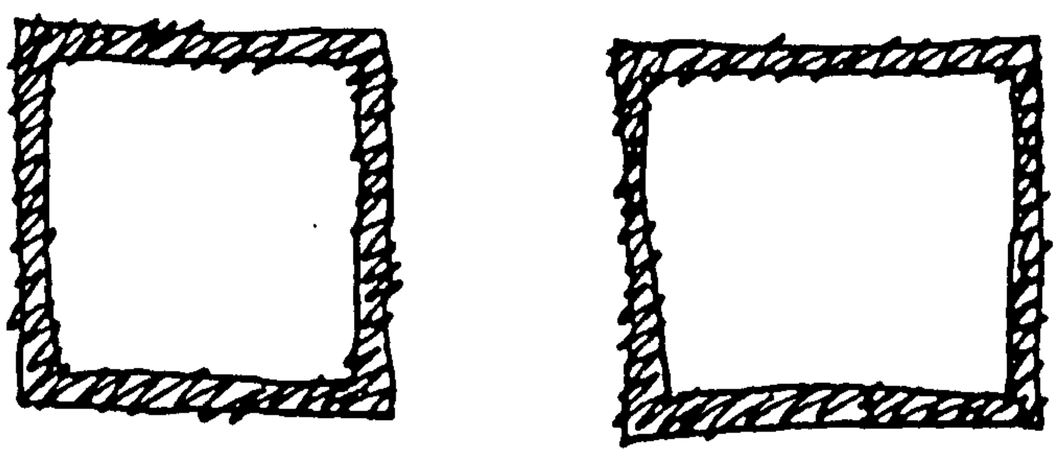
I.12.ii Continuous Spaces



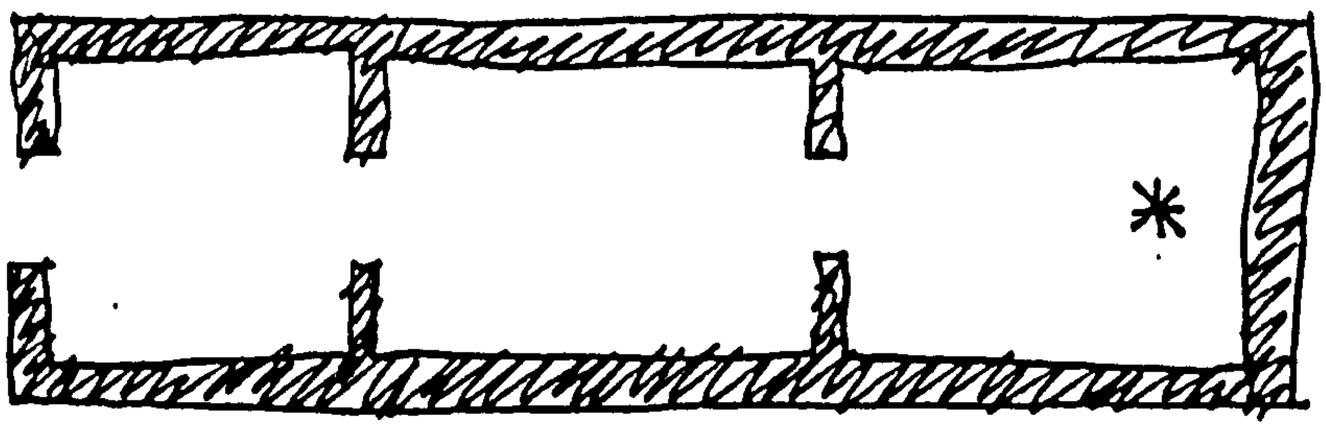
I.12.iii Connected Spaces



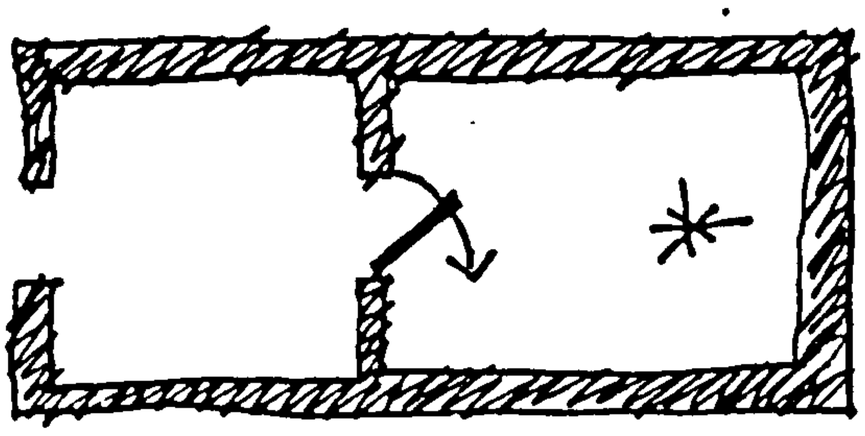
I.12.iv Penetrating Spaces



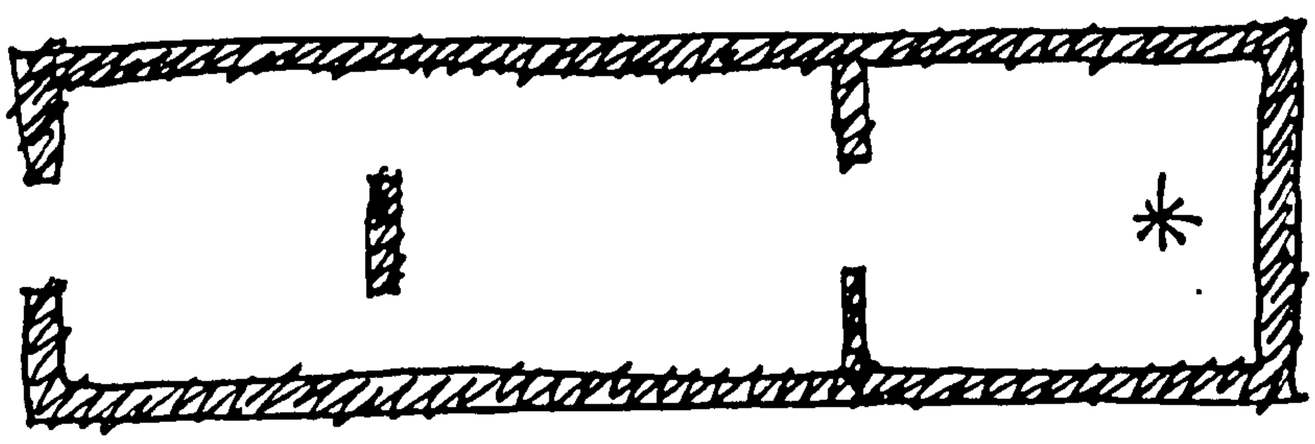
I.12.v Isolated Spaces

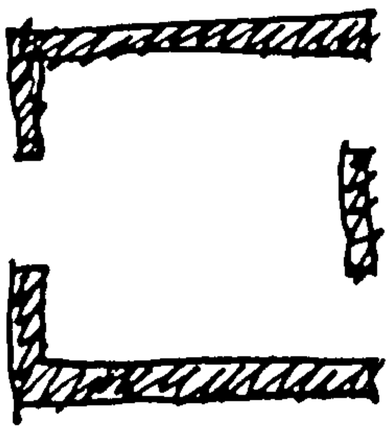


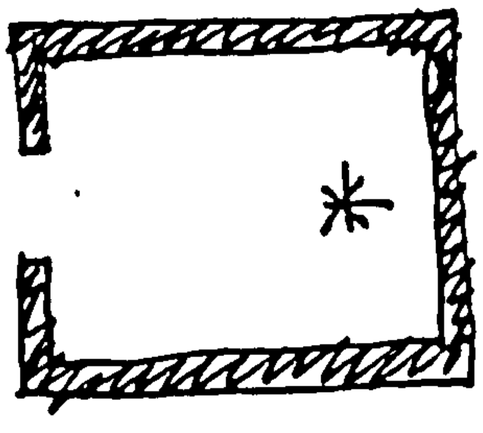
I.13.i Connected Spaces



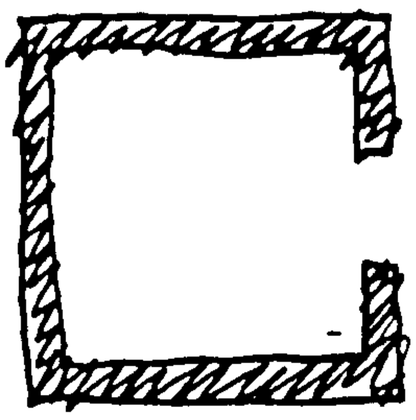
I.13.ii Broken Connection

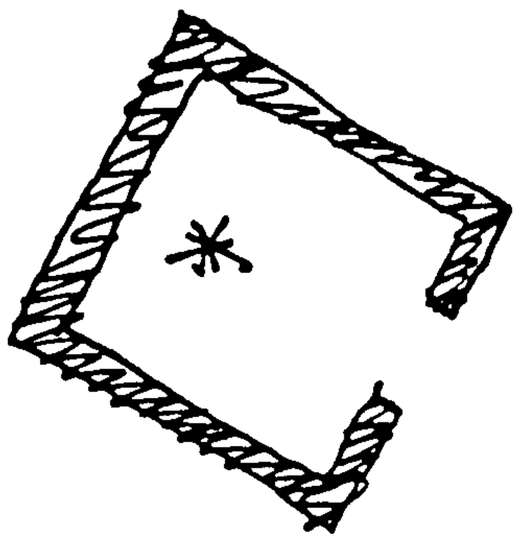






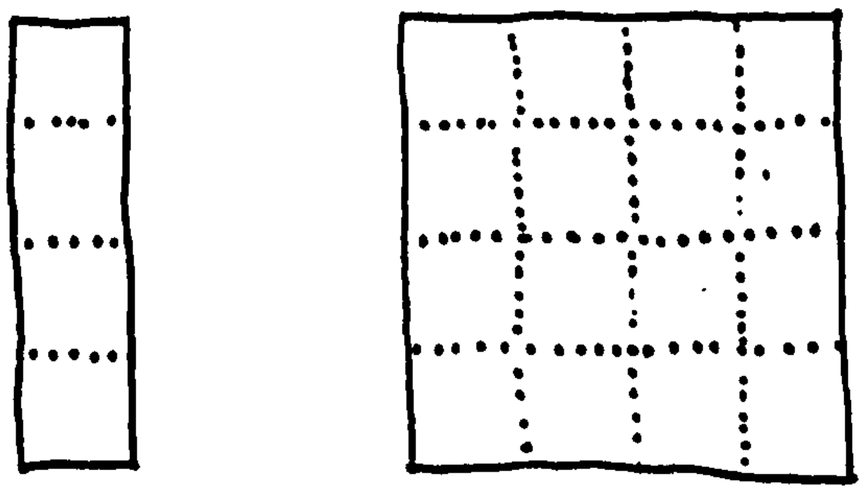
I.13.iii Inferred Connection





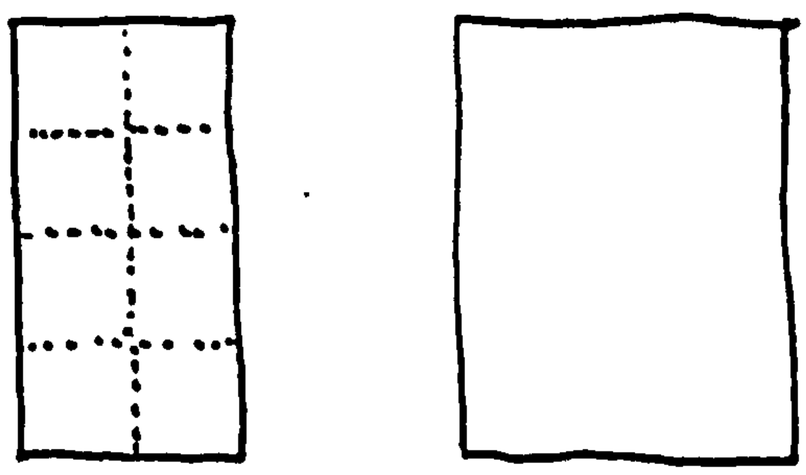
I.13.iv Divided Spaces

I.14.i Proportion: 4:1

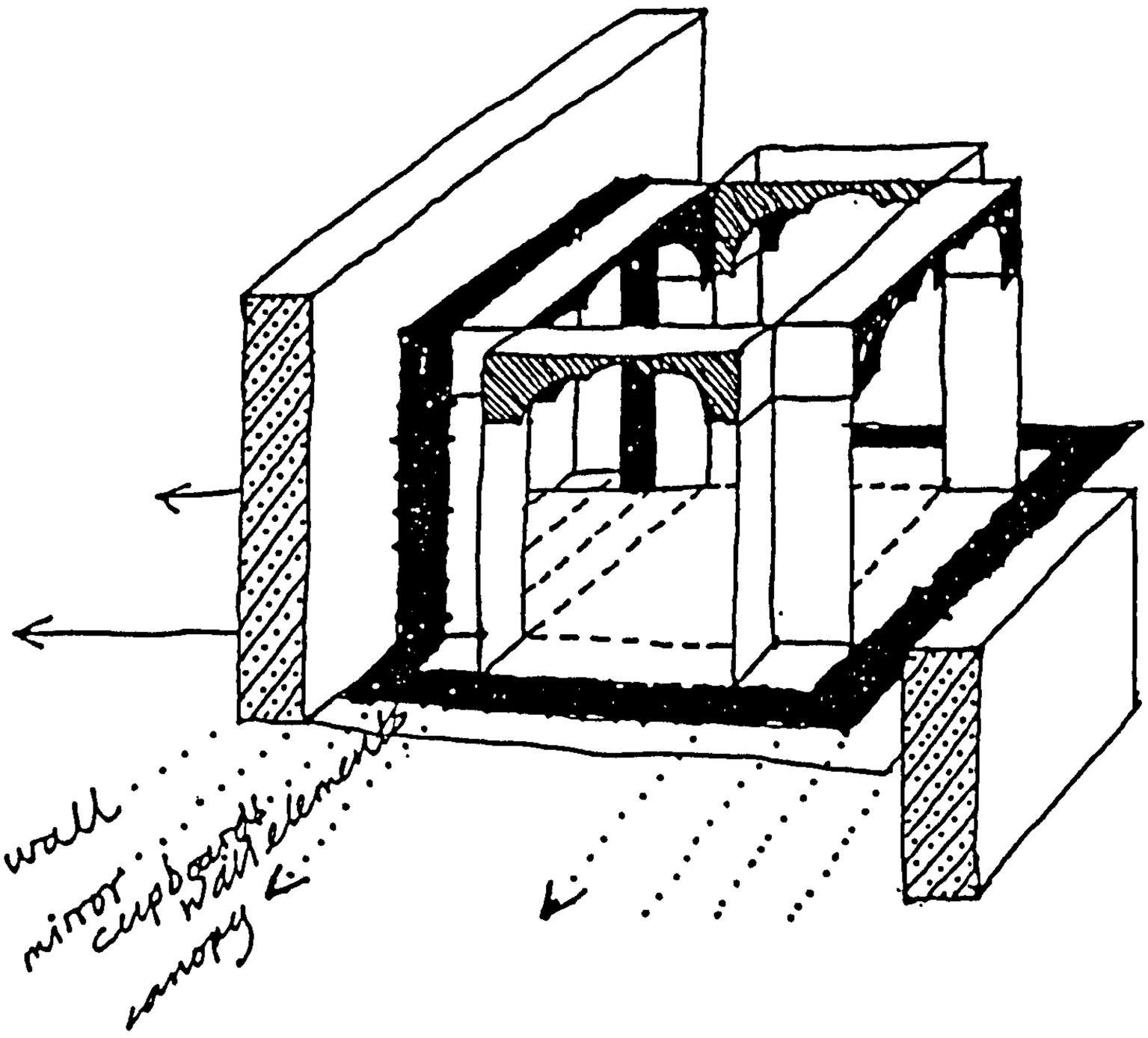


I.14.iii Proportion: 1:1

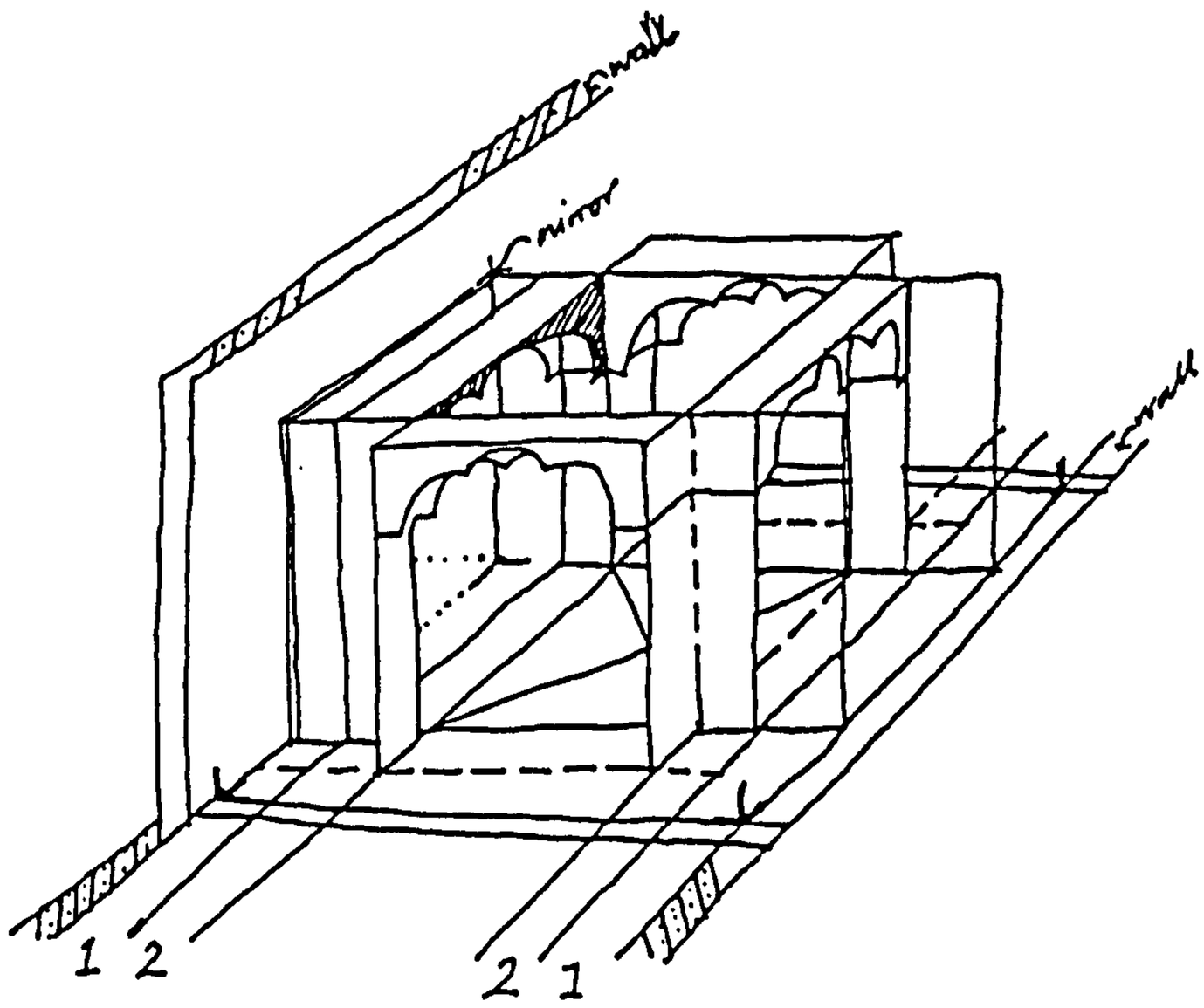
I.14.ii Proportion: 2:1



I.14.iv Proportion: Golden Section (A-Size)



I.15.i Dining Room Analysis, Sir John Soane's Museum - Leon van Schaik



1 wall elements, cupbds, chimney
2. virtual structure: canopy/screen

I.15.ii Dining Room Analysis, Sir John Soane's Museum - Leon van Schaik

Architecture and Space for Thought.

A Thesis presented for the degree of Doctor of Philosophy

by

Ranulph Glanville.

Centre for the Study of Human Learning,
Brunel University

Volume 3
Appendices

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX A

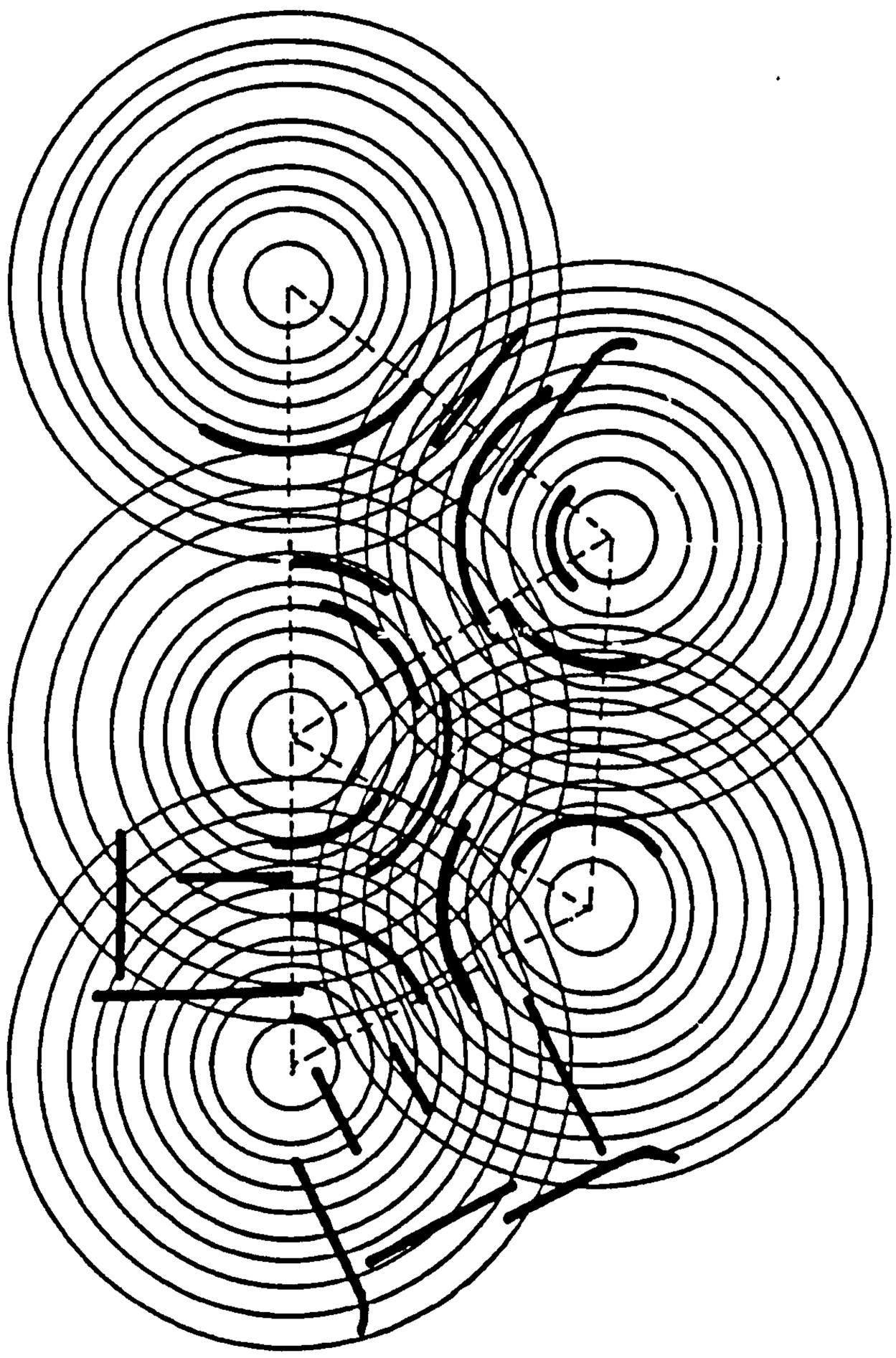
"Amazing Space! for the Architectural Stimulus-response Rat?"

from:
Architectural Association Quarterly, volume 9 nos 2 and 3, 1977.

aaq

Architectural Association Quarterly

volume 9 numbers 2 and 3 1977



An illustration from the book *Trames Planes* ('An Introduction to the Architectural Study of Grids') by Jean Zeitoun (published in French by Dunod, Paris 1977)

Published by
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London WC1

contents

TEXT BOUND INTO

THE SPINE

AMAZING SPACE !!!

for the Architectural Stimulus-response Rat ??

Ranulph Glanville

AAQ volume 8 number 4 Ranulph Glanville wrote a
me – a state of the art – of work in the field of repre-
ing spatial understandings. The major criticism he
e was that, for all of the interest that the work showed,
oided the main question: since it always assumed the
ables, the qualities in terms of which we should
esent our understandings, it was not researching what
ables might be really appropriate, but rather whether
ever variables we could think of were at all usable.
other words, it is the experimenter (who as a good
ist, will not take part in the experiment) rather than
participant who will decide in what terms the parti-
t should describe his experience. In that article, he
promised to present a position derived from research
what variables would be really appropriate. This is
article. It is in two main parts: a text elaborating a
s; and a series of brief descriptions of the experi-
s referred to in the thesis, their results, and samples
eir data. (In this edition, it is not possible to present
l inventory of all experiments and courses, which
er over 20.) There are (for a change!) no references:
, but not all, can be found in the previous resume.†
Glanville does not think they are very relevant in a
e like this, which should stand on its own feet, un-
ed by others.

Think of some space, preferably one you hardly know. Then describe it, as well as you can, and keep on doing so until you really can't describe any more. When you've done, work out the order of the description, ie what you were first interested in, what next, and so on. Finally take your description back to the space and compare the two, looking specially for things you got wrong.

I have not carried out the above as an experiment but I include it, because, if you recognise what I say here in it, you will have an infinitely more convincing demonstration than any amount of experimental evidence. If you want to use it so, read no further until you have done so.

I venture the following description of what happened. When you went back to the space you had described you found your description woolly and/or downright inaccurate, but nevertheless recognisable; that you started by trying to describe and define the space as a whole, and then worked through to various details; and that sometimes you started inventing – you weren't quite sure how things were, but you thought they ought to have been like you described them.

From this we can extract various points. For instance:
–that we have a 'cognitive model' which helps us understand space, and which allows us to re-invent and remember it (sometimes wrongly);
–that when we try to describe a space we try to indicate a whole and then to elaborate on the parts;
–and that even when we don't know something well (and the converse, finding something new in a room we've always known, holds equally true) we can describe it – and recognise it.

The thesis that I have developed (and it's likely to continue developing and changing) is based on these observations. Its main points are that:
1 we understand spatial experience as a whole, not as a collection of parts (ie 'top down', not 'bottom up'[1]);
2 when obliged to experience space through the medium of a collection of parts, we do not understand it;
3 we each have out own cognitive model which allows us to understand, remember and recognise space;
4 this cognitive model permits us to invent, re-invent and attribute qualities to spaces;
5 means of representation of spatial understanding need

to reflect the structure of this model, ie to work from 'top down' and not 'bottom up'.

I shall describe the evidence supporting each point from experiments carried out in the AA School under the titles which follow:

A *a space as a whole*

London can be considered as being made up of areas (parts). And yet, a group of students who try to locate these areas can do so only with very limited accuracy (*experiment 1*). One can argue, fairly, that ignorance can be overcome. No doubt a GLC official concerned with defining borough boundaries could do this test. But this misses the point, for all those students are still alive and living in London. That is to say that the inability of the students to accurately locate the parts separated out for them has not prevented them having an understanding of London, the evidence for which is that they recognise such a dangerous place, and are still alive!

But is there positive evidence to affirm this? When students were allowed to see an unfamiliar space for controlled time spans (2 seconds, 10 seconds, 1 minute, 5 minutes and for as long as they liked) and were asked to draw it, it was found that they could and that the drawings showed a sense of completeness (*experiment 8*). Even more interesting, they had no great difficulty remembering the space 10 days later. When the drawings were pinned up they had great difficulty in estimating accurately how long a view of the space each drawing represented: the period of viewing appeared not to be of great significance. From this, one concludes that the experience of space is understood as a whole, not as a series of (ready chosen) parts.

By way of confirmation, students who had surveyed a room blindfolded, trying to visualise it, were astonished by the room, when they actually saw it.[2] The whole was definitely not just the sum of the parts. (*experiment 6*)

B *parts obscure this whole*

This blindfold survey can tell us more. One accepts that colour and, to a lesser extent light are things one cannot experience when blindfolded. But texture, surface, distance, scale, angle, and detail can all be felt and can be tested (try, for instance, pacing out diagonals). One would imagine that, given a cognitive model, the removal of visual aspects of space from direct experience would encourage other senses to substitute where possible, and thus allow visualisation. But that is not so: a quick glimpse makes a whole understandable, but three hours of continuous search by feel does not.

There is, however, a difference in these two modes of perception: the glimpse allows the instantaneous experience of a whole, but feeling is a prolongued serial activity; one collects one chunk of information after another, trying to add them in to visualise the whole. The first is 'top down' and the second 'bottom up'.

Further evidence in support of this can be found in the failure of the attempt to find a collection of terms with which to describe spatial experience (*experiment 4*). The painful isolation (by a group) of 15 terms with which to describe spatial experiences, produced almost complete incomprehension when used socially. On being asked which terms they would use to describe a set of experiences, the students chose very differently. Even more remarkable was the lack of personal knowledge, for they ranked the terms in the order they felt they had used them; their rankings were then compared to the actual use rank. Between the two there is an almost insignificant connection: the students simply did not understand how they had used their own terms.

Here, too, they are being asked to experience in terms of parts, not wholes. It seems that the cognitive model, liking to work from 'top down', finds itself confused when the structure is the opposing 'bottom up'.

C *cognitive models help us understand*

There are some people (notably behaviourists) who deny the usefulness of such a concept as a cognitive model.[3] In their world, we are (sophisticated) deterministic machines running a series of programmes converting an input into an output. In their view, the cognitive model is a fraud. It cannot, therefore just be assumed, so I shall present some evidence in its favour. Of course, the 'top down'/'bottom up' distinction is evidence, and more.

The main features of a cognitive model is that it provides a personal interpretation of reality. That being so, we would expect major differences in the ways that different people using the same means of representation, express their understandings of the 'same' thing.[4]

Consider, for instance, the ideas of direction and distance in the city (*experiment 3*). It would appear, from common experience, that we frequently find other people's ideas different to ours. Annetta Pedretti invented an elegant technique to show this, which generates individual maps that would be, if our understanding was Euclideanly cartographic, circular.[5] They never are (they are rarely even vaguely circular). They elongate, fragment, change direction; they are extraordinary pictures of those things we call distortions but which are actually differences between our cognitive models, shown by comparison to the cartographic model.

Another piece of work, equally revealing, was done by Tim Richardson to present a composite view of Leadenhall market, culled from maps drawn by half a dozen Lloyds clerks. It shows the differences between them by

...doubts as to what is where:
...there is a pub at a cross roads called *The Lamb*.
...is a Post Office separated from the pub by a blank
... There is a cafe separated from the Post Office by a
...space. Next to the pub on the other street is a
...shop or possibly a supermarket or possibly a huge
...ding Lloyds Old Building, or Lloyds might come
...e cheese shop/supermarket or there may be no
...at all. Next to one of these there is a bank which
...fact be Lloyds (not the bank). This bank forms a
...to Lime Street and the street leading to *The Lamb*.
...of the block is occupied by Lloyds, unless Lloyds
...the entire block apart from the Post Office.'
...other level, the article I presented in *AAQ* volume
...r I argued for the reality of a cultural awareness,
...y in the cognitive model which was the common
...between Finnish architecture and Finnish language.
...y, we can refer to the understandings that were
...by the students using the 15 terms that were derived
...cussion of space (*experiment 5*). Asked to examine
...n they thought these terms related, each student
...ed a hierarchy of meaning relationships, which
...thought of as a personal knowledge structure,
...a technique invented by Kathryn Findlay. These
...d a considerable difference in structural organisa-
...hich was attributed to different learning conditions).
...lso showed a considerable difference of opinion
...how the terms related, which again argues for the
...of the cognitive model.

...*nitive models generate qualities*
...ase that one catches a very brief glimpse of a space
...ing else, eg a car) I have argued that it is recog-
...a whole (*experiment* 8). But we are all familiar
...e way we elaborate on that, deducing qualities
...whole (so that we say 'Yes, it was an Oldsmobile –
...one with a roof-rack, I think. Yes, it must have
...yellow Oldsmobile with roof-rack, about 1965').
...tried to describe a space, as I suggested at the
...g of this article, then I have ventured that you
...that sort of thing at some point in your descrip-
...is where the cognitive model shows itself.
...the extraordinary result that a brief viewing of a

space was pretty much as good as a long one, requires of us one of two explanations: either that the whole, as instantaneously perceived, cannot be elaborated; or that our ability to elaborate comes from the inventiveness of the cognitive model. But we have already dismissed this first option, for we can find something new in a room we have known for years. It is the ability of a brief viewer to elaborate his view of the whole, developing and inventing details from his cognitive model, that makes it possible for his description to be as complete as that of a longer viewer (although not necessarily as accurate: but untested).

And so it is with remembering and recognition. If we cannot make a whole (as when we survey a room blindfolded), we have nothing to invent from. We may remember a part, recognising it when we see it later, but we do not remember the whole. This has been observed to happen: comments, (extracted during an attempt to re-draw a visualisation from memory, 4 weeks after such a blindfolded survey) such as 'I can't remember' and 'I could if I'd seen it', bear witness.

On the other hand, the way in which students can generate a structure for London, shows how, given an idea of the whole, a student can easily generate parts and their relationships (*experiment 2*). It is interesting to compare this ability to the inability to locate named parts.

E *appropriateness of representations*

If you ask a group who have generated London structures to collect evidence for their views and present such evidence, you will find that the evidence for each structure tends to be exclusive both in its content and its interpretation (this, of course, is deeply significant for planners).[4] This means to say that there is a mutualism between that which is being described and that which is describing: they both confine each other. If you ask people to consider the city from the point of view of its service systems (or Urban Technologies), you will find that the view of place, space, distance and connection is very clearly defined, and quite distinct. There is a need for the representative system to match the system being represented.

Consequently, if we wish to represent our understanding of space, we need to do so in a manner which does not deny the structure of our understanding, so we need a language that can express the whole and then refine it.

In general experience, we know this because when we talk about a room, we first provide a general outline and then gradually refine out the detail (this is just how we would progress down a logic tree.) I am not pretending that we do not do things one after another: but I suggest we do the more general things first.

However, we, the expressers of our understandings, are not the receivers. And some methods of communication allow us to perceive a whole and then elaborate details, not only in their content but also in their form. These include drawing. By contrast, spoken language has to be understood as a series of events, from which we can develop more general understandings.

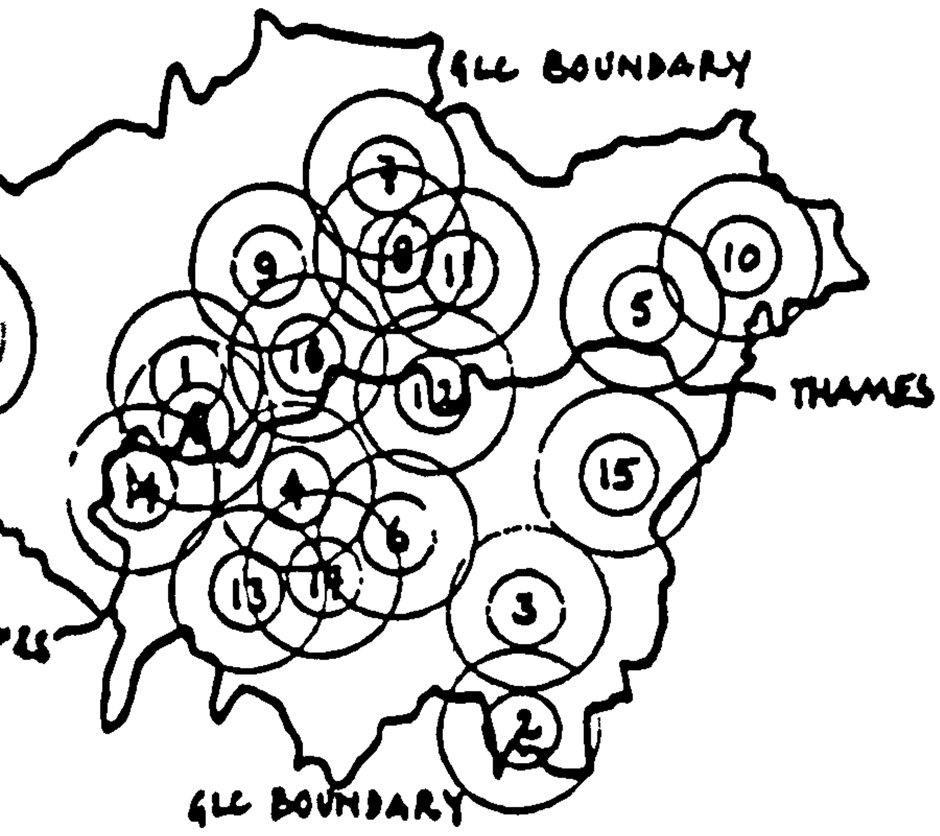
So I take the position that the means of representation we use should not only be capable of representing wholes before parts, but should do so in a form that is perceptually similar; which explains why drawings represent spatial understandings well, because they also can be interpreted as wholes.

ment I

Knowledge (1973)

on
on areas were listed, and an outline map of the GLC,
the Thames was also marked, was provided. Students
ed to locate the areas on the map. The maps were
using a map with circles of 4 and 8km diameter, from the
f the listed areas (derived from the Ordnance Survey).
ring was liberal: if there was any way that the student
e got the area correctly located within the circles, it
pted.

s did not find it hard to do this, but they got very low
The lowest accuracy was 0% at both 4 and 8km scales.
est accuracy at 4km was 31.6% and at 8km, 63.2%. The
was 9.1% and 22.2% areas correctly located.



be located
n
d Hill
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ch Village
ton
ersmith
stead
church
n
all
en
ead
p
o
am
am
dge

below left:
Marking map with 4 and 8km marking circles
below:
Table of results demonstrates clearly how inaccurate London knowledge is, and how little improvement there often is when the marking area is increased

student	number of places located	number within 4km	number within 8km	% places located	% correct 4km, total places	% correct 8km, total places	% correct 4km, places located	% correct 8km, places located
a	15	0	0	78.9	0.0	0.0	0.0	0.0
b	18	4	6	94.7	21.0	31.6	22.2	33.3
c	3	1	1	15.8	5.3	5.3	33.3	33.3
d	14	2	3	73.7	10.5	15.7	14.3	21.4
e	17	2	6	89.5	10.5	31.6	11.8	35.3
f	10	0	0	52.6	0.0	0.0	0.0	0.0
g	5	2	2	26.3	10.5	10.5	40.0	40.0
h	12	2	5	63.1	10.5	26.3	16.7	41.7
i	15	3	10	78.9	15.7	52.6	20.0	66.7
j	3	1	2	15.8	5.3	10.5	33.3	66.7
k	8	0	1	42.1	0.0	5.3	0.0	12.5

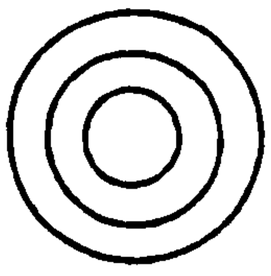
student	number of places located	number within 4km	number within 8km	% places located	% correct 4km, total places	% correct 8km, total places	% correct 4km, places located	% correct 8km, places located
l	15	6	7	78.9	31.6	36.8	40.0	46.7
m	18	1	5	94.7	5.3	26.3	5.5	27.7
n	7	0	2	36.8	0.0	10.5	0.0	28.6
o	6	0	1	31.6	0.0	5.3	0.0	16.7
p	18	3	12	94.7	15.7	63.2	16.7	66.7
q	7	2	2	36.8	10.5	10.5	28.6	28.6
r	14	6	11	73.6	31.6	57.9	42.9	78.6
s	11	0	4	57.9	0.0	21.1	0.0	36.4
t	5	1	2	26.3	5.3	10.5	20.0	40.0
u	10	2	4	52.6	10.5	21.0	20.0	40.0

riment 2

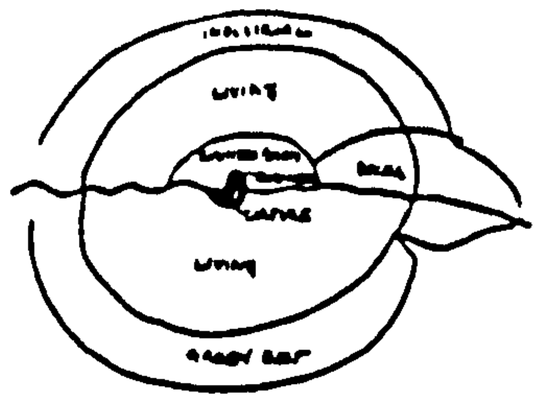
n's Structure (1973-7)
Leon van Schaik

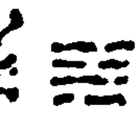
ction
ral structures (concentric, radial, lattice, zone, grid)
ven to students as possible structures for London, and
dent was asked to depict in his own way how he thought
n was structured. It was not obligatory to use the given
ures, either singly or at all.

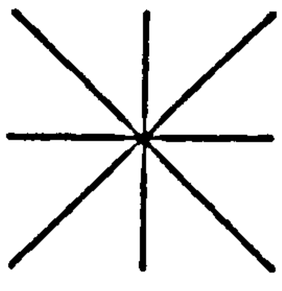
s
st is used in 2 ways. Over the year or once, prescriptively.
ver the year, its occasional administration shows different
ches to (and successes at) learning, in the ways a student's
ures develop. As a once-off test, its prescriptive use (when
osen structure's value has to be proven) demonstrates that
ular description will be validated by evidence largely
t from that which proves another one.



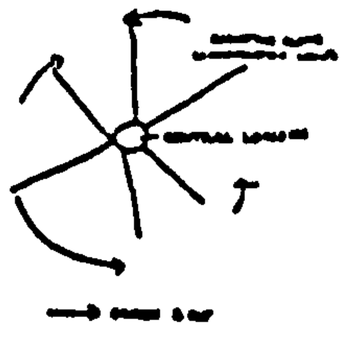
concentric

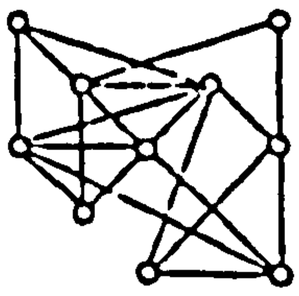




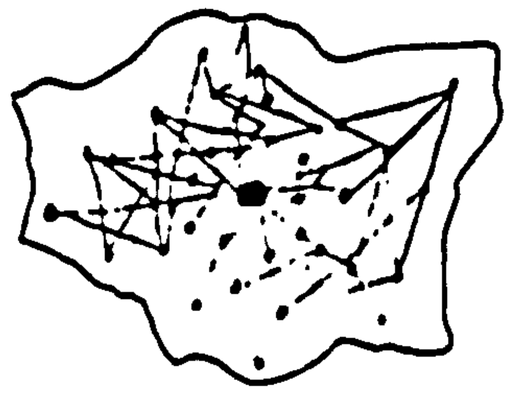


radial



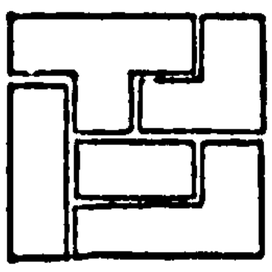


lattice

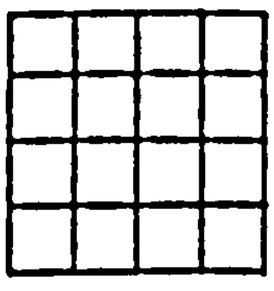


es of drawings by one student, made throughout the year,
shows the continuing development of the structure

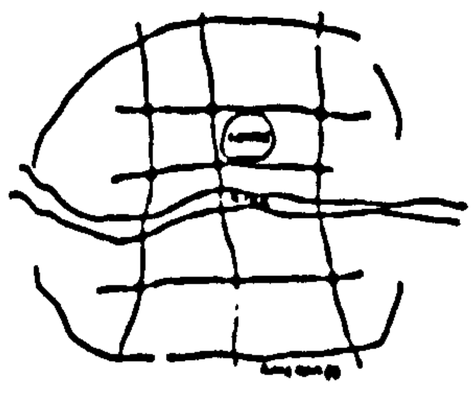
es of each of the five archetypal structures with drawings
ems showing each of the five structures being applied to
e London



zone



grid

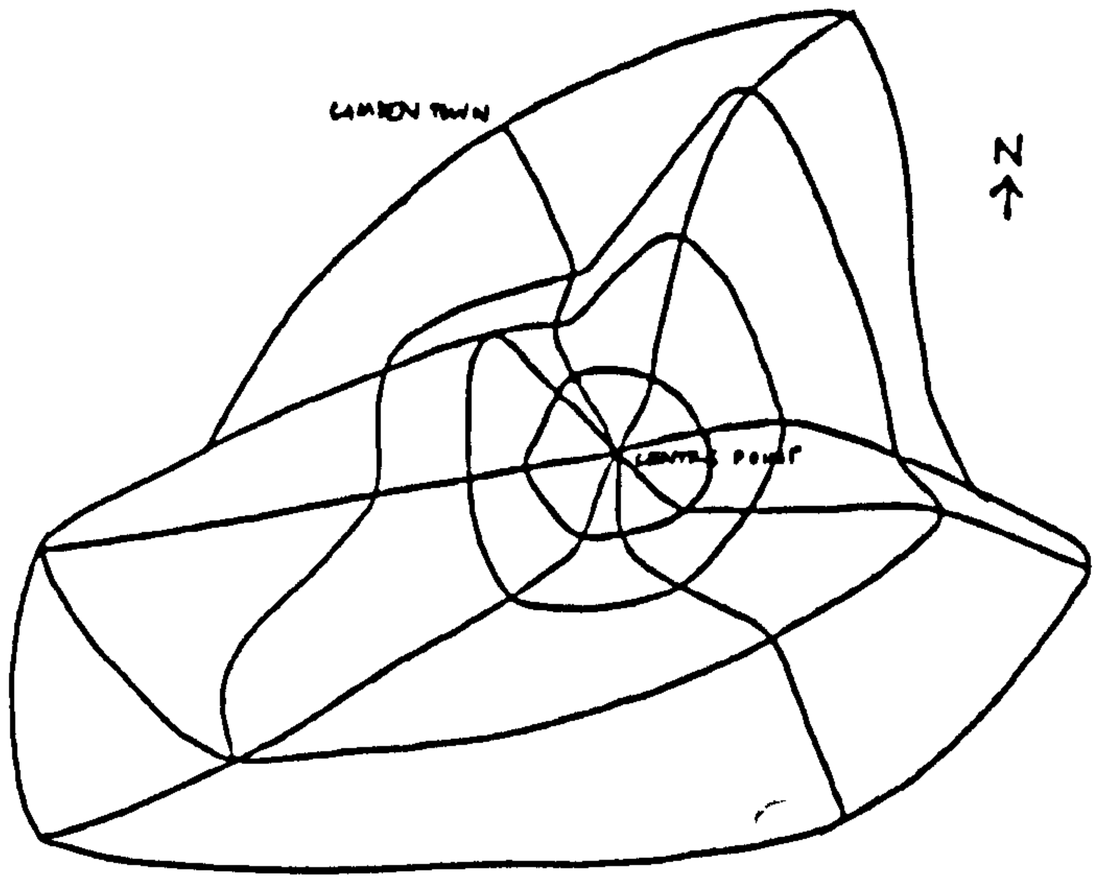


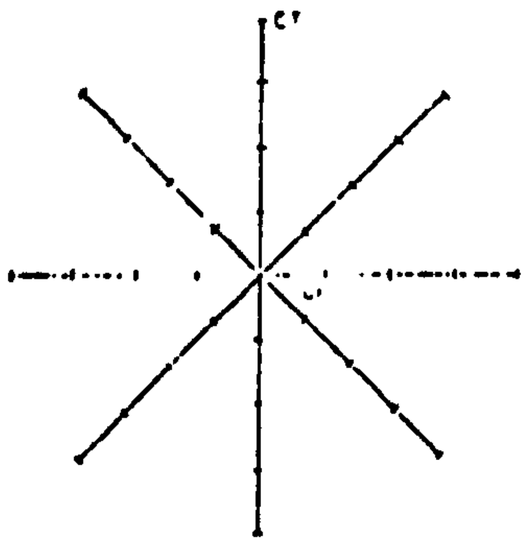
experiment 3

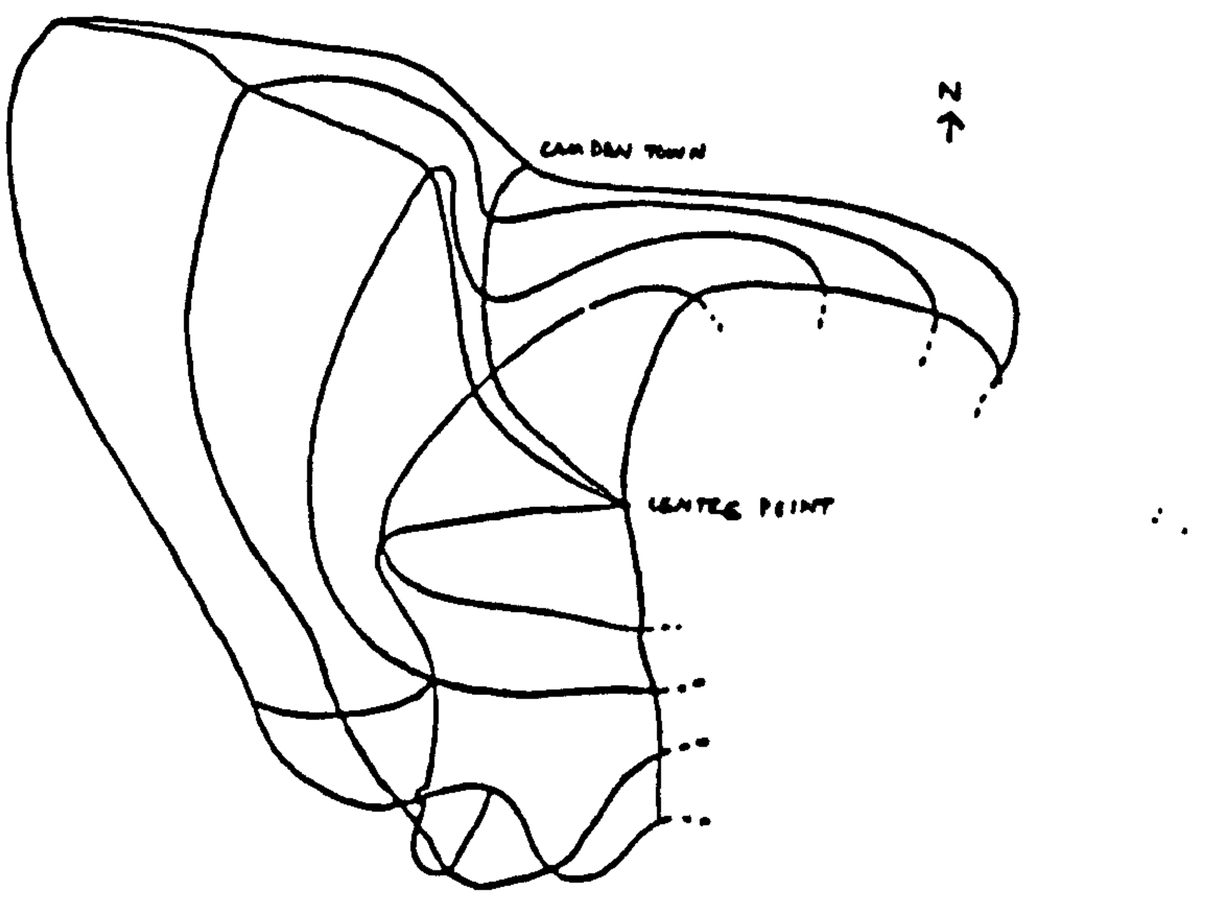
Distance in London (compass version 1973-6)
Annetta Pedretti

description
Students were asked to think of themselves as being in a helicopter looking down over London through a compass form. This form has 4 axes which pass through a common centre, each axis being divided into 8 equal parts. The centre is said to be over Centre Point, and the end of one axis over Camden Town tube station. Students named the places which they believed lay under each dividing line. The position of each named place was traced off the Ordnance Survey, and the resultingly distorted axes were drawn, together with connecting circloids.

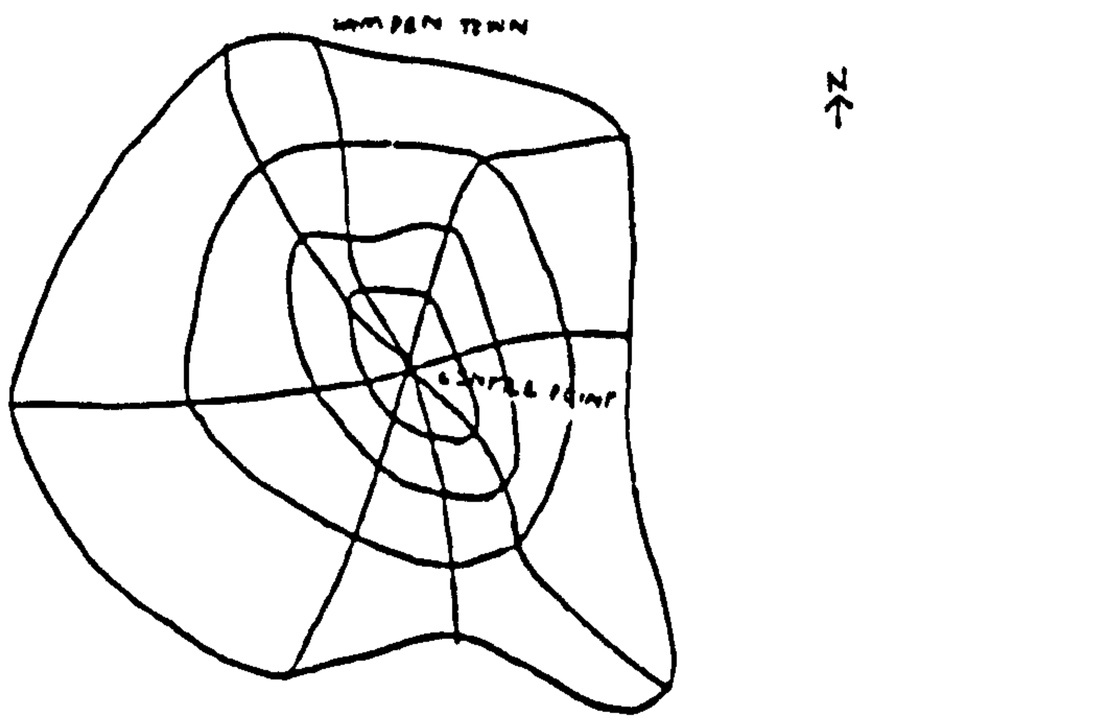
results
An accurate cartographic knowledge of London would produce straight axes and concentric circles. These never occur because human concepts of straightness and equal distance are not the same as the cartographic ones (hence we must learn to read a map). Every map so produced is different, but it is unwise to generalise: the maps are more useful to mirror one's experiences.







above:
The compass form used to assess ideas of distance and direction in London
right:
Three maps made by tracing the cartographic location of points marked on compass forms. Note the distortions from circles, the areas of ignorance and the different sizes. (All three maps use the same scale and orientation)



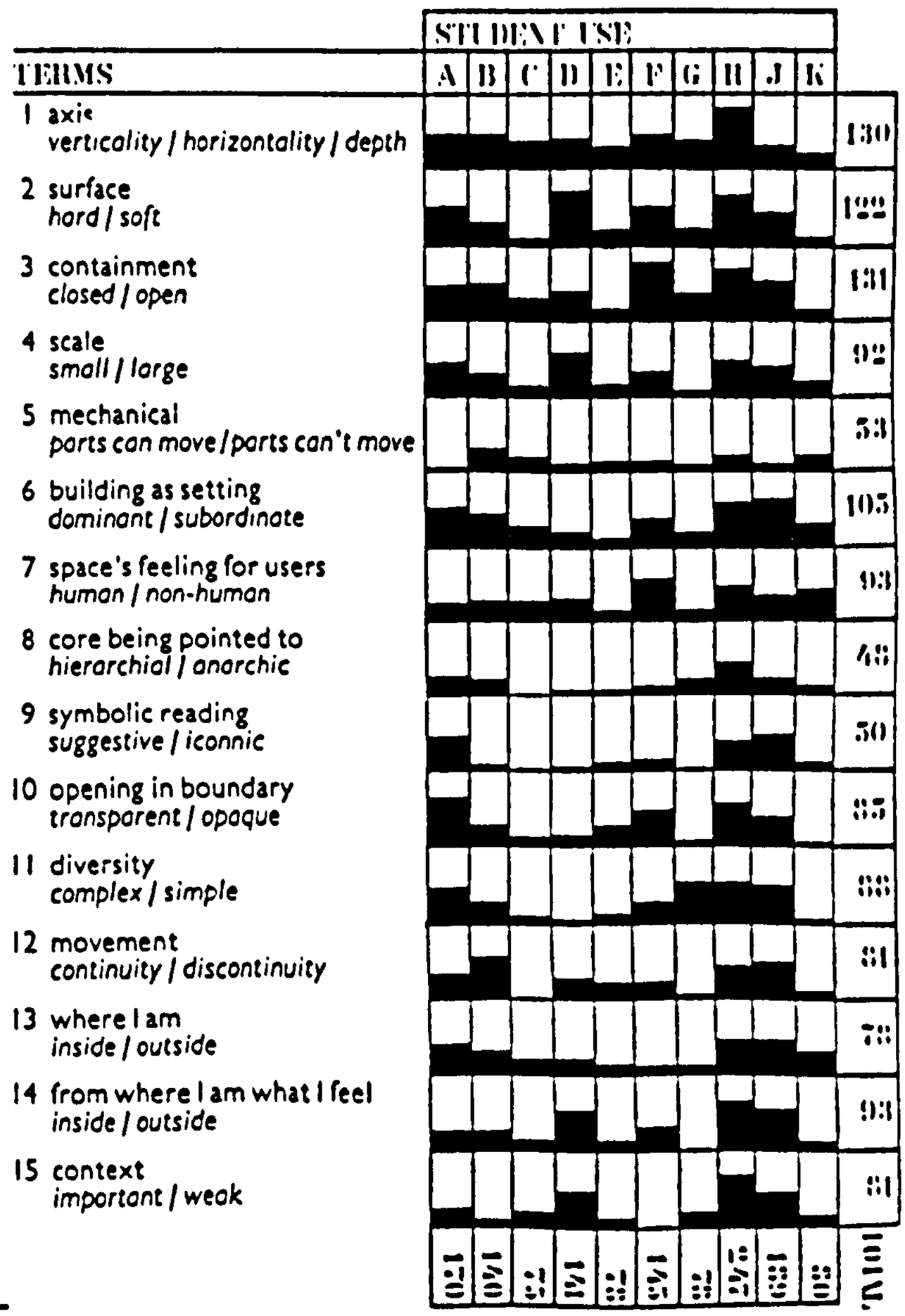
ent 4

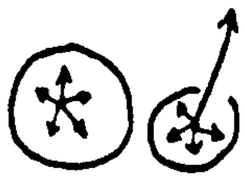
n of Spatial Experience (1974-5)

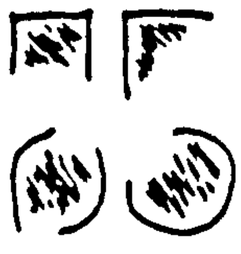
lly's Repertory Grid technique was used interactively
of students to isolate and test mutual understandings
ith which to describe slides of Aalto's Paimio
sis Sanatorium. Negotiation of meanings between
nbers was meant to unify the terms. Tests of actual
by each member, and of each member's believed
e compared. Finally, diagrams were made of each term.

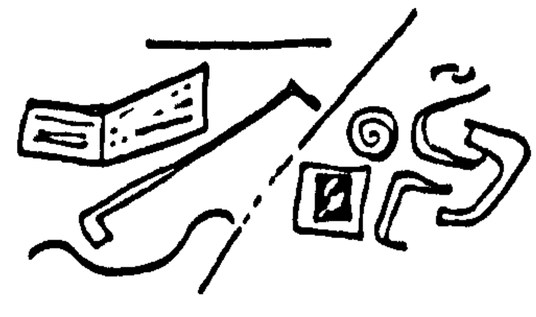
n of 15 terms was satisfactorily but painfully derived.
not cover all aspects of description the students felt
ed, but did cover most. However, each student used
very differently: one averaged 7.72 terms per slide,
34. Furthermore, no pattern could be found between
ages, and the students' knowledge of their use of
ch was very inaccurate (giving a Spearman's Rank
rg between 0.656 and −0.300 and averaging 0.286
dard deviation of 0.370, over the 15 terms).[7] But when
were drawn, there was an astonishing similarity.

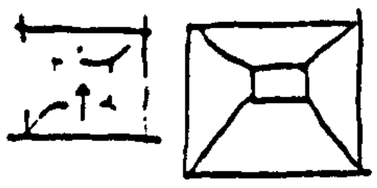
below:
The 15 terms derived by the group of students, showing how each student used them in describing 32 slides. The scale is 0–30
below right:
Ranking chart of one student's actual and believed use of terms
right:
Diagrams of the term 'containment'

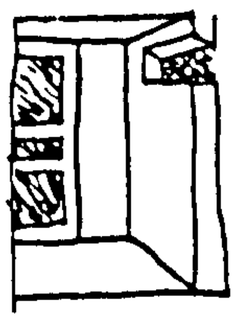




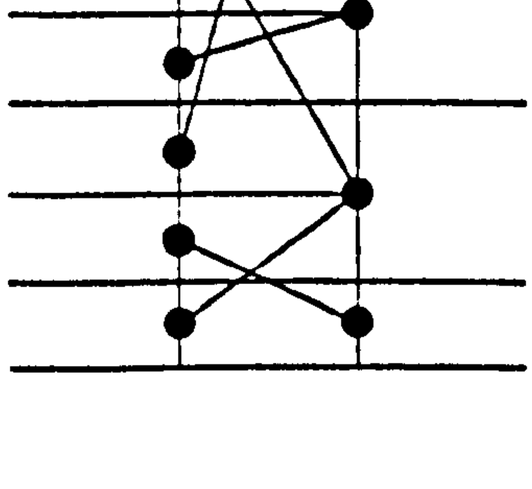








rank	believed term	actual term
1	*where I am*	surface
2	*from where I am what I feel*	scale
3	*surface*	where I am
4	*building as a setting*	from where I am what I feel
5	*context*	axis
6	*scale*	containment
7	*axis*	space's feeling for users
8	*diversity*	diversity
9	*space's feeling for users*	movement / building as setting
10	*core being pointed to*	
11	*movement*	mechanical / context
12	*mechanical*	
13	*containment*	core being pointed to / opening in boundary
14	*symbolic reading*	
15	*opening in boundary*	symbolic reading



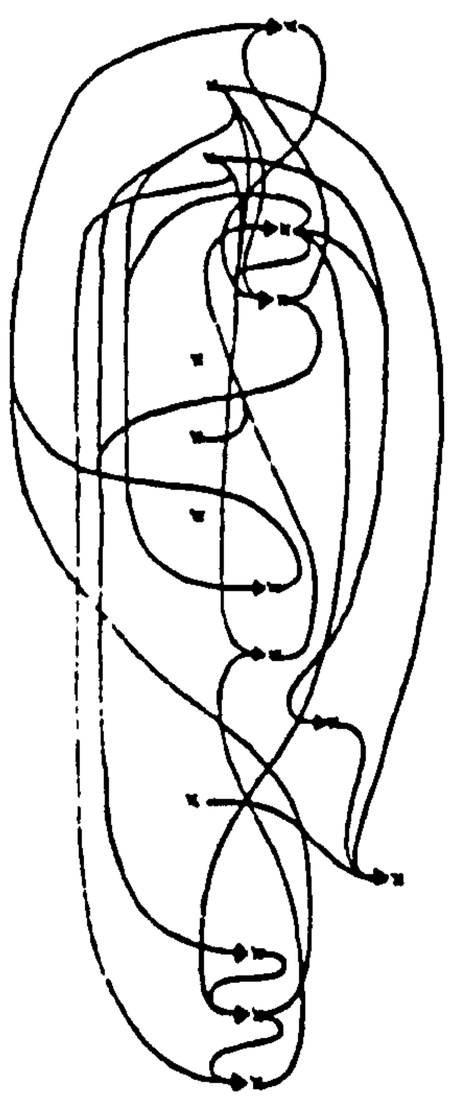
riment 5

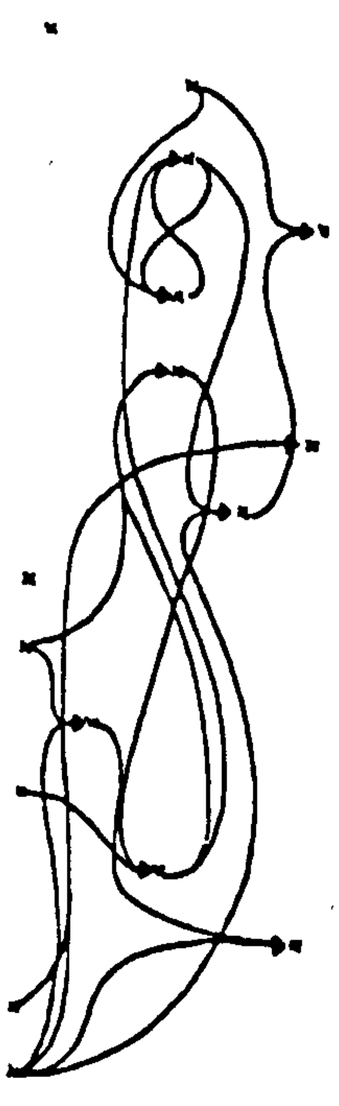
ral Knowledge Structures (1975):
eveloped by Kathryn Findlay

ption
f the 15 terms derived in the 'Description of Spatial
rience' experiment was arranged in a circle on a form.
ts (who had used the terms) filled in the form according
rule that any term could be generated by at least two
. These term relations were transformed by a simple
m to make hierarchies.

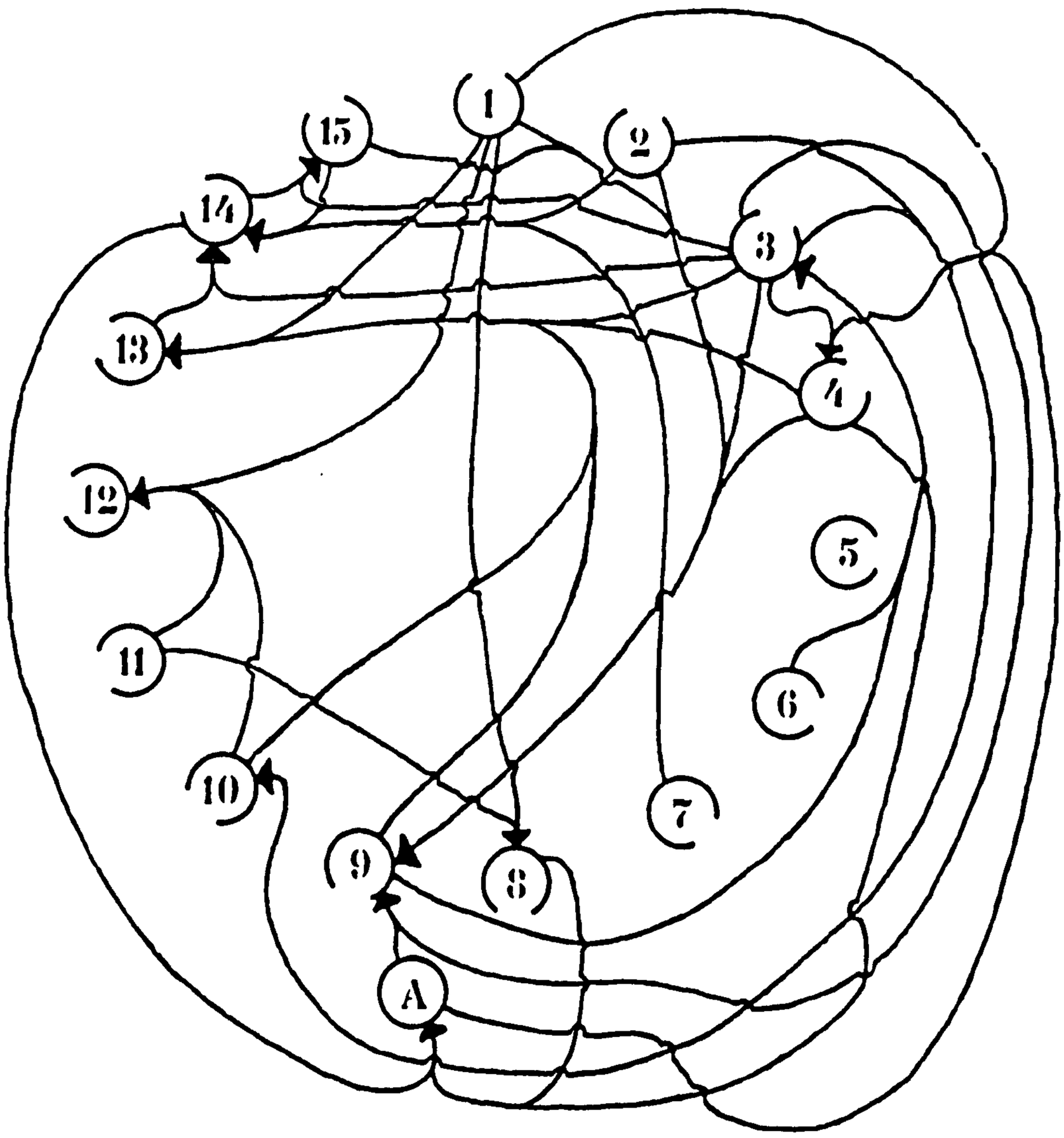
erarchies demonstrated that very few term relationships
e same for different students. Only 98 relationships were
of which but 12 were the same. When converted, the
g hierarchies showed a remarkable variety, the forms of
could be interpreted as showing the students, learning

below:
Two personal knowledge structures, based on the filled-in term derivation form
right:
A filled-in form, showing the personal derivation of terms by one student





A
axis
surface
containment
scale
mechanical
building as setting
space's feeling for users
core being pointed to
symbolic reading
opening in boundary
diversity
movement
where I am
from where I am what I feel
context


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
A

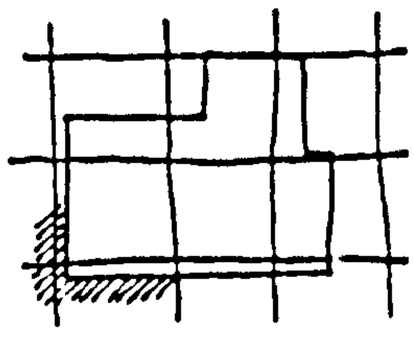
periment 6

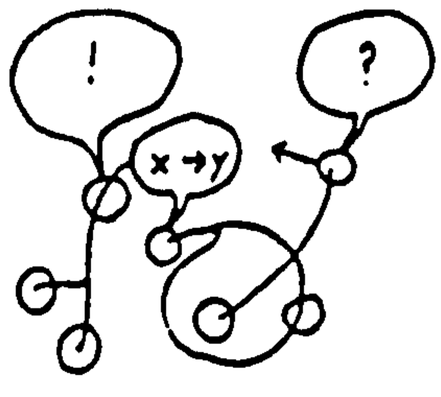
e Blindfold Surveys (1976-77)

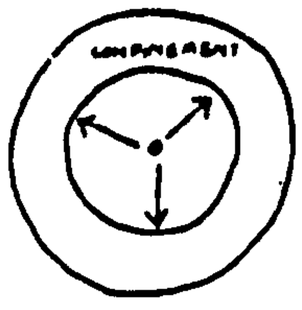
scription
eral such surveys have been carried out. In them, blindfolded dents were placed in unfamiliar rooms, and asked to draw em (they are allowed to leave the room and remove their rfolds in order to do this). In different versions students were ed to isolate elements in their drawings, redraw other dents' drawings. and to represent the room (still unseen) m memory. They were eventually allowed to see the room.

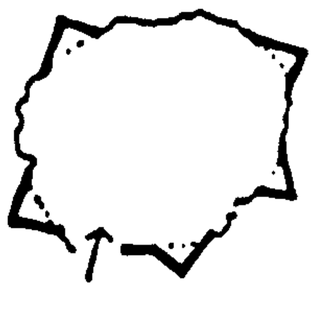
student felt his drawing of the unseen space was adequate. en asked to represent the unseen space from memory 10 s to a month later, they had very great difficulty. But when wed to see the space they were astonished at it. Even the empt to redraw other students' work, in order to extend derstanding, did not change this. Most participants have found Blindfold Survey to be a gripping experience.

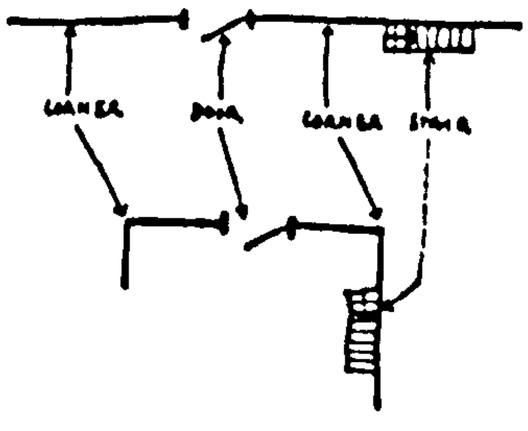
below:
Drawings of visualising strategies attempted by students in a blind survey
below right (*lower*):
A perspective and plan drawn by the same student of a room that has been blind-surveyed
below right (*upper*):
Plan of the same blind-surveyed room by another student

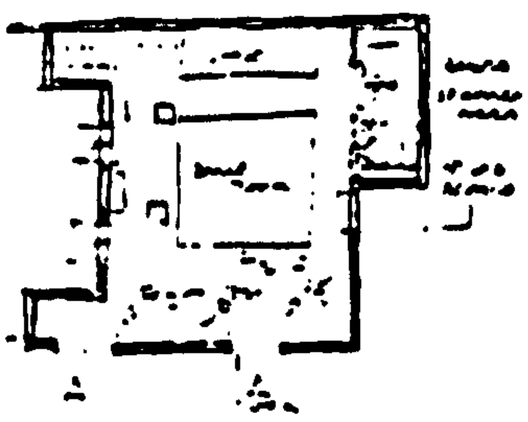


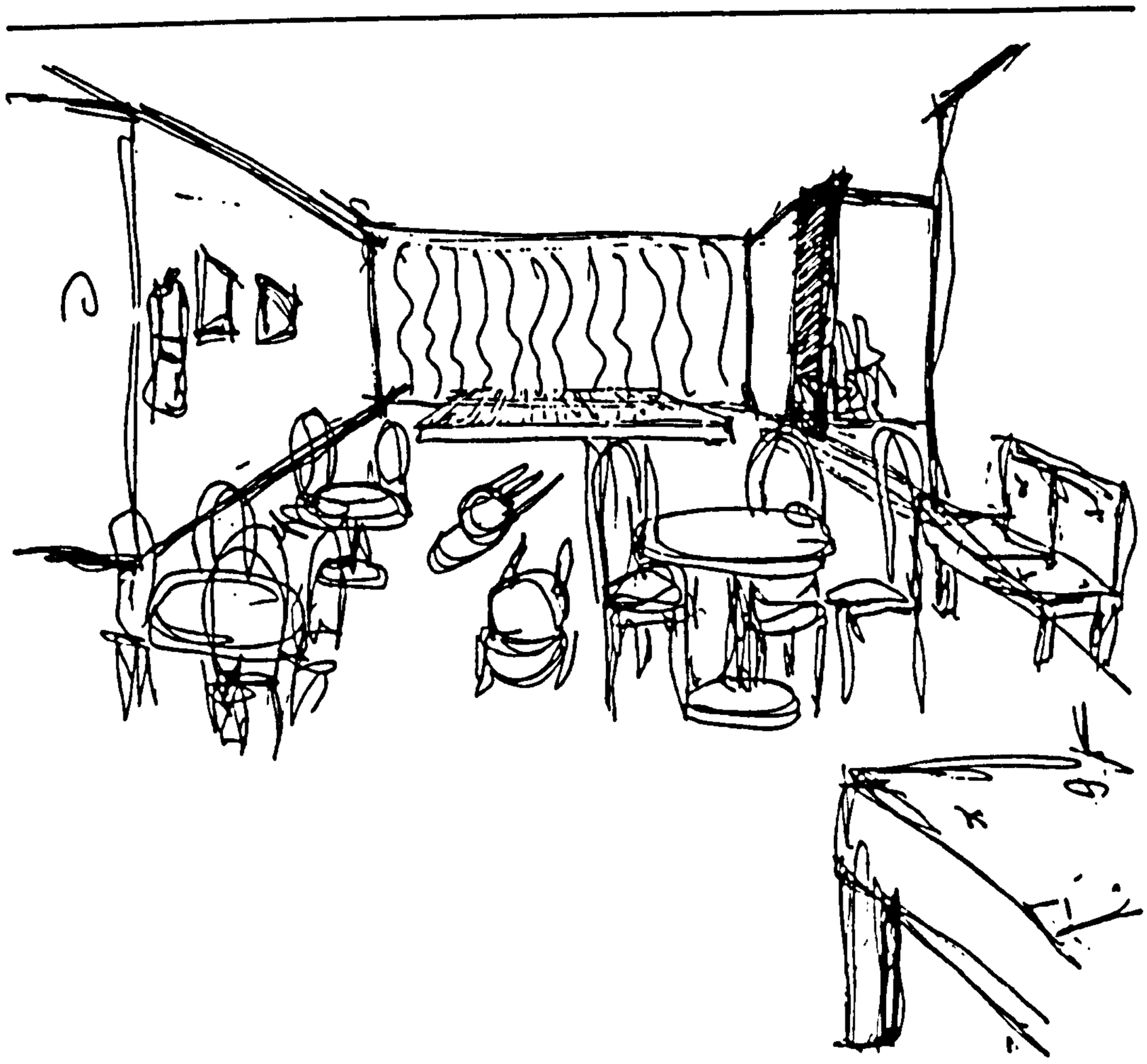


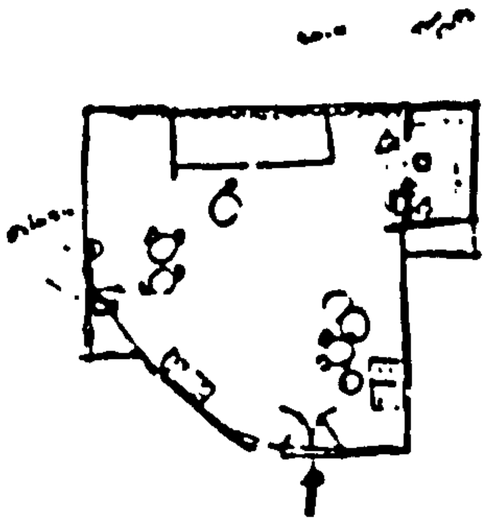












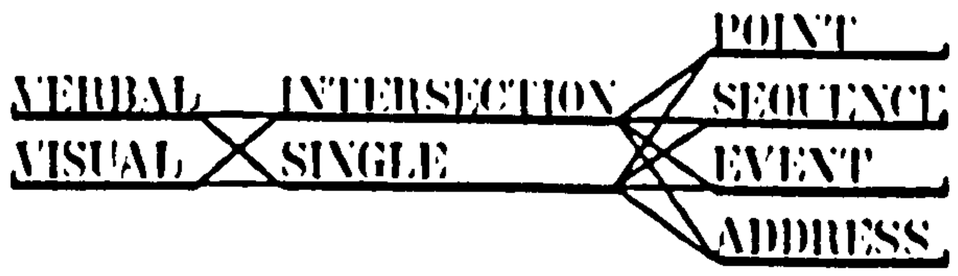
riment 7

ion, Distance and Directions (1976):
a Pedretti

ction
ren at an adventure playground were given a collection of
o places at which they could take brass rubbings. They had
t only about two thirds of these places, using the clues to
em. The clues were of different types: purely verbal, route
rs, landmark references etc.

ldren rarely selected a verbal description, and were
arly averse to verbal route descriptions. Without
ion, when a verbal clue was chosen, it was classed as
t and there was little success in following it. Visual clues,
arly visual landmark referenced clues, were very easily
d.

below (upper):
The eight qualities that describe the 16 Treasure Hunt clue types
below (lower / lower right):
Sample clues, taken from three different Treasure Hunts, showing each of the qualities used in describing places
right:
Charts of selection (upper band) of clue types and success (lower band) in using them, by individual qualities, for three Treasure Hunts. The charts are not directly comparable and can only be taken as indicative since they are drawn for each quality and not for compounds



verbal
single
sequence

turn left out of the playground
go straight and turn into the third street on your left
it's right ahead

verbal
intersection
event

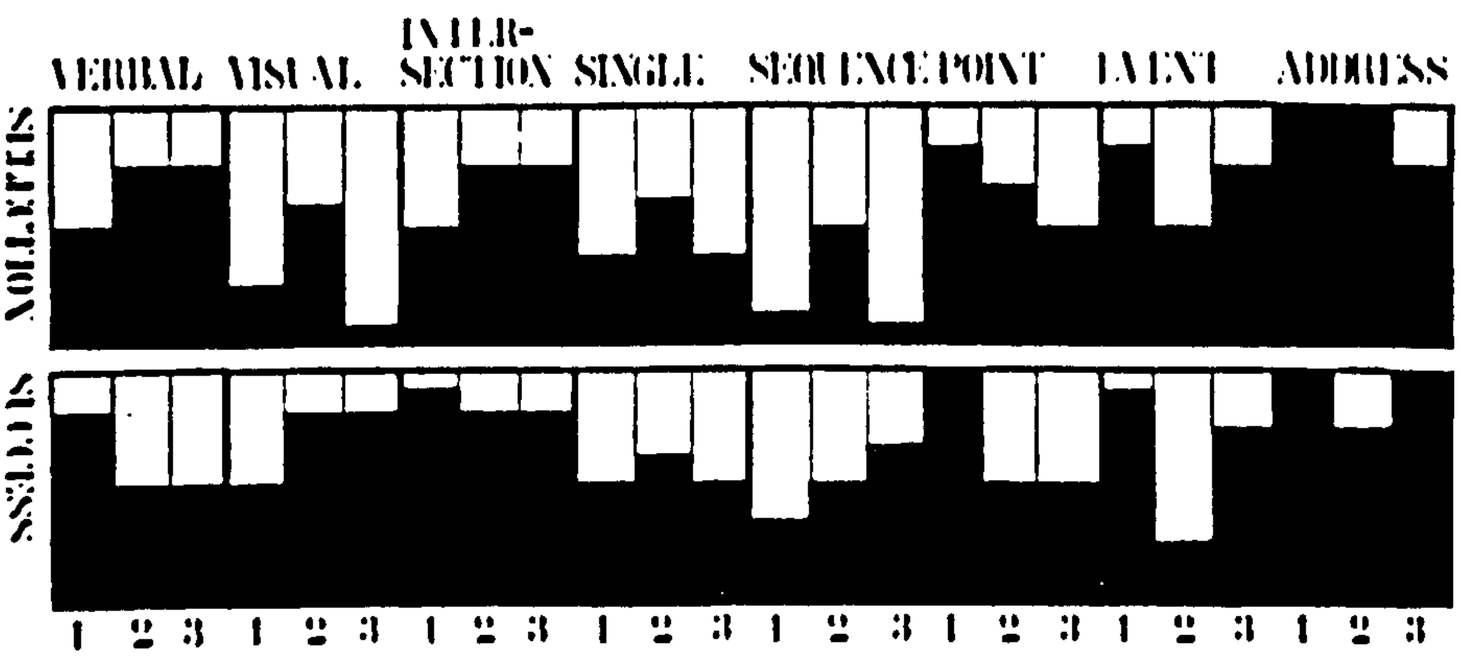
where the 28 bus going towards Kensington joins the 22 bus

verbal
single
event

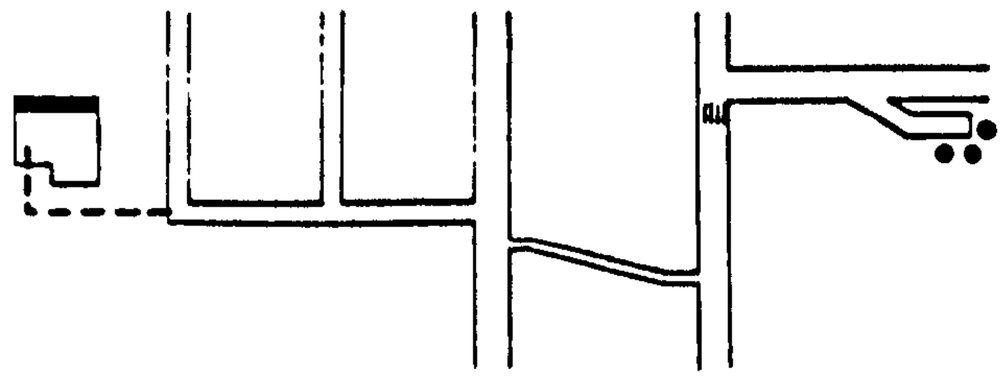
in a long alley where lots of cars go to get repaired

verbal
single
point

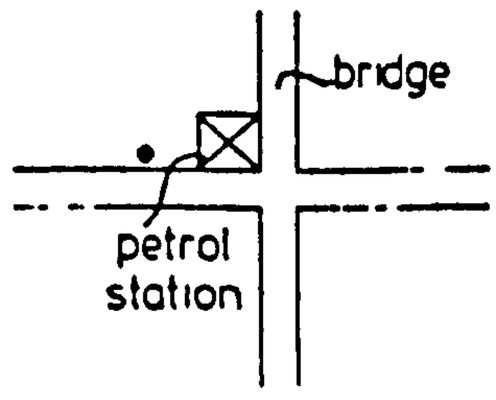
in front of the 'Dental and Foot' surgery



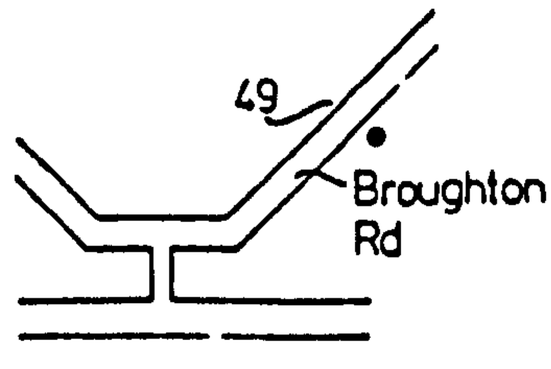
visual
s.ngle
sequence



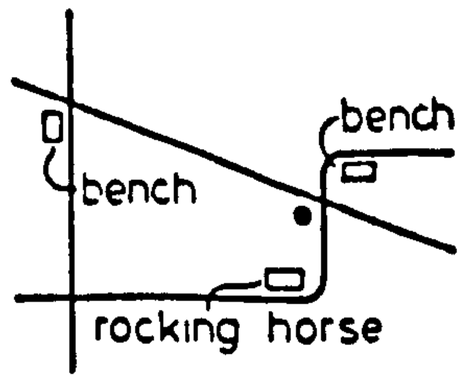
visual
intersection
event



visual
single
address



visual
intersection
point



riment 8

rolled Viewing (1977)

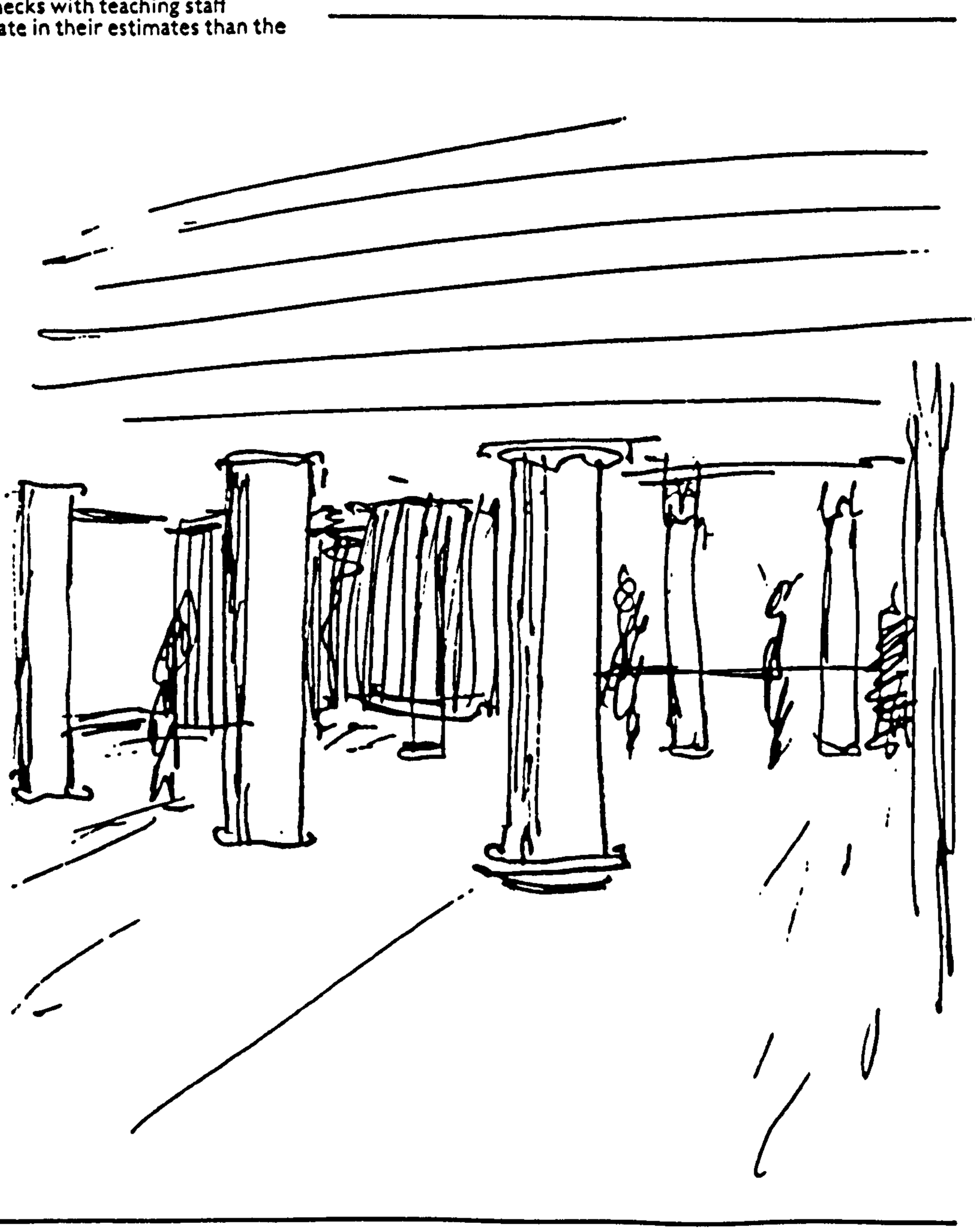
ption

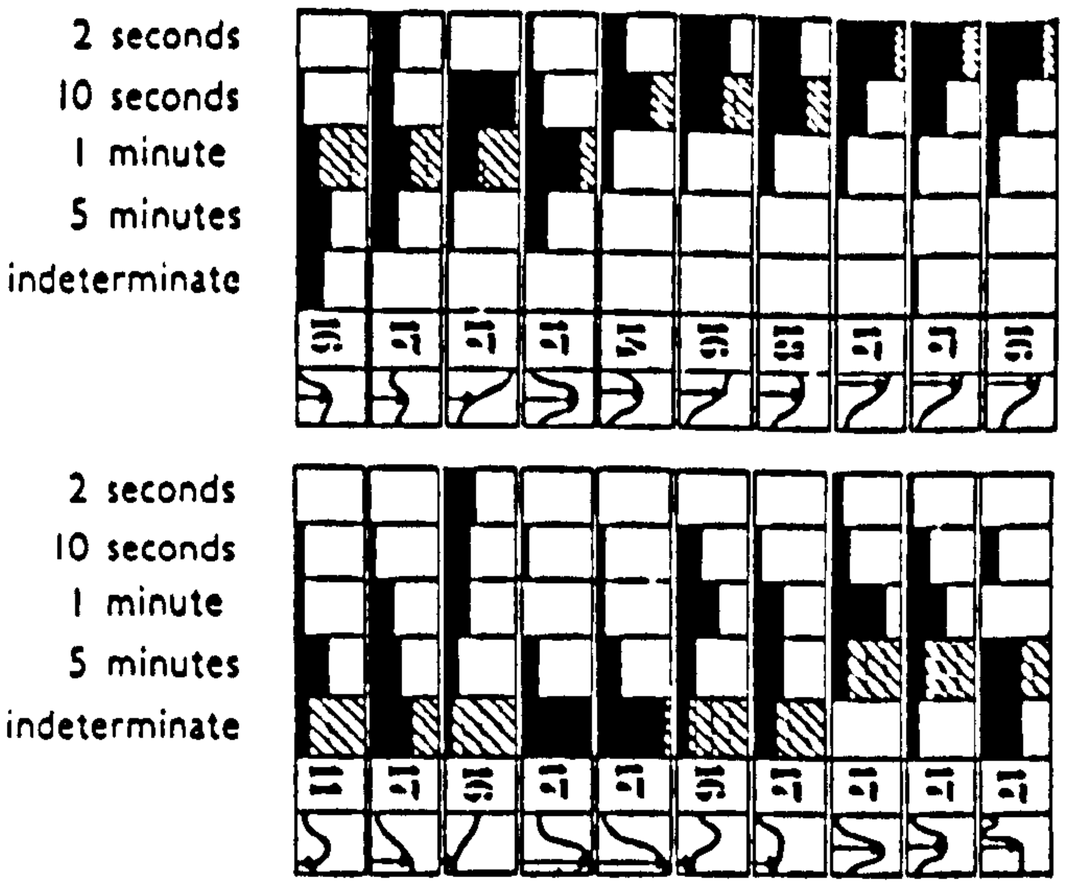
ents were placed in an unfamiliar room, blindfolded, and allowed to remove their blindfolds for controlled periods re: 2 seconds, 10 seconds, 1 minute, 5 minutes and also long as they liked. They were lead in and out but were not fically prevented from moving inside the room. After they ft, they drew the room (and did so again, 10 days later). each drawing session, they pinned their drawings up, and ked the time of viewing that each drawing represented.

s

udent had particular difficulty in drawing the space, no r for how short a time he had seen it.[8] Nor was there any lty in remembering it, to re-present it 10 days later. ver, there is little correlation between the time during the room was seen, and the guesses about this by the other cipants. (In 20 instances, only 11 cases had the largest vote e actual viewing time, and in only 9 cases was there a rity vote for that time: furthermore, the majorities are erall. With the exception of the 2 second viewings, the ion is fairly uniform). Spot checks with teaching staff ked they were no more accurate in their estimates than the ecting students.

below:
Sketch of the room used for controlled viewing by a brief viewer
below right:
Sketch by a longer viewer
right:
Histogram of viewings: the hatched area shows the time the viewer actually saw the room, while the black areas show the guesses as to the viewing time that the viewer's drawing represents. Note the discrepencies! The scale is 0–12

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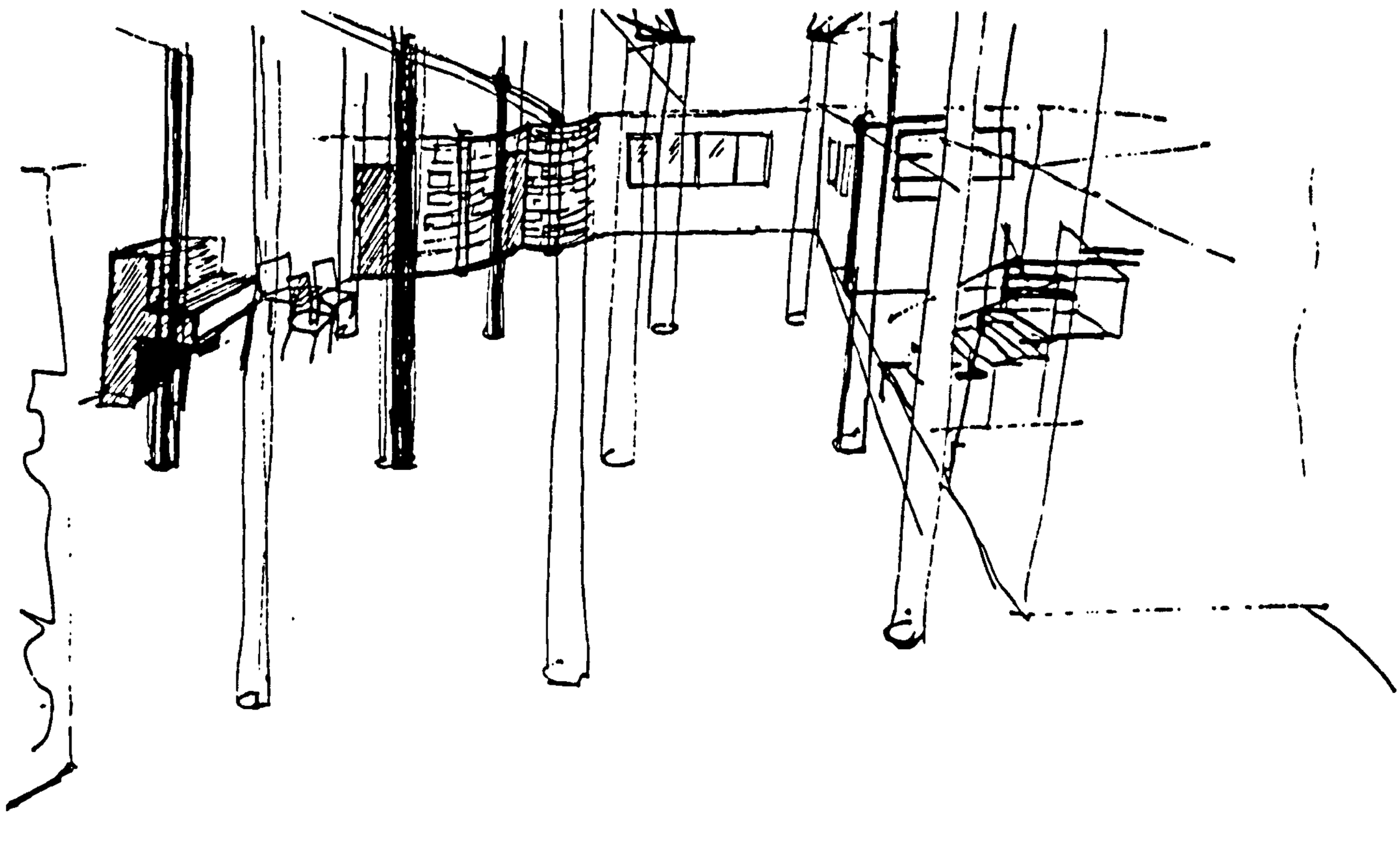

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX B

"Is Architecture just a Hollow Space? Or is it the Empty Set?"

from:
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contents

Architecture and Space

A portrait of Frederick Kiesler with the model for his 'Endless House' project shown in the recent AA exhibition on his work

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is Architecture just a HOLLOW SPACE?

or is it the EMPTY SET?

Ranulph Glanville

For the last five years, Ranulph Glanville has, together with several students and colleagues, been working on how we understand and might describe our experience of space. Starting with attempts to find appropriate verbal terms, he has become more and more convinced that such forms of description are not only irrelevant, they are structurally contradictory. Since arriving at that conclusion, he has begun to examine the nature of spatial experience, and feels that, by and large, we understand little of this because we are asking the wrong questions. Thus, for example, the position taken by most people working in the field assumes that the terms and ideal within which we can successfully describe our experience (the variables) are known. However, there is the question of whether the variables used are truly descriptive, or are, rather, prescriptive, and oblige us to force our experience to fit their mould. By asking people to describe and reflect upon their experience, not within a ready-made descriptive frame of reference, but in such a way that their cognitive models can express themselves through whatever form of description seems appropriate, he is trying to check the validity of these assumptions.

In this article, he gives a general overview of work, drawn loosely from many areas by people interested in the question of how we might describe our experience of space, pointing out the particular limits of each effort. (That these limits does not mean they are worthless, only that they are human.) In an article to be published in a later issue of AAQ, he will argue and illustrate the position he has arrived at.

I might argue that the perplexed situation in which architecture finds itself today is the result of a problem with space. There have been, throughout history, inherent concepts of space that have pervaded particular architectures and which have been formulated in ritual descriptions of ordering and organizing systems. Often, these descriptions have actually been non-spatial, defining approaches and ways of, handling space through the description of characteristics that define space, and descriptions of how to make it, rather than by describing space itself. In this sense, concepts of symmetry, proportion, the orders, etc, are non-spatial, although they define spaces.

So it happens that different architectures have set up systems of limiting the handling of space by creating ritual descriptions (formalised or otherwise) which provide a framework both for the generation, and the understanding of a concept of space. This is a way of creating and modulating spatial experience and awareness.[b]

Recent developments in architecture would suggest that we are lost in a sea of spatial concepts, unable to handle the complexity of possible approaches: witness the extraordinary lack of confidence that currently promotes preservation of even the most mediocre buildings, in preference to trying anything new. We must be the first generation to be so lacking in confidence that the heritage we leave will be the refurbished work of others. But what should the current concept of space be? What happens after functionalism? The range of the spatial problem is simply too great, but a reasonable account discusses conceptual anarchy (in the real, non-perjorative sense of the word), super-mobility and inter-changeability, and opportunity for the machine (ie, the computer and a very sentimental, Corbusian attitude to mass production and social obligations). In this one makes one's choice, either in the traditional ostrich position or in a universe called 'reality', confined by the plethora of rules, aspirations and charitable intentions which so preoccupy (rightly) those who actually build, as restrictions placed on legitimate action, or as obstacles to be hurdled or skirted. Few of those who take either position (or both) manage anything that is of substantially higher quality than banal and dreary, no matter how titillating or worthy. It could be argued that this has always been so – that architects have rarely been exceptional and that only the exceptional survives. But this is a distressing argument, even if it may be true, because it means that there has always been a high percentage of architectural dross, and that we haven't improved on it. Should we not, then, be able to? Could there be something we could try, in order to improve? And, if it is not true, would we not improve things today so that we at least approach the standard of earlier ages, even if we cannot pass it?

Spatial theories

Given a feeling of inadequacy in our spatial understanding, it is interesting to look at the sort of work being done on space, and ways of describing it, today. As architects, we naturally look to our own heritage and to those who make the theories and criticisms of our own subject from within.

Philosophy and ethics

Space, as a distinct term, worthy of isolated discussion in anything like the sense we use today, was largely the invention of Camillo Sitte.[1] Of course, the word (and many understandings of it) had existed long before. But architectural (and urban) 'Space' was the invention of Sitte.

Developments of ideas concerning architectural space have been mainly aesthetic. Traditional devices, such as scale, proportion, axis and light have been brought to bear on the idea. Eventually Giedion[2] produced the startling idea (the one which so elegantly undermines Pevsner's crude dismissal of Roman architecture as engineering and which Pevsner seems to continue to miss)[3] that the concept of space, although only recently named, had always been present in architecture and had taken quite different forms at different times. Architecture had moved into its own Einsteinian phase: space and time were united in a developing physical form. From this provoking and acute analysis, there flowered three schools. The first, brilliantly initiated by Panofsky,[4] related the concept of space at a particular time to the concept of the culture (or the mood)

of that time. Since Panofsky's devastating analogy between 'Gothic Architecture and Scholasticism', attempts have been made, notably by Norberg-Schultz,[5] to generalize the analogy.[c] Unfortunately, few periods formalise their mood so clearly and precisely as 1130-40 to 1270. However that may be, the approach depends on some formal, quasi-philosophical statement being made, and until such a statement is made of today's philosophies,[d] it is not likely to lead to our developing today's appropriate spatial preoccupations: and so it will always tend to post-rationalisation.

Linguistics

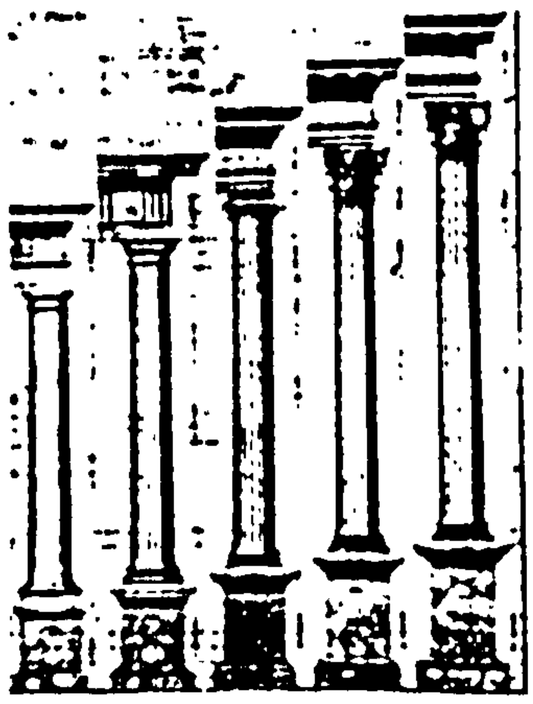
The second approach, much less pure, is that which draws upon the known and developing science of linguistics. In this case, an analogy is not drawn, as in the first, at the level of the abstract mood, represented in two forms (scholasticism and architecture), but between architecture as a functioning sub-system of the science and the science itself[6] (thus, architecture is a special form, epitomising and realising the generalized concepts of the science). There is no doubt that this is an entirely reasonable approach, if handled intelligently and sensitively.[7] The science of linguistics is primarily concerned with the generation of meaningful representations of humanly formed concepts, and the architectural formation of space can reasonably be thought to be similar.[8] The 'Language of Architecture' is, of course, no new title: in a way even Vitruvius[9] is talking about this. Certainly discussions of the orders etc, assume that they are dealing with a linguistic description of the creators of space (wrongly as it happens: almost the last thing linguistics is about is lists of appropriate actions, and recipes for magic solutions).In this respect, the work of Hillier and Leaman is interesting, specifically, they appear to be trying to draw up, using a structuralist approach, a general linguistic system from which different architectural syntaxes may be generated (and to check these against actualities). It is a slightly back-to-front approach. 'General Linguistics' is a generalisation of already existing specific linguistic studies while this is an attempt to make specific languages from an assumed general linguistic – which is clearly valuable, but has two limitations: it is a tool for making grammars – but most architects are not 'grammaticians' they are aspiring 'writers' and they need to learn how to write; and, while it certainly does handle two-dimensional enclosures, it is still subject to the criticism inherent in the position I disclosed, that we don't know if the way it does this has any bearing on our experience and understanding of space, which exists in three dimensions, because we have never examined this. While language systems are interesting *per se*, that is not our concern.

A further development of this approach is 'Semiotics' which its founder, the linguist, de Saussure[10] wished to be a generalised theory in which linguistics plays its part – the theory of signs. It can be argued that this is identical with the much older theory of representations: it certainly has much in common with linguistic philosophy and in particular Wittgenstein.[11, 12, 13] This approach has two problems: firstly, that the theory itself is somewhat ragged; secondly, that architectural critics and commentators (eg Jencks)[14] use it in ways that are both architecturally and semiotically so banal that one must question the usefulness of their efforts. No doubt, the less trivial approach of men like Eco[15] will lead to results of some value but one does question whether an approach which puts space in a subsidiary position to its means of expression is necessarily the most promising.[6]

Aesthetics

The final architectural approach is the straight aesthetic one. The description of space in aesthetic terms is really the traditional form of criticism and it has been very successful while architecture and theory have worked together. But it is full of remarkable assumptions which make the aesthetic treatment of space seem like a form of complex game. Fine, sensitive work has been done this century in the aesthetic examination of space:
Le Corbusier's[16, 17] proportions and images,
Cook's images and collages,[18]
Lynch's images and lines,[19]
Critchlow's lines and proportions,[20]
Banham's mechanisms and eclecticisms,[21]
Venturi's eclecticisms and transparencies,[22]
Rowe's transparencies and collages,[23]
are a sufficient sample – but one is left, nevertheless, with the question of relevance. At certain times, most games cease to be reasonable models of the real world, which reduces their ability to illuminate that world.[e] In a post-relativistic world of doubtful events occuring in the flux of space and time one can ask whether concepts such as 'Axis' have much to tell us about the basic malaises of our so-far unanswered, new problems. Indeed, those who work with such concepts seem, in fact, to have their whole architecture formed by them, rather than the reverse. It is clear that attempts at the construction of proto-axial images in the most exquisite and transparent proportions are not often helping us make pleasant new spaces. I suspect that this is largely because although these concepts may remain valid and valuable, they are neither necessarily relevant, nor wide enough in range to help us explain our contemporary spatial quandaries.

Claude Perrault's 1676 reworking of the Five Orders



Non-architectural spatial theories

If, as I believe, the general pre-occupational approaches of architectural theory are neither facing nor solving problem in the contemporary understanding of architectural space, where else could one look?

A certain amount of research has been done, by workers in fields other than architecture, into descriptions of con-

=porary spatial experience. Specifically, sociologists, thropologists, environmental psychologists, psycho-gists, perceptual psychologists, urban geographers and =puter scientists have thrown in the glove. What have y to tell us?

ace and society

is sometimes hard to separate the sociologists and the an geographers. For one thing, they often work ther, and for another, they frequently exchange fields. d of course, as generalising scientists they are interested generalised understandings. This may be their greatest akness. Consider, for instance, a major sociological covery, the 'neighbourhood'. Young and Willmott's standing analysis[24] gave sociological validity to the idea ich was quickly taken up (admittedly in a somewhat digested way) by planners and architects. The idea is foundly simple: a community can be seen to define elf (in physical and geographical terms as if a community uld not define itself and still remain a community). As a al insight, this confirms commonsense understandings. it only works for those sorts of communities that are graphically close – probably by necessity of work and/ of historical circumstances – and thus have an over-wering internal structure complete with a dominant ture defining an outside. This fits oppressed communi-s particularly well – Welsh mining villages, East End mmunities and even middle-class ghettos threatened by orways, for instance – but it doesn't fit all communities, d is a false generalisation. Gareth Williams' gypsies and etta Pedretti's A1 truck drivers are two communities amined by AA students for which a physical 'neigh-rhood' is meaningless. I would hazard a guess that the ery stockbroker belt communities are no more bound neighbourhoods, in Young and Willmott's sense than ne two. The sociologist looks for social spaces, spaces of mmunal interaction. Sometimes these can be repres-ed on cartographic maps, but this is rare and only tionally holds true as a generalisation over a limited ge. Architects' (admittedly pretty weak-minded) empts to transplant them wholesale, to New Towns, ban Developments and Expansion Areas, simply re-force the tentative nature of these spaces which in order work, presuppose particular types of both social inter-ion and community life-style.

Sometimes hard to distinguish, the anthropologist, un-e the sociologist, has no axe to grind. His studies tend to more descriptive (and consequently less prescriptive). e theories of anthropologists and particularly Levi-rauss,[25, 26] have had a good hearing recently and have en widely accepted, even by philosophers. Levi-rauss's structuralist notions have been developed by hitects as Typologies (in the AA, this view has been berated by Su Rogers and Elia Zenghelis,[27] and Leon rier.[28]) The view here, based on the examination of the t of space, of culturally remote societies (remote-rance of cultural form or time), is that only limited mbers of things are possible, ie that there is a finite and dable universe. This is fine as an account of what has happened so far but it fails to take into account either del's Theorem[29, 30] or the Law of High Numbers: that it assumes that the explanations of hindsight are the es of prediction. Wittgenstein demonstrates that this attitude of historical inevitability is void:[31] rather we find astonishing new things, after which we alter our explanations.

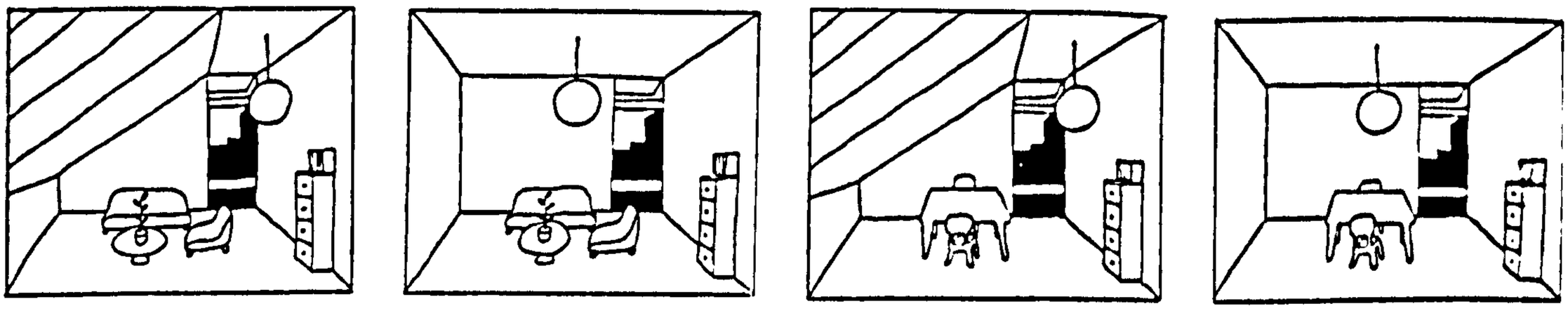
But, even leaving this argument aside, one has to ask in what way, precisely, the examination of different situations can elucidate our problem, which otherwise merely leaves us bewildered. For all the usefulness, for instance, of Hillier and Leaman's research based on such views, one cannot help asking, 'What is the value of the assumptions that lie behind it?'

The extension of sociological approaches has been carried through, largely, by urban geographers. The popular idea of a geographer is now clearly out-of-date, and the urban geographer is often more interested in the mechanics of population movement than in the effects of ice on the landscape. A look at Emrys Jones' *London Atlas*[31] for instance, will show an attempt (using entirely arbitrary areas) to display the social structure of London spatially and to show changes in this structure. White and Gould's *Mental Maps*[32] the most readily-accessible introduction to the subject, starts with drawings of personal understandings of urban spatial structures, and generalizes these into desirability contours for population movements. Morrill's and Johnston's books[33, 34] attempt to portray social structures in specifically spatial terms, thus combining Young and Willmott's and Gould and White's two approaches. The trouble with this, from our point of view is that it's far too large-scaled. It is not about perception or desirability of particular types of architectural or even urban space. It is about ways specific locations can become attractive and about simple, mechanistic reasons for this (eg, better job opportunity, low cost housing, social homomorphism). It may well be that such descriptions really account for the desirability of the locations we inhabit: certainly convincing correlations between them have considerable predictive power. But all they tell us about architectural space is that it is not often something which gives us a good reason to choose to live somewhere; which, considering the quality of most of today's product, may not be entirely surprising.

Perceptual places

The approaches made by psychologists also intermingle, not only with each other, but also with the sociologist's and urban geographer's, perhaps not surprisingly, since several of those most closely associated with environmental psychology in this country are also sociologists.

Environmental psychology is the name by which the most obviously relevant work is known. In Britain, it is almost synonymous with the names of Lee, Canter, and Smith although there is considerable work being done in the USA and Sweden. This is a field which should be full of promise: and, when it sticks to the more measurable aspects of the environment (eg, heat, light and sound)[35] it adds considerably to our understanding. The trouble begins at a more ambitious level, when the psychologist tries to examine what we prefer in the environment, because he is stuck with the same old problem: what characteristic can and should he try to evaluate? If there is no reasonable way of representing today's ideas (such as they are) of space, what can he test? Are there actually any such ideas? His answer is to resort to the old architectural vocabulary, liberally peppering it with references to the importance of



Experiment to link furniture, ceiling pitch and friendliness

object features in the space, assuming that there are suitable descriptions. Thus, considerable effort can be put into examining the significance of the positioning of coffee tables in working-class housing[36] which tells the architect that incorporating such and such a table, in such and such a position, will have particular symbolic meaning. But this really tells us very little about space itself: it tells us that a particular object can take on a role of token, and be treated as something around which an almost Jungian social ritual can be played out.

On the other side of the coin is the preference test: this involves representing various alternative treatments of enclosures, and tells us a fair amount about people's desires within a very limited frame of reference.[37]

Would you prefer the window high or low?
answer 'So that I can see out of it';
Do you prefer timber or concrete panelling?
answer 'Timber'.

These are valuable discoveries, but they are talking about the trimmings, and they are talking within the framework of the conventions of architectural drawings which, as we all affirm, are not explicit (if they were, why would we have to learn to read them?) In fact, the best piece of work of this sort I have seen, was carried out by Anthony Daniel in his first year at the AA, and showed how, by altering two or three line thicknesses on an elevation, you could entirely change people's attitude to what was otherwise the same thing.

Sometimes this sort of work comes up with valuable insights: Canter's example of high-rise dwellers disliking their flats for reasons of design (up-ended cul-de-sacs) and mechanical dependence (it's a long way to climb), rather than because of remoteness (being up high etc), is just one case.[37] But, by and large, the problem of the description of spatial experience is never really faced: the concern is with operating standard terms (rather than questioning their adequacy) and with object-tokens (rather than the relationships existing between them) while it is in these relationships that we find space.

Why these limits?

Why has this happened? It might be that psychologists and architects understand each other's field inadequately, or even that psycholgists are rarely called in by architects and so, although they give advice, their advice is not often the advice architects are looking for or listening to. Many psychologists will admit to this. But I have a feeling it is also to do with the 'origins' of the concern, as expressed in, for example, the work of the naive linguist Benjamin Lee Whorf.[38] Whorf's hypothesis is a strange one, to do with listing. David Crystal claims it set linguistics back twenty years, because, while it was acutely observed, it concerned itself with object-tokens, and not with relationships.[39] What Whorf actually did was to connect vocabulary to events, that is, to claim that words give mastery over things, so that more words give more mastery: if there are more words for states of a fire, you have more mastery over that fire (Whorf was, like the American composer Ives, an insurance agent). This is true. But it appears that the mastery comes from the relationships between the words, not as Whorf believed, from the words themselves (which, as any lexicon shows, can only make sense through their inter-relationships.

It is interesting that, since Whorf's effort, few linguists, psycho-linguists, linguistic philosophers have tried to contribute to understandings of space. They have been much more concerned with the formation of concepts and the relationships between language and thought. Work linking language and architecture has been carried out mostly by architects. The one notable exception has been Wittgenstein, whose vignettes on space are telling, and indicate some of the difficulties encountered (and so rarely faced) when trying to represent spatial experience.[40] For example, 'it could very well be imagined that someone knows his way around a city perfectly, ie, would confidently find the shortest way from any place in it to any other, and yet would be quite incompetent to draw a map of the city; that, as soon as he tries, he produces nothing that is not completely wrong (our concept of 'instinct').'

The evidence which I will present based on my own work, in a later *AAQ* article, specifically develops this point of view. In brief, one of the main contentions, discovered in the earliest experiments, is that people represent their ideas differently. Since ideas can only be assessed through some means of representation (and one believes Whorf about one's own ideas, at least in this respect), the best one can do is to examine such representations, equating them with the ideas. Thus one maintains that everyone sees things differently, even though there is a commonality that allows us to speak of 'the same' (when I say two things are the same, I am, in fact, insisting that they are different). The implications for the nature of the Objects we perceive is as great as it is for the means of seeing, and in particular it means that we never see the whole of an Object (the Whole Truth), and that we can only describe an Object by using another one in its place.[41, 42] Thus, the problem is one both of representation and of the equating of two different perceptions.

Consequently, one is concerned with the psychologist's attempts to grasp the mechanics of perception. Experiments such as the Ames Room, paradoxes such as the Necker Cube, deceptions such as the appearance of a shape from interference in other shapes, provide the main illustrative material.[43] But of course, what they are concerned with is the mechanics of perception, that is, how things such as the eye-brain interface interpret informa-

[44] and not with what the brain might think of this
[45] retation.[45] Perception and cognition are inextricably
d, the opposite sides of the same coin, but they do
to be mutually exclusive points of view: if perception
ncerned with how sensory information (signal) comes
the world outside to us, cognition is concerned with
our models of the world outside affect the way we see
is, apparently, there (data).[46, 47] Any description,
h involves recognizing a similarity between what is
ived, through a mental model of what is perceived,
a way of representing it, is clearly cognitive, since it
es this externalising of the model of the world. So
while we learn from the perceptual psychologist a
ing of relationships between the informational struc-
f the world and the ordering of the sensory data we
n from it, we clearly do not learn about the type of
ence or the ways we might usefully describe this.[48]

puter concepts

final set of people are concerned with ways in which
ight describe space. Those who are concerned with
puter simulations (or syntheses) and even computer-
d design, must, of necessity, state formally the
ies, and the relationships holding between them,
ved in architecture.[h] Although one might hope that
approach could lead to some deep analyses and des-
ons of spatial qualities we find rather the opposite.
ad of treating architecture as design most computers
ering it as problem solving.[49] In using these terms I
ming at the following basic differences. In problem
g one has a known starting point (the problem): a
(the solution); a field of operation (the problem to be
d and the range of possible actions) and one operates
ally through this. Any collection of sets and connec-
s leads to the unique solution. But with design, the
em, the goal, and the field of operation are unclear
they gell together, each modifying the other to create
whole. Any collection of sets and connectives, in an
ined field of operation, can have another contra-
ry set generated:[50, 51] the unique solution disappears
se one does not know which are the relevant sets.
, the computer's interests in design, where not to do
ling problems, critical paths etc, is sadly to do with
ational topologies[52] (which any designer handling
anisational problems can cope with)[i] or with set
ric models, rather as described above, to provide an
ner's list of design criteria. The one, profound
son I know is Nick Negroponte at MIT,[53, 54] where
puter builds up use-of-space, and identity models:
even these remain inexplicit as to the spatial qualities
discern (if any).

clusion

is could be the start of something big

ould not be thought that I am just trying to denigrate
ork that I have described. I understand as well as
body else the contingent reality researchers face, and
its limits, and with appropriate allowance made for
ecessary) assumptions, the work adds something to
derstanding and ability. The question is only about
limits and assumptions (which it sometimes fails to
or respond to). If we are trying to understand how
derstand space, to tap our cognitive models, then it is
vital that we should not force such models into particular representational frameworks, for, as I have argued, we can only see the ideas through their representations. Unless we, as the originators of our own models, can be allowed to find our own ways of expressing them, so that we can see the relationship and so that we believe there is not too great a distortion, it will not be our model that we display, but the interaction of our model and an investigator's prescription. (I am fully aware that I am talking about an ideal, but an ideal is almost, by definition, something we should work towards.) As far as I can see, virtually all the work on our understanding of space assumes an appropriate means of description and is hence prescriptive and distorting. What we need, before we can reasonably ask people to use such prescriptions, is the justified sense that they do relate to understanding without grossly distorting it.

In consequence, if we want to generate ways of describing, and to examine our cognitive models, we must take into account the limitations of descriptive structures in order to assess their appropriateness, as well as considering the nature of the processes of observation and description, and of observable objects.

It seems remarkable to me that from the examination of what is currently a questionable field of dubious merit (architecture, and the architect's handling of space), evidence should come that I believe to be of profound significance to philosophical, psychological and representation theories. I will try to expound them in my follow-up article, accounting for five years' work trying to nail-down our understanding of space.

Notational references

a
I use the word architecture in the widest sense adumbrating urbanism, planning and so on.

b
How else can it be that the centrally-generated external Greek space, in which to see was to participate and be included, is treated by modern man as an object-token, a thing to be approached and over-populated at the central generator?

c
For a detailed criticism of his work, see my review in *AAQ* volume 8 number 3.

d
I am specifically referring to a draft to a series of articles intended for publication in *Architect's Journal*. I hope my reference to this draft source will not be considered unethical or misleading.

e
Games *per se* have no need to elucidate the real world, of course.

f
Although oppression is not obligatory.

g
Indeed Paul Lawless, of the AA Planning Department, recently delighted me with evidence that, using 45 different criteria, 45 different sets of neighbourhood could be found in Manchester.

h
More cunning users can make computers participate in defining these, but this makes no eventual difference.

i
Although Peter Jackson has produced a programme which goes far beyond this, and generates surprising alternatives.[55]

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R Glanville 'What is memory, that it can remember what it is'?

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M Vernon *The Psychology of Perception.*

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J Letvin, H Maturana, W McCulloch and W Pitts 'What the Frog's Eye Tells the Frog's Brain'.

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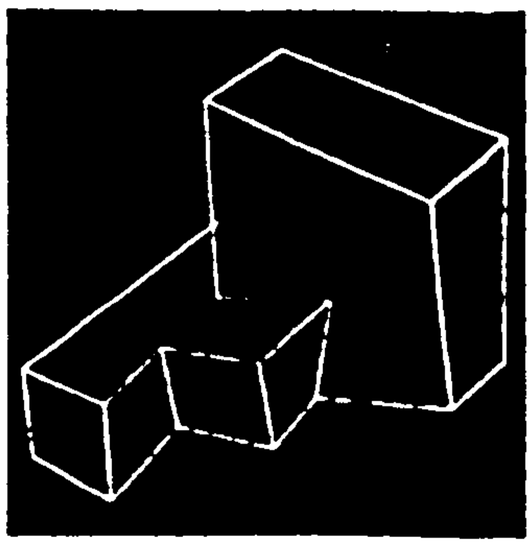
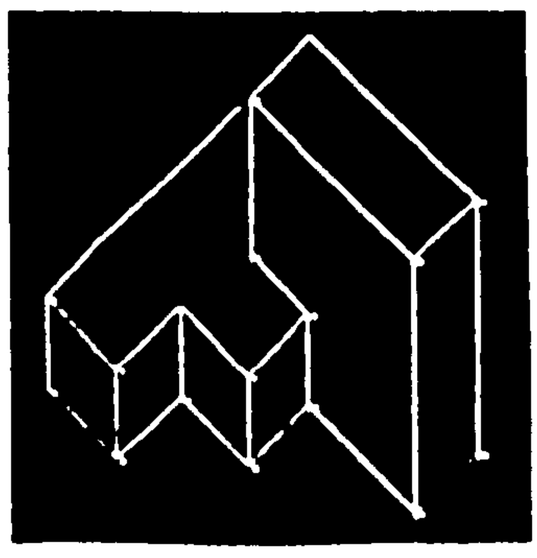
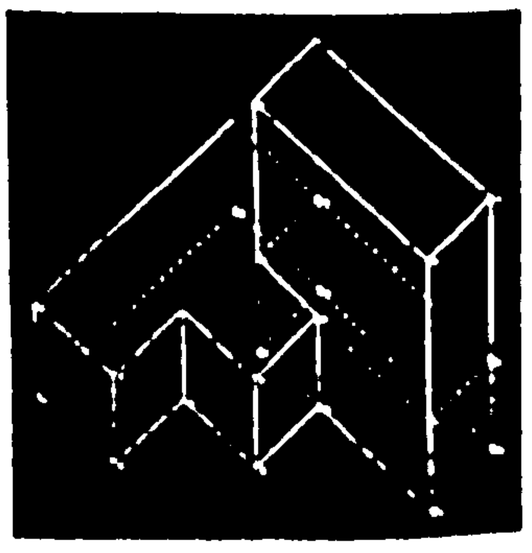
Aspects of Negroponte's Architecture Machine







ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX C

"Mapping Realities."

from:
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volume 12 number 4 1980

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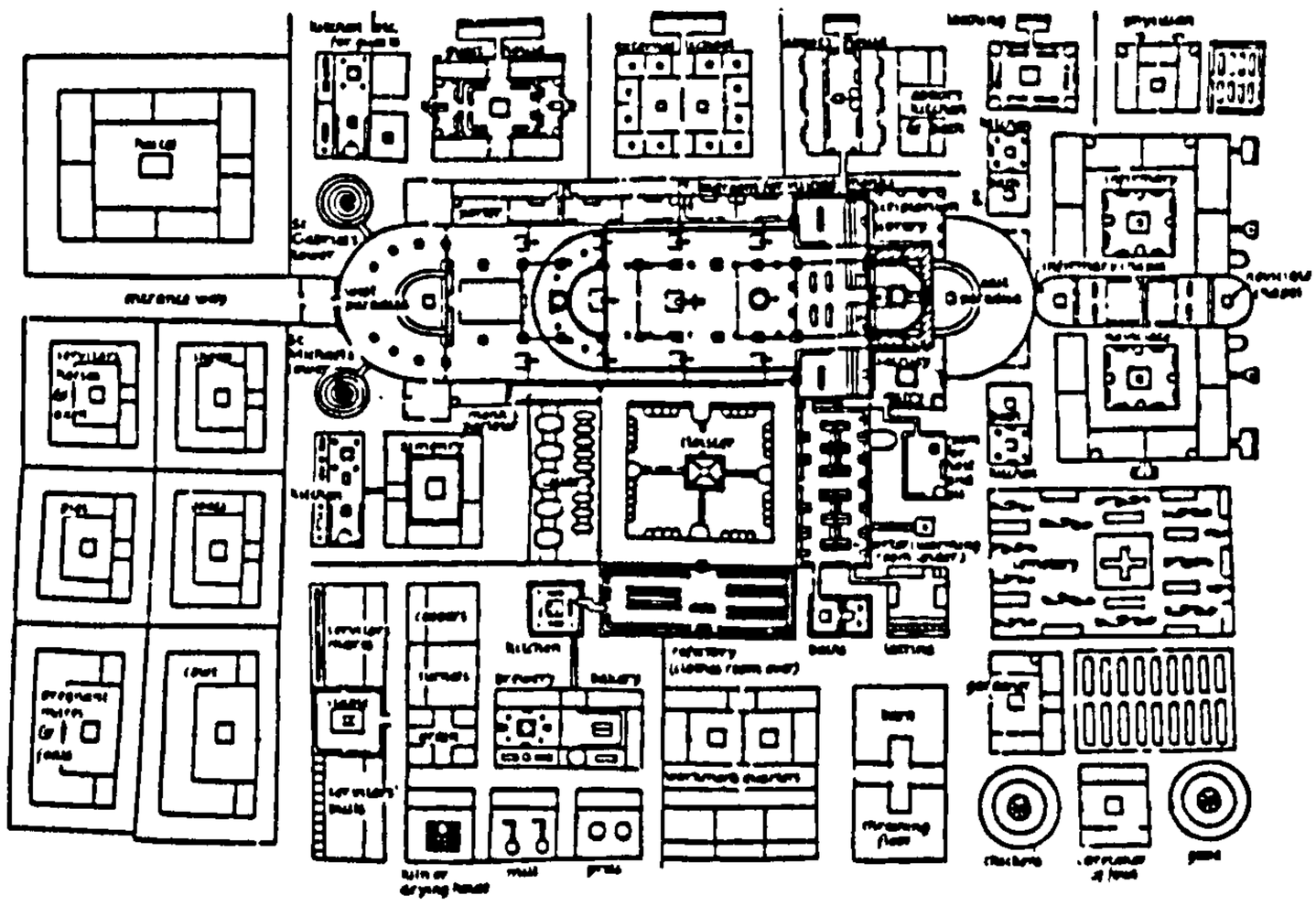

This representation of a Utopian reality shows, in plan form, one of the most astonishing documents of early medieval Benedictine monastic architecture. It is reproduced in Wolfgang Braunfels, recently-published study *Monasteries of Western Europe* Thames and Hudson, London 1980. The document itself is preserved in the library of St Gall and this version has been re-drawn and its legends translated

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DESCRIPTION: INVENTION: REALITY

Maps: reality

Ranulph Glanville

Dr Glanville examines the nature of maps, the rôle they play in defining the world and how we go about building it

Figures referred to in the text are displayed in general sequential order on pp.23–31

It is well-known that it is far harder for a natural speaker of a language to understand (in an academic sense) its grammatical structure and limitations. Of course he understands them, intuitively and sub-consciously (if they indeed exist) far better than the foreigner; that is why he speaks fluently and without flaw; and yet that natural speaker, considering a foreign language, will often notice things that shed light on his own natural language. In talking about architectural drawings, architects are confronted with the same problem of familiarity. We can, of course, talk about architectural drawings as mechanical projections, or in a number of other ways; but we can also treat architectural drawings in a manner analogous to that in which language was discussed above. That is, we as architects may look at another similar, but distinct, 'language' in order to reflect on lessons we can learn about architectural drawings.

It is this second approach that I shall follow here. As my 'foreign language', I shall use maps, which have an obvious similarity to architectural drawings, while remaining clearly distinct. What I want to do is look at the ways that the distortion and editing, which I shall show to be essential in making maps, are not a disadvantage, but actually provide a whole extra expressive dimension which the skilful cartographer exploits to great effect in creating his picture of reality. This is not, of course, an attempt at any profound views on cartography *per se*; rather it is the exploitation of one discipline in the service of another.

The most important feature of cartography that I wish to concentrate on, is its inherent inaccuracy. This inaccuracy comes about in two ways, the first of which is mechanical: the problem of projection. I should emphasise, straight away, that this inaccuracy should not be regarded as malicious. Since it is inevitable, it cannot be bad, any more than our need to breathe is bad. The question of accuracy is not even really one for comparative assessment. If you cannot be absolutely accurate, you can have no one standard against which to measure and compare accuracies. So I regard the inaccuracy of projection as benign; as generating the necessity for maps that must contain interpretation and cannot be thought of as neutral.

The problem of projection is essentially encapsulated in the problem of converting a three-dimensioned sphere into a two-dimensional plane, as is demonstrated in *figure 1*. This is a problem in principle, as opposed to a problem in the technology of execution. There have, of course, been many attempts at resolving this problem in which a 'minimum' of distortion is allowed to creep in. It is not the fact of this distortion that interests me; it is, rather, how it is used. Most of us have grown up with projections, such as Mercator's (*figure 2*), which display the world in such a way that the powerful European countries are relatively large and central, while the dominated Third World countries are comparatively reduced in size. This is a product of a projection technique in which some parts must appear unduly large. But which parts are so enlarged depends on exactly how and where the tehnique is applied. It is quite possible to create the map in such a way that Europe appears small, while parts of the Third World (which, in Mercator's day, Europeans were busy conquering and exploiting) appear large simply by tilting and spinning the globe a bit before constructing the projection; obviously, not the sort of impression the princes, merchants and adventurers, who originally commissioned the maps, would wish to create. It is still amazing and

salutory to consider the apparent and 'actual' sizes of, say, the United Kingdom and India, and the way they are reflected in the significance we give to each in our consideration of the world.

As a way of demonstrating these differences, consider for a moment Buckminster Fuller's extra-ordinary dymaxion world-map; extra-ordinary because of its daring originality. In his article 'Fluid Geography', Fuller considered an icosahedron built around the world, with the land surfaces projected onto each face of the solid. This gives a remarkably small range of size distortion, and allows the icosahedron to be folded out flat by cutting along selected edges. So far so good; but what is interesting here, is what Fuller does as he unfolds his map; for he is quite aware of the arbitrariness of the decision of how to apply the projection and of its intentionality. Thus, he provides several maps which accord to different intentions in what he wishes to show. (*figure 3*)

So it is also with the prime position at the centre of the map. It might seem sensible to us for the 0° meridian to run down the middle, leaving Great Britain at the centre of attention (after all, we carefully engineered the meridian to pass through *our* Royal Observatory). But, in American atlasses, we Europeans are amazed to find the USA in the centre, with Europe posted to the eastern fringes of the map.

Such distortions might be thought only to matter when dealing with at least large parts of spheres; but this is, of course, not so. For while the sphere-to-plane conversion problem disappears from significance, when the area of the sphere is small and the surface curvature is so minimal, that it can be considered as being flat; this does not get over the normal problem, when the surface is not a simple section of sphere but undulates, undulations having been relatively insignificant when still operating at the scale of the whole sphere. A good example of this problem is tackled by the Swiss Federal Topographic Survey.

Even the most sophisticated of stereoscopic aerial photographic techniques have not superseded the traditional skill of sketching (*figure 4*). It is not just a matter of overhangs creating obscurities, or of shadows blotting out great areas, though this is problem enough. The sheer vertical distances may be so great, the cliffs so high, that interpretation errors and ambiguities in the photographic data require resolution by reference to straight-forward, old-fashioned sketches, which are used in preference to photographs precisely because the skilled surveyor can choose what to include and what to edit out, in a way that will help the cartographer decide on his interpretation. In such circumstances, the distance distortion can be infinite; a vertical cliff will appear to have no distance at all; and should corrective devices, such as shading or contour lines, be used, considerable de-coding and unravelling will be needed in order to ascertain the cliff-height. The estimation of distances along the mapped surface, is, under such circumstances, very tricky, and there are necessarily very real distortions. This leads one to the second type of inaccuracy in maps, the inaccuracy caused in editing and interpretation. The need for sketches in the Swiss survey provides a good indicative introduction. Map-making necessarily involves editing; not only, however, in the way described, but because maps are intentionally simplifications. They are not intended to contain all available information (for instance the exact position of every boulder in a rocky field), but rather (in exactly the same way as a scientific theory) to contain the least possible information, arranged as unambiguously and simply as will permit a skilled map-reader to extract and generate an adequate image of that which is mapped, in the terms in which he wants this image. This is usually achieved by the use of some consensual conventions: for instance, the scales, information selection, key symbols and colouring of our Ordnance Survey; but this is not necessarily so. Many maps derive their power and interest, either through deliberately breaking the conventions, or through setting up particular conventions more appropriate to the points being made. It is on these kinds of maps that I wish now to concentrate.

If the projection distortions, in which the European countries appear relatively too large (and where Britain, the USA, or whichever country is making the maps, appears in the centre), are considered as propaganda, they are not the only ways in which propaganda appears in maps. There are several ways of doing this. In a sense, the most straightforward involves a sort of *Gestalt* switch, in which the outlines of various countries are seen, not as the countries themselves, but as something else. This type of map was particularly common in the Victorian era (*figure 5*), but is, in origin, much older. For example, the medieval map of Opicinus de Canistris (*figure 6*) which is surprisingly 'accurate', shows the Mediterranean, with Europe and Africa copulating. Quite what the intent of this comment is, is not clear!

However, propaganda can be served in other, less cartoonistic ways; for instance by changes in scale. This is very similar to projection distortion, but is far less mathematical and is also far more openly wilful. The sketch map of the United Kingdom produced by the Doncaster Development Corporation is a fine example (*figure 7*), and is a telling commentary on the way British northerners feel about the southerner's view that civilisation stops at Watford (or is it Potter's Bar?). Of course, this map relies, as do so many others, not only on the amusing comments, but also on the common knowledge of the 'real' shape of the United Kingdom. Such maps may be used, also, to demonstrate this most clearly. A comparison of the sizes of Manhattan and Long Islands and Cape Cod, highlights the relative importance of the home city and its playground. Even more telling is the comparison of provincial, small-minded complacency of the Bostonian's view, in which the central portion of the USA is virtually empty, to the cosmopolitan, openness of the New Yorker's: a characteristic many believe continues to this day. These maps may bring to mind Steinberg's wonderful *New Yorker* magazine cover. Of course, these are highly-intentionally distorted maps, but the same sorts of characteristics may be found appearing quite unintentionally. In the recently-published British Rail *Sealink* map (*figure 10*), showing connections from Britain to Europe, a marvellous 'little England' mentality is apparent. The main island of the United Kingdom (note that Ireland is absent) appears as big, and with as complicated a rail system as the whole of Europe; and the Channel has become merely a narrow river; (surely a novel conception since we joined the EEC). It is not only for these characteristics that this map is of interest, for it also reflects interesting attitudes to continuity and direction; after all, in a train journey, what matters to the passenger is the continuity of places passed through, and some approximate sense of their separation. The detail of bends in the track is essentially irrelevant, and absolute direction is unimportant. In a sense,

places follow straight on, one after the other. Thus, the graphic exigencies that require the positioning of Milan in the space at the European left-hand centre of *figure 10* is in no sense offensive, although we know quite well that, geographically, this is wildly inaccurate. Nor do we care that the distance from Grantham to Peterborough, in the United Kingdom, is shown as roughly the same as from Minsk to Moskva in Europe!

The most familiar map using this sort of distortion must surely be the London Underground map, constantly revised and updated as new lines have been introduced. This map is not only a masterwork of graphic clarity, it has also had a profound effect on the way in which many, if not most users of London, have learnt the city, and has left traces of various geographical distortions in most of their minds. For instance, the apparent straightness of the District and Circle lines between Embankment and Gloucester Road stations ('Gloucester' was spelt 'Gloster' in the original 1886 District Line map). So successful has this map been that British Rail, for instance, have copied it for their 'Overground' map; and the New York City Transit Authority attempted a version for their infinitely more complex system: a map that ended up being over-complicated, and hence, thoroughly confusing. (In the last year, this map has been replaced by another, far clearer one that works as a sort of kit-of-parts). Distortions in geographical location have been used as a way of generating debates about urban knowledge in the Architectural Association School by Annetta Pedretti. I will not explain the technique here. (It is covered in my article 'Amazing Space! For the Architectural Stimulus-Response Rat?' *AAQ* volume 9 number 2/3 1977, and in more detail in my recently-published book *Calculator Saturnalia* G Pask, R Glanville, M Robinson, Wildwood House, London 1980.) Were there to be no distortion, the map in *figure 12* would consist of regularly-spaced axes surrounded by regularly-spaced perfect circles. That it does not indicates distance 'distortions' which, upon enquiry, were found to run along, for instance, a regulary-used tube line: the Central. Applying a similar transformation technique to the tube map itself produces, from the square grid on the original, a meshed net of considerable irregularity (*figure 13*). From such maps, a mirroring of personal, urban, spatial perception is possible.

However, there are other aspects of these maps that are also of interest. In pursuing the concepts of continuity and sequence, we have the source of the route map. While we are all familiar, nowadays, with the sort of motorway route map prepared by the RAC and the AA, which accurately, but simply, reflect our perceptions of such journeys, we may not be aware that they have a long history. The sort of information seen in *figure 14* (which it is nice to compare to the map from approximately a century and a quarter before (*figure 15*)) indicates a refinement on that seen in the amazing Mathew Paris map from 1252 (*figure 16*), in that the towns are presented in plan, and the bends in the road are shown (while the road width is absurdly disproportionate); perhaps refinements of dubious value, unless the road is either very ambiguous or very badly sign-posted! Paris's map is an extra-ordinary achievement, in which towns, a day's journey apart, are marked on part of the London to Rome route. (London is on the bottom left, running through Rochester and Canterbury to Dover, and thence, in the right hand column, via Calais or Boulogne, on to Beauvais.) The towns are characterised by sketches of their appearances, and are spaced according to that other standard for measuring distance, time; (a *journee* was a convenient day's travel).

This brings me to another point. As we know from our use of time in defining distance, distances and sizes in maps may represent things other than lengths and ground areas. The use of time in making maps continues today, and is most effective, as in *figure 17* (which first appeared in *New Society*) showing Britain drawn in terms of travel times from London. The effect is extraordinary, with poor Stranraer posted, at nine hours, rather further away from London than Edinburgh. Times have since changed, of course, with New York only three and a half hours away by Concorde; there are many ambiguities: eg why isn't the time taken to get to the airport included?; but the cartogram would be substantially the same shape today, as recent work by some first-year Architectural Association students has shown. It is the shape itself that is so powerful and even shocking, a power which rests, once again, on the fact that we know the 'proper' shape of the United Kingdom, and so can appreciate the difference when an alternative form of projection is used; in this case, distance by time as opposed to distance by length. Similarly the two maps of Finland (*figure 18*) which first appeared in *Helsingin Sanomat*, and which are drawn for aeroplane (heavy black line), rail (grey line, Finnish trains are rather slow) and road (thin black line) travel times from Helsinki and from Oulu, makes the point not just about the type of projection used, but also its place of application; and reinforces the points made earlier.

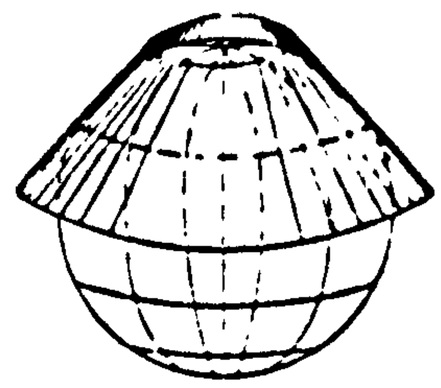
A nice inversion of the representation of the distance-for-time substitution may be found in *figure 19*. This map, from *Scientific American*, shows the effect of the time-zoning in the United States. The central line indicates the 'real' time, with the white areas to the east and west indicating how much, late or early, each main city is relative to this. The map has been used to establish how changing time zone boundaries might effect savings of energy by allowing better exploitation of daylight hours. However, just as exact direction is not important in the British Rail *Sealink* map (*figure 10*), there are some circumstances under which not only is direction irrelevant, but so is distance, and even what is passed by. The most obvious instance of this is air travel, where one is simply processed (by a large variety of time-consuming distractions) from one place to another. This is demonstrated in the Swissair system map (*figure 20*), where neither distance nor direction are intended to be understood as in the map at all, rather only the inter-connectedness. The Finnair system map (*figure 21*), is another fine example, containing as it does, not only flight destinations, but also a complete timetable. In a sense, there is one further type of map that is even more abstract, yet, paradoxically, may be more real and less distorted than any of the others we have looked at. A fine example may be found in J R R Tolkeins's *The Lord of the Rings* (George Allen and Unwin, London 1954), where a completely invented world is demonstrated and elaborated in map form. There is an old history to this: Thomas More illustrated his Utopia with a map (*figure 23*), and rather more eccentrically, there in the delightful ocean chart from *The Hunting of the Snark* (*figure 24*). Not quite so abstract, are maps such as that in *figure 25*, which was published by the *Sunday Times* in order to emphasise the imbalance between physical size and population in British electoral constituencies. It may come as quite a shock to see just how tiny Scotland is compared to London, a shock brought home, as

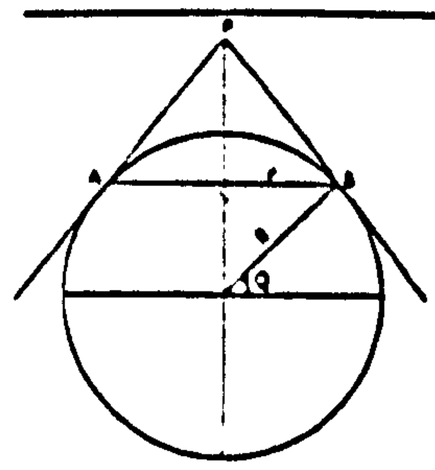
with the travel cartograms (*figures 17* and *18*), by our familiarity with geographical Britain. The use of maps to make such sociological comment is extensive. Indeed a major reason for the initial mapping of cities was not only to show property and ownership, but also physical and social conditions. The tradition is continued in, for instance, *London Atlas* and its off-shoot *A Social Atlas of London* (J Shepperd, J Westaway, T Lee, Clarendon Press, London 1974) from which *figure 26*, showing the population structure by sex and age in each London borough, is taken. The point of this map is that, in a sense, everything cartographic in it is irrelevant! The names of the boroughs would surely be enough to communicate all the information that is intended to be communicated in the map. The map does, however, have the wholistic immediacy that visual media hold over the purely verbal; the set of maps collected together gives a very subtle and complex picture of the city. A rather more cartographically-based, sociological map, is the map prepared for the National Temperance League in 1885, showing the locations of public house in central London (*figure 27*).

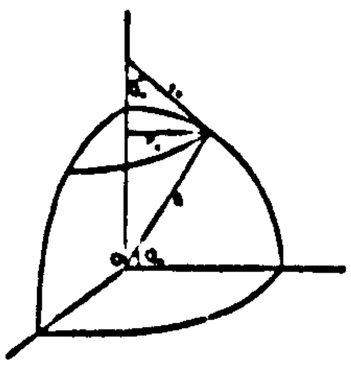
This study in no sense runs the full gamut of maps; but then, it is not my intention to do so. What I have presented, is essentially a collection of maps chosen by me for their peculiarities. The simplifications and distortions involved are, I believe, a real bonus, because they may be used to advantage in expressing not just that which is important, but also in obliging us to recognise that an interpretation must be made and understood as an integral part of the act of representing the 'reality' we see around us.

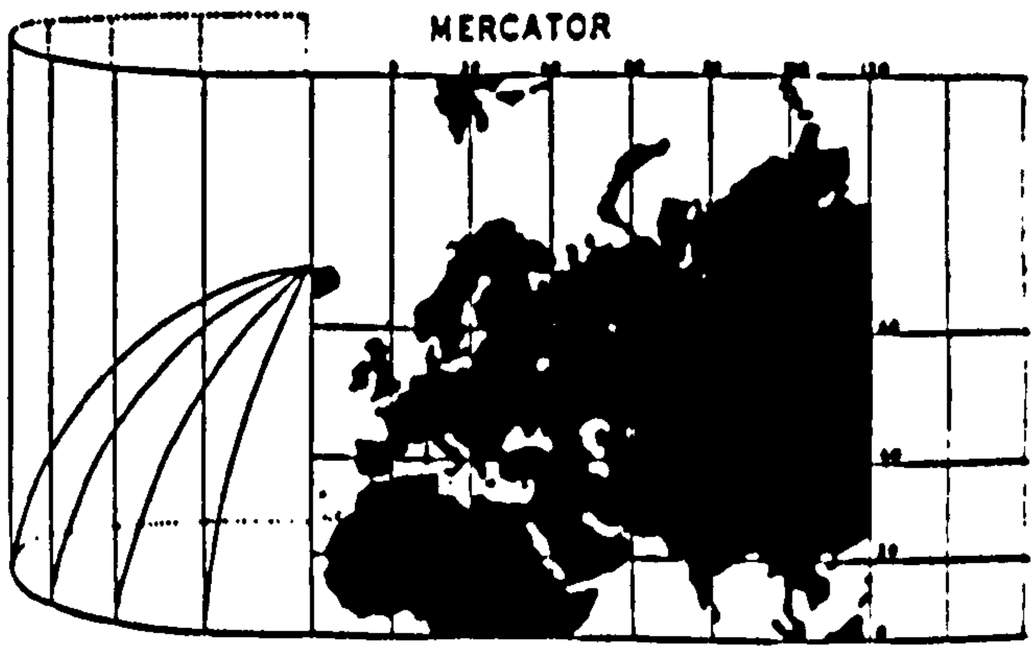
Clearly, this is the position in which the architect, drawing some project, finds himself. It is not just a matter of mapping out the building, of constructing and exploring the 'realities' we perceive and make; but of selecting a way in which we can genuinely explore and develop our ideas in a manner which, while bound to distort, makes use of distortion that is both sympathetic and relevant. While the sorts of distortions, and their conscious and unconscious uses that I have shown in the making of maps, are in no sense to be taken as demarcating ways of arranging architectural drawings, there are rich, and often subtle, analogies that each draughtsman may draw. I could try to do that for the reader, but I will not: not as a 'cop-out', but because it is my firm belief that the deepest and most meaningful analogies for a designer, are those he constructs and maps out for himself, so that they truly reflect his own reality.

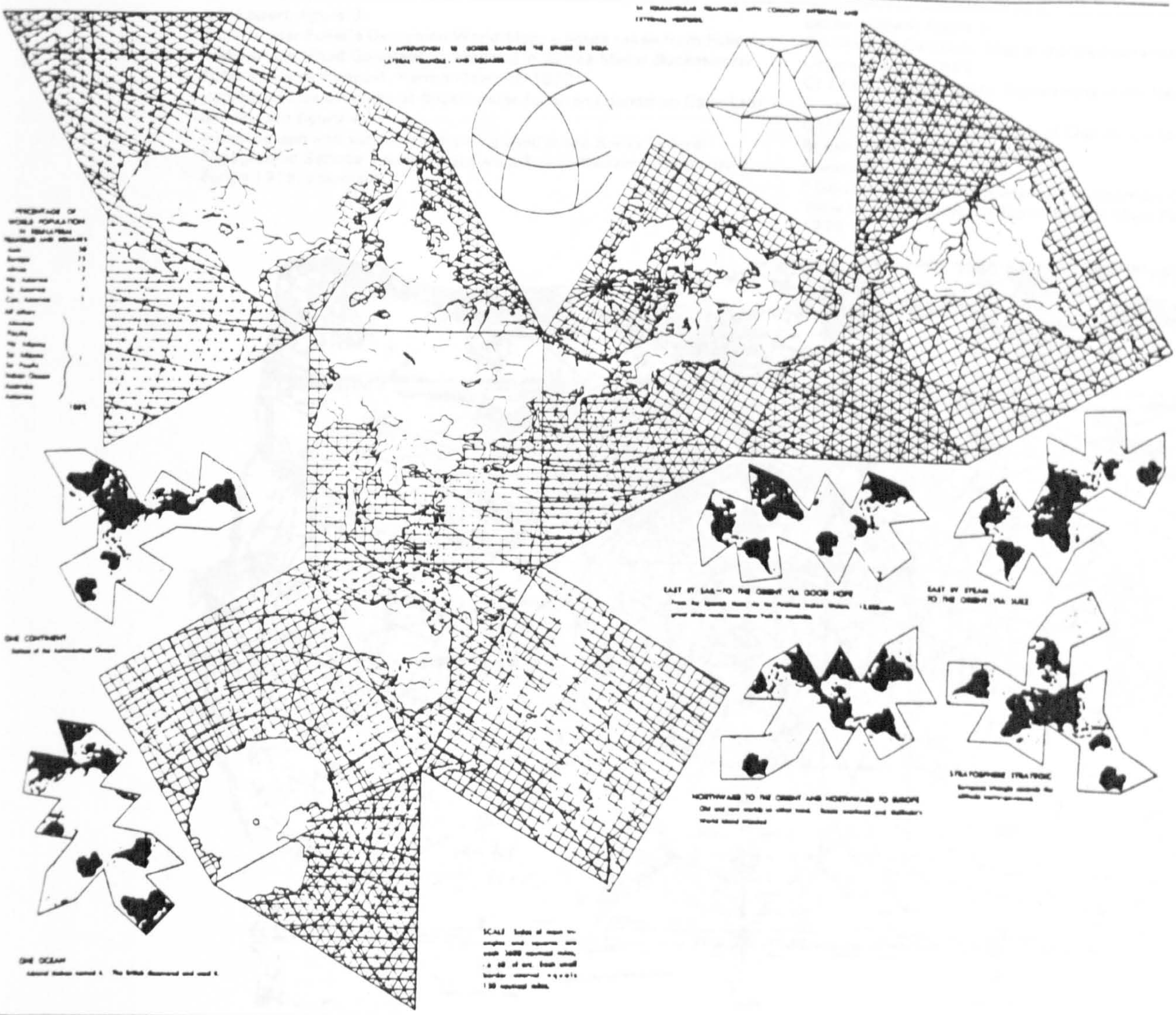
below (trio), figure 1:
J Tilmont (ed), 'Projection – the Cone Tangent to the Sphere' *Atlas Classique* Collection Roland, Wesmael-Charlier SA, Namur Belgium, 1949
below (lower), figure 2:
J Batholomew 'Mercator's Projection' *The Comparative Atlas of Physical and Political Geography* Meiklejohn and Son, London 1949

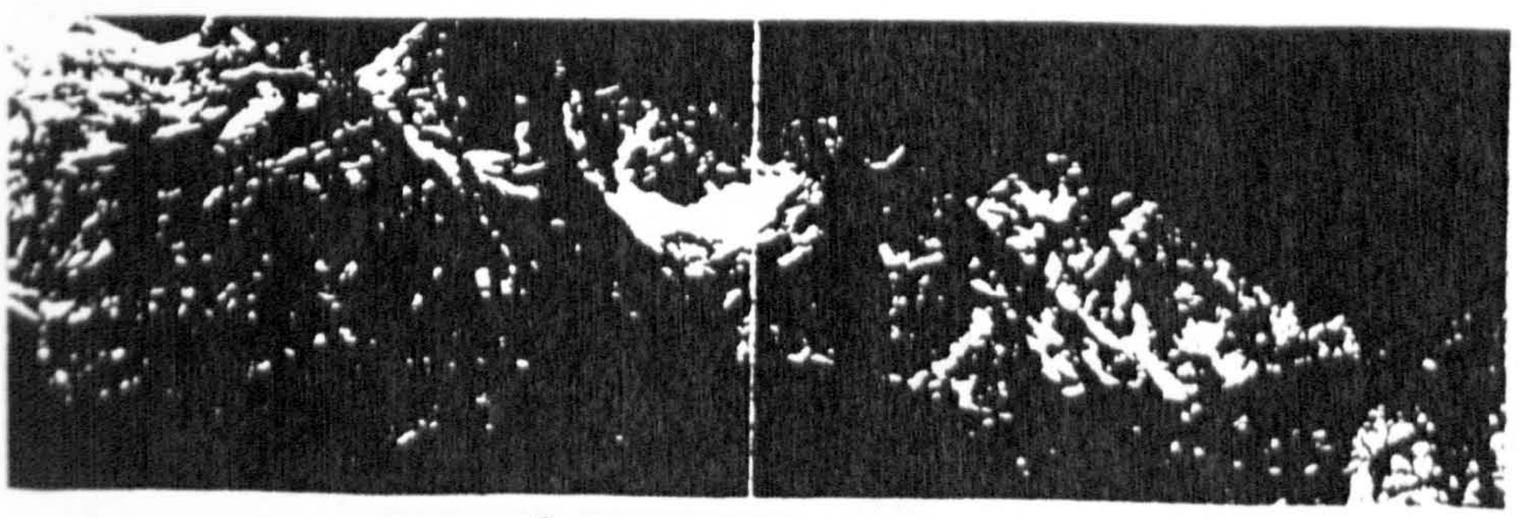






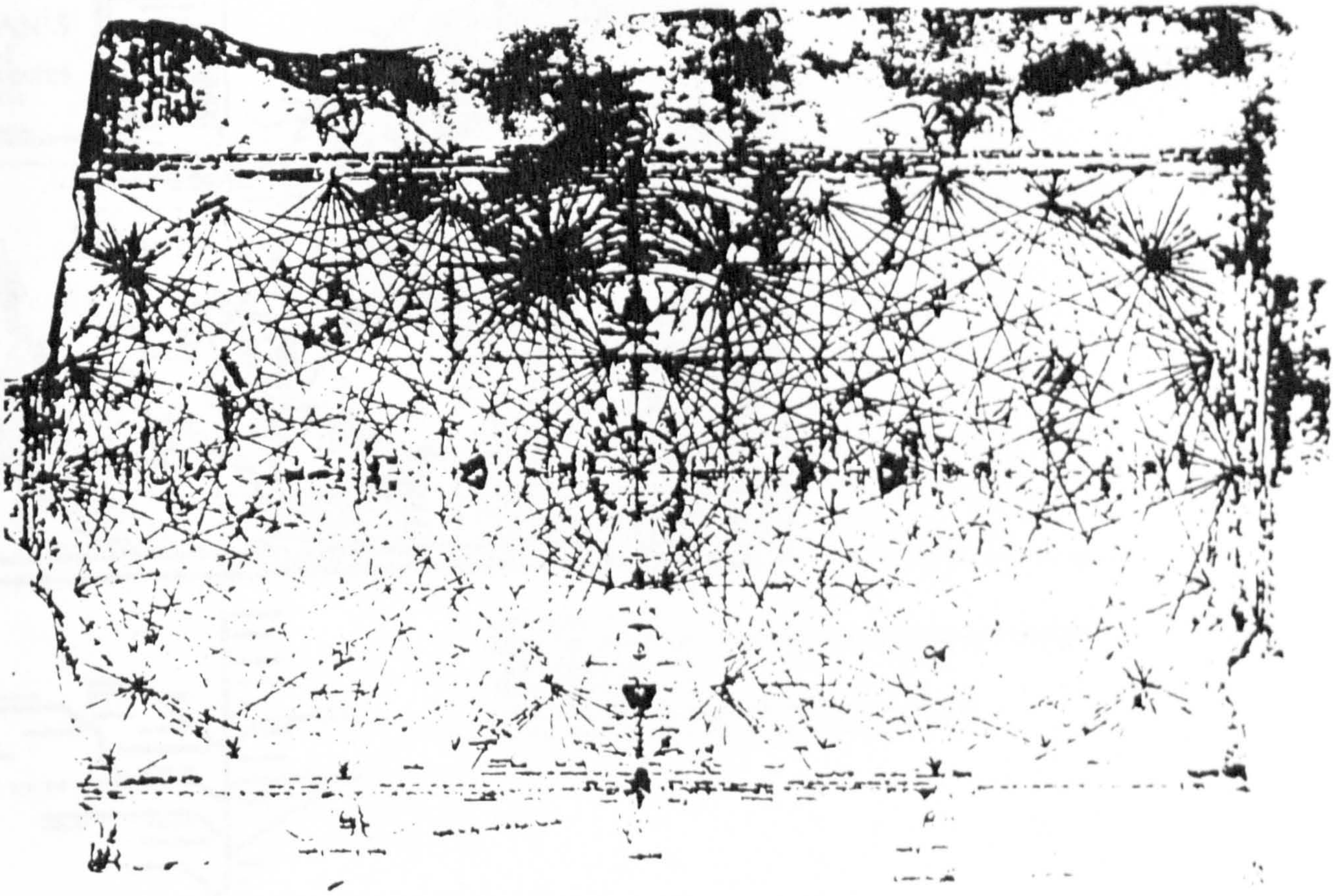






left (upper), figure 3:
Buckminster Fuller's Dymaxion World Map: a figure taken from Fuller's 1944 article 'Fluid Geography' reprinted in James Meller *Buckminster Fuller's Reader* Penguin, Harmondsworth 1972
(reproduced by courtesy of Buckminster Fuller and Jonathan Cape Ltd)
left (lower), figure 4:
A photograph and surveyor's drawing used in the Swiss Federal Topographic Service's surveys *Schweiz/Suisse/Svizzera/Switzerland* Zurich 1978, volume 4

below (upper), figure 6:
Opicinus de Canistris' Map of the Mediterranean: in the Vatican Library, Pal Lat 1993
Cf E Kris *Psychoanalytic Explorations in Art* New York 1952
lower left, figure 5:
G Hill 'The Baltic in the Shape of Charon' *Cartographic Curiosities* British Library, London 1978
lower right, figure 7:
P Gould and R White, Doncaster Development Corporations's map 'How Londoners see the North' *Mental Maps* Penguin, Harmondsworth 1974



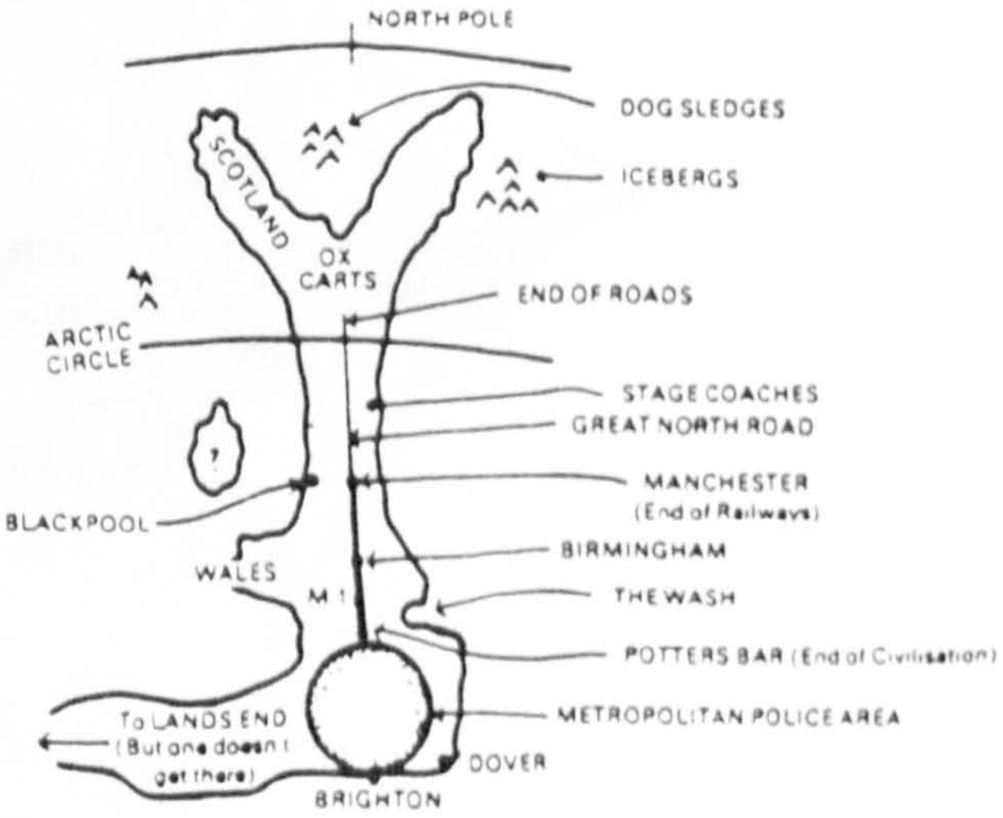


figure 8:
P Gould and R White 'A Bostonian's Ideas of the United States of America' *Mental Maps* Penguin, Harmondsworth 1974

left, figure 10:
British Rail 'Sealink Services to the Continent' *Heading for Holland 1980* Sealink Travel Ltd
below, figure 13:
Annetta Pedretti's Underground map (pre-Jubilee Line)
(reproduced by courtesy of Annetta Pedretti)

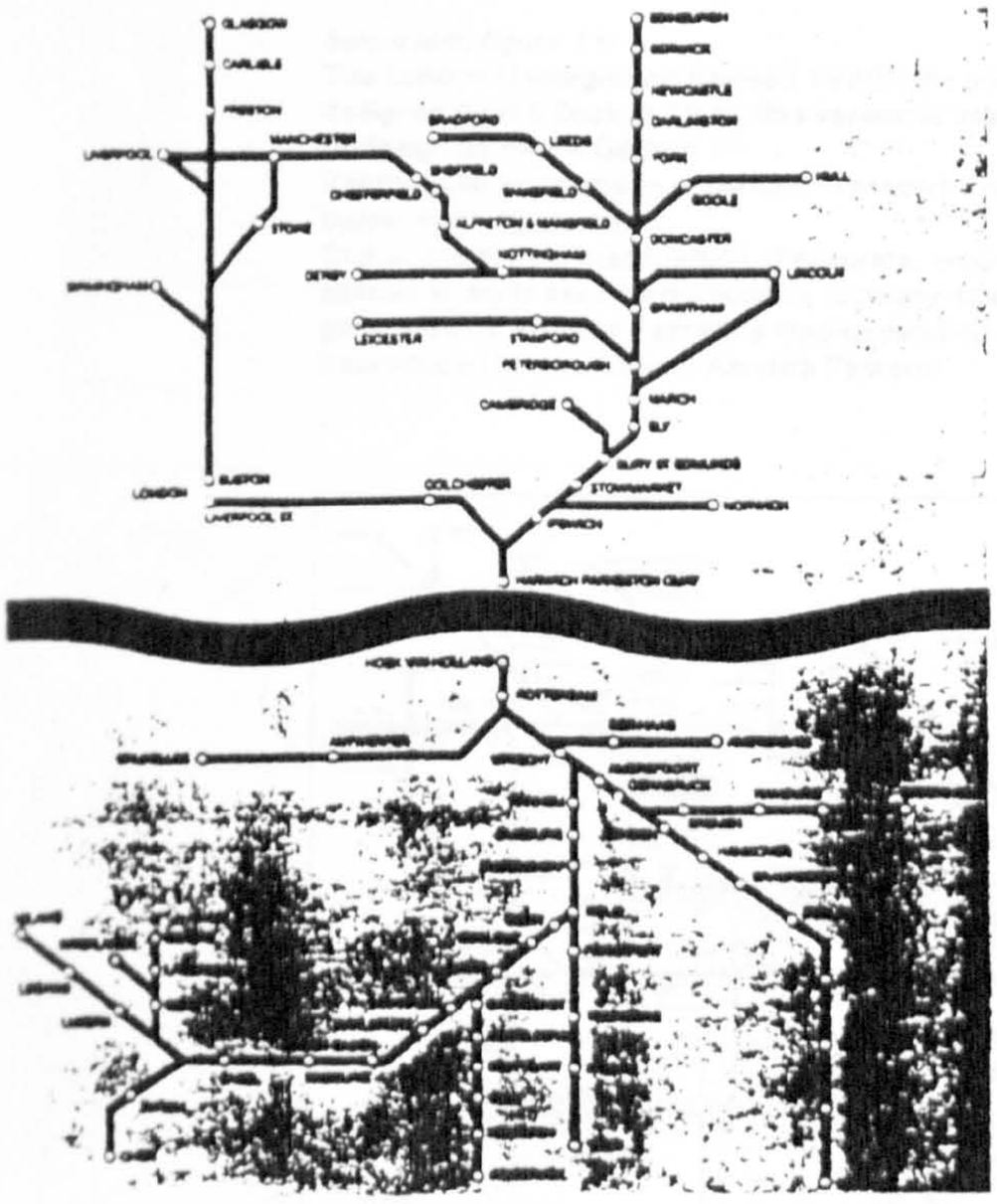
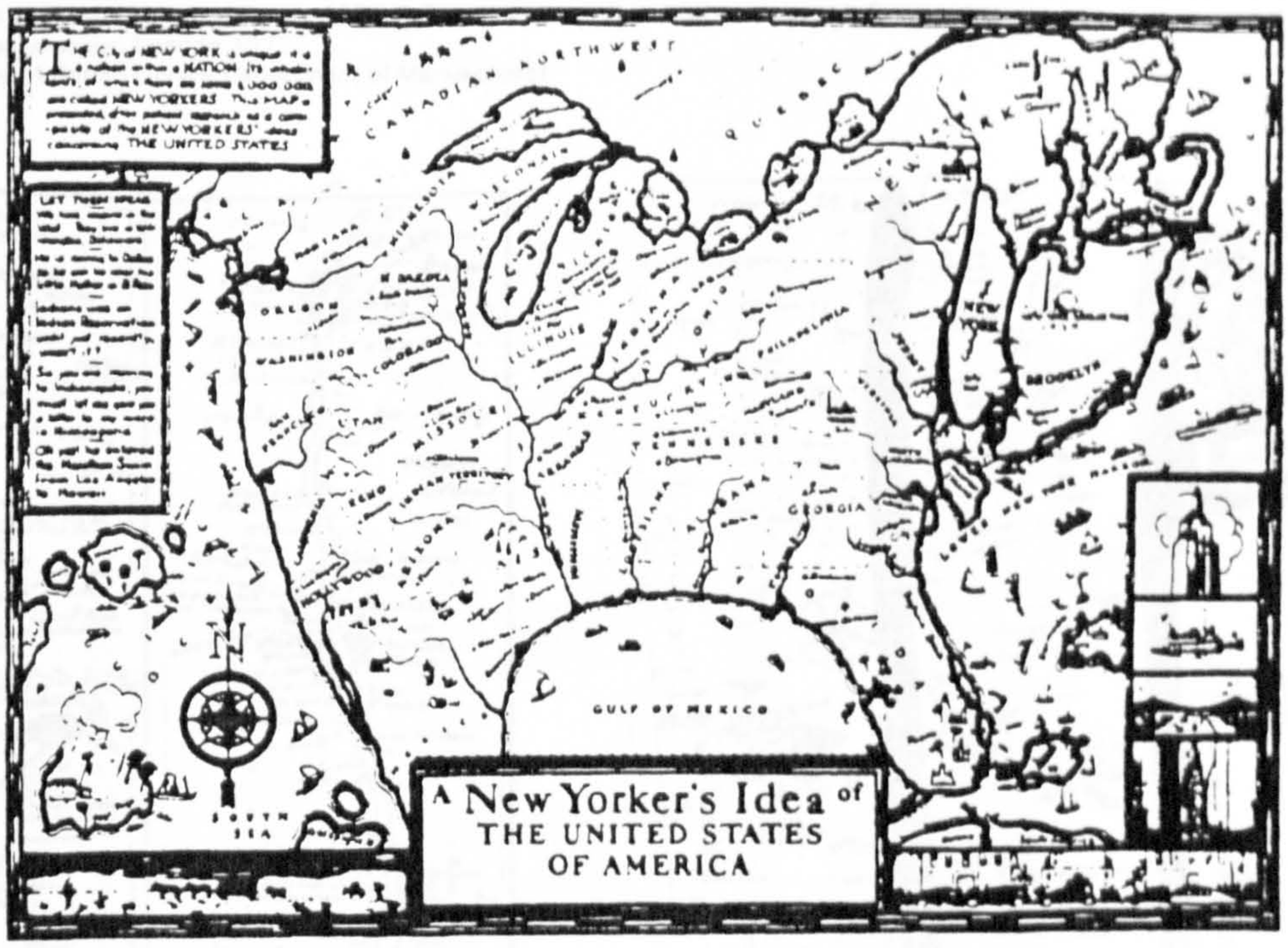
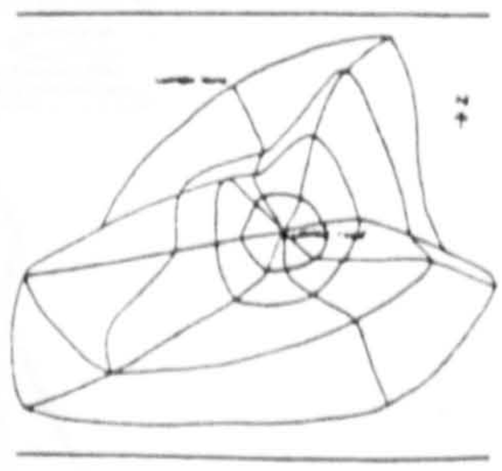


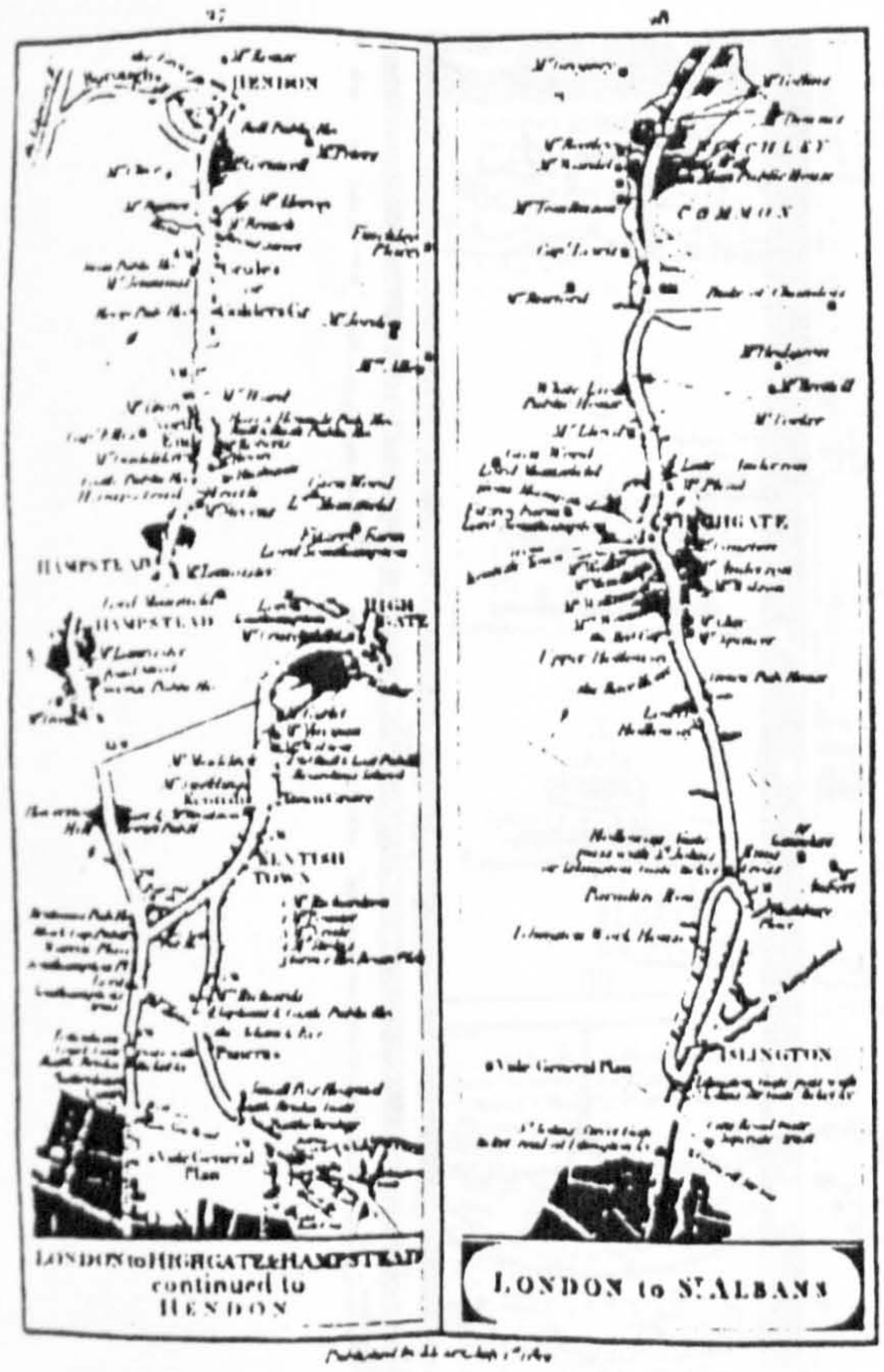
figure 9:
P Gould and R White 'A New Yorker's Idea of the United States of America' *Mental Maps* Penguin, Harmondsworth 1974

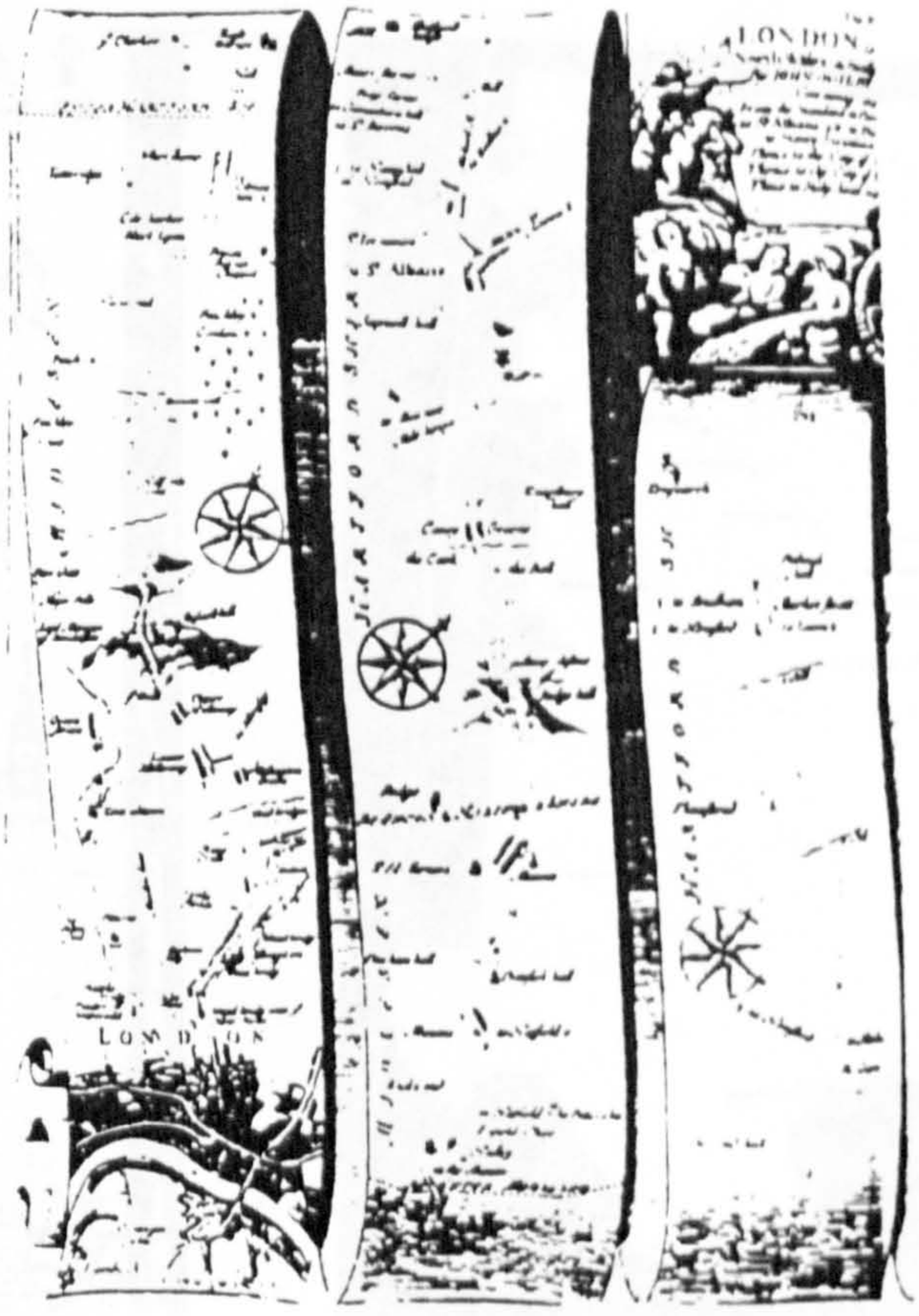


below left, figure 11:
The London Underground (revised 1980); the original map was designed by H E Beck in 1933; this version is based on a 1958 re-design by Paul E Garbutt
(reproduced by courtesy of London Transport Executive)
below right, figure 12:
One of the mental maps which, if accurate, would consist of regularly-spaced straight axes surrounded by regularly-spaced perfect circles, generated by Annetta Pedretti's map-generating technique
(reproduced by courtesy of Annetta Pedretti)

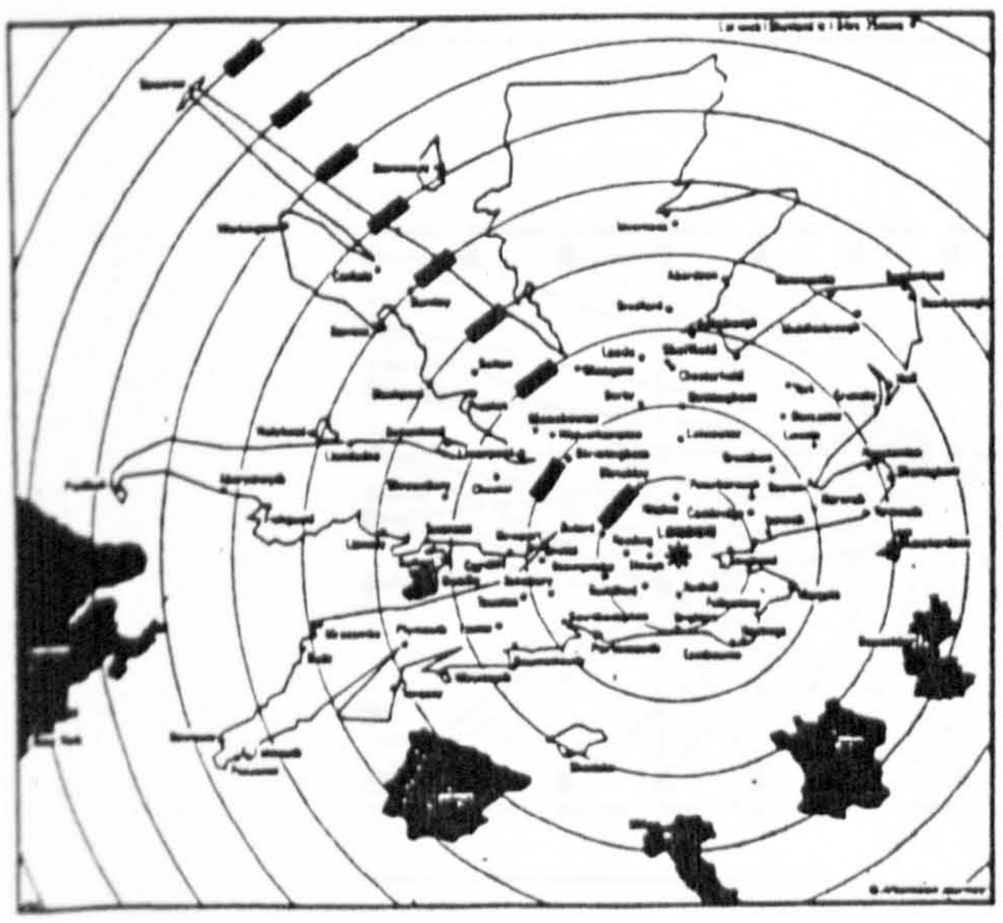


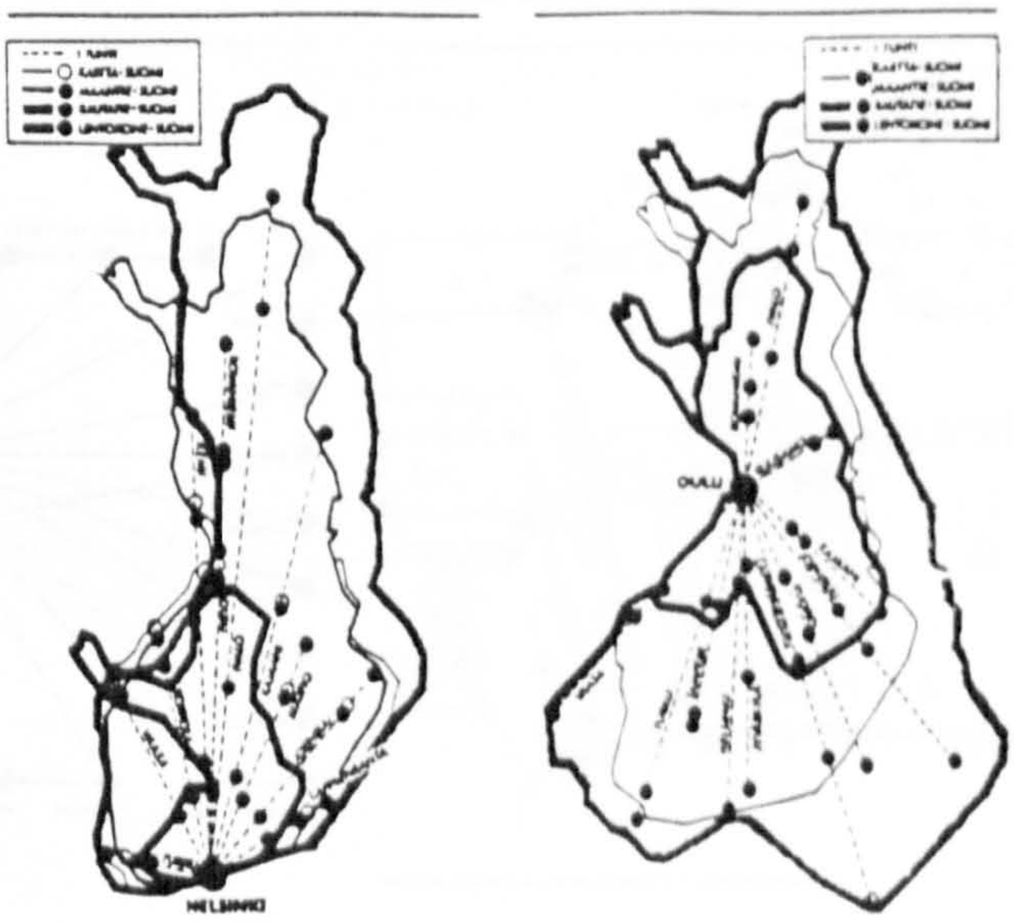
below left (upper), figure 14:
Route map from London to Hendon (left) and London to Finchley (right) John Cary 1801; P Glanville *London in Maps* The Connoisseur, London 1972
(reproduced by courtesy of The Museum of London)
below right (upper), figure 15:
'The Road from London to St Albans' John Ogilby 1675; P Glanville *London in Maps* The Connoisseur, London 1972
(reproduced by courtesy of British Library Department of Manuscripts)



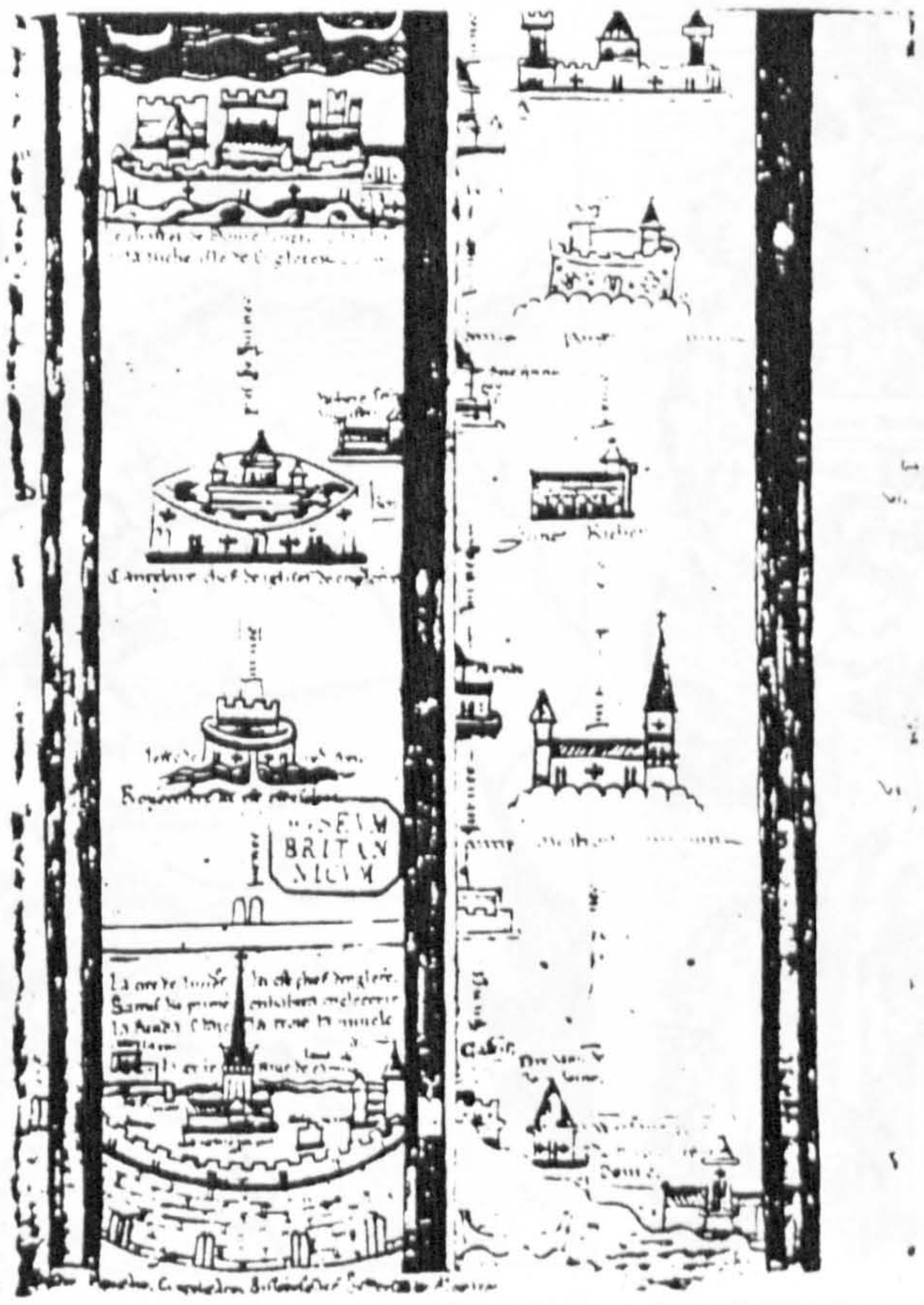


below left (lower), figure 17:
A Lockwood, *New Society*'s 'Cartogram of the United Kingdom' according to travel times from London, *Diagrams* Studio Vista, London 1969
below right (lower) duo, figure 18:
Maps of Finland by travel time from two centres: Helsinki (left) and Oulu (right), *Helsingin Sanomat*

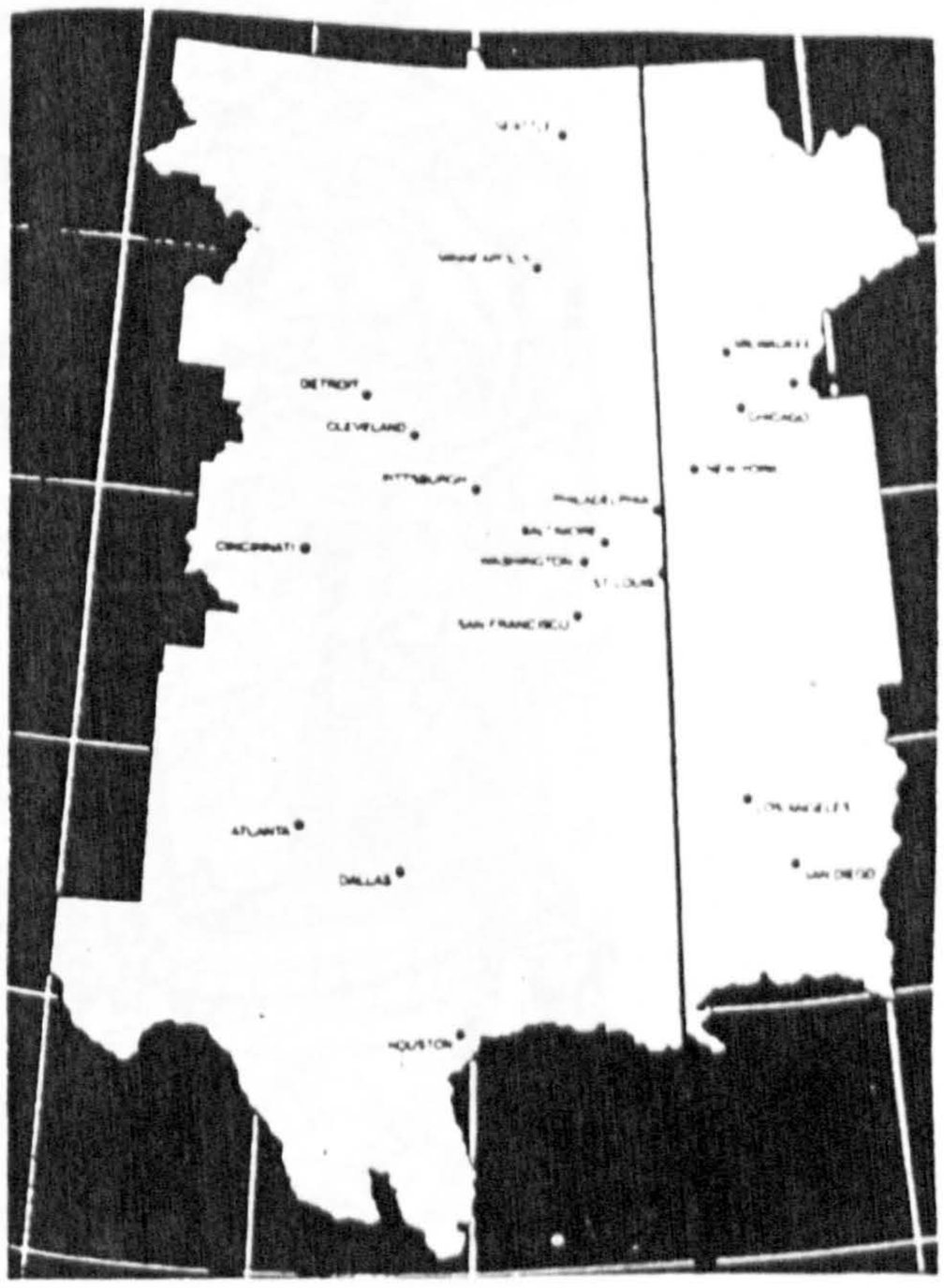




below left (upper), figure 16:
First section (London to Reims/Beauvais) 'Route Map from London to Rome' Matthew Paris 1252; P Glanville *London in Maps* The Connoisseur, London 1972
(reproduced by courtesy of British Library Department of Manuscripts, MS 14 chapter vii folio 2)
below right (upper), figure 19:
'Daylight Distortions in the USA': a map used to calculate potential energy savings, *Scientific American* 1980



below left (lower), figure 20:
A Lockwood, Swissair system map, *Diagrams* Studio Vista, London 1969
below right (lower), figure 21:
Finnair system map with timetable, Finnair Summer 1980 domestic schedule



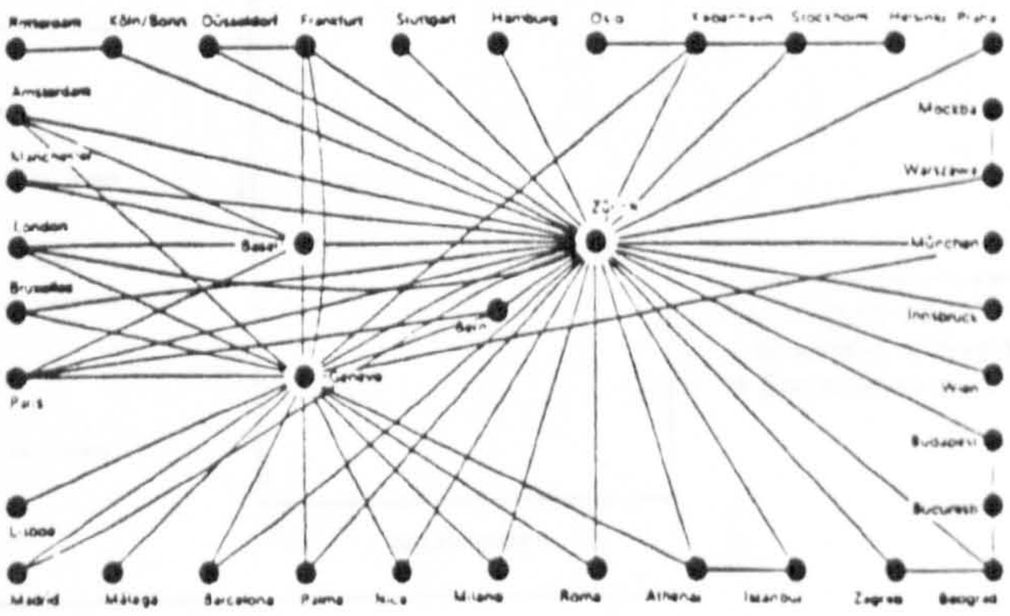


figure 22:
J R R Tolkein 'The Imaginary Landscape' *Lord of the Rings* George Allen and Unwin, London 1954
(reproduced by courtesy of George Allen and Unwin)

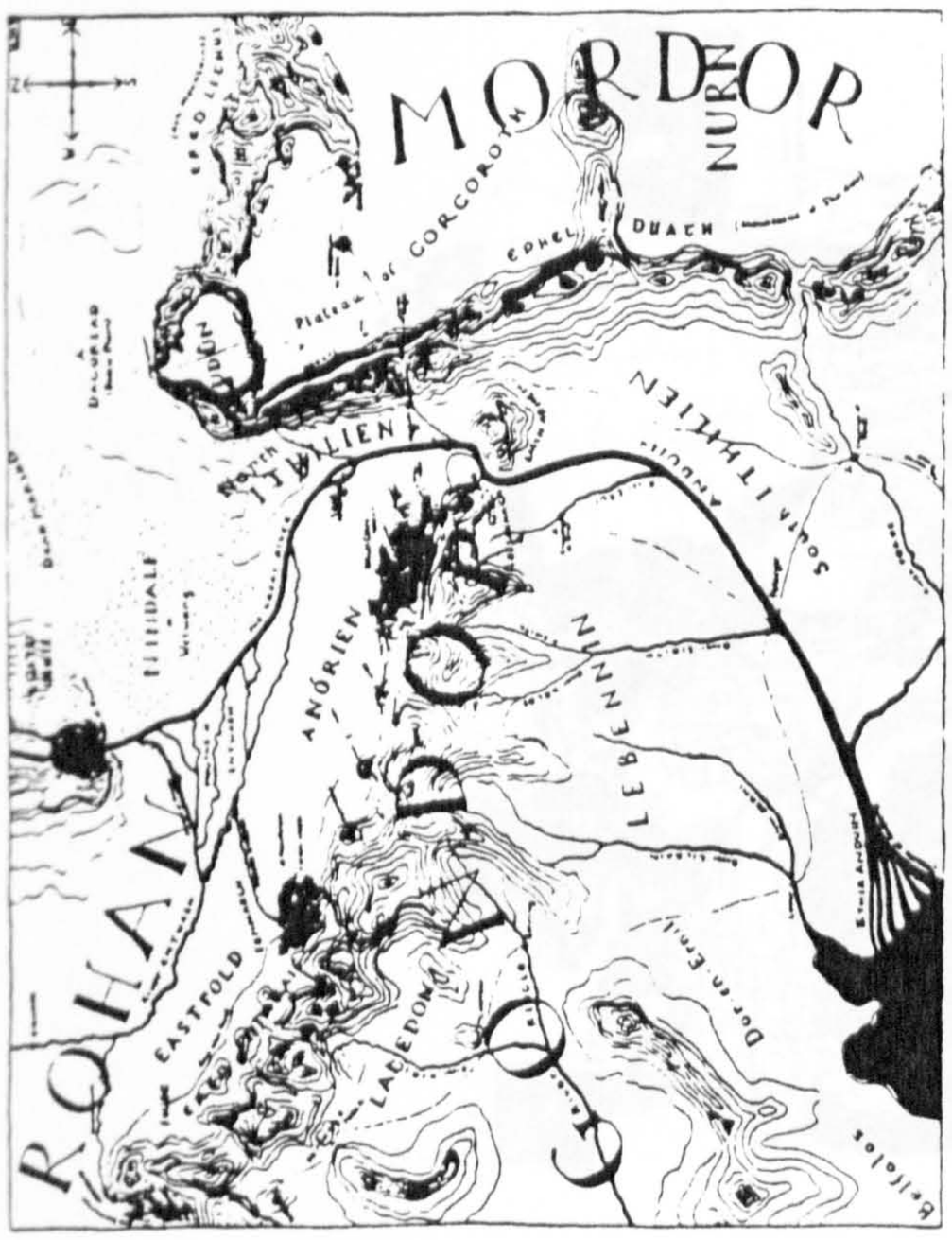
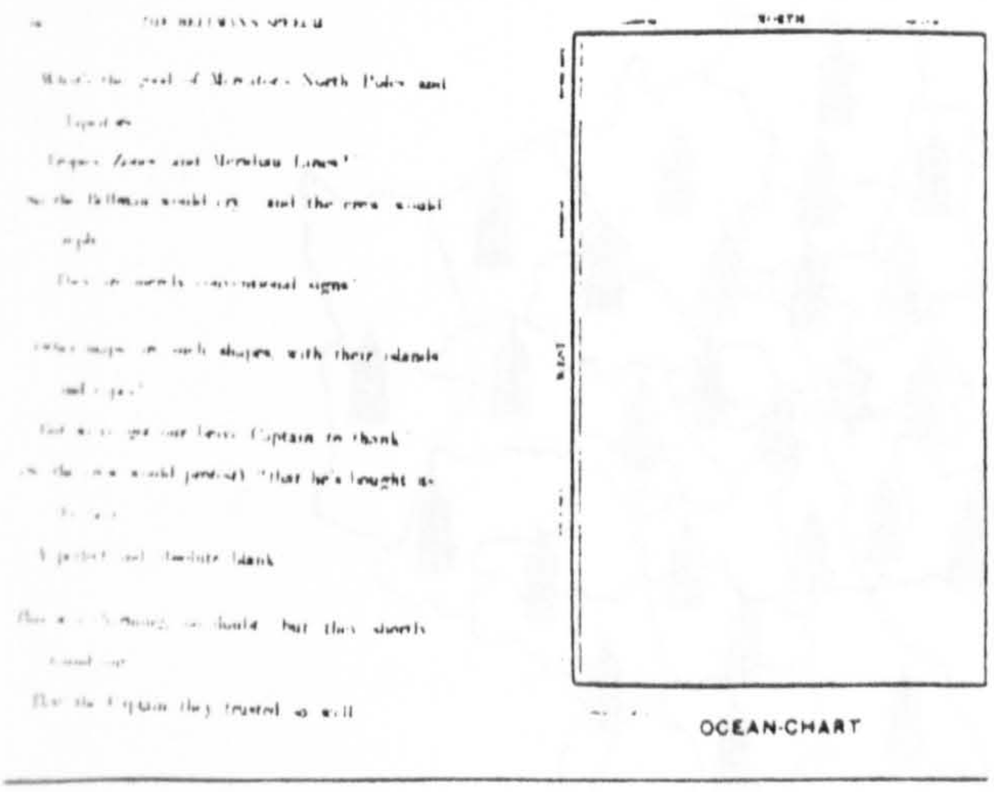


figure 23
G Hill, an illustrative map of Thomas More's Utopia 'Cartographic Curiosities' British Library, London 1978



left, figure 24
Lewis Carroll 'The Ocean Chart for the Bellman's Map', G Hill 'The Hunting of the Snark' *Cartographic Curiosities* The British Library, London 1978

right, figure 26:
J Shepherd, J Westaway, T Lee, 'Age and Sex Structure in London' *A Social Atlas of London* Clarendon Press, London 1974

figure 25
A Lockwood, 'Where the Voters Are' : a map showing constituency populations, published by the *Sunday Times*; *Diagrams* Studio Vista, London 1969

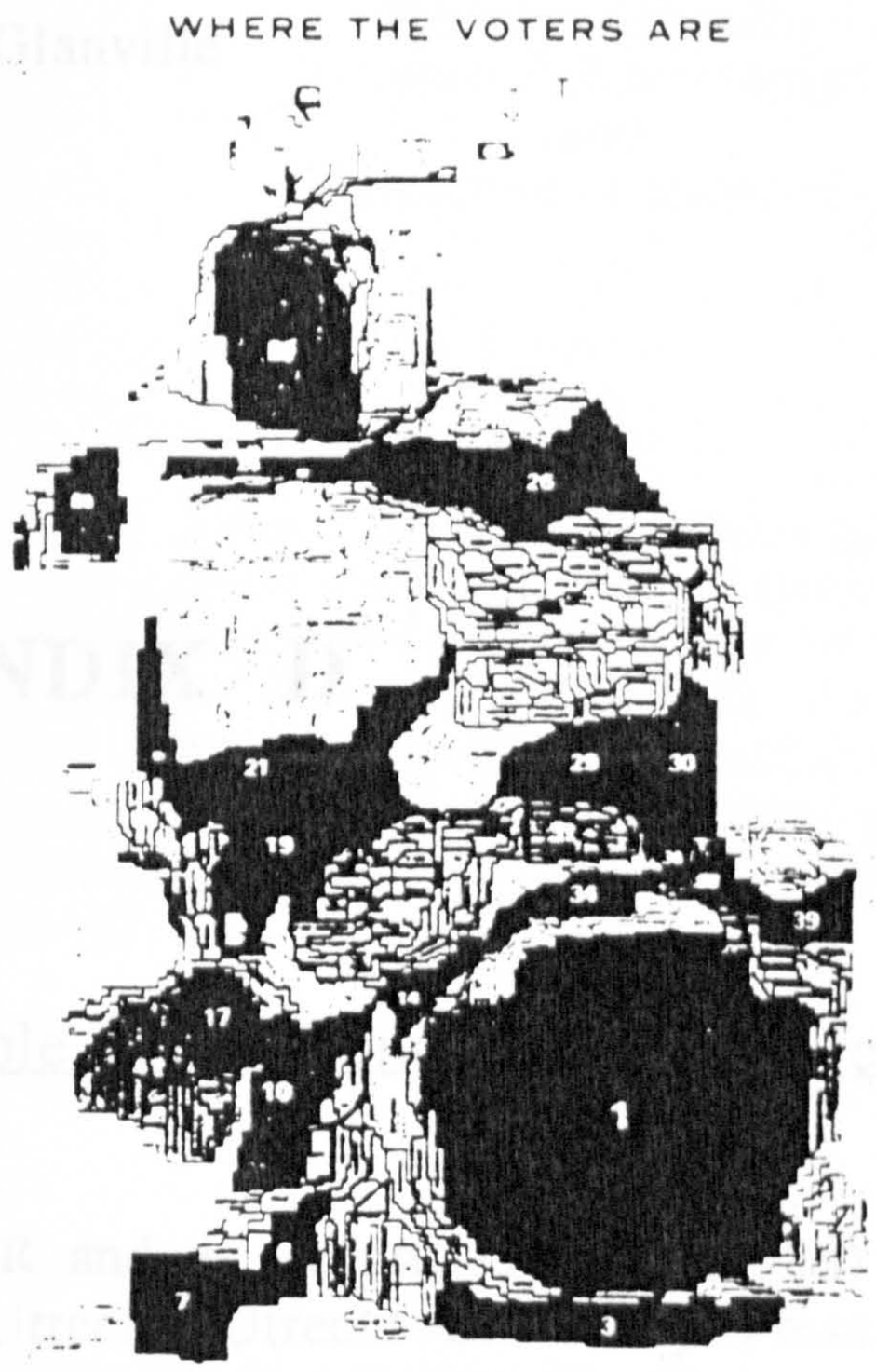


figure 27
'Public Houses in Central London 1885' a map intended to fight 'The Modern Plague of London' : P Glanville *London in Maps* The Connoisseur, London 1972
(reproduced by courtesy of The Museum of London)

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX D

"Impossible Worlds and Other Mythical Beasts."

from:

Glanville, R and de Zeeuw, G (eds) (1988) "Problems of Impossible Worlds", Utrecht, Utrecht University Press.

Impossible Worlds and Other Mythical Beasts.

For Eric Rennick, who taught me the History of Art.

Ranulph Glanville
University of Amsterdam
and
Portsmouth Polytechnic

ABSTRACT

In this paper I look at the notions of Impossible and Possible Worlds, showing how one can be converted into the other by the creation of novelty and explaining the responses one can make on finding oneself inhabiting an Impossible World. I then give an example of an inherently Impossible World which has been made to appear Possible and has thus created novelty (and great beauty: the example is painting). Finally, I examine the roots of Impossibility, and define a preliminiary taxonomy of the sources of Impossible Worlds.

PAPER

"Once we lose faith in the blanket formula of education, in the magic fashion in which education, using the passive capacities of children, is to create something out of nothing, we can turn our attention to the vital matter of developing individuals, who as adults gradually mould our old patterns into new and richer forms." (Margaret Mead)

WHAT AND WHY: IMPOSSIBLE WORLDS

An Impossible World is a World in which there are very few options but to be imaginative - like a sort of assault and initiative course that demands imagination. For even (or, perhaps, especially military) assault and initiative courses demand of those sent on them great creativity in their thinking!

Thus, an Impossible World is, in my terms, a world in which one finds oneself, in which one cannot see a Possible way to achieve that which one wants: usually, to escape from the Impossible World or to survive in it (which is tantamount to escaping its Impossibility). In this description, I believe I can claim a certain proprietary interest [1].

Why, then, should there be any interest in Impossible Worlds? My answer, which comes from 15 years of experience in exploring and exploiting the notion, is because it may be Possible to escape if something new is done

to change the perception of the Possible: ie, if there is a creative act producing novelty. I have used this idea extensively in setting projects for my students over this time, in order to encourage them to be creative (to re-find the skill they had before it was schooled out of them) in some sense, ie, to use the idea to encourage the release or amplification of creativity.

The fact that such novelty may only be locally novel (eg the proverbial re-invention of the wheel) in no way takes away from it as an act of individual creation. If every invention we each made had to be universal in its novelty, we would all be dead even in a constructivist world, for we depend constantly on individual invention just to create and maintain our cognitive being: so we are constantly creating new concepts that make sense of or modify ones that already exist for us, accomodating that which was previously unaccomodated into our new scheme. Nor, without this constant invention, would any objects of observation have obtained any constancy! (I am intentionally avoiding the complexities of linguistic locution that are necessary to reasonably present a constructivist argument, in the interests of brevity and comprehensibility, for this paper is not primarily about the nature, explication and implications of constructivist world views). The fact that any particular World is Impossible for one does not mean that it has to be so for another, nor that any World, Possible for one, is so for another. Were this condition not to hold, social learning (of the sort where re-inventing the wheel is deemed, in social terms and according to social criteria, to be a waste of time) would be Impossible.

In claiming that, in order to escape from or survive in an Impossible World it is necessary to be creative and to make something novel, I am not claiming that these are the only circumstances in which creativity is called for, not am I claiming that to be placed in an Impossible World guarantees a creative act. There may even be catatonia: but then nothing new was ever achieved without risk being taken (otherwise it would not be new, hence unknown, hence unpredictable, hence new).

Thus, the Impossible should be distinguished from the merely very (or even inconceivably) difficult: for, in the latter, there is at least the assumption of a tacit possibility absent in the former. (However, it may be Possible to redefine some very difficult situation so that it is Impossible.) The difference is akin to that between a number that is vastly, indescribably, indefinitely large, and an infinite number: an exclusive difference of class.

POSSIBLE AND IMPOSSIBLE WORLDS

Let me, then, start by explaining the dynamic that I see behind the relationship existing between Possible and Impossible Worlds.

There are three of these dynamics.

1) An Inhabitant of an Impossible World may convert it to a Possible World by the creation of (what is to him, at least) novelty.

2) An Inhabitant of a Possible World may convert it to an Impossible World (often by treating the Possible World Impossibly), again by the creation of novelty.

3) An Inhabitant of a World, formerly Possible, made Impossible by him by the creation of novelty, may make that Impossible World Possible again, either by back-tracking (the destruction of the novelty just created), or by the creation of further novelty. In the latter case, habits may be broken [2].

An inhabitant of an Impossible World may take one of 3 courses vis-a-vis his current location (predicament!):

1) He may **stay there.** This will probably lead to a rather unhappy and vacillating existence (unless the inhabitant is that rare sort of person who thrives on explicit paradox), or lead eventually to catatonic behaviour: indeed, it is likely that many psychological pathologies may be explained in terms of the confrontation and inhabitation of Impossible Worlds. But not here. It is only of interest here, where I am concerned with creativity, in that some inhabitants remain inhabitants of an Impossible World by in effect following course 3) below and redefining the Impossible as Possible, probably without us ever noticing or him ever remarking it (ie, the inhabitant survives).

2) The inhabitant **back-tracks** out of the Impossible World, leaving by the way he came in, and returning to the safety of a Possible World. This is a familiar enough phenomenon, expressed, for instance, in the phrase "backing off in the face of a challenge", and is, again, of little interest in considering Impossible Worlds as a source of creativity, although of much interest in the examination of management techniques, domination, cowardice etc..

3) The inhabitant **escapes**, reconstructing the Impossible World so that (at least to him at the time) it becomes Possible. This necessarily involves the creation of novelty already mentioned. This is the area of response to the inhabitation of Impossible Worlds that is of interest here, and which may lead to all sorts of Possibilities through the exploitation of the means of escape itself. Naturally, there is the risk element involved, and 1) and 2) both indicate some (rather dramatic) results of inhabiting Impossible Worlds without escaping satisfactorily [3].

In the history of human achievement, we tend only to hear of (major examples of) such escapes - ie case 3) - precisely because this way of exploiting Impossible Worlds can lead to the creation of novelty, and is therefore of value and interest (in our image of our civilization as "developing"): interesting enough for us to explore an example here of an Impossible World that has undoubtedly lead to the creation of novelty, the products of which are of great beauty.

AN IMPOSSIBLE WORLD MADE POSSIBLE

In the history of the development of Western pictorial art, one of the major factors has been that pictures have been made that appear to represent three dimensional (ie "real world") objects existing in three dimensional (ie "real world") space.

But there is an impossibility here, for the picture plane within which this representation takes place is the 2-D (two dimensional) picture space (the flat surface of the canvas, for instance). Thus, the objects and their relationship in space that are being represented are being required, by the painter and later also the viewer, to inhabit an Impossible World of 2-D. And so we have an example of an Impossible World made Possible.

This difficulty does not, of course, confront sculpture, most of which has been of figures (occasionally groups of figures), which are still 3-D, and exist in 3-D space such that the viewer can go around them, just as the objects depicted exist. It is only in this century, and almost certainly because of innovations in pictorial art, that sculpture has become concerned in any significant manner with such ideas as space contained within the the body of the sculpture (the equivalent of the architect's normal public interior space as invented by the Romans), as opposed to generated around it, as with most sculptural and living figures do (in the manner that the Greeks generated their architectural space around their temples). This may help account for the extra-ordinary similarity of sculptural objects throughout the history of Western art, at least until very recently.

However, for painting, the situation is markedly different. Any representation of 3-D objects inhabiting 3-D spaces within a 2-D picture space necessarily involves a translation (usually considered an information loss, although this is a very biased interpretation. I have shown some similar process also occurs in cartography, which is faced with a very similar problem).

This is the Impossibility that faces the painter: how do you present in a 2-D picture space objects related in space that may be understood as being 3-D [4]. And, although we are all so familiar with an accepted way of doing this that it may at first appear neither to be nor ever to have been an Impossibility, it is!

If we go back less that 1000 years, to the tradition of the Icon (which still flourishes, little-changed, today), we find a means of representing space that does not rely on the prespective projection that was introduced by (and, indeed, some would say, generated) the Renaissance. For, in these older "pre-mediaeval" paintings, spatial relationship was not represented via perspective - and the figures were flat and posed in a set and stylised way we would now celebrate by the term "iconically". Instead, they were arranged in such a manner that the relationship of the figures in plan was simply drawn up as a sort of tiered elevation, with strong maintenance of the topological invariancies. (This is as if the whole culture perceived space in the manner of a pre-projective Piagetian child [5]).

There is no doubt that these pre-Renaissance pictures have great beauty and value, nor that they did develop in several ways during their period of

dominance, including their mastery of the presentation of 3-D objects and spaces within the picture space albeit using conventions and techniques quite different to those we are used to (for instance, the relationship between height and distance was appreciated and represented, although explaining this leads to other problems that I do not wish to tackle here), but there is, equally, no doubt that this means of expressing 3-D in 2-D also ran out of both interest and steam, and, at least so far as the critic is concerned, the problem of the Impossibility of the painter's World re-surfaced. So that, as a result, we had a change of style that we refer to as the (a) Renaissance.

In painting, this event is often placed for convenience and clarity at the divide between the more or less contemporaneous paintings of Duccio (pre-Renaissance) and Giotto (Renaissance). The difference can be summarised through reference to Giotto's rounded, composed and interacting figures (his groups could be understood as forming a whole together), and the integration of depth into his pictures by dramatic reference to a fixed vanishing point.

And it is this that indicates the change. Where, previously, figures had been drawn in their position in plan (almost as an architect draws an elevation, for architects have a completely different convention all of their own), they were now drawn according to a visualisation in which as objects recede they converge: a projective space that became formalised in the mathematical rules of perspective which generated the sort of projection we generally expect in a figurative picture (but which, it happens, is optically and mathematically slightly inaccurate).

So that the Impossible World of the representation of 3-D in 2-D, formerly made Possible by the representation technique of iconnic tiers and topological invariancies, once again become Possible through the invention of the fixed vanishing point perspective projection. (This is not the only interpretation. For instance, the fixed vanishing point and perspective projection gives a particular role importance to certain figures, and to the position of the artist.)

This escape from the Impossible guided the development of Western pictorial art for about 600 years, and moved from Giotto's fumbling first attempts through the mathematically explicit paintings of the mid-Renaissance, where the explicit perspective constructions predominate (usually worked out by architects, and built into buildings that could be used as models in support of the cause), on to the "tricks" of the Flemish and English Renaissance, full of devices to demonstrate the painter's virtuosity in handling perspective. Simultaneously, the Italian Mannerists began to dispense with the need to be explicit about the perspective constructions used, and to rely more on figure modelling and grouping, secure in the knowledge that their patrons and the public at large were fully educated and quite fluent in the conventions of perspective, and needed neither clues as to how it worked, nor to be reminded at every turn that artists, having mastered it, really could control it! From this, it was only a step to the romantic and naturalist paintings in which figures are dotted around a landscape, full of hints of depth but with little or no explicit perspective projection or fixed vanishing point, a line of development

finally ending with the whispy, misty paintings of the Impressionists and post Impressionists, in which the explicitness of the fixed vanishing point and perspective projection has totally vanished, and these devices, so clever in inventing a way of making an Impossible World Possible, and so valuable in offering themselves as both technique and framework for the exploration of 3-D space in the picture plane, no longer hold sway.

And so, we are back where we were before the Renaissance stormed in: our World, held to be Possible for 600 years (and producing much wonderful work as a result) is no longer Possible, and we need a new way out of the Impossibility of representing 3-D in 2-D [6].

Such a new construction was discovered by the Cubists (most particularly Picasso and Braques around 1910), who had realised that much of our experience and enjoyment of the 3-D World is through movement around objects in space, collecting a number of different views through which we create our own image of the totality (analogously to the way we guess what is on those facades and sides that are not visible but are imagined into our Renaissance fixed vanishing point perspective projection picture). Their revolution was to use a collage of views to compose together in terms of the picture space a representation of the totality of the objects and spaces as appreciated in 3-D, which they did at just the time that there was developed, anyhow, a machine for capturing perspectives "without" the intervention of the artist - the camera (in contrast to the camera obscura, often used earlier by artists to help them set up the perspectives they were to depict).

Although this is neither intended as, nor could ever claim to be a history of Western painting, and although the point of Impossible and Possible Worlds has been made, it would be unfortunate not to give a passing reference to developments since the advent of Cubism [7].

In terms of the dichotomy between 3-D and 2-D Worlds, there have been 4 main streams: the first is the explicit continuation of what a scientist might like to refer to as the "Cubist research programme"; the second a retreat to a super-realism (while photography has moved away from its role as realist); the third and fourth have been to deny (interest in) the problem posed by 3-D and 2-D - in the first case by dealing only in the space of the picture plane itself, and in the second by allowing the picture plane to become in its own right a 3-D object, creating its own relationships in 3-D space. Not that this is a full account of current painterly concern, for many painters have lost their hunger for the picture space all together.

Thus has a World, Impossible, been (re-)made so that it seems Possible, by acts of great inventiveness - real creations of novelty - which, themselves became devices worthy of deep study and development, (at least in the case of the fixed viewpoint and perspective projection), which were exploited and developed by the community of painters (and sculptors and architects) for 600 years, with results of great beauty, insight and, dare I say it, truth and which we love, admire and learn from. But this is just one example of an Impossible World. And, while it is interesting to consider others, it is even more interesting to consider whether there is a way in

which the range of Impossible Worlds can be organised to bring clarity to the sources of their Impossibility.

A TAXONOMY OF IMPOSSIBLE WORLDS

Any attempt at a taxonomy, and especially one attempted so early on in the life of an area of interest, is liable, later, to be found profoundly lacking. Yet I shall attempt at least to initiate a discussion in this area by introducing what is at least a form of classification if not, perhaps, the taxonomy I am aiming for.

Impossible Worlds may be defined as belonging to 3 groups, each with sub-groups, and sometimes with further sub-sub-groups. In the listing below, examples are given under each sub-group (and sub-sub-group) heading

The 3 groups are characterised as being Impossible as a consequence of

1) theoretical limits
2) pragmatic limits
3) problems of definition.

Their degree of Impossibility seems to decrease in this order, but all are, to all intents and purposes, Impossible rather than merely very difficult.

1) theoretical limits

1.1) in principle

Certain things are Impossible in principle, in our constructions of the World. It is, for instance, Impossible, in principle, to attain a temperature lower than that of absolute 0 (0^oK, -273^oC). Equally, it is Impossible for a system with less variety to effectively control (without applying extra limits) another system (Ashby's Law of Requisite Variety): this is one reason that teachers can only control a classroom full of children by restricting their Possible behaviours. Of course, the example given above of the Impossible World of 3 dimensions being presented in 2 belongs here.

1.2) theoretically in practice

There are occasions when it is Impossible to do things for serious practical limitations of a theoretical kind. Thus, Bremermann has shown that there is a limit to the amount of information that any fixed quantity of matter can compute within any given time. It follows, therefore, that matter can only, over its lifetime have computed a certain maximum, in principle. Any question that can only be answered (in terms of the form in which it was presented) by computing more information than can be computed by the locally available matter in the locally available time is in an Impossible World. (One example is that the earth could have computed about 10^{90} bits during its lifetime, yet the Possiblities in the number of chemical combinations for the exclusive choice of a combination of 5 materials (using the exhaustive search method) involves 10^{100} bits, which exceeds

10^{90} by the order of 10^{10} bits. Therefore, calling upon such a calculation establishes an Impossible World.

1.3) internal structure

Certain propositions are in some sense contradictory, with the contradiction arising internally, as a result of the structure of the proposition. Such propositions are called paradoxes, and fall into various classes)such as the infamous "Catch 22"). A typical paradox, such as the pair of statements

"All Cretans are liars.
I am a Cretan."

cannot be resolved in terms of the conventional logic we allow to delimit what constitutes propriety in arguments. These statements create Impossible Worlds (although, in certain religions, notably Zen Buddhism, they are used as aids towards achieving the enlightenment of a higher understanding, in effect, making the Impossible Possible by jumping into a different perceptive framework)

2) pragmatic limits

2.1) local limitation

This is the Impossibility caused by some local limitation which is private to the system and may be neither noticeable nor understandable at all to those not involved in the system. An example is the mental block. For instance, a person isolates a problem, and posits some solution that turns out not to work. So the solution is modified yet still doesn't fit. This is continued, until the string of modifications becomes very confused, and the solution so messy it is probably no solution at all. The person has become so tied up in the way of thinking he had set himself off along that he has forgotten the problem, and has trapped himself in irrelevant detail. This is a local limitation that he has applied, and creates, for him, an Impossible World.

2.2) conflicting demands

Similar to 1.3), this is the World which becomes Impossible through the action of conflicting demands being co-existent (ie, a contradiction or mutual exclusion exists as a result of these demands). (The difference between this case and 1.3), apart from a certain precision in the logical conditions, is that 1.3) Impossibility is due to internal factors, while 2.2) is externally generated, reflecting external factors.) For example, there is frequently a conflict between political expediency and long-term requirements, which creates an Impossible World (easily resolved by forgetting one of the requirements: usually, in this case, the long-term).

3) Definition difficulties

3.1) Inadequacy of definition

This sub-group has 3 sub-sub-groups:

3.1a) Worlds made Impossible through ambiguity

3.1b) Worlds made Impossible through under-definition

3.1c) Worlds made Impossible through over-definition

Any of these may lead to or be symptomatic of the sort of contradiction found in 2.2) and 1.3).

3.2) Inappropriate means of description

There may exist a conflict between the structure and possibilities of that which is to be described and that which is the descriptor such that it is Impossible for the other to represent the one. At a simple level, it is Impossible to say some things in one language that may be said in another, usually for reasons of historical semantics and / or lack of vocabulary. (Inhabitants of the Nordic countries have about 40 terms for different types of ice, whereas the British have about 5.) But there are also structural conflicts, such as those between global (wholistic) means of representation (such as pictures), and linear, ie serial (such as the written word). These have such different structures that it is demonstrably Impossible to represent wholistic activities, for instance, in serial languages.

CONCLUSION

In this paper, the value of the notion of Impossible Worlds, and our potential responses to them as having the potential to engender creativite novelty, have been described, and one such (the depiction of 3-D objects in 3-D space in a 2-D picture space) has been explored as an example, to show how an Impossible World can be made Possible, and how in becoming seen as Possible it has given rise to great creativitiy. Finally, a taxonomy of reasons why Worlds are Impossible was attempted under the three groupings Theoretical Limits, Pragmatic Limits, and Definition Difficulties.

But nothing has been said on how to handle Impossible Worlds, how to generate them, and how to recognise when you have one. Appended to this paper there are some lists that represent first attempts to approach these three areas. They are not particularly well ordered, and some are frankly incomprehensible (since they have private references which I do not consider worthwhile explaining here). But they do represent things I have found useful in the time I have been using the Impossible World notion, and they were offered to students in a course in Impossible Worlds that was

held in Amsterdam just before the conference. The lists are tentative, and any suggestions will be welcomed. They are included, as it were, by way of introduction!

UNICORNS

This paper is called "Impossible Worlds and Other Mythical Beasts". This is a reference to a story I once heard by, I believe, Steinbeck. In the story a man goes into his garden, and, upon repeated questioning by his endlesly nagging wife as to what he's doing, replies that he is playing with the Unicorn. She ridicules him, saying "The Unicorn is a Mythical Beast".

Eventually, she calls the Mental Hospital, which send around a team with a straight jacket to collect him. When they enter the garden, the man tells them that he is quite sane, but his wife is not. When his wife protests that he has claimed to have been out in the garden for hours playing with the Unicorn, he reminds her (and the team) that "The Unicorn is a Mythical Beast".

She is removed to the Mental Hospital.

He goes on playing in his garden.

Somehow, this story seems appropriate.

FOOTNOTES

[1] As far as I recollect, the term came into being as focus for this conference at a meeting concerning the research project "Support, Survival and Culture" in Amsterdam. At that time, the meeting's concern was with creativity. I explained that I believed (like Froebel) that creativity was teachable since we are all naturally creative, only we allow our educational systems to impair our creative abilities, and that I believed I did indeed teach it. When asked how, I explained that one thing I did was to place students in what were, to them, Impossible Situations, ie, I made them inhabit Impossible Worlds, and then try to invent their ways out. This idea was taken up as an area for research, and as a way of approaching the study and effecting of creativity (early publicity for the Conference referred to "Problems of Creativity").

[2] Thus, a smoker cannot exist without a smoke. This is his Possible World. In order to break the habit he has to face the Impossible World of going without a smoke. The resolution of the Impossibility of this World is to give up (create novelty in his life). He may also vacillate between smoking and not smoking in the Impossible World, which, as all smokers denied will affirm is very uncomfortable and makes you nervous, or he may retire back to smoking. If he is to invent a way out so that he can give up, he will have to re-design his way of constructing the World that is Impossible so that it becomes Possible. I make no attempt here to account for how that may be done, although there are some general suggestions in the appendices for techniques through which ways may be found of making the Impossible Possible. If I could really find a general solution, I should be very rich and famous.

[3] I like to think of improvements in world athletics (track and field) records in terms of an Impossible World. In October, 1968, Bob Beamon, long jumping in the Olympic Games in Mexico City, jumped 8m90, thus

bettering the previous longest recorded jump (Igor Ter-Ovanesyan's 8m31, June 1962) by a staggering 59 cm. The concept of a world record is that it is the best ever achieved, and so the idea of improvement related to it is, naturally, that you can only do just a very little better: ie, attempts on world records are predicated on the records being the best ever achieved, and therefore only just imaginably surpassable, in extremis. In Beamon's case, folk-lore has it that before the Olympic final at which he broke the record, the other competitors said amongst themselves that they must not make Bob angry, because he was liable to really smash the record. He got angry! The point of this story is that when something breaks the limitations applied to what is considered the Possible, hence defining the Impossible, a dramatic way can be found out of that Impossible World. There is literally a jump in what is considered Possible. However such a dramatic re-definition of the Possible has prevented any other athlete getting anywhere near the record since, reminding one of Jesse Owens' earlier record (8m13) that survived over 25 years from the time it was set in 1935.

[4] It is hard, given our cultural tradition and centuries of training, to remember that there are other ways of perceiving 3-D space than the essentially projective manner in which we currently generally describe our experience, and towards which so much of our effort in the development of representational tools has gone, so that, for instance, almost the first thing one asks about any C.A.D. system is whether it projects perspectives with hidden line removal. But many other ways do exist, ranging from Einstein's space-time continuum to the very abstract, and n-dimensional spatial relationships expressable in topology, and include some very odd personal and private constructions.

[5] In discussing Piaget, Medina insists that it is unreasonable to attribute to societies the properties of individuals, as Piaget is inclined to. While I agree that this sort of generalisation is very dangerous, I must insist that, in this case, the evidence of painting is conclusive. I believe Medina's disagreement is improperly founded. This is a case of society developing and sharing together ways of seeing (both philosophies and technologies), which have changed as a result of Society's continued investigations. It does not mean that society, at any one stage, is less or more developed in its intellectual skills and abilities, rather that it has found and favours particular ways of seeing and of presenting what it sees (which we cannot properly separate). This is similar, but not identical, to McLuhan's arguments about medium and message, because McLuhan is concerned with the dominance of the character of the various technologies. Nevertheless, he does show that ways of seeing and of presenting what we see change with eachother, and that this bears no relationship to social intelligence, or, indeed social cognitive development. But then, neither does Piaget.

[6] The extra-ordinary similarity of this progress (in tackling an Impossibility and gaining all sorts of peripheral benefits from making it (seem) Possible, only to have to re-think everything again later) to our understanding of the progress of science is, to my mind, both remarkable and rewarding.

[7] My verbal presentation at the conference consisted, essentially, of a lecture that was a biased history of Western painting, examining this Impossiblity and the ways it had been made to appear Possible. It was so biased in order to emphasise this particular point, given limited time and concentration, and also exists as a full length illustrated lecture. The point here, however, it to concentrate on Impossible Worlds in general and in particular, and not on my garbled History of Western painting!

APPENDICES

to follow in final draft

REFERENCES

to follow in final draft (including cross-referencing into the text, of course)

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX E

"Construct Games."

Unpublished Manuscript

CONSTRUCT GAMES

INTRODUCTION.

This package contains the rules and forms for two games which are based on the "Personal Construct Psychology" of George Kelly. The games are designed for non-verbal use, and are social games. This is important because little work has been done on non-verbal construing (thinking), partially because there are few techniques, and also because it is notoriously difficult, not to communicate, but to communicate non-verbally in a precisely analysable way; hence it is hard to develop articulate social constructs.

Most games have, as an aim, the idea of winning. These games, however, are co-operative: there is no winner, or rather all the players win if the desired end result can be attained. Both games are to be played by three players, although a fourth may keep a record (in which case the role of record-making should rotate).

The games may be played at whatever rate the players wish, from a gentle contemplative pace to a rush (although record-keeping is hard under such circumstances). The record of the games may be used as a reminder of the thought processes that the players went through, and gives information for analysis by standard techniques, if required.

The forms that are needed for record keeping, as well as the game lay-out formats will be found after the rules for the games. These should be copied or photo-copied for each game. The games require a number of objects to be played with: each player should

bring six or nine (by agreement - in examples here we will use six). These objects should be examples of things about which the players agree that they would like to make judgements. Alternatively, the objects may be supplied for the players to use (possibly by an investigator).

The rules given may be changed and bent in any way the players (or investigator) feel appropriate, by agreement.

THE FIRST GAME

Requirements:

Three players and possible fourth (record keeper), 18 or 27 objects to be used, copies of record forms.

Aims:

To develop social agreements about ways of thinking about objects, by attempting to complete arrangements in the manner of another player.

Rules:

Preliminary.

Duplicate the game layout format so that play can be made on it (I find the floor is a good place to do this.) Mark the left end "pair" and the right "differ".

Pool the objects. Throughout the game, players should limit their comments: if necessary they may ask for/give an explanation, but comments should normally be restricted to "yes", "no", "agreed", "shall we move on?", "have you finished?", "are you sure?" etc.

Part 1

Select three objects at random from the pool and give them to the first player, who will lead.

The first player divides the three objects into a "pair" (which have some quality in common) and a "differ" (which has a different quality). Place the pair at the pole on the left and the differ on the right of the line.

The first player now places the remaining objects on the line at the appropriate approximate position (I to V).

The second and then the third player (who have, so far, watched the first player) reposition any of the objects,other than the first three,on the line, showing where they think the objects should go between the poles. (Differences of one position - say II to III are not really significant, but II to IV is).

The objects are then re-pooled, and three selected randomly for the second player, who repeats the procedure in the role formerly occupied by the first. Then the third leads.

When each player has lead two or three times, and when the players feel they understand each other's ways of arranging the objets, play proceeds to part two.

Part 2

Select, again, three objects at random from the pool and give them to the first player, who establishes the pair and differ as before.

The second player now lays out the remaining objects as (s)he believes the first would have done. Then the third player modifies the second's arrangement, if necessary, to represent how (s)he thinks the first player would arrange the objects.

The second and third players now try to reconcile any (significant) differences they have by taking it in turn to move the (non-pole) objects until they arrive at an arrangement they both think represents the first player's arrangement, or they decide they cannot agree.

The first player shows his arrangement to the others, and, if there is a (significant) difference all three players attempt to come to

another agreement.

The objects are then re-pooled and part 2 is repeated with first player 2 and player 3 taking the lead.

If the players find they are not managing part 2 very well, they should return to part 1. When they manage fluent negotiation, agreeing object arrangements, they should proceed to part 3.

Part 3.

Part 3 is essentially the same as part 2, but is rather freer and more fluid.

The first player sets up the poles from three randomly selected objects as before, but now all three players arrange the other objects, negotiating an agreement between themselves as they go along. Even the pole objects may be changed if this appears necessary.

An agreement is reached when none of the players feel a pressing need to re-position any of the objects. (This usually happens quite suddenly: players just stop and smile!)

This process may be continued as often as desired, with the lead revolving in the usual manner. The point of the game, to arrive at agreements about non-verbal thoughts by considering how others are thinking, has been achieved.

THE SECOND GAME:

Requirements:

Three players and possible fourth (record keeper), 18 or 27 objects to be used, copies of record forms.

Aims:

To develop social agreements about ways of thinking about objects, by incorporating some of another player's objects within your own arrangement.

Rules:

Preliminary

Duplicate the game layout format so that play can be made on it. (I find the floor is a good place to do this). Mark the pair and differ points and label the player locations. You will probably want to have a copy of the step-by-step game position diagrams to hand: you will need them if keeping a record.

Pool the objects.

Throughout the game, players should limit their comments: if necessary they may ask for/give an explanation, but comments should normally be restricted to "yes", "no", "agreed", "shall we more on?", "have you finished?", "are you sure?" etc...

Part 1

From the pool of objects each player is given three objects, selected at random. These (s)he divides so that there is a "pair" (which have some quality in common) and a "differ" (which has a different quality). The pair is placed on the left and the differ on the right of each player's initial playing position line.

The remaining objects are now divided between the players and are positioned by each player at the appropriate position between the pair and differ objects (which are at the poles), according to how much of the two contrasted qualities represented at the poles each object has.

When each player has completed this, they may exchange objects, and position any swapped object appropriately. Then the objects that did not initially define poles are replaced in the pool, and the pole objects are "compressed" so that one player's differ and another's pair fit together, as in the diagrams. Play now proceeds to part 2.

Part 2.

'Each pole now has three objects on it: two provided by one player and one by another. But because these pole objects are not chosen by just one player, each player will have to re-consider the original qualities he was dealing with. This is shown by the repositioning of the objects remaining in the pool between the poles, just as in part 1.

When the objects have been re-positioned, and any exchange has taken place, the objects at the positions next to the poles are compressed, while the remaining objects are re-pooled. Play now passes to part 3.

Part 3

The players divide up the remaining objects in the pool and re-position them, as in part 2. When all the objects are re-positioned, the two remaining positions are compressed, and play passes to part 4.

Part 4

Part 4 allows a revision of object positioning, by mutual agreement of all

players. After any such revision, the game is considered complete. The whole process may then be repeated as often as desired.

Notes

a) In as far as it is possible each player should try to arrange for at least one object to be in every position.

b) Objects on pole positions may be exchanged or moved, but only with the permission of the player who originally placed them. Objects on positions that have been compressed should be treated similarly.

c) Objects from the pool may be placed at any positions between and including on the poles, whether such positions have been compressed or not.

REFERENCES

George Kelly's Theories are expounded in

Kelly, G "Theory of Personal Constructs" vols. 1 & 2, Norton, New York, 1955.

A shorter and more palatable introduction is

Bannister, D & Fransella, F "Inquiring Man", Penguin, Harmondsworth, 1969

although it is quite hard to obtain.

If you have enjoyed these games and feel you would be interested in others which are similar, you could consult

Pask, G, Glanville, R & Robinson, M "Calculator Saturnalis", Wildwood House, London, in press

which should be published in S-ring, 1980.

The First Game uses a technique invented by Laurie Thomas, which can be found in

Thomas, L "The Tutoring of Art Students: applying an Approach and Technique based on the Repertory Grid" C.S.H.L., Brunel University, Uxbridge.

For a review of the use and values of these games, see

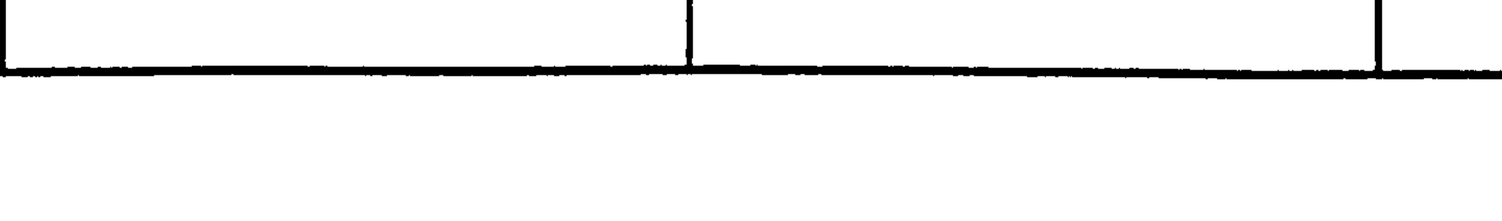
Glanville, R "Constriction by Diction & Construing by Doing",

presented at the 3rd International Congress on Personal Construct Psychology, Breukelen, The Netherlands, 1979.

ELEMENT USE (both games)

	Player 1	Player 2	Player 3
	a	b	c
1			
2			
3			
4			
5			
6			
(7)			
(8)			
(9)			

THE FIRST GAME - LAYOUT



Turn

Game Part

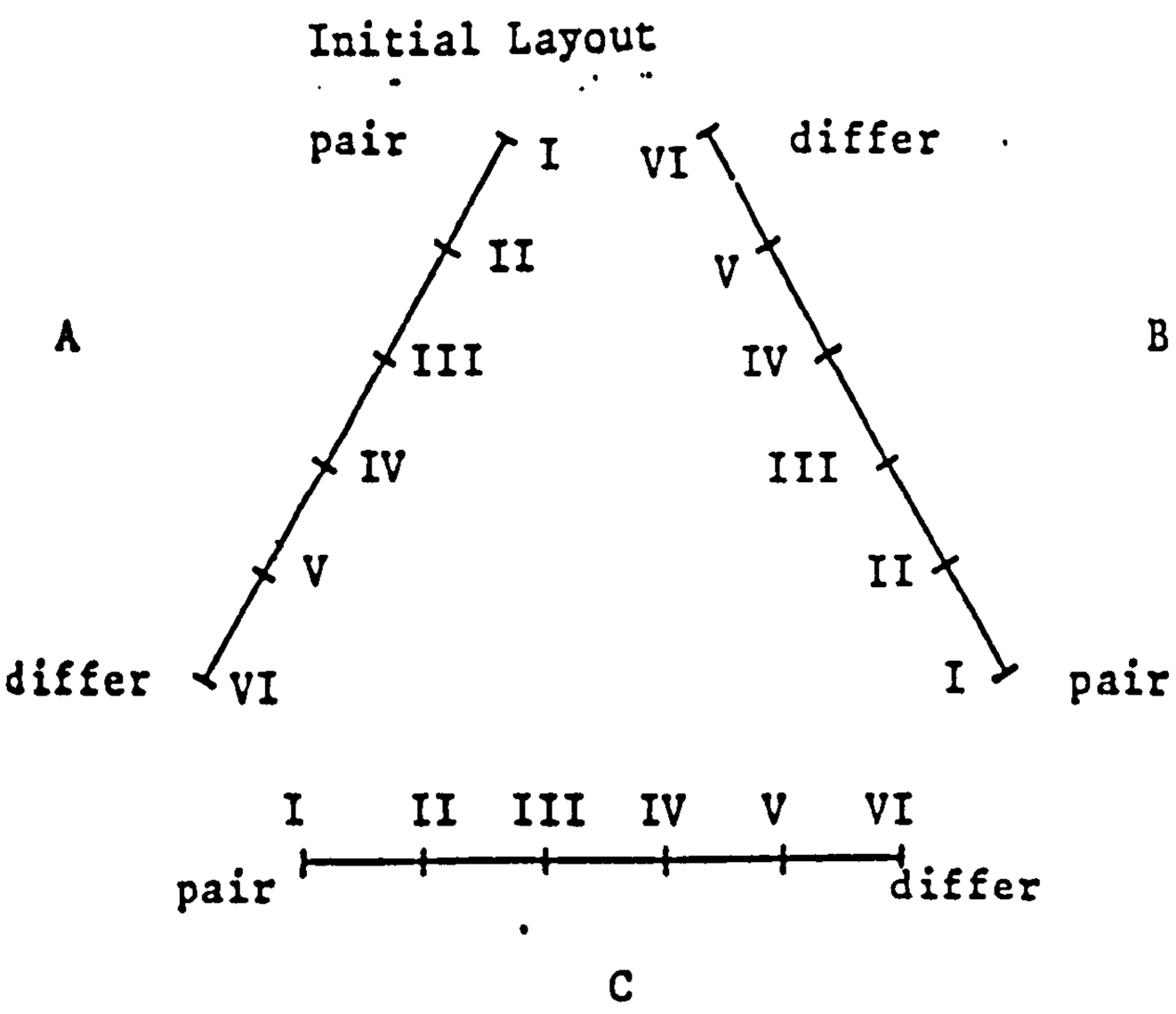
Poles positioned by

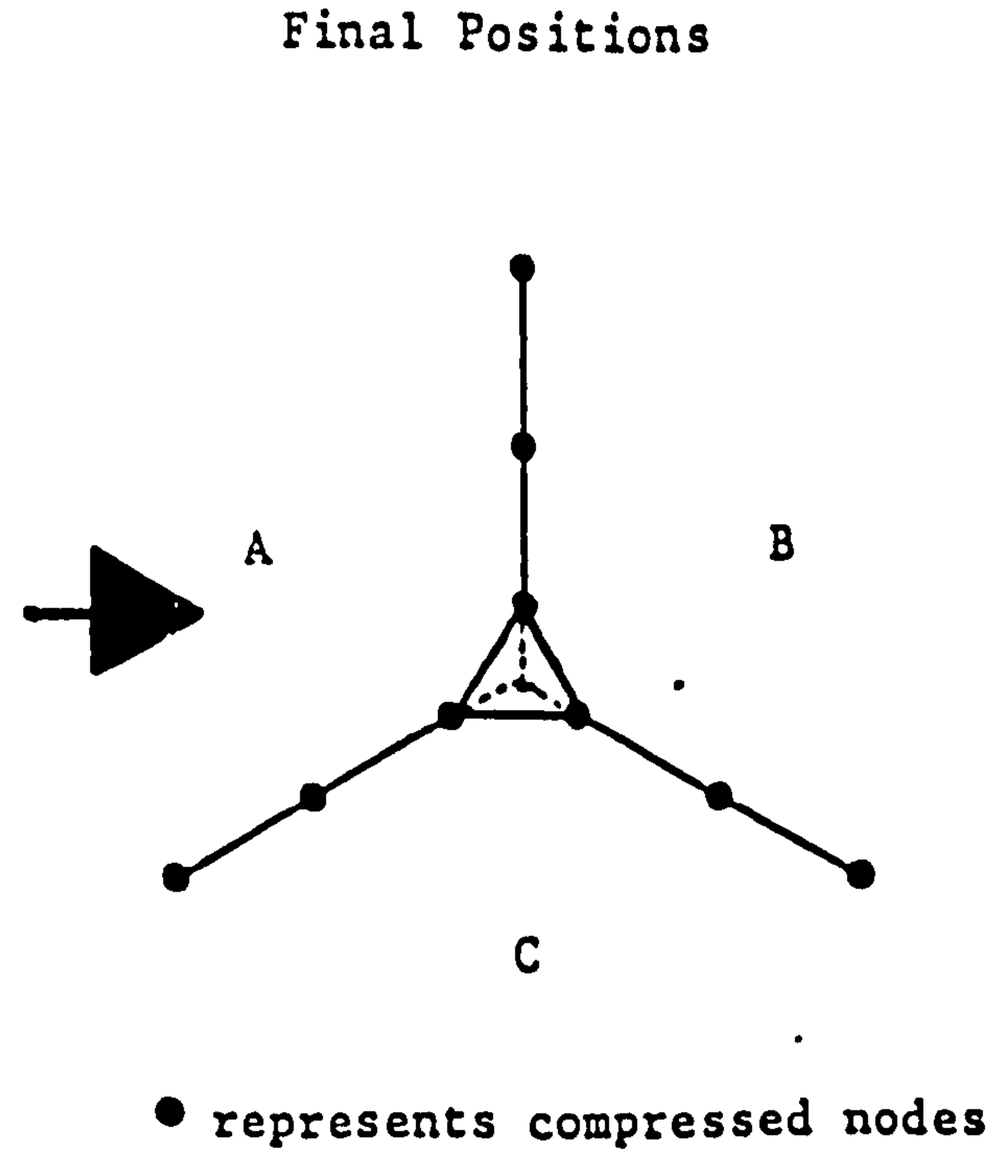
Infil by

Infil in the manner of

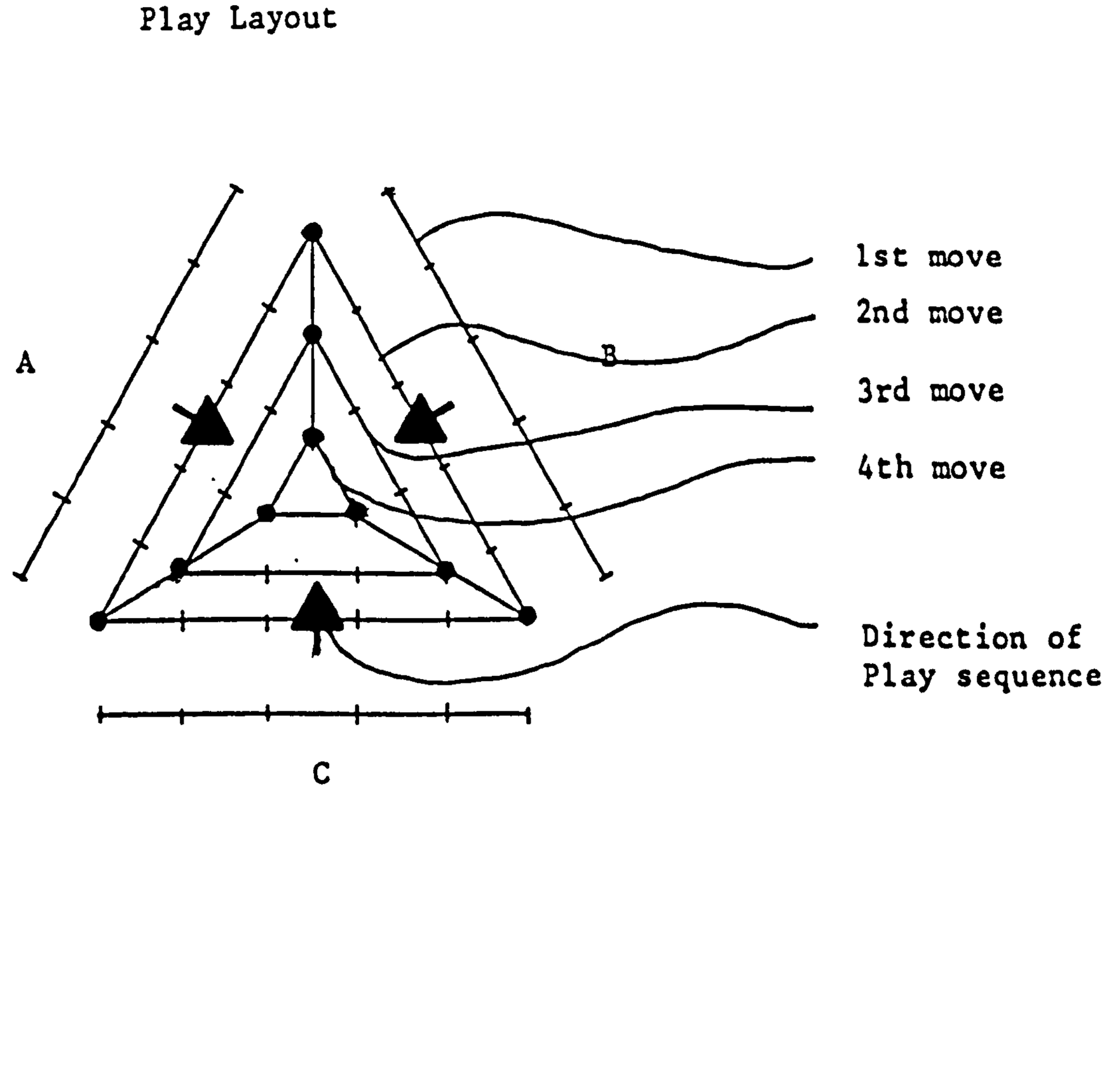
make a record of element positions turn by

THE SECOND GAME - LAYOUT



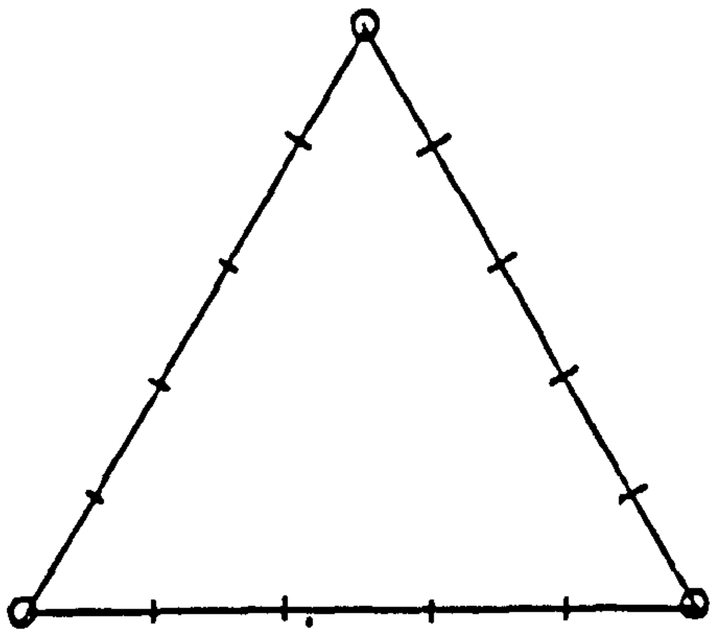


● represents compressed nodes

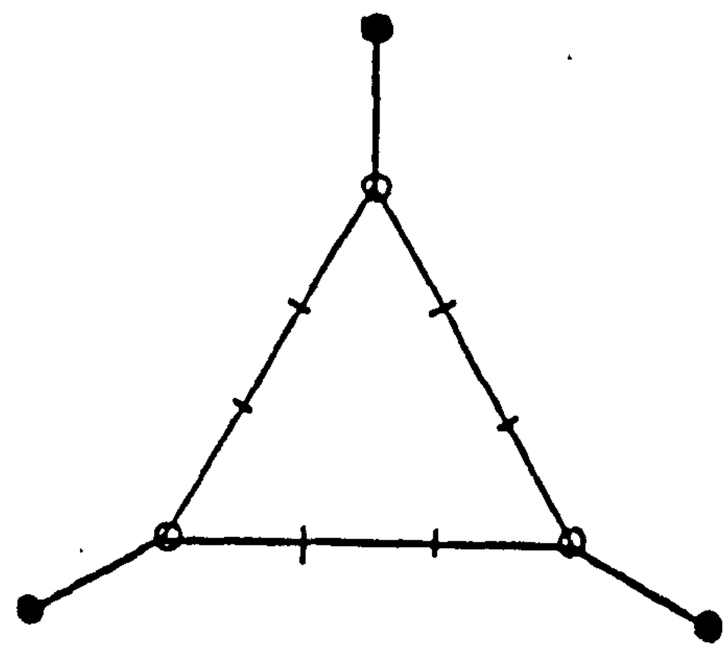


THE SECOND GAME - MOVES

2nd move



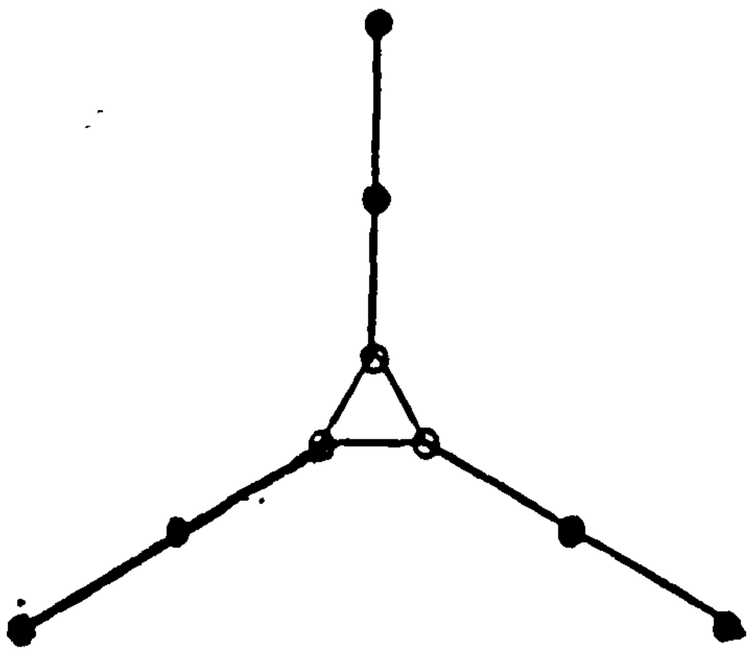
3rd move



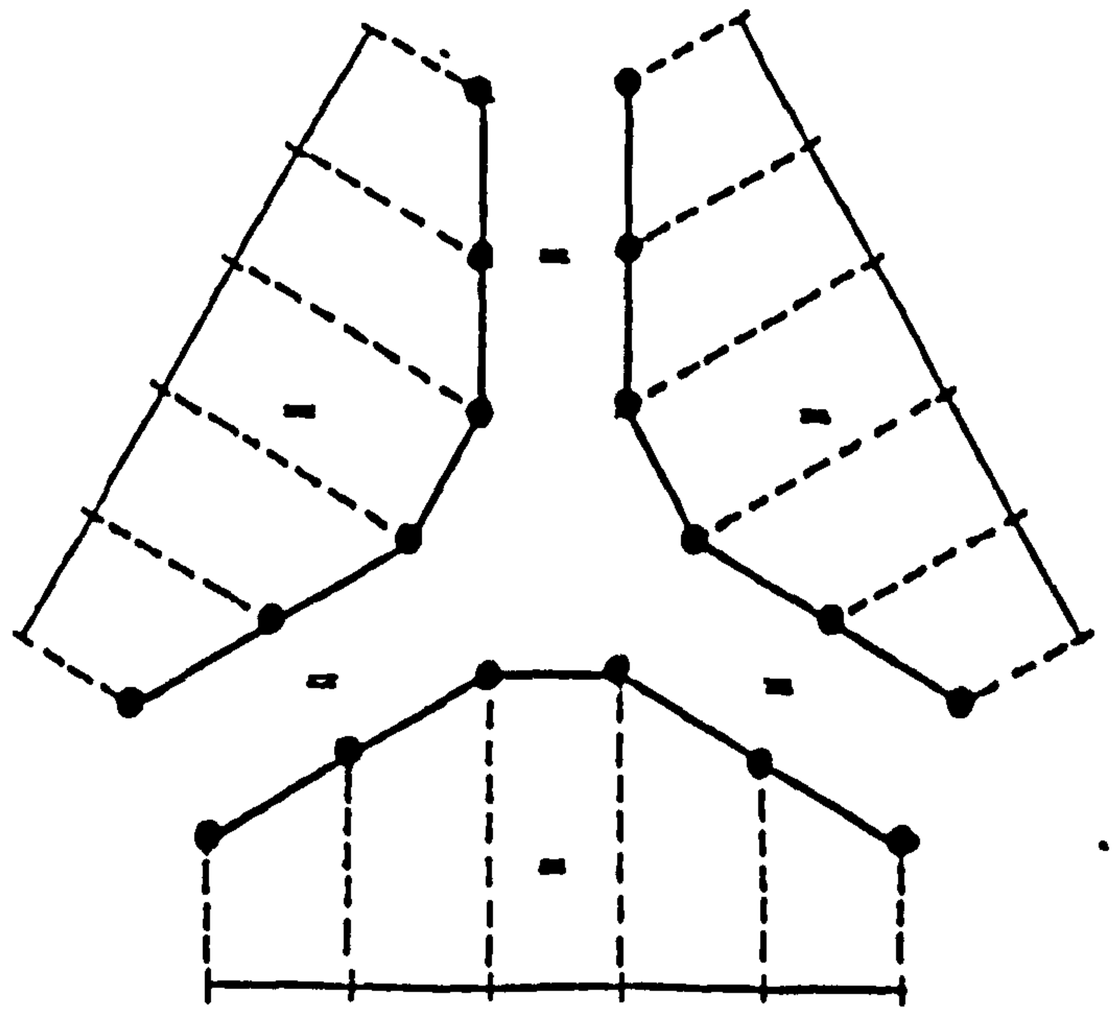
o represents node

o represents node compressed this turn

4th move



Summary (conclusion)



THE SECOND GAME - COMPRESSIONS

player	position of elements					
	I	II	III	IV	V	VI
a	AI	AII	AIII	AIV	AV	AVI
turn 1 b	BI	BII	BIII	BIV	BV	BVI
c	CI	CII	CIII	CIV	CV	CVI
a	AI BVI	AII	AIII	AIV	AV	AVI CI
turn 2 b	BI CVI	BII	BIII	BIV	BV	BVI AI
c	CI AVI	CII	CIII	CIV	CV	CVI BI
a	AI BVI	AII BV	AIII	AIV	AV CII	AVI CI
turn 3 b	BI CVI	BII CV	BIII	BIV	BV AII	BVI AI
c	CI AVI	CII AV	CIII	CIV	CV BII	CVI BI
a	AI BVI	AII BV	AIII BIV	AIV CIII	AV CII	AVI CI
turn 4 b	BI CVI	BII CV	BIII CIV	BIV AIII	BV AII	BVI AI
c	CI AVI	CII AV	CIII AIV	CIV BIII	CV BII	CVI BI

Element compression showing shared elements for each player at each turn in the game.

APPENDIX F

"Why Design Research?"

From:
Jacques, R and Powell, J (eds) (1981) "Design / Method / Science",
Guildford, Westbury House

WHY DESIGN RESEARCH?

Randolph Glanville
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This paper considers the nature of scientific knowledge and of scientific research NOT as a paradigm for design but, conversely, as a design activity in which particular (although not necessarily articulate) restrictions are allowed to operate. As such, considerations of science as design have a reflexive character - design is designed - and science/design is subject to all the problems that face such self-referential systems. Recent thought on self-reference is consequently brought in to enlighten understandings of science/design.

Science, it is therefore argued, may not be used as the yardstick against which to measure design. If anything the converse is the case. And research into design should be considered as providing a paradigm for science.

INTRODUCTION

A large part of this paper could be seen as a paper on the philosophy of science. What it intends addressing is the nature of research. Contrary to Bruch Archer (1979), I do not see there being a need for a new and special area of design research: rather, I think that what is called for is a modicum of honesty on the part of the research community.

Put in a nutshell, what I think is this: research, itself, is a design activity. It is a far cry from the popularised misrepresentations of the scientific paper in the learned journal, as Medawar (1963) has shown us. And it is only because of the fraud perpetrated through this form that some people feel the need to argue the specialness of design research, while other people refuse to fund it. Design is a basic human activity, and is also the basic activity in scientific research. So that while I agree (Glanville (1980b)) with Archer about its specialness, I no longer agree about its isolation.

What is being expressed in the title of this paper is not what perhaps appears at first glance. What I want to get at is not so much why we must have a field called "design research" but rather why research must be considered as design. In fact, put this way round, what I'm getting at then supports Archer's position perhaps even more strongly than his own arguments: if research (and experimentation) is design, there can be no excuse for not funding design research! But it also gives design research a rather special position, for, like the philosophy of science, which tries to analyse scientific thinking scientifically, linguistics, which tries to talk about language in language, or cybernetics, which feeds back information about feedback (only a cybernetician should be allowed to talk about his own field in such a jesting manner), design research is, in fact, research into research: a reflexive field of study which will need to learn from and recognise within itself all the theoretical devices developed in those other fields to resolve the circularities of reflexivity and to admit the associated problems of self-reference vis-a-vis meta-levels.

Thus the title of this paper expands:

Why Design Research?
Why Design Design Research?
Why Design Research Research?
Why Design Design Research Research?
-or-
Why <u>not</u> design research - What other options do we have?
-and, of course -
Why Research Design?
etc.

ESEARCH AND EXPERIMENT

he notion of research that I want to attack is not the sophisticated and sensitive ne that a philosopher of science, in part because he is interested in theories tc., puts forward. It is the naive belief that science is conventionally pre- dictable and logical activity (the problem is that of induction), and that experi- ents are step-by-step, causally powered routines.

n applying for a research grant, as any applicant knows, the most important equirements are to explain exactly what you will do, what you will analyse (and hich statistical procedures you will use), what the results will be and how they ill be useful. These are absurd requirements. Not only is the association of sefulness with knowledge quite arbitrary, it is also banal in the sense that if a ew piece of knowledge is to appear, it may be that the insight resulting in fact nitiates a chain of new insights that produce all sorts of novelty which is use- ul. But behind this false utilitarianism there lies another serious misrepresent- tion. If what is being carried out is really an experiment involving testing and transformation - as opposed to, e.g., meditation - only then the result can only e predicted as a hunch - a potential re-validation of some theory. Then, if the wrong" result (or even no result) emanates, the experiment must be changed, to find ne that gives a result that is acceptable. Now, say that the experiment to be arried out is a complex one in several stages, and something goes wrong early on: everal later stages will almost certainly have to be changed, in a manner whereby ach depends on the others. (This is a broad characterisation shared by many and erhaps most cogently stated in Lakatos (1969)).

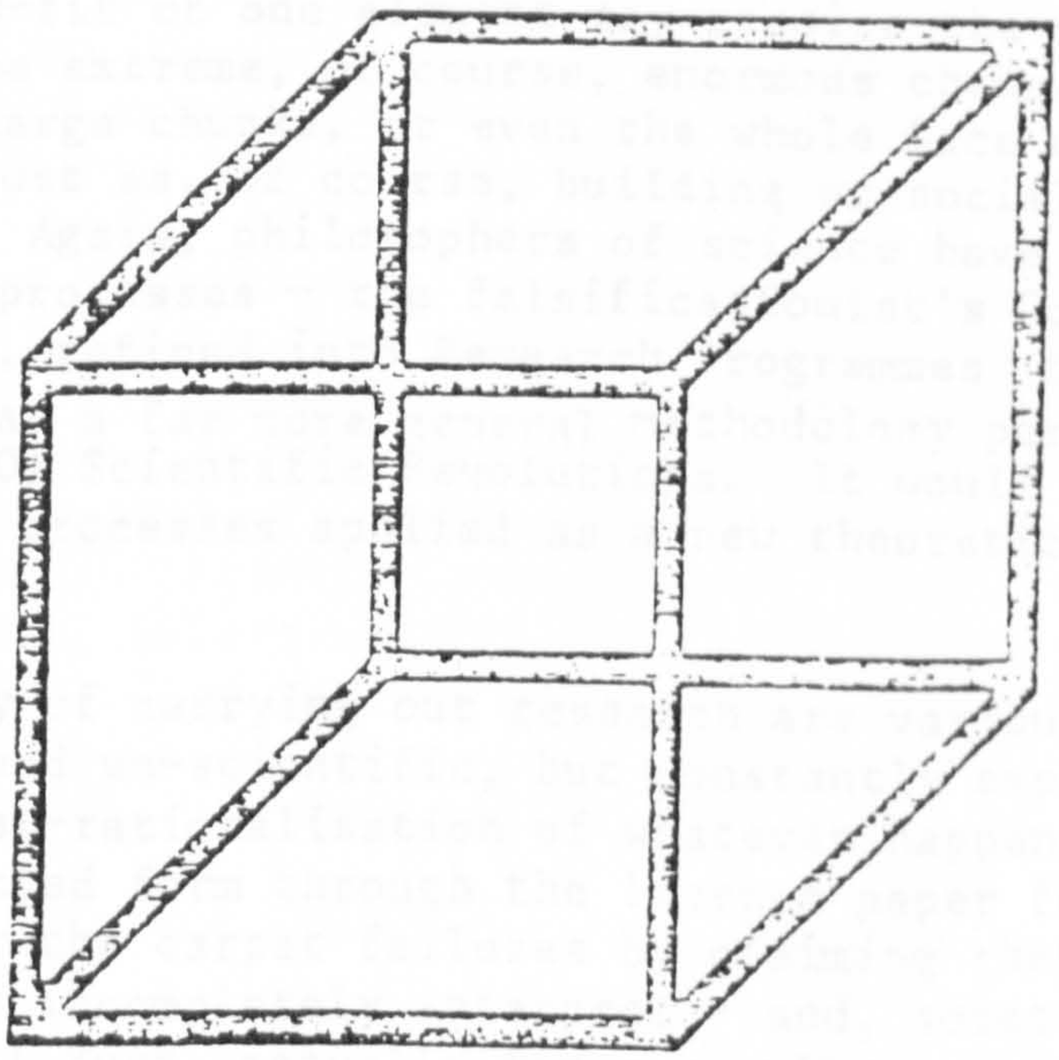
hat I'm getting at here is a Kuhnian point (Kuhn (1970)) of the sociological and sychological aspects of science, how we think of experiments. We tend to think of hem, unless we are very careful, as they are written up, which, of course, is oloured by the appalling characature of science which we laarn in our school xperimental apprenticeship: "method; observations; conclusions." Any normal ccount of an experiment tends to present it as a logical step in the slow develop- ent and refinement of the (predetermined and unchanging) corpus of knowledge known s science. (This is exactly what leads to the familiar "problem of induction", the roblematic hub of all philosophies of science that assume this inevitability, see.e.g alzers (1978)*) But this fails to take into account what actually happens in terms f the actions of the experimenter and the effect the new knowledge may have on the orpus.

nly in very rare cases, which I consider as specially restricted and which are sually either very simple or very technological, is an experiment set up without n idea of the outcome to be tested being held in mind, and without some part of the xperimental procedure needing to be changed because it doesn't quite work. The ctions of an experimenter, from his initial idea of what he might do to the creat- n of some final, acceptable, working output are no more naively linear than are hose of traditional designers - and every attempt to account for and create design rocesses that function in such a linear, "problem solving" (i.e. simple causalist nd flow chartist) manner have, as we have seen, lead to sterility. The reasons for

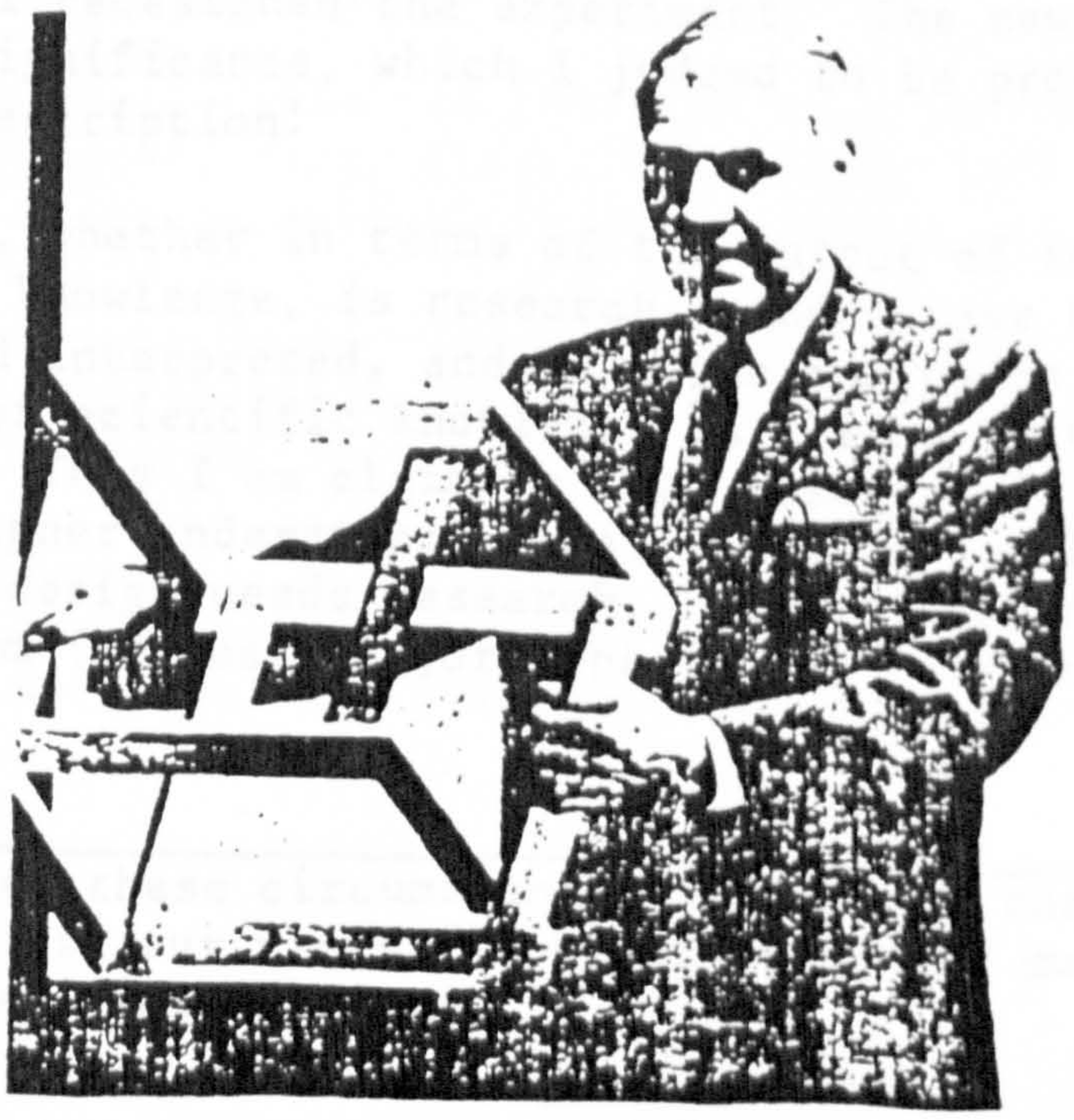
*e also a major part of Niddirch's (1968) excellent collection of papers

this have been widely expounded and are to do with such non-deterministic concepts as chance and randomness, (Jones, 1979), creativity, learning (Glanville, Pedretti & Jackson (1979), wholism, circularity and feedback, (Glanville, 1979c, 1979d). Such discoveries and arguments made in the field of Design Research do not need elaboration here! In fact, it is this very activity, design, that lies behind the general ability to create the possibility of new outputs, be they buildings, spoons or knowledge from scientific experiment. This involves the active, creative participation of the agent involved, a fact that is now accepted by virtually every philosopher of science under the title "hypothesis dependency".

(A nice example, probably known to most readers, is the perceptual psychology advocated by Gregory (1970), where he discusses the interpretation of ambiguous figures - e.g. the Necker Cube -



in which the image "reverses" in such terms. I have noticed, incidentally, that I have difficulty creating the reversal, no doubt due to the dominance of one hypothesis that comes from an architectural training in the axonometric. Such a cube has, in fact been made.



rthermore,—the-creation of fields of scientific knowledge can be looked at in the e way, as being designs. In fact, they are probably closely analogous to cities both scope, scale, sociality, anonymity, time-span and conservertism (It is tempt- to use a building as a simplification of the city, and hence to develop an logy for science, although it must be remembered that it is a simplification, rticularly in that it can be seen as terminating. But this endeavour must await ther paper).

discovery of a new piece of scientific knowledge does not exist in isolation. It ulates the attempt to create new knowledge (in order to test and refine the know- ge already existing) and affects the local knowledge around it, in much the way the creation of a new building may "upgrade" an area and cause other new build- s to occur in the city.

s is to say that the purpose of scientific experiment is to produce output which only increases the scope of science, but also tests the already existing know- ge, and, where it is found lacking, requires its modification: which, of course ulates right through the whole corpus requiring a constant change, just as, in design process, the mis-fit of one element may require the change in a whole ing of decisions. In the extreme, of course, enormous changes may have to be e, completely altering large chunks, or even the whole face of science as we previously known it, just as, of course, building or social forces may create sive changes in a city. Again, philosophers of science have worked out elegant acterisations of these processes - the falsificationist's Conjectures and tations (Popper (1969)), refined into Research Programmes (Lakatos (1969)Xand by Landau(1981)considered as a far more general methodology particularly applicable design), and Kuhn's (1970) Scientific Revolutions. It would be interesting to sider theories of design processes applied as a new theoretical basis in the osophy of science!

acteristic of such a way of carrying out research are various behaviours normally idered rather improper and un-scientific, but constantly experienced by honest gners. They include post-rationalisation of whatever happened (which scientists ise in a highly restricted form through the learned paper format); attempts to ain away and brush under the carpet failures by claiming they are not basically ant (much as scientists incompletely interpret - and, sometimes, as in the gations against Sir Cyril Burt, actually fix - results, an experience surely y schoolchild repeating a famous experiment and getting a "wrong"*answer will ber); working on hunches and sudden insights (ask a scientist how an idea came to him and his human normalness will become apparent); and the admission of personal ning arising from mistakes. In fact, it is these characteristics that, by and e, are evoked in order to explain the workings of the scientist's mind: "I had den idea so I set about setting up an argument to support it and designing an iment that would test it. The experiment didn't work, but I didn't give up. I ained away the incorrect data as resulting from poor experimental design, and, ning from my mistakes, I redesigned the experiment. The new experiment gave me result I wanted at 5% significance, which I judged to be proof of my point." re with the standard description!

I have discussed above, whether in terms of the output of individual experiments e growth of scientific knowledge, is research. And I have tried to show that iments are designed and interpreted, and that the inclusion of the output of an iment into the corpus of scientific knowledge is also a matter of design, and design of the corpus. Thus I am claiming that research is a design activity in the way any normal designer understands, that research involves and needs h, just as research-as-design needs research. Design Research is, in effect, indistinguishable from (at least major aspects of) research into research.

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does "wrong" mean, under these circumstances? It means that, according to the dge we have it doesn't fit our views (in hypotheses) and must therefore be rect. But it may be that view is wrong.

It is in this sense that design research is a reflexive subject in the manner of philosophy of science, linguistics and cybernetics as I pointed out earlier. So, if design has lessons and possibly even provides a paradigm for science, - or at least for scientific research - how might design learn from these subjects, and be reflected in them?

The most important characteristic of these subjects is that they examine themselves in their own terms. For instance, the linguist discusses (natural) language in terms of (natural) language. This highlights a particular "problem" - the problem of levels. In the classical paradigm, the something talked about is on one level and the something in terms of which it is talked about is on another, "meta" level. Much work has gone into exploring the classical paradigm, showing that it is impossible to describe something, with certainty, both completely and consistently in its own terms (Gödel's (1931) Theorum). This gives rise to the "problem" of levels (also known as the "problem" of self-reference). Some subjects, for instance the three mentioned, do and must talk about themselves in their own terms - that is, their meta-levels are the same as their levels (Pedretti (1980)). This leads to the difficulty that they are to be considered as incompletely and/or inconsistently described, in terms of the classical paradigm. But must this be so?

At the extreme limit, a system which is dynamically stable and distinct (such as a living entity) - that is, something which remains independent, must contain its own description, so that it can reproduce itself without reference to others (Maturana (1970) and Varela (1980)). In this case, the level and the meta-level, the thing and its description, together are inseperable constituents of the thing. Thus, it must be that the classical paradigm is inadequate, for it rejects such self-referential systems, which nevertheless clearly exist: as fields of study, as animals, and as, as some of those including myself, who are developing the theoretical consequences of such systems claim, everything about which we can know and think. (Glanville (1975, 1978, 1980a, 1980d), von Foerster (1976)).

There are two ways out of this. The first, conservative way is to attempt to patch-up the classical paradigm in order to reduce the problem. Such attempts (which, of course, follow the design principle of scientific knowledge already shown as the constant modification of the corpus of scientific knowledge) are, however, never likely to succeed completely since they are in essence based on a way of structuring knowledge which specifically excludes self-reference. Indeed, Gödel, who provided the proof of this, worked until his dying day to sort out how human intelligence, which he did not believe could be encompassed in the paradigm, could be accounted for - and failed*! This approach will admit of highly specialised special cases of partial, or limited self-reference (e.g. Loefgren (1968)), but admits it cannot account for complete self-reference and therefore either shrugs its shoulders at, turns it back on it, or says it's really a problem.

The second, radical approach takes the position that self-reference is obvious and must therefore be accepted**, (e.g. Glanville, (1975, 1978, 1980a, 1980d). The problem it then faces is to encompass, in a meaningful way, the sort of level/meta

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*Thus Gödel considered that machine intelligence, necessarily bound by the classical paradigm, could never, in principle, emulate human intelligence. In this view he is not alone!

** An extended debate on these issues occurs in the privately circulated proceedings on the Workshop Conferences on Self-reference (Pedretti, 1980).

level-reference of the classical scientific paradigm: that is, to redesign the whole of scientific knowledge to encompass not only the classical view (possibly modified) but also those things which are currently excluded.

This is a call for a scientific revolution, and a lovely exemplification of the operation of Occam's Razor, (Glanville, 1980d). It is, in its own way, as profound a revolution as that of Einstein's adumbration of Newton's mechanics, with as many ramifications (as discussed in Chalmers (1978)). And, of course, design and design research are necessarily, as I have argued, in the vanguard of this programme.

In taking this second view, certain basic tenets of the classical paradigm have, of course, to be modified: for instance, the concept of level. Levels in description and in knowledge are assumed to be basic, in the classical paradigm, (e.g. Pedretti & Glanville, (1980) Glanville, (1980c)). But, if self-referential systems, which do not have such levels,are basic, then levels cannot be. Are there, then, any levels at all? Or is the whole of knowledge a sea of little isolated bits, unrelated (for relationships other than identity immediately generate levels) - a deceit. This would obviously be an awful thing were it so,for it would mean that scientific knowledge was an illusion (and, for that matter, the essential cognitive ability to recognise things) - which is as counter-intuitive as the refusal to accept self-reference. It also runs counter to the argument used in support of the radical view, that within it the classical paradigm may survive as a special, if limited, case.

The solution to this lies in remembering how it is that levels come into being. There may or may not be levels in nature - in the real world - but this we may not know because we can never see the real world cold, without interpretation, without hypotheses. The question of levels in nature is, anyhow, irrelevant. Science (and how often do we forget this in our oversimplifications) is a corpus of knowledge, and a corpus of knowledge requires agents to know it. It is not constituted of cold facts, but of working hypotheses. The corpus of knowledge does not, a priori, exist; it is constructed. The relationships in it have to be made through the act of relating, and they have to be expressed linguistically, and stabilised through shared interpretation in shared language (as demonstrated by Pedretti (1978

All this is done by the scientist, through reference to self-referential systems as others. And it can easily be shown that the sort of mechanisms that must be assumed for self-referential systems to be observable to others (without which assumption there would be nothing left to talk about!) permit the making of such relationships and thus of levels (Glanville (1978)).

This, of course, re-affirms the centrality of the scientist and his hypotheses in making science - as a design act informed and supported by the very nature of design research as a reflexive system - and it reinforces the concept of science, of levels, of concept formation as being a public endeavour, (as Chalmers (1978) and Kuhn (1970) insist).

But it also provides the theoretical basis for the observer in any experiment - or the designer in any design - as being involved in a circular, feedback process in which the observer's description and the experimental arrangement's behaviour interact and modify each other until they are in apparent agreement, allowing predictions to be made (inductively) without there being the need for any recourse to "truth" (that word particularly inappropriate to design), hence removing much of the "problem" of induction, and allowing a similar circularity to exist between the experimenter, the experiment, the experimental medium and the representational medium (i.e. how to say something),(Glanville (1979d)).

And it provides a neat solution to the problem of absolute knowledge vs basic ignorance. I think it is beyond argument, nowadays, that we only know through interpretation - as has been argued throughout. The problem here is how do we gain and hence <u>have</u> knowledge, in spite of our necessary basic ignorance? And the answer lies in the difference between self and other: we have no absolute know-

ledge outside the self, but we can have some knowledge, through the "design/designer circularity" of others, in which relationships are developed between the various others, which are then assembled and represented in various levels. Any designer knows, of course, that design is a matter of few absolutes (except socially applied absolutes such as regulations), and a lot of interrelated compromises which lead to some new "whole thing" (Glanville (1977)).

Finally, it is worth mentioning in passing a few further consequences of this point of view (which may be pursued in the literature). Designers know, from experience, that designing is a matter of keeping several things in mind (both consciously and sub-consciously) at once, and gradually getting them to fit together (often in quite surprising ways). Theories handling self-referential systems require a similar performance. Rather than handling determinate elements in sequence, they attempt to synchronise several distinct elements to occur together. (Glanville (1978), Pask (1978)). The implications for this in computing terms, and CAD, are particularly important. Furthermore, the conventional views of representation (as a sort of coding) have to be changed to be both more subjective and more conversational - again something designers recognise in creating and discussing (both verbally and non-verbally) their work. This whole field is being exhaustively researched by Pedretti (in progress), who has also worked, with me, on aspects of elicitation and representation of spatial perception and architectural design. (Glanville, Pedretti & Jackson (1979), Glanville (1979a)). Using the self-referential paradigm we can, in fact, relate coding, communication, conversation, consciousness and intelligence as being manifested behaviour of groupings of synchronised self-referential systems working together. Finally, the ideas of inside and out, of boundaries, of inherent properties become modified in such a way that properties of things are seen as being inserted by the designer, rather than being present as inherent in the first instance (Glanville (1979a)).

It can thus be seen that the theoretical developments with regard to reflexive systems are not only fuelled by the nature of design research, but also account clearly for much of design as an activity and experience.

WHY DESIGN RESEARCH?

There remains one point to be clarified: the question of the title. "Why Design Research?" Why should we research into research, design design, and so on?

The answer to this is, I think, rather shocking. There is, in principle, no reason at all. It is merely a matter of faith. The faith is rather that of the patient attending psychotherapy, of the person who believes that by becoming more aware of himself he will learn to perform better. This is a common educational belief, one to which I subscribe, but which can never be conclusively proved and which, in as far as my knowledge goes, has never yet been even circumstantially demonstrated. (For instance, some people appear to benefit from psychotherapy while others don't, but who knows if those who benefitted might not have done so without therapy, or if those who didn't would have, if left alone?). This, of course, parallels the whole business of usefulness and knowledge - we may know, but that does not necessarily mean our knowledge is useful, any more than knowing about how we perform means we can improve our performance.

Nevertheless, this is a position widely held in our Western Culture, that knowledge brings, as it were, power, and that through this power we can control, manipulate, change things (e.g. espionage). In a sense, this is a justification for science - and speaking materialistically we may claim that the technological embodiments of the advances made by science do indeed provide some justification for the pursuit. Then, since scientific knowledge comes through the medium of experimental research, research into such research would be seen to be not only justifiable but highly desirable since it should lead to improvement in the activity of research. Certainly given virtually the only available experimental training of today, which designers will recognise as the articling of an apprentice to an attelier, one wonders whether a new and more "efficient" way of teaching experimenters might not emerge, as we believe (but are we right to do so?) has happened with designers. But it is also

ledge outside the self, but we can have some knowledge, through the "design/designer circularity" of others, in which relationships are developed between the various others, which are then assembled and represented in various levels. Any designer knows, of course, that design is a matter of few absolutes (except sociall applied absolutes such as regulations), and a lot of interrelated compromises which lead to some new "whole thing" (Glanville (1977)).

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nceivable that doing research on research, design on design, could give us a
:ale for comparison: for the body of research (for example) could be compared to th
eneralised view of research which might act as a (temporary?) norm.

nus, given the (hard to justify but generally held) view that knowledge improves
ings, if our knowledge derives from research, it is surely sensible to acquire
owledge of research in order to improve research. Since research is a design
:tivity, this, of course, means knowledge of design and design research.

nder these circumstances, the beautiful activity that is science will no longer be
en as mechanistic, except in retrospect. It will truly be understood honestly, as
great creative and social design activity, one of the true social arts. And its
aradigm will be recognised as being design.

nus design will take its true place as the basis for the activities that create
:ientific (as well as other) knowledge, and will no longer be sneeringly and
:ivially dismissed by those who adjudicate without creating, and who are fooled
nto believing that science is as she is writ. There will be no need for a special
rea of design research, for all research will be seen to be part of design research
ith that which we call, now, design research being the most basic of all.

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ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX G

"The Architecture of the Computable."

From:
Design Studies vol 1 no 4, 1980.

In the following contribution by Glanville there was a conflict between making the paper clear and providing an illustration relating to its contents. Glanville's version as submitted, was intended to show, through its own development as a written paper, how a design may come into being. However, to help the reader avoid some mystification or frustration, the Editors have themselves redesigned the paper, parts of which have been set in a different sequence so that the empirical essentials of the contribution may be rapidly grasped, thus making the original introduction the conclusion. Should the reader so desire, it is possible to reconstitute the paper as originally submitted by reading the conclusion, 'An Apparently Irrelevant Beginning' (in Box p223) and then the paper as it stands.

Glanville draws heavily on recent Western perceptions of Zen Buddhism. This emphasizes the characteristics of 'wholes' and the subjective grasp of forms and other overall relationships 'in a flash'. (There is, of course, a well-established Western heritage of discussion and research on such themes which ranges from the Greek philosophers to the present time).

The architecture of the Computable

RANULPH GLANVILLE
Portsmouth Polytechnic, School of Architecture, King Henry I St, Portsmouth, UK

Certain assumptions about the computable are shown to be structured in a different style to that of the representation of our perceptions. This, it is argued, provides an analogy for the process of design. An alternative way of thinking about the computable is proposed, and certain applications in education are raised.

THE COMPUTABLE

What is meant by *computable*? This surely needs elaboration. To a cybernetician it means intentionally establishing a (productive) relation between things. To a computer scientist or programmer, it means something rather more restricted, namely the collection of tricks that a machine can be made to perform. The difference is important, for the cybernetic definition is more general and less confined than that of computer science, but I suspect that most of the time when we talk of computing we are thinking of the latter. Yet this is exactly the meaning that I want to question.

Computability is often thought of in terms of the sorts of electronic computing machine with which we are all now familiar. These machines* and their programs are distinguished by being (amongst other things):

- digital (that is, their values are always set in terms of some absolute initial standard, the bit)
- serial (that is, they handle one thing at a time and in strict sequence)
- variable-based (that is, they need prior definition of what is to be considered)
- quantity-based (that is, they operate by considering how many bits of whatever variable there is, and they consider quality only as a definition of a variable).

*But note that recent developments in computers using ganged microprocessors may change the machine interpretation from computing to what will shortly differentiate as Computing.

Remember, of course, that this is how their precursor, Babbage's *Analytic Engine*[8] worked.

However, when computable is used in the cybernetic sense, it is not necessarily only

- digital (because analogy is possible)
- serial (because analogy only exists in a concurrent universe)
- variable-based (because the computation may distinguish and define the variable)
- quantity-based (because analogies do not necessarily require quantities but may be drawn between qualities alone).

To differentiate these two orthographically, I will call the former definition (computer science's) computing and the latter Computing. It is in these two and the differences between them that this paper is interested.

SPACE FOR PERCEIVING

The difference between the computable and the Computable provides the basis for a good analogy in environmental psychology. Almost all the work that has been done on how we perceive, conceive and remember our physical environment has examined the character of the computable. The typical way an experiment is set up, in keeping with the standard scientific procedure, lies in isolating and fixing all but one variable and then testing a subject's (verbal accounts of his) behaviour as that variable is changed.

In doing this, things have been so arranged that the subject's experience must be accounted for through these variables and, furthermore, the subject's attention is directed towards the experience he should be concerned with, since a cognitive subject is not inert, but conscious. This approach is similar to the computing approach, and has the two major features that in it variables are already chosen (by the experimenter) and the subject must perceive and account for his experience through these variables. (It was at this point that the second skeleton was recorded as part of a conversation.)

It is also possible to set up (less hygienic) experiments which explore how subjects perceive and experience space, without assuming the variables, or even that there are such variables, ie experiments that are about the Computable. I have set up several of these, and it is my experience with them that has led me away from my idealistic, but childishly naive 'science rules' view of the 1960s. A brief account of these experiments is appropriate and fuller descriptions can be obtained.[9,10]

It should be understood that these experiments do

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not, cannot, and are not intended to conform to the normal high standards of scientific objectivity. There are four reasons. First; they are not meant to be objective because they are concerned with personal experience as a cognitive process. Second, because the purpose in the experiments is exploratory and educational, for both the subject and myself, rather than data-productive, and these experiments are used as teaching tools and to develop ideas. Third, they are not interested in the testing of my (experimenter's) preselected variables but in the elaboration by the subjects of what their variables might be. Fourth, one cannot discuss cognition without discussing how it is represented (the cognitive processes are as Wittgenstein[11] and Gregory[12] have shown, hidden behind their representations and are in no other way accessible), so that the experiments cannot actually directly tackle their main concern, but only its representation. These latter two are the normal conditions of experimentation where cognition is concerned, which may mean that some would prefer not to call my experiments' experiments', but something else. But to ignore them is to ignore the reality that psychology both is and works in, which we do too often and at our peril.[13]

THREE EXPERIMENTS

The first experiment (1973-74) was an attempt to develop a common (verbal) vocabulary through which a small group could discuss spatial experience. The techniques used were based on George Kelly's personal contruct elicitation,[14] with extensions by Laurie Thomas.[15] From a large selection of slides of Alvar Aalto's Tuberculosis Sanatorium at Paimio, each subject chose three. Then groups of three subjects pooled their slides and made constructs, first personally and later, by negotiation, as a group. Groups exchanged subject members so that representatives of each group could negotiate constructs. Finally the initial slides were shown again, appropriate descriptive constructs were named, in public, and another process of negotiation was used to reduce these constructs from over 70 to the more handleable 15 listed in Figure 1.

Axis
Surface
Containment
Scale
Mechanical
Building as setting
Space's feeling for users
Core being pointed to
Symbolic reading
Opening in boundary
Diversity
Movement
Where I am
From where I am what I feel
Context

Figure 1. List of 15 constructs

After negotiating social constructs at great length and with considerable single-mindedness, one might reasonably expect that, when shown the chosen sides,

- each subject would use similar constructs much of the time
- each subject would have a fairly clear idea of how he used the constructs

neither of which was the case. Not only did construct usage differ substantially between subjects but also, when a comparison was made between believed and actual frequency of usage, no connection was found (Figure 2).

However, when asked to draw what each construct meant, a similarity did appear (see Figure 3).

This experiment was interpreted as showing what architects have long known – that words are not very good for describing spatial experiences, which are infinitely better communicated by drawing.

The second experiment (1975) grew out of this interpretation, and has achieved a certain notoriety. It is a blindfold survey and, having on occasion taken part myself, I can confirm the findings from my own experience. In it, subjects tried to visualize and draw a previously unfamiliar (and unusual) space while blindfolded. They could leave and reenter the space and remove their blindfolds after they had left. Mostly they drew when outside, using their drawings as hypotheses about the space, though some tried to draw in the space (blindfolded!). Sessions usually last 2-3 hours (by the subject's choice). In one particular session, I spent nearly three hours examining in minutest detail what I later discovered was the underside of a staircase, without being able to visualize it at all; even the (fairly accurate) drawing did not help me, and I had no sense of the whole. This finding is universal, and has been highlighted by the variety found in drawings by different subjects of the same place (Figure 4), as well as by asking subjects to draw the space from memory after a time lapse, to which the response runs: 'I can't remember it, but I could if I'd seen it'.

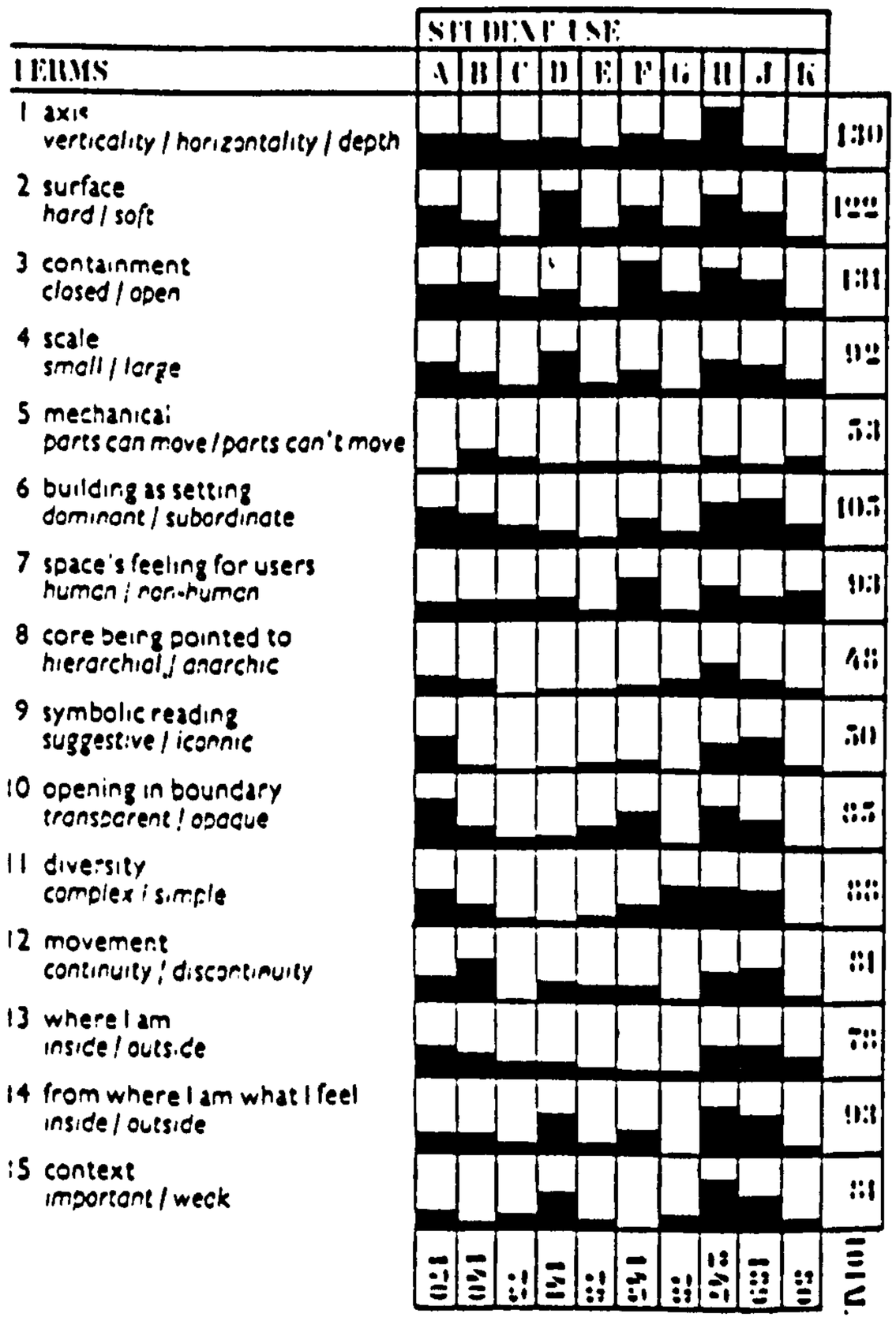

Figure 2. Total use of the 15 terms for each subject and each slide showing the difference in each subject's use and in the ways of describing each slide. (The process of assembling this data tends to minimize differences: the individual subject by subject, slide by slide data is even more varied)

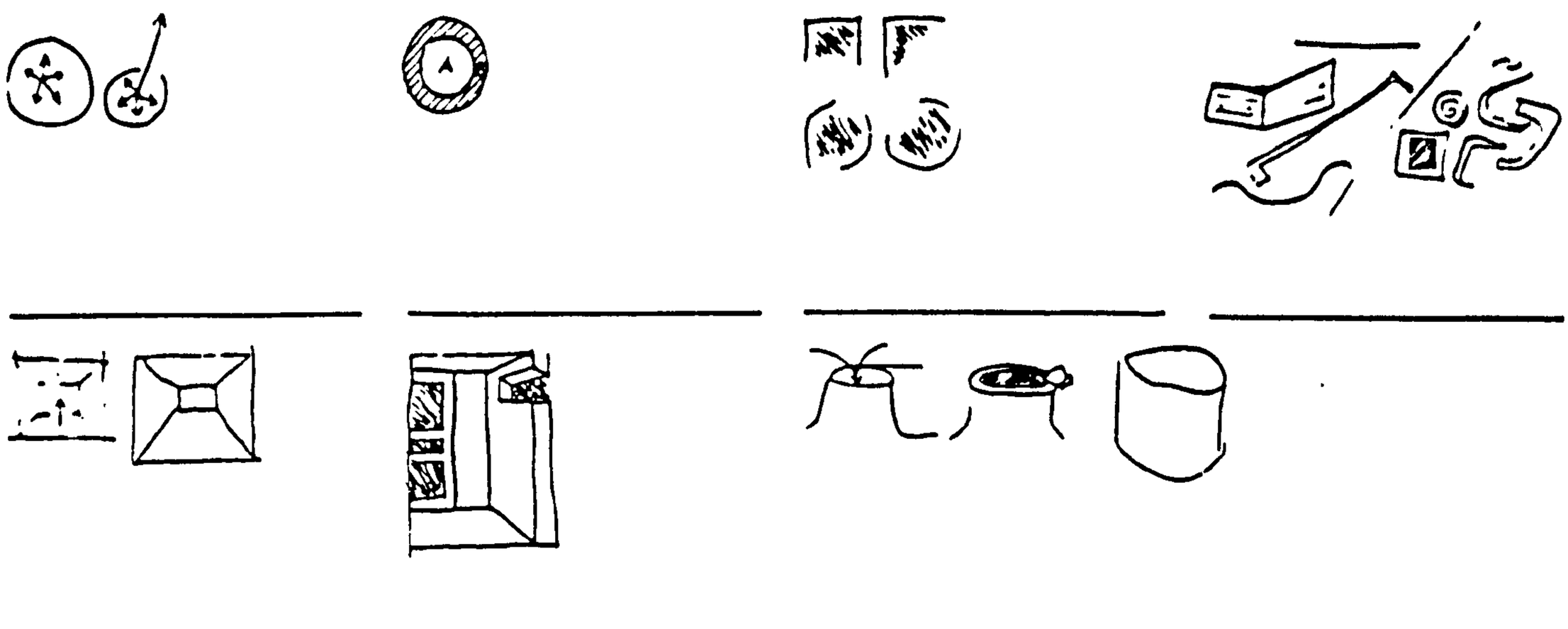

Figure 3. Drawings of each subject's interpretation of the term 'containment'. Although each subject used each term differently, there is an obvious family resemblance between these drawings

The idea behind it is that if deprived of visual information, the cognitive process of internal visualization will be used to form a picture of an unseen space and will, by so doing, demonstrate something of a subject's way of visualizing (such as his personal spatial variables). The most revealing information of all, however, comes from the subject's reaction when finally allowed to see the space. This reaction is instantaneous — a sort of 'wow' of complete revelation, a moment of enlightenment, from which I concluded that it was not only that words were not much good, but rather that serial processing (words following one another, feeling one's way round a room from detail to detail) and particularly the division into parts was totally inappropriate to how we see space.

To test this, I carried out a third experiment, in controlled viewing (1976-77). For this, another unfamiliar and unusual space was chosen. However subjects were allowed to see it, but only for rigidly controlled time periods, namely 2 s, 10 s, 1 min, 5 min, and as long as they liked (in practice normally about 15 min). They were asked to draw

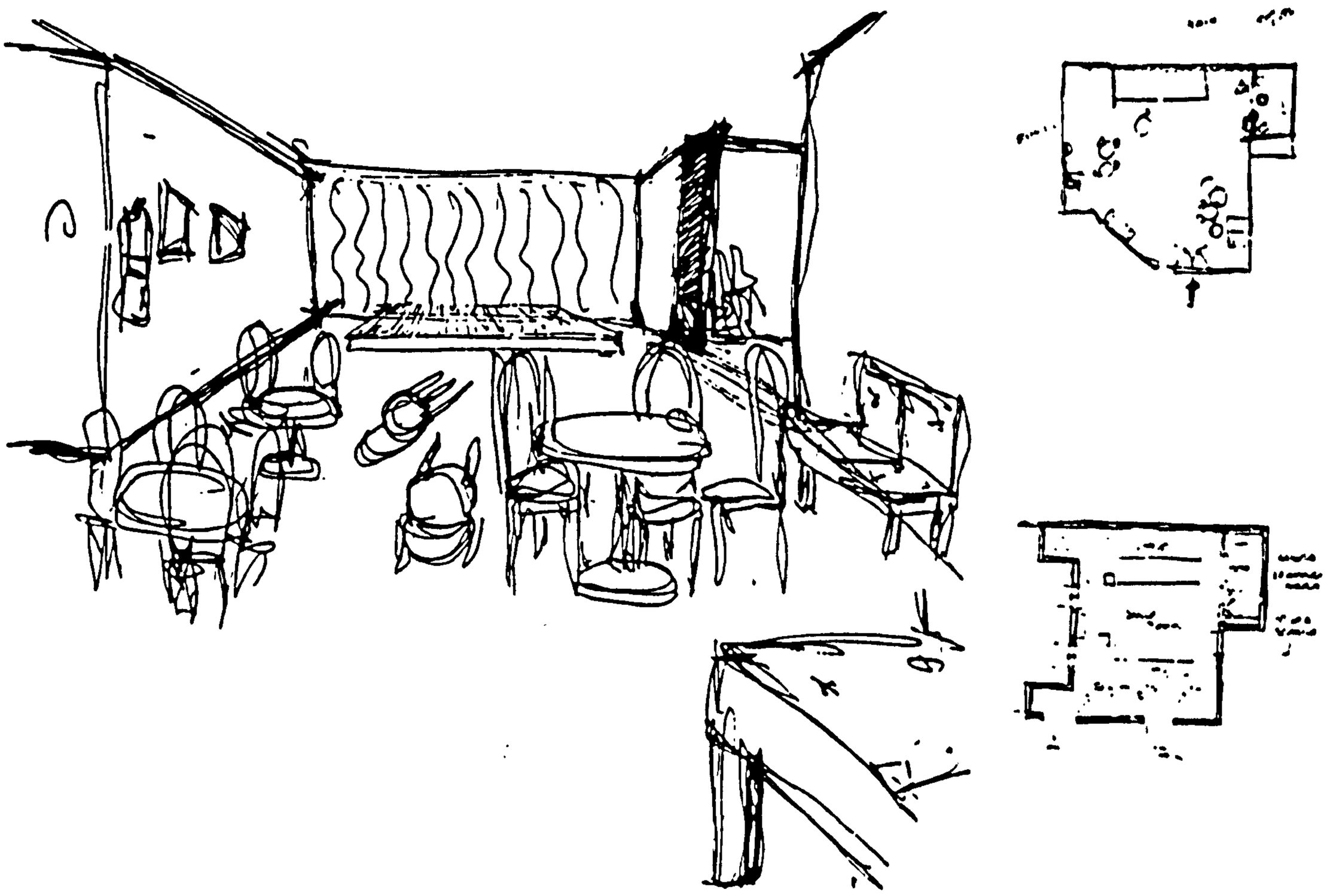

Figure 4. Two plans of the same room (with a perspective of the upper one) made from a blindfold survey by two different subjects. Note that even the basic plan geometry is different. The room was, in fact, a discotheque with a central wooden dance floor and mirrored columns

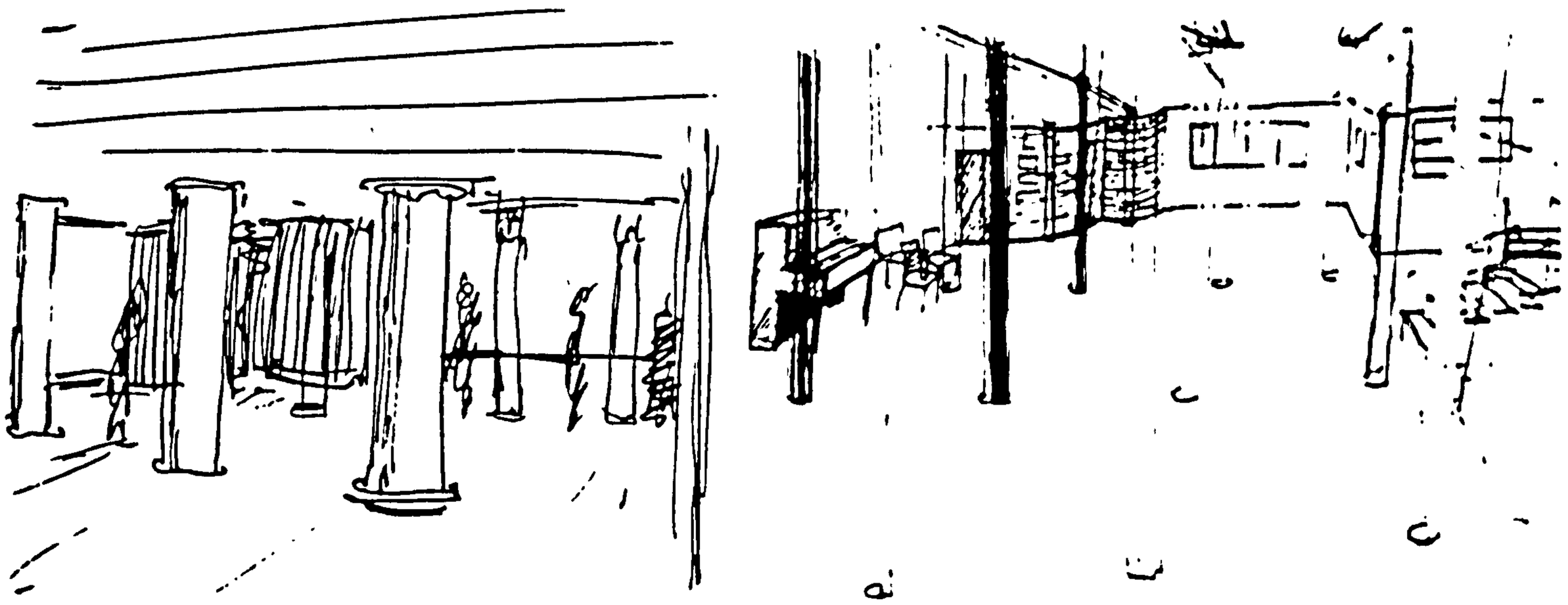

Figure 5. Two drawings of the same room (part of an old warehouse) made after controlled viewings of different times by different subjects. Note the differences in details (eg column capitals). The two subjects had very different levels of drafting skill, but it is nevertheless hard to guess how long a viewing each represents. The left drawing represents a 2s viewing (drawn by an unskilled draftsman) while the right was drawn by a good draftsman after a 15 min viewing. When shown together, in lectures, the audience tends to lump them together at a 1 min viewing

what they saw, after leaving the space and their drawings were then pinned up to form an exhibition from which each subject estimated the time of viewing that each drawing represented. Figure 5 shows two such drawings, and you may be interested to estimate how long a view each represents.

The idea in this experiment was that, if perception of space is in terms of wholes rather than parts, it should be hard to guess how long a view each drawing represents, since the whole is seen instantaneously. This turned out to be so, as can be seen from Figure 6.

WHOLES AND PARTS

The interpretation I place on these experiments is as follows: spatial perception and the representation of spatial experience is a wholistic event, in which a sense of a whole is elaborated over a history into detail. The detail may be said to constitute the parts of the whole (actually, a part is a(nother) whole in a role). They are not predefined, but are elaborated over time through the subject's perceptual interaction with the whole. This, of course, means the parts may always be elaborated into smaller subparts at a later time as the perceptual history develops and hence there are no absolute variables, but rather personal ones that change, which can be accounted for by the author's Theory of Objects[16] and by Glanville and Pask.[17] The mechanism is similar to that Piaget requires for the development of object conservation.[18] This, again, means that there is a specific style (in Pask's sense of cognitive and learning style[19]) to (visual) spatial perception; the gestaltist top-down experience as indicated in the tree of Figure 7.

The top-down nature of (visual) spatial perception has consequences in perceptual mismatch, since bottom-up perception cannot work happily, for at least two reasons. The first is the difficulty in reconstituting the exact tree from the bottom, not least of all because to do so requires that the node is predefined. Several reconsitutions are possible even in the simple tree shown in Figure 8, and even assuming that the second reason can be overcome.

The second reason cannot, however, be so easily ignored: for the bottom-up style of work there are two prerequisites. The bottom nodes must truly be at the bottom, with nothing below them, and they must be clearly and comprehensibly defined. But the fact of the elaboration of parts (and the uncertainty about when this may happen) makes it impossible to determine that they really are at the bottom (Figure 9). And, anyhow, the defining of any of these parts involves their being treated as wholes so that they may be defined at all[7] (ie their part-ness is a role they play in relation to other roles, which must be apparent from the midway nodes, at once parts of the top and wholes of the bottom!) see Figure 10.

Such an interpretation is borne out by two common experiences. Think of a whole, such as a familiar room, in

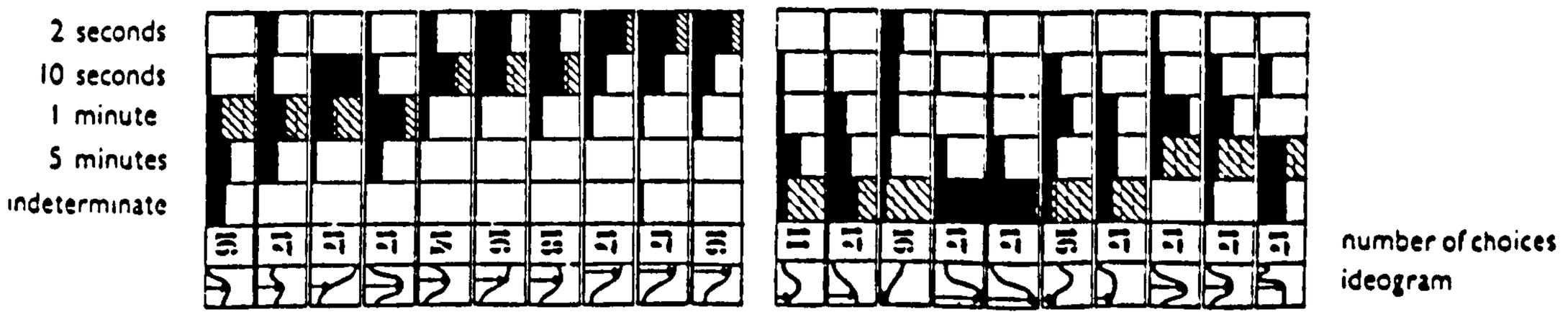

Figure 6. Viewing times guessed for each drawing, with the actual viewing time indicated by the hatching above the guesses. Even in the case of drawings representing 2 s viewings, not even half the guesses were right. The periods were 2 s, 10 s, 1 min, 5 min, and as long as the subject liked

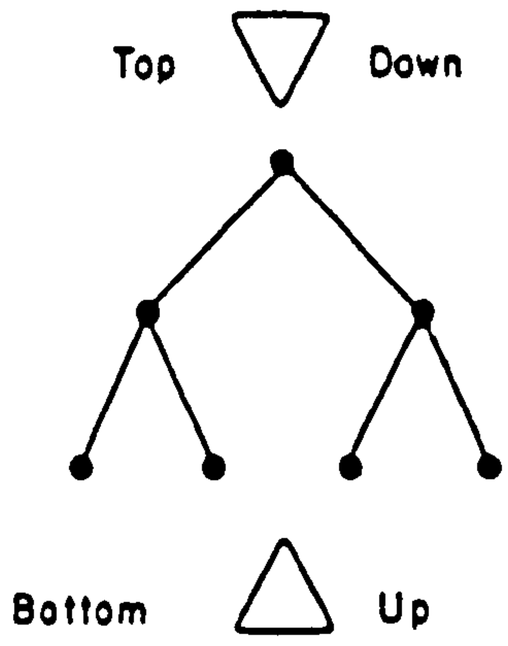

Figure 7. Tree indicating gestalist top-down experience

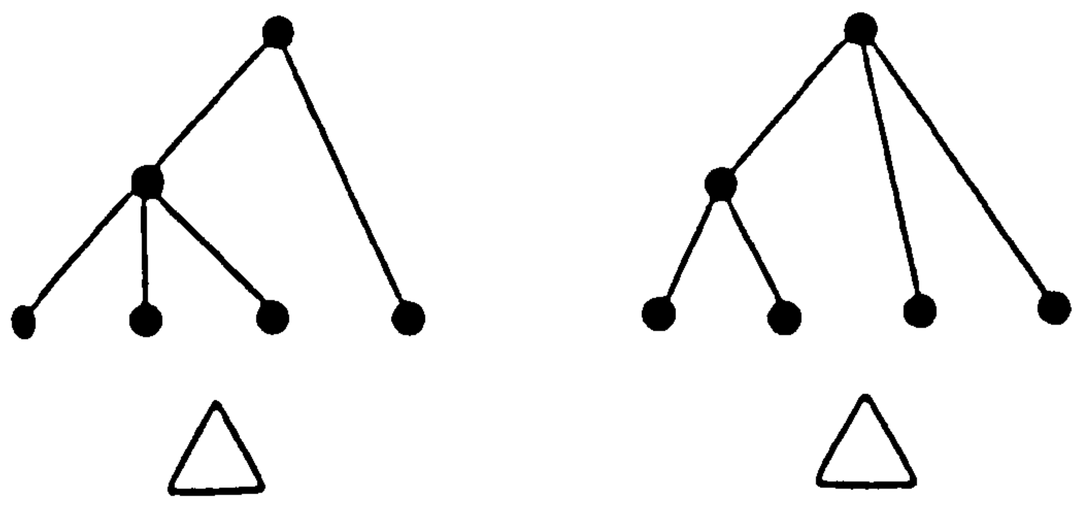

Figure 8. Reconstitutions of simple tree

which you suddenly find a crack in a wall, ie a new part elaborated. (Without consulting others you can never know if it is new or if you have only just noticed it.) It does not change the whole, of course, but there is no way that you would reconstitute the whole from that crack as being a new, fundamental, basic property of the room. That is, the crack is not treated as a variable.

Alternatively, think of how, generally, you draw or talk about a space. Try writing down a description of the room you are now in. Unless there is something particularly interesting in it, you will almost certainly outline it first and then elaborate the details. (You will not, however, describe the greater whole that the room exists in.) Experiments in descriptions of New York flats,[20] indicate that this downwardness is more-or-less universal (although how, exactly, one progresses down the tree is open). So do my observations of subjects drawing in the controlled viewing experiment, where, I maintain, subjects outline the whole and then draw in more and more detail — frequently inventing it when they cannot refer to the space itself. One of the drawings includes nonexistent capitals on the columns, see Figure 5. This is an assertion which I hope to examine in detail, particularly the strategy of each tree, later.

This interpretation throws light on the other two experiments, thus: the problem is not primarily visual/verbal, but whole/part. In both cases it was necessary that a spatial experience was acquired through parts — verbally through the accepted vocabulary in the first case and by the assembly together of sequential touch data in the second.

THE COMPUTABLE (AGAIN)

If what I have said so far holds true, something important has been learnt about the computable. Undoubtedly much of our description of the world through parts is very powerful and works elegantly and excellently. But not in all cases. At least in the case of the representation of spatial experience (which cannot be separated from spatial experience itself), we cannot define the parts beforehand (isolate the variables), and hence we cannot hope to analyse or synthetize our experience in these terms. This is to say, spatial experience is Computable but *not* computable. Spatial experience is not in terms of ready-made absolute standards, it is not serial (though it is historical), it is not variable-based and quantity is therefore irrelevant.[21]

The experience of a space is an experience of continuous learning and refinement, reflecting that side of man's nature that needs to explore experience and learn more than that which is needed to account and explain. Perhaps this is more general than we admit? It most certainly implies that the normal approach to computing and design, and to environmental psychology, is deeply anti this human experiential mode.

DESIGN — A POSTULATE

Now I will make a postulate. It seems that when we want to examine designing, we should examine how we represent things. This is because the process of (for instance) drawing is, in a sense, actually an act of design — the re-invention of the space is only different from the invention of the space in the sense that the space is assumed to have been invented already. Yet, to me-the-experiencer, my first experience of the space is my first experience, whether I am visiting a space someone else has created or making one of my own. Thus I am not very concerned with the difference between drawing from life and drawing from imagination: I take it as read that the manner of the representation of spatial experience is a good model for the understanding of the design of new spaces.

THE QUALITY OF ZEN

The postulate about design, the observations on the wholistic aspect of spatial perception and the impossibility for the experimenter of separating representation from experience, give rise to a particular problem. What is quality and how

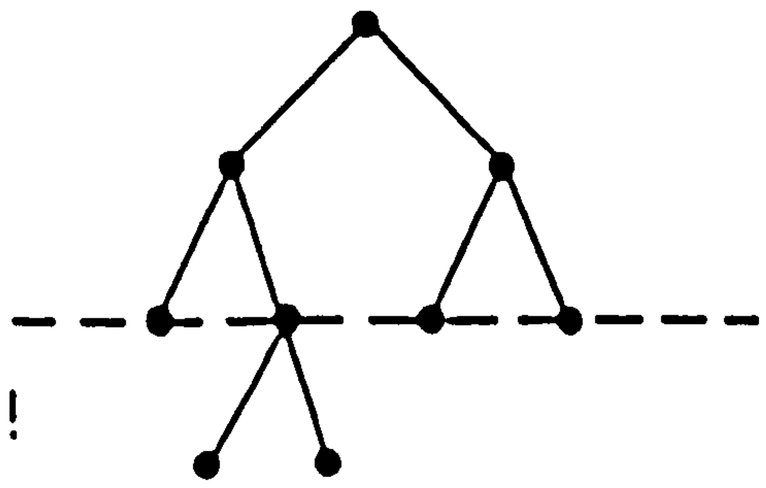

Figure 9. Bottomless tree

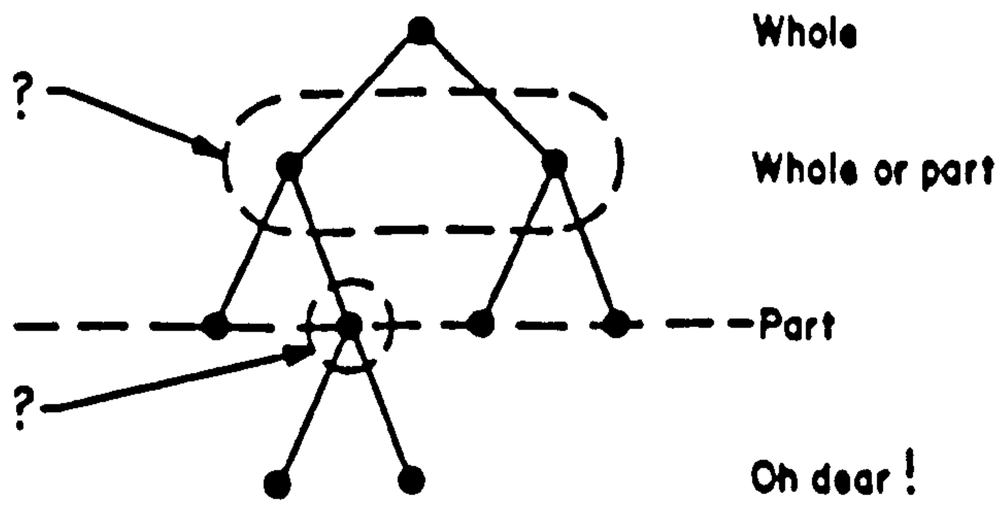

Figure 10. Tree: is it a part or a whole?

do we recognize it (without which intentional education is, of course, impossible)?

I have argued that we perceive and represent spatial experience in terms not of predetermined, variable-like parts but of a whole into which the parts are elaborated over the course of a history. This is, of course, what I believe Pirsig is talking about in his book on Zen, and is why I provide *'An apparently irrelevant beginning'*. It is even more what the Cage follow-up to Herrigel's archery story confronts. In terms of any performance criterion (ie scoring on the target) the master archer who misses the bull's-eye is a very bad archer indeed, and should never be considered a 'master'. In our earlier terms, he fails at the level of the computable because he hits the wrong place! How, then, can he be a master?

The answer, as we said, cannot lie in the method of assessment we would expect to apply, that is, in his measurable performance in a computable world. It does, in fact, lie in his masterly quality as an archer in the activity of shooting arrows from bows, not in the result. It is his relationship with the activity he undertakes — in a Computable world — that makes him a master, and it is in this necessarily undefinable but nevertheless recognizable way of acting that his masterly quality lies.

And, of course, it is this recognition that is the problem because it is not a matter of definition and cannot therefore be programmed in or instructed. But it is recognizable to the Zen master who knows when others attain it ('enlightenment'). In our culture we are so materialistic and reductionist that we forget this far too easily, even when falling in love (an activity frequently confused with sexual intercourse and quantified by orgasm counts): we recognize it when we see it, but try to define it by referring to other things and then it eludes us. Our master archer is a master not through his satisfying certain quantities of a number of variables, but because of the wholeness of what he does.

This is the moral of the Zen story, and is where its sting is for designers, because if the observations I have made, and the arguments I have woven around them are right, then design is an activity to be engaged in the same manner as Zen archery. Design cannot be taught by the prescriptive definition of procedures, it is something that runs on recognition.

The difference is like that between wandering and walking, in this sense: If you want to go somewhere specific and you know where you are and your route (by a map, previous experience or whatever), you can walk straight there, going as fast as possible and resenting the time wasted on the journey. You do not enjoy the trip, it is just a boring nuisance. But you do not always walk like this. Sometimes, in the countryside for instance, you just start wandering, going nowhere in particular and looking at whatever random things you find, until suddenly you have the feeling of arrival and your wandering makes sense. This wandering is a process akin to that in the Computable and is the best analogy I can find for design, while that rushed and bored walk is problem solving and is computable.

DESIGN

At the heart of design, then, is a peculiar activity, for it is an activity that discovers a new whole without being able to define beforehand what this whole should be, but which nevertheless is recognized by the designer as being appropriate (I do not deny that some things can and should be specified, of course. I want, however, to emphasize this different and unique aspect of the activity of design.) The distinctiveness of this activity was recently convincingly argued, in *Design Studies*, by Bruce Archer.[22] What is amazing is that we ever forgot it, and the manner in which we have ignored its importance and universality.

Consider, for instance, the training of an experimental scientist. This man is being trained to analyse the real world so that humanity can better understand and account for it. He will repeat earlier experiments, and he will be taught that he deals in facts, coldly and objectively.

However, this is really not his greatest skill! His skill is the design of new and successful experiments — sometimes by modifying existing ones and sometimes by acts of greater novelty. This he is never taught, it may never even be mentioned, and the passion and inspiration

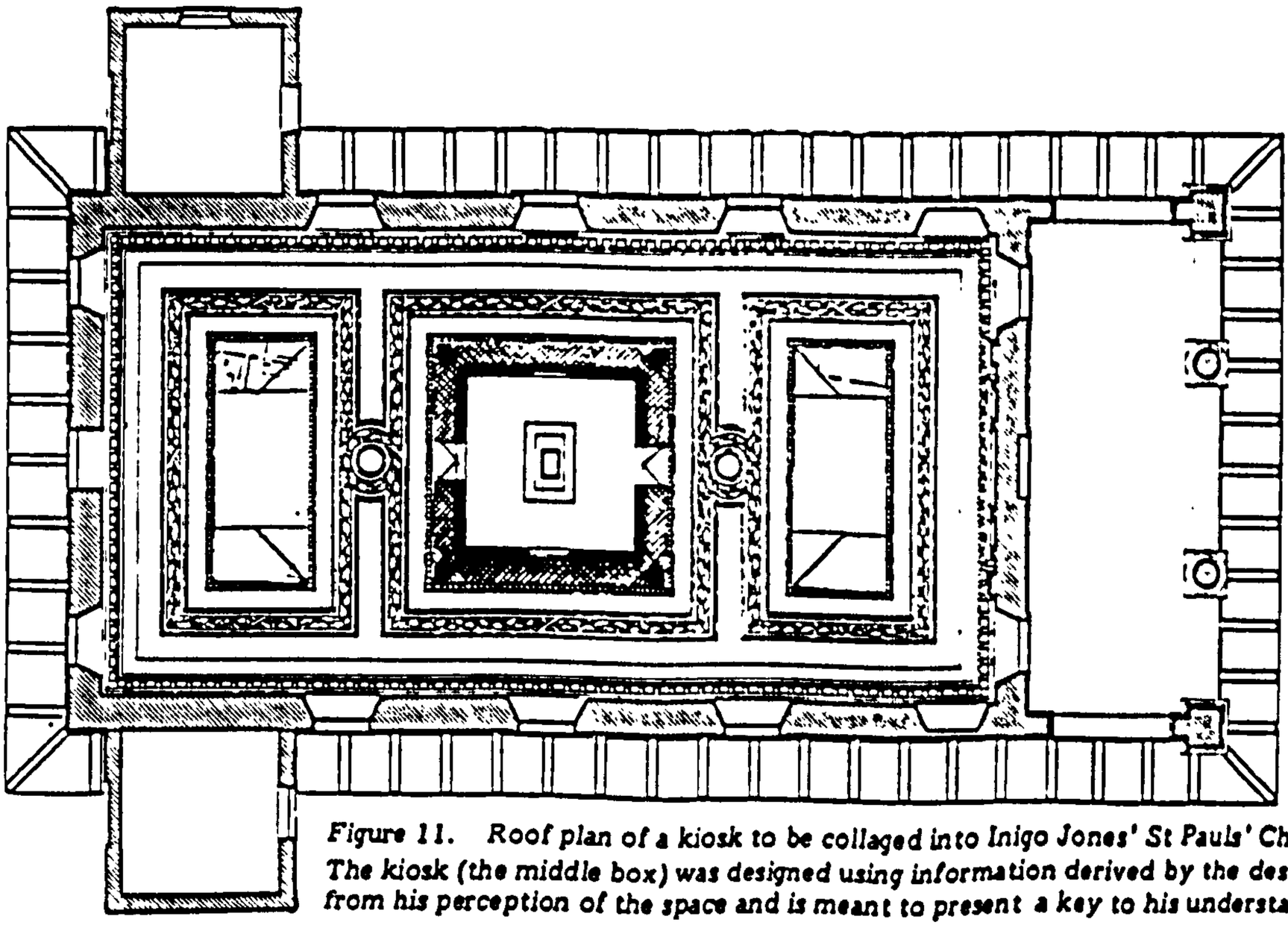

Figure 11. Roof plan of a kiosk to be collaged into Inigo Jones' St Pauls' Church, Covent Garden. The kiosk (the middle box) was designed using information derived by the designer, Patrick Beale, from his perception of the space and is meant to present a key to his understanding of the space

needed are specifically excluded from his account. He is, of course, a designer, but he doesn't admit this or the importance his design ability has for the success of his experiment and hence his contribution to understanding.

DESIGN EDUCATION AND RESEARCH

But how can you teach the unteachable, learn the unlearnable, screw the inscutable? For us, with our culture, the short koans, swordstick attacks, humiliations and privations of Zen are so foreign that we cannot grasp them, and, anyhow, what we want to learn is design, not Zen.

The existence of the Zen master, just as the continuing success of some teachers and some institutions, indicates that the Zen-like skills of design can be communicated. Nevertheless our success rate is low, and we badly need to improve our skill. But here the problem lies not only in the very small quantity of research that has been carried out on design but also its bias which has usually been towards the isolation and quantification of variables which, if my argument about spatial perception and its relevance to the process of design is right, is exactly *not* what design is. Much of this research is so richly structured in terms of its assumptions that it is probably preventing the exploration and revelation of the very thing it is trying to get at.

What is needed, then, is a more open-eyed research programme that will examine design as design, for design's sake, rather than as pseudo-sicence. I would venture that such a programme might be organized around how subjects draw from memory, and the differences between such a drawing and what is really there. I have used this technique as a reflective design tool – a way of showing a subject how he perceives space and of using these perceptions in designing a new space[23] (Figure 11). From this we may be able to find a better means of education.

THE ARCHITECTURE OF THE COMPUTABLE

What I have argued about the wholes, the distinction between the computable and the Computable, and about

An apparently irrelevant beginning

This paper is based on anqther written in 1978.[1] Amongst the comments made about its forebearer was that the beginning was irrelevant; I believe the beginning was crucial and critical, but, even more, I believe its apparent irrelevance tells us a lot about design.

At the moment I am designing this new paper. But I shall begin where I began in the other one. Why I did so will become clear later.

In his book, *Zen and the art of motorcycle maintenance*[2], Robert Pirsig continually tackles the definition of quality. To paraphrase outrageously, his point is that one does something well when one has a deep but intuitive involvement in it, not when one intellectualizes. Not that he is against the intellect, or its achievements. He is, rather, against our current pre-occupation which attempts to explain everything as being the proper operation of a collection of procedures on a set of defined variables. His objection then (and he speaks as a scientist), is to the overstretching we require from a frequently but poorly understood methodology – the Methodology of Science. He dislikes the indiscriminate use of the reductionist approach.

In a book that preceded Pirsig's by a good 20 years, Eugene Herrigel[3] writes of *'Zen in the art of archery'*. The traditional Japanese bow is apparently so powerful that a strong man can hardly tension it. Herrigel tells of the archery method in which, standing with the bow held above the head, the archer feels himself to be at one with the target, and finds that this somehow permits the bow to be tensioned and the arrow to hit the bull's eye. There was apparently a master archer who could unify himself with the target with such clarity that he would go down to the range and shoot bulls' eyes even in pitch darkness.

John Cage was travelling with a Japanese friend on a train, and recalls, in *Silence*[4] that he reported Herrigel's note about the archer's success with bulls' eyes in the darkness to this friend. Far from being surprised, the friend retorted that in Japan there was still living (at the time) a master archer who had never been known to hit the bull's eye, even in broad daylight.

I don't want to mystify, and that's probably enough of Zen for the moment. But the reason for bringing it up at all is to ask an important question for architecture, a question to which I think there are a lot of misleading answers being given.

The point with the master archer who so singularly fails to hit bulls' eyes is that, in any assessment based on performance specification and definition of aims, he must be deemed to fail, since he clearly doesn't score well. Yet he is considered to be a master archer. If that's so, his 'mastership' must come not from his performance, but from the manner of his engagement in archery. That is, it is a matter for recognition, not measurement, and this, in turn, says something about quality, in the way Pirsig does (which, no doubt, accounts for his title).

The Ultimate Question

My introduction runs intentionally against the main flow of this paper. It is placed as it is not only to provide a constant source of back reference modulated through each following section, but, also, because this paper is an analogy for the activity of design . . . it is a design, laid bare. Even the skeletons for its construction, and their modification, can be found (in the Appendices).

Now, however, I shall start from a different beginning; the ultimate question of design, the Universe and everything.

The Ultimate Question, which I will discuss mainly in terms of architecture, is:

What is computable?

That is a very ordinary question (so is 'what is 6 x 9? (Adams[5])). Its significance lies in concepts entailed by computability as we normally use the term: enumeration, definition, standard, problem statement, and so on. It involves the concepts of completeness, consistency, axiomatization, self-reference, paradox. These are fascinating areas, but here I will try to broach them only through the medium of architecture, not as a conceit, but because they are well-handled elsewhere.[6,7]

This paper is about what can be computed in architecture and 'The Architecture of the Computable'. (It was at this point that the first skeleton paper began).

design leads ot our reconsidering the manner in which we compute within certain task areas. In particular, we must not treat design as computable, because of the structural mismatch: it is, rather, Computable, with the concomitant changes that implies. It is only by making these changes that architecture and design will become Computable, for they depend on a type of process which has a different architecture. In this sense, the activity of design research becomes design, and the computability of architecture generates the Architecture of the Computable.

THE ORIGINAL INTRODUCTION — AN ALTERNATIVE OR PERHAPS A CONCLUSION

The design that is this paper is a product of an accident. Half way through writing it I received from J Christopher Jones (with whom I had never previously corresponded) a copy of the paper he wrote for *Design Studies*,[24] which I had not previously seen. It turned out that he was doing the same thing as I was trying to do: that is, he wrote a paper that not only talked about design but was, explicitly, a design itself, reflecting that process just as I intend this to do. He framed his paper with an introductory section explaining this, which I borrowed in my original, but has been changed in this version. The point is, of course, that it is extraordinary how designs happen. There was no way that I could guess beforehand that I would get a copy of that paper, itself composed with the conscious use of chance, or that it would be in any sense relevant to what I was doing. Nevertheless it happened that way, and all I did was to exploit it, to wander (as I said earlier), and to find a way that let the ideas develop and grow, until the paper and its content gelled.

(This introduction was the last piece of this paper written.)

ACKNOWLEDGEMENTS

The work described here has, in the main, been carried out at the Architectural Association School of Architecture, London. Figures 1-6 first appeared in the *Architectural Association Quarterly*, but are the author's copyright.[9]

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APPENDIX 1

(The working skeleton of this paper, with later modifications indicated by numbers (the higher the later).)

The Architecture of the Computable,

1. Zen beginning. ?What can be computed (and computation as analogue for conventionally taught)
1 perception of space, design, (learning)
perception – parts and wholes.
3. Wholes & wholes & wholes
(examples + Linde) cf Canter's use of variables.
3_3 Computability
design – postulate ∴
recognition & Zen
(Wandering, Zen ∴ quality)

1 NOTE ON MEASUREMENT & STANDARD
∴ educ. type → design is different . . . how does scientist design experiment?
Insert
∴ design studio programs Motif 8 Hole in City, analogy etc.
∴ The architecture of the computable and v.v.
1. You can start anywhere
2. Insert essay skeleton (inc. numbering) somewhere – and show it as a way of designing
2. The paper does what it talks of, is an analogy of design process, is an allegory of itself.

APPENDIX 2

(Two later skeletons, taken from conversational descriptions of what the paper is about.)

2 views of COMPUTABLE - computer scientists' and cyberneticians'.
How computer science view dominates research: the approach, the views, the possible.

How that (partial, cf cybernetics' wholistic) view is perceptually inappropriate. Used because it's easy (we have the methodology) but crushes the other view. Design thus taught that way — tho' design is not analytic but synthetic and not partial. Peculiar that scientists have to design experiments, but are not taught. Computer Science computable sometimes relevant, but always.

Analogy -- the only initially productive relation which can be used with wholes (defines parts as consequence of analogy).
Analogy of wandering & walking
Writing a paper is also designing and is an analogy for the process of design.
Computable — recognize objects (Object constancy): perception of whole and development of parts — which is one thing design does (?) and is how we perceive space though not how ordinary programs work: if there are variables/things held in common we have to find them out: they are not given. Boo to behaviourism!

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX H

"Construct Heterarchies."

From:
International Journal of Man Machine Studies, Vol 13, 1980

Note:
A slightly extended version appears in Shaw, M (ed) (1981) "Recent Advances in Personal Construct Technology", London, Academic Press

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Construct heterarchies

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This paper presents a technique for deriving individual construct heterarchies, and for comparing several such without loss of sharpness in the initial act of constructing. It explains uses—both potential and in practice. The technique is related to Kelly's Personal Construct Theory, and some of its limitations and implications for that Theory are explained.

Introduction

The views of Kelly (1955), around which this issue of this Journal is developed, involve the personal creation of bi-polar constructs on which individual perceived elements are assumed to be located and which assemble together in a heterarchy leading to a small number of base constructs which are the key to the individual personality. While I doubt the universal validity of the bi-polar construct (see also Easterby-Smith, 1980)—especially for visual perception and when used in accounting for the act of design (which is the making of a new construct, which in itself, in Kelly's terms, requires a set of personal meta-constructs that permit the generation of a new personal construct and thus, also, of course, the generation of the personal construct heterarchy), the elegance and simplicity of Kelly's vision has lead to its extensive application through simple mechanization in various program suites, (Shaw, 1978, 1980; Shaw & Thomas, 1978; Slater, 1977, 1980; Bell & Keen, 1980; Leach, 1980; Easterby-Smith, 1980; Eshragh, 1980) that are often found useful and personally rewarding (to the user). The assumed bi-polarity of a construct has even been brought into doubt by one of Kelly's followers (Rosenberg, 1977), and I find no need to insist on it. The relaxation of this requirement brings Kelly's views of heterarchial concept organization closely into line with other constructivist psychologists—especially, of course, Piaget (1972), and also Pask's work on learning and knowledge (Pask, 1972; Pask & Scott, 1972, 1973; Pask, Scott & Kallikourdis, 1973; Pask, Kallikourdis & Scott, 1975).

However, the discovery of (representations of) such personal heterarchies is not necessarily easy. Piaget achieves it by himself analysing his notes of observations made over long periods and of many subjects. Kelly does it through an iterative process of questioning, which also takes a long time. His followers use various modifications (e.g. Fransella, in Fransella & Bannister, 1977), interviews subjects and elicits constructs and their ordering herself). Computerization speeds up the iterative process as demonstrated in other contributions to this issue, but may be somewhat limited—in that it is wholly reflective—and even Pask's learning machines take a long time and suffer (though progressively less so) from their similarly machine-bound imaginations.

† The work described in this paper was carried out, in the main, at the Architectural Association School, London.

Leaving aside the whole question of the bi-polarity of personal constructs, there remain two distinct technical problems that, although they have been resolved in various forms, could well be better resolved in practice. The first of these is the rapid generation of personal construct heterarchies, within a group of constructs. The second is the comparison of individual personal heterarchies of constructs—between common representations or between common heterarchial forms, without compromising the initial sharpness of individual constructs.

I propose a technique that goes some way towards this, and will discuss some of its implications and limitations not only in Kelly's terms, but also in terms of other constructivist theories, and I will introduce some apparent by-products of the technique.

TECHNIQUE†

The technique assumes a group of constructs (not necessarily bipolar) to be already chosen, but does allow for a portmanteau construct (usually denoted A) which represents the supra-ordinate construct "an important construct that's otherwise missing from the group". These are arranged in whatever manner is chosen, although experience suggests that arranging them—anagram-wise—in a circle is a good way, and this is the way we will used here (Fig. 1).

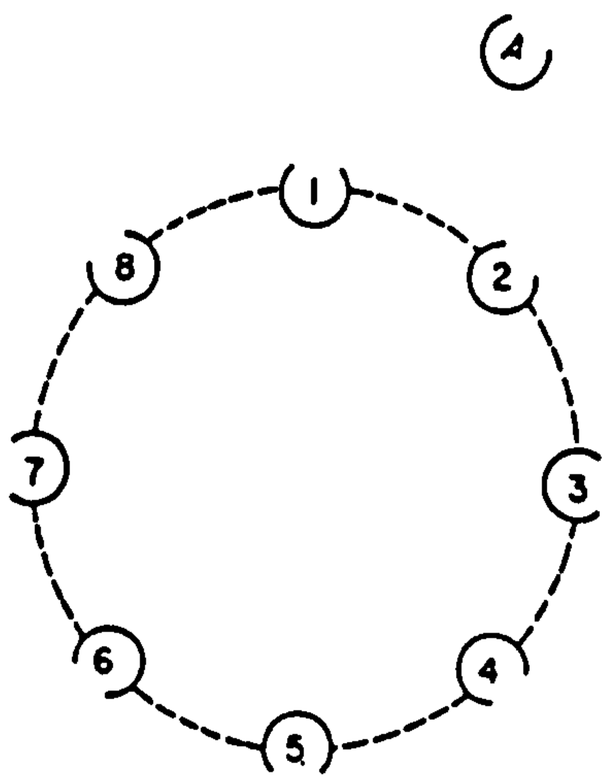


FIG. 1. A circle of eight constructs (here denoted by numbers), together with the portmanteau construct A, which is left outside the circle to highlight its role as covering something that is missing.

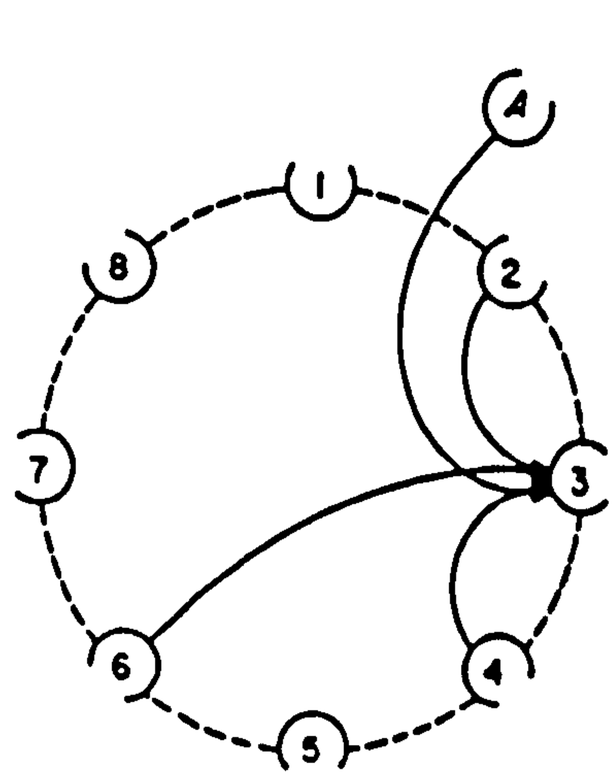


FIG.-2. A circle of constructs being filled in. The arrowhead points to the construct derived from the constructs at the bottom of the arrow stems. Note that more than one derivation may be possible, and that all derivations must be made from at least two other constructs.

Each construct in the circle (excepting, by choice, A) is then considered in turn, from the following point-of-view. It is assumed that construct generation (within the closed-system of the construct group) requires the interaction of at least two other constructs, as is a pre-requisite in Pask's (1975) productive relation between "topics-to-be-learnt", for the following, very commonsense reason: if one construct "topic", or one of the author's "Objects" (Glanville, 1975, 1978, 1980*a*) comes directly from another

† This technique has been described in a borrowed, variant form by Pask (1976). The variation is strange since Pask neglects his own rule for topic generation in not requiring at least two topics to entail another.

without the inclusion of some new information (necessarily from, in this closed-system, other constructs), it can only be the same as the single construct it is derived from (Fig. 2). Thus, a participant will consider whether each and every particular construct can be derived by some sort of (not necessarily, but possibly specified) interaction between two or more other constructs. The derivations specified are shown by an arrowhead, entering the derived construct, the shafts of which emanate from the constructs which, acting together, produce this construct. It is normal—even to be expected—that some constructs will be derivatives of other constructs, themselves derivatives of the first (double-bind), and that some will not be derivatives of any others at all.

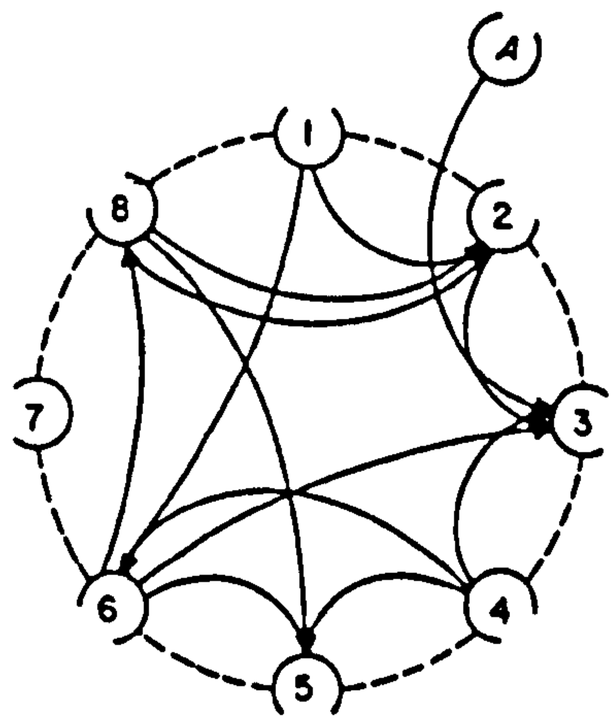


FIG. 3. A filled-in construct circle. Note that constructs A, 1 and 4 have no derivations and will be placed at the base level when the heterarchy is assembled, that there is a double-bind between 2 and 8, and that construct 7 is completely unconnected.

Having thus completed the interconnecting of the constructs in the circle, (Fig. 3), it is necessary to rearrange them to demonstrate the heterarchial structure of each participant's understanding. This is done according to the following procedure:

(i) Isolate out all constructs which have no arrowheads pointing into them, and lay them out upon a line at base level (L_0).

(ii) At the second level (L_1) place all those constructs derived only from those constructs on the base level.

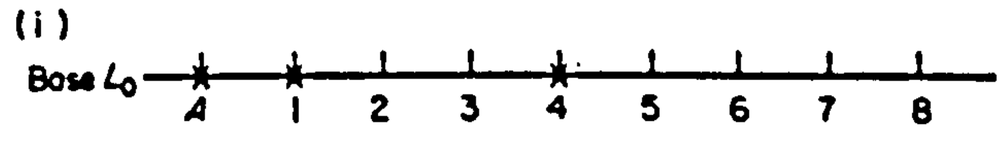
(iii) At the third level (L_2) place all those constructs derived only from those constructs on the base and second levels.

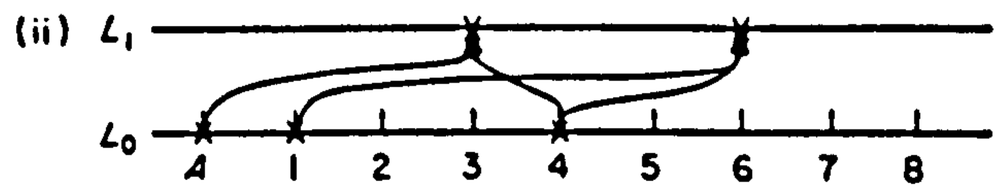
(iv) Continue until there are no more constructs to be derived and place all constructs that appear as top nodes on the same top level, since the only meaning in the levels is within their own branches of the heterarchy (Fig. 4).

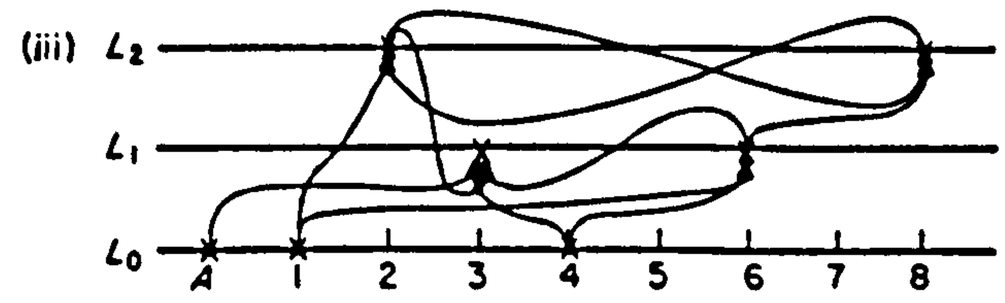
There may be four peculiarities that occur within the procedure which need special attention.

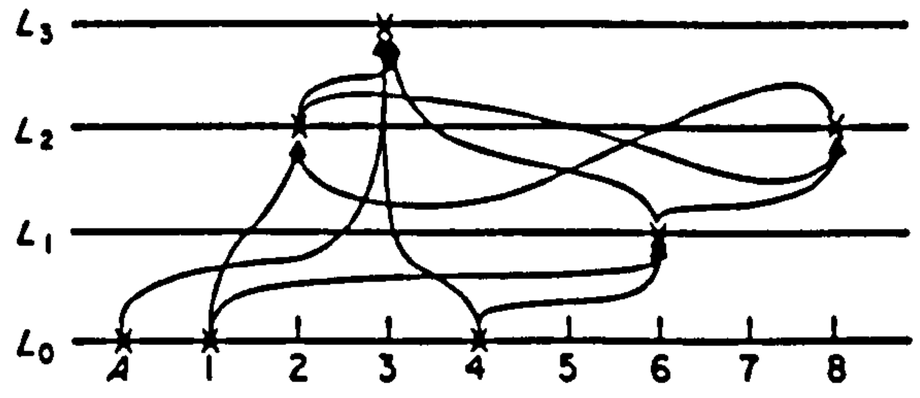
(a) Some constructs may not be connected in at all, (e.g. construct 7 in Fig. 3). These are not part of the participant's heterarchy, from which they are isolated. They may be omitted, left on the base line or tabulated separately, at will.

(b) The double-bind mentioned above may be encountered, where one as yet underived construct depends on another underived construct which in turn depends on the first. The normal way to handle this is to put all such constructs on the same level and









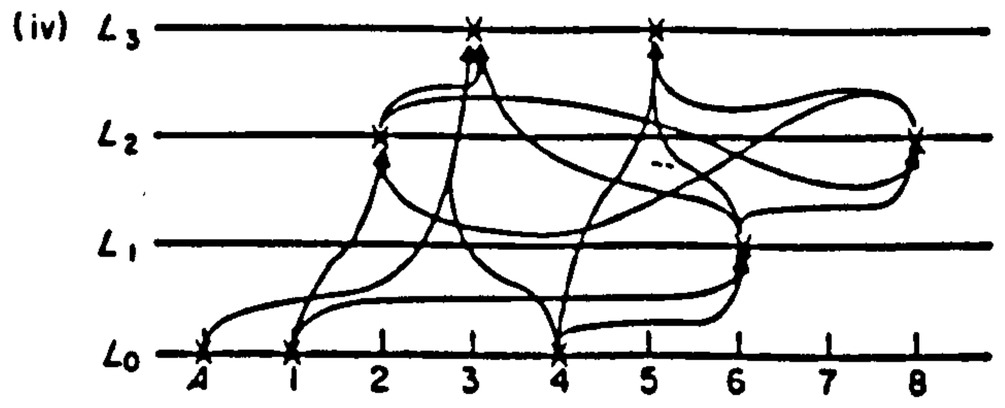


FIG. 4. The creation of the heterarchy from a construct circle, shown in four stages demonstrating the four instructions.

(i) Isolate out all constructs which have no arrowheads pointing into them, and lay them out upon a base line. (The unconnected construct, 7, is omitted.)

(ii) At the second level, place all those constructs derived only from those constructs on the base level.

(iii) At the third level, place all those constructs derived only from those constructs only on the base and second levels. Note the double-bind between 2 and 8, and the second (alternative) derivation of 3, which requires its level to change, as in the lower diagram, to the third level.

(iv) Continue with the derivation of construct 5 (which is derived from three constructs), and note that construct 3, which was raised to the third level since it had a derivation depending on constructs 2 and 6 already being derived, is also a point at the top of the heterarchy.

allow them to be used (together with already derived constructs on lower levels) to derive each other within the same level, (Fig. 5). Such an arrangement may even pertain on the base level. However, there is a justifiable argument that such a double-bind denotes a common but unelicited construct embedded within the constructs in the double-bind. Consequently, the double-bind may be broken by the insertion (on a

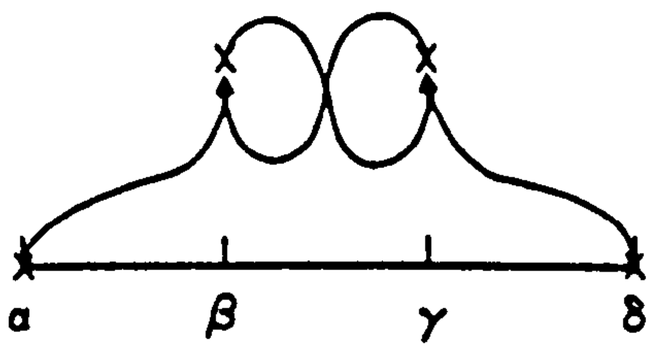


FIG. 5. The double-bind between β and γ, which is resolved by placing both on the same level.

lower level) of a new common construct, quite distinct from the supra-ordinate "spare" construct called *A*, and which may then be elicited and named, which, together with other constructs on other (lower) levels generates the two constructs that were in the double bind (Fig. 6). Note, however, that the elicitation of such a construct implies an expansion of the original circle of constructs and a possible consequent alteration of the derivative connections, which will in turn require a reformulation of the heterarchy and, possibly, further and novel double-binds.

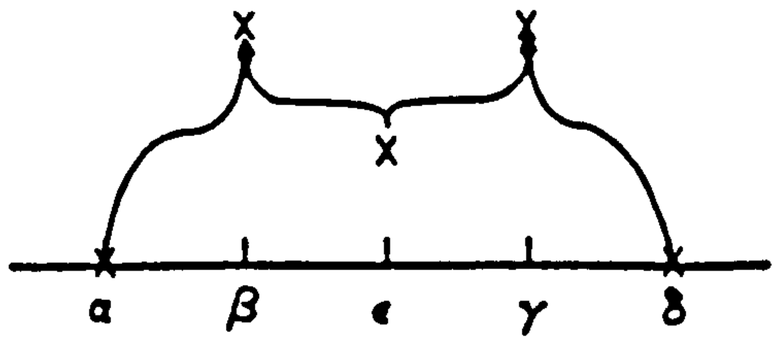


FIG. 6. The double-bind between β and γ, which is resolved by calling upon a new, common construct (ε) placed at a lower level.

(c) A construct may seem to need to appear at more than one level in the heterarchy. Should this be the case, it should always be placed at the higher level. All that has happened is that there are two or more derivations, one (confusingly) relatively simple and another depending on the prior derivation of a construct the simple derivation did not need.

(d) Under certain circumstances (only very rarely found) there are no underived constructs (i.e. ones without arrowheads entering them). In this case, the base level will consist only of double-bound constructs which are derived from but are also in their turn the derivation base of each other. This extraordinary event may be handled by the first double-bind technique. The second, requiring the assumption of sub-base-line constructs seeming a little esoteric. In the only case I have yet met, (Fig. 8(iii), where all constructs except *A* are on L_1), all constructs were bound to each other. The pathological condition that could create this sort of confusion will be mentioned later!

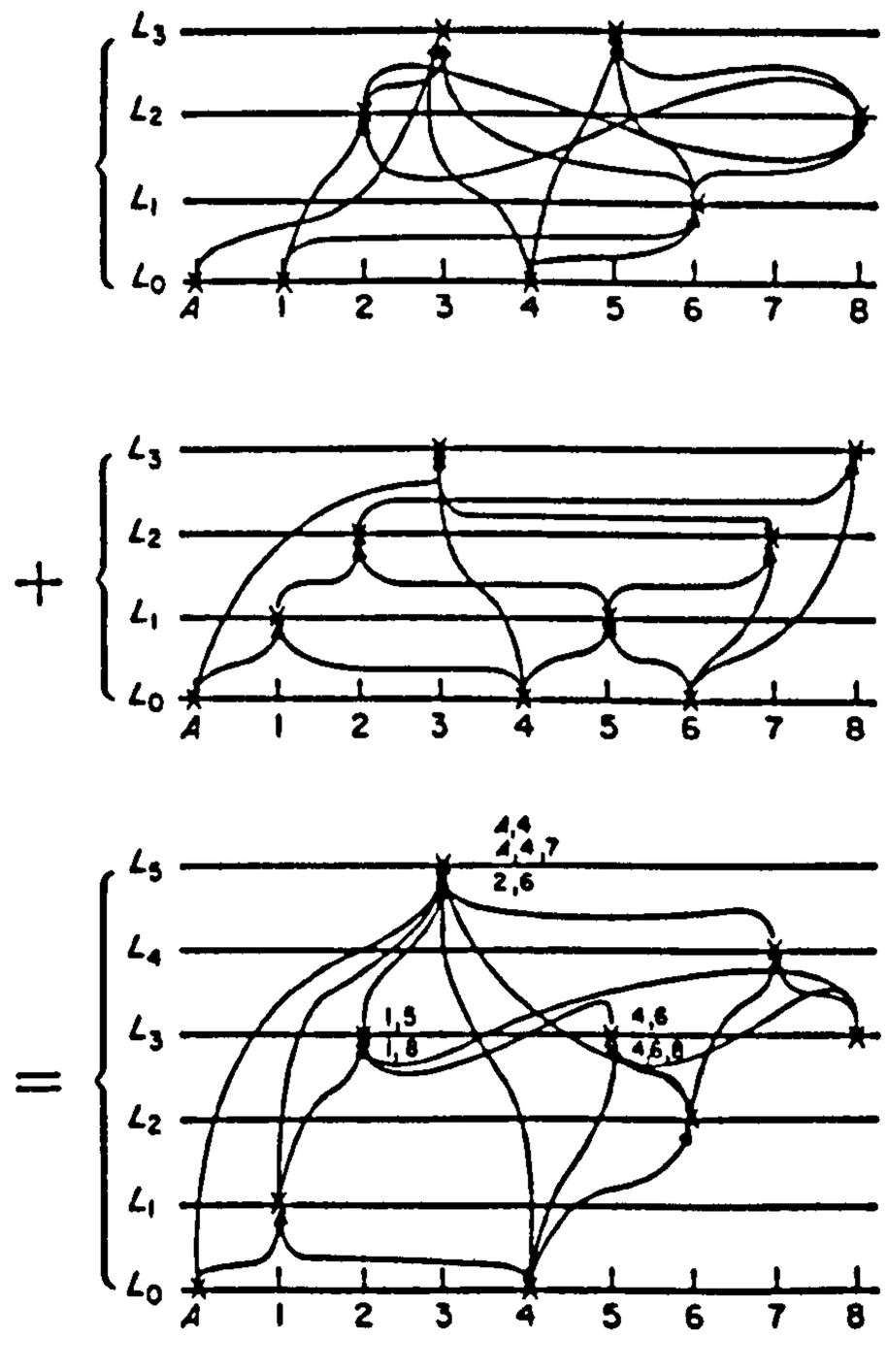


FIG. 7. Two heterarchies combined (alternative derivations are shown by the numbers of the constructs from which they are derived, rather than by separate arrowheads, which would in this case confuse the diagram). Each of the original heterarchies is a particular interpretation of the combined heterarchy, which also permits other, new heterarchies to be made. Note that the number of levels need not in all cases be the same.

Applications

There are three areas of application of this personal heterarchy generation technique.

The first is the obvious one, for which the technique was developed: the personal derivation of a personal heterarchy from a collection of elicited constructs. The technique presented here is reflexive, and distinctively sharp valued, and no more need be said about this application. The examples in Fig. 8 show various different personal derivations actually elicited from a supposedly (but actually dubiously) shared set of constructs.

The second is the social application. This may be thought of in two ways: the common form of heterarchies reflecting different constructs, and the common constructs reflecting different heterarchical forms.

Consider two heterarchies of identical form, but generated from constructs that inhabit different universes—say the universes of mechanical springs and electronic oscillators (an example beloved of Pask). Here the forms of two heterarchies match, but the names of the constructs are different. However, the workings of both are so similar that they are analogous to each other and may both be considered as alternative physical versions of the one abstract heterarchy—viz. oscillator theory. This is a special

case, for it may not always be possible to establish similarities between the constructs in different heterarchies with the same form. But it may be, and anyhow the form itself has something to tell us, as we will discover in the third application.

When the constructs are held in common, in name at least, the difference in the form of the individual heterarchies shows up different points-of-view. As such, each heterarchy shows an individual compilation of knowledge. These may be thought of on individual realizations of an Entailment Mesh (Pask, Scott & Kallikourdis, 1973; Pask, Kallikourdis & Scott, 1975; Pask, 1975), that is as Entailment Structures, and their relatedness may be computed by considering each heterarchy as a different unfoldment of a category, (e.g. Ginali & Goguen, 1977; Open University Course Team, 1976, and also Leach, 1980). Being able to look at a collection of such construct heterarchies can also help determine the underlying assumptions made by several individuals and hence of what are conventionally thought of as their semantic networks (e.g. Katz & Fodor, 1963; Winograd, 1972). This is obviously valuable when, for instance, there are irreconsilable differences, beyond negotiation, in industrial disputes, although any similar heterarchy generating technique could be used. The particular advantage of the technique presented here is that the initial sharpness is not lost, and the heterarchy generation is personal.

The comparison of construct derivations has, however, another social application when a collection of these heterarchies is used together. Consider, for a moment, how several textbooks of some common subject differ. It is not that the things-to-be-learned are particularly different (although there may be some differences in terminology and certain fringe topics may not be universally included): rather, it is their precise interconnection and logical development. We normally refer to this as "difference in perspective". There is nothing inherently right or wrong in any of these arrangements: they are potentially valid alternatives, and may, of course, be set up as such, allowing each individual learner to follow whatever bit of whichever argument he finds more appealing.

For some years Pask has used such alternative structurings of fields of knowledge, which are called "Entailment Structures" and are particularized versions of rather more general (and circular) "Entailment Meshes". The problem, however, with this technique is that a researcher has to extract the argument from several textbooks, and the learner cannot modify this arrangment. The technique given here allows a far simpler way of sharing the alternative arguments—that is, of course, of showing alternative construct generation and derivation heterarchies. That such alternatives are useful, Pask has shown. Imagine, for instance, trying to compose a manual on how an internal combustion engine works: the complexity of construct connectivity is considerable and to trim this to fit one overview is thoroughly risky because the particular way one person does it may be virtually incomprehensible for another, (Fig. 7).

The third application is rather more arbitrary. It appears to be the case, but the only reason I can give for it being so is purely speculative.

If personal heterarchies are examined, they appear to demonstrate characteristics of each person's learning ability. Take, for instance, the examples shown. To me, as the teacher of the students who produced them, they reflect precisely the problems I noticed each suffering in trying to execute an architectural project, as shown in the captions to Fig. 8. Such a judgement is, of course, quite subjective but I am not certain how that limitation can be overcome—or even whether it should be.

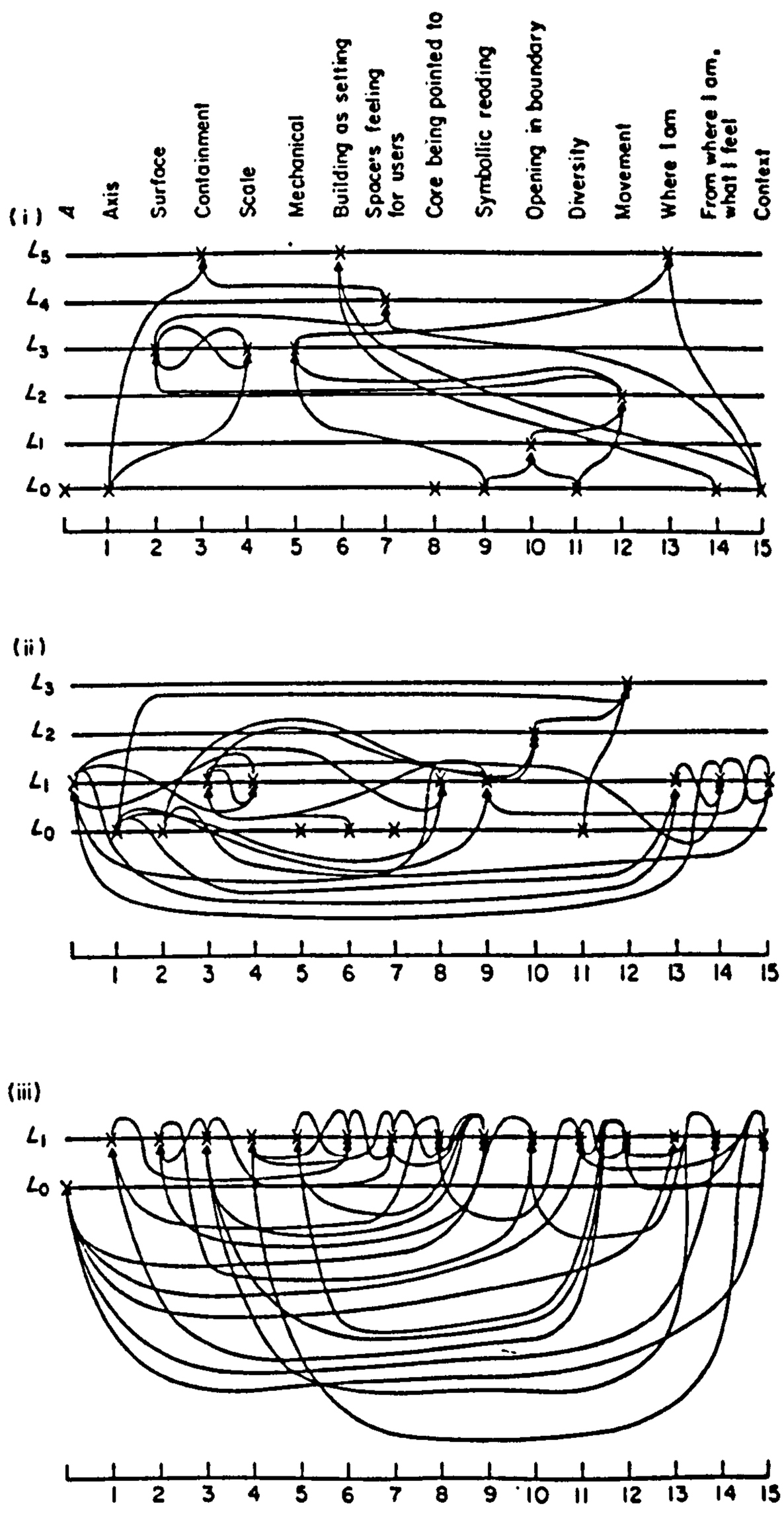


FIG. 8. Three heterarchies of a common subject matter generated by architecture students. Note the considerable difference in form, and the manner in which the reflect learning abilities.

(i) This student's learning was characterized by being relatively straightforward, but had the weakness of trying to please too many people at once.

(ii) This student started well, but, at a point in the middle of a project would get confused and overcomplicate things. If this stage was passed, there was a happy outcome and a good project.

(iii) This student could never get beyond the stage of having an idea and going away to consider it, as a result of which many objections were found, and some other idea would be grasped at. The student did not complete the course.

My explanation of why these heterarchies might reflect learning ability is that, where there are many constructs double-bound, there is a problem of having too much to handle at once (along the lines of Miller's (1956) argument on short-term memory and informative processing), or alternatively, of having to invent sub-constructs which split the double-bind; and that, where there are too many top points in the heterarchy the student is involved in a too-distributed set of goals which is, again, informationally unmanageable. Of course, the extra ordinary student for whom everything is interconnected (Fig. 8(iii)) has a problem very akin to the (as yet fictitious) one for whom none are connected—where do you begin and what connection do you follow—a terrifying problem when looked at in this manner.

Practice

So far, in practice, this technique has been used on four different occasions.

The first occasion, for which the technique was invented, was the analysis of a study syllabus for an architecture course in which the experimenter selected important terms from an international manifesto prepared by the teaching staff, and invited both students and staff to demonstrate their heterarchies. In fact, this was found to be very difficult, because the anagram circle technique had not been incorporated, and the need for construct generation by construct interaction was found to be hard to understand and even harder to remember in use. Furthermore, it was found that selection by each individual from the experimenter's initial selection of the terms that were significant to each of them meant that not only were the heterarchies difficult to extract, they were also consituted of such different terms that about the only thing which could be said of them was that each participant had a unique and distinct interest.

For the second occasion, the names of the constructs were much more rigorously determined by the group (Glanville, Jackson & Pedretti, 1979). Furthermore, the anagram technique had become incorporated. As a consequence, it was much easier to derive and compare the heterarchies. It was on this occasion that the reflection of learning became apparent, and this paper has been illustrated mainly with examples taken from this use.

The third occasion was Pask's use where, from several heterarchies, he does indeed build up entailment meshes, and persuades participants to debate the relevant validity and generalizability of their various heterarchies.

Finally, the technique has been used to generate a symposium syllabus by using the heterarchies that various participants at an earlier symposium (on self-reference) made of a collection of already debated named constructs.

On all occasions except, perhaps, the first, the technique has been found useful and rewarding.

Conclusion

This paper has presented a technique for deriving individual construct heterarchies, and for comparing several such without loss of sharpness in the initial act of construing, and has explained uses—both potential and in practice. The technique has been related to Kelly's Personal Construct Theory, and some of its limitations and implications for that Theory explained.

Kathryn Findlay first required the invention of this technique. Heinz von Foerster suggested the anagram form.

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Appendix

NOTE ON THE DISAMBIGUATION OF SOME POTENTIAL GRAPHIC AMBIGUITIES

It has been pointed out to me by Gordon Pask, since this paper was first published in the International Journal of Man-Machine Studies (Vol. 13, 1980) that there is an ambiguity in some of the figures—specifically Figs. 2, 3, 4, 7 & 8.

This ambiguity comes about after the event. That is to say, the ambiguity is not in the figure (or the procedure for its production) as it is made, but it becomes apparent when the figure is looked at as a finished object, from an external point of view. This ambiguity is graphical in origin, and may be simply overcome. If you look at Fig. 2, you will notice the arrows entering the construct labelled 3 have become ambiguous. It is simply hard to know from which other constructs 3 derives, and how many different derivations there are. This graphical problem is almost bound to occur. Another difficulty may be in sorting out which arrow shafts are which. But, equally, the act of filling out the form is not ambiguous, and is a procedure that is both enjoyable and relatively hard to cheat, for the method of transforming from the circle into the heterarchy is by no means obvious or simple. Thus, it is worth keeping the form, but also recording some further information when the form is being filled in, to remove the ambiguity, viz. the numbers of the constructs that produce whichever construct you are interested in. So that, by construct 3 in Fig. 2 should be recorded A, 4 and 2, 6. (If the means of combination/interaction of the constructs is being considered, that may also be recorded, viz. $A \wedge 4$, $6 \rightarrow 2$.)

This sort of ambiguity also pertains in a similar manner in the heterarchical figures e.g. Fig. 4iv (the heterarchy of the circle filled-in in Fig. 3, which is the completed version of Fig. 2) is ambiguous in its cold state as a graphic object, and even I, the heterarchy's creator, had difficulty in sorting out the derivations of the same construct 3. The full scale of this potential ambiguity may be seen in Fig. 7, particularly Figs. 7ii and 7iii. The solution to this problem is of course anticipated in Fig. 7, where in adding two separate heterarchies the result had to be shown without graphic representation of the separate derivations which are notated by writing them by each construct. Thus construct 7 has the three derivations A, 4 and A, 4, 7 and 2, 6.

This slight addition to the notational task should remove the ambiguities.

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX I

"The One Armed Bandit."

From:
Powell, J, Cooper, I and Lera, S (eds.) (1984) "Designing for Building Utilisation", London, Spon

Designing for Building Utilisation

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THE ONE ARMED BANDIT

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ABSTRACT

This paper explores the consequences, both in terms of human thought and combinatorics, of quantification used in so many fields nowadays, including Building Utilisation Studies, and argues in terms of complexity and design thinking, that a radical change is needed in the quantitative way we describe the environment.

The One Armed Bandit works on the principle that you insert discrete units of money and get less out. You may get a short-term gain. But, in the end, you will lose. It repays, normally, 75% of the money inserted.

Some people claim they win. And they may. I am not aware of any study having been carried out on this. However, from the point of view of the (thinnish) analogy I wish to pursue, this is not important. What is important is that *we* lose. There are individual short-term gains, but we, collectively, lose. It's a mug's game.

Although we may gain in less obvious and measurable ways.

I have no objection to measured studies of building performance, per se. But I do have a problem. The problem is that I teach design, and assessment of a building doesn't tell me much about what to do in designing. It tells me (for instance) that a building will (or does) not work (or, if I am lucky, work(s)), but it tells me little of significance about how I should do anything about it.

Of course, with experience, I can make hunches with a better than average likelihood of improving things. But this is all rather hit-&-miss when compared to the apparent precision of the assessment.

It is not that I don't have a token explanation of this phenomenon. This explanation lies in the traditional contrast of analysis and synthesis (deduction and induction, serial and holist thinking, right and left brain functioning). But having this explanation, while excusing me, does not help me do anything about it. And I am not sure there is not a better or more relevant duality.

So I should like to try to open up another possible way of looking at this problem, in case this produces a question that may help me act. But I doubt that I can answer this question, yet.

We are obsessed by quantification and measurement, and not without reason. Indeed, the OU has several courses specially on the subject, so important does it appear to be. Measurement has led to a simple form of assessment of design ability, and to tremendous results in terms of Western technological development. And it is easy to measure, for instance, a sound level, or a length. It is, however, hard to comprehend the experience of a specific decibel level - to understand. I am sure many of us will remember the difficulties we had in the Cubs and

Brownies, estimating length. And the figure, while it may tell me some of what I should do, still does not tell me how to do it.

Traditionally, measurement and complexity are closely related. Whenever we have simple repetitive units, we may end up with rather a lot of them. When we have a lot of things to handle at once, we say we are confronted by a complex situation. It is harder to add 2222 to some number than to add 2. Complexity, thus, becomes a concern.

George Miller (1) has demonstrated that humans appear to be able to handle about seven lumps of information at once, to keep them "in mind". It is, of course, relatively easy to invoke situations in which we have more than seven things to cope with at once. Life is such a situation, or think of the complexity of walking, for instance. (2)

Yet, we can live (walk).

However, the creation of more than seven things to be handled at once is a simple result of the sort of factorising that our use of quantification produces. We package up our descriptions into multiples of many small units - which we like to call variables. This makes them apparently easy to handle, but also leads to the complexity problem. In turn, we attempt to get over this complexity: by increasing our ability to cope with it (using computers, which can be very effective number handlers) and by finding shorter (simpler) ways of describing things.

A lot of work has been done on both approaches, with remarkable results. Computers have become faster, bigger. Yet Lehmann(3) demonstrates that they can never be taken to be reliable.

And specifying simpler ways of describing and operating on our world is also dubious. Simplicity is as I have shown (4) related to notions of the unprovable just as randomness is. There is no certain measure of the simplest, as there is no absolute proof of the random. Hence, simpler is a relatively meaningless term.

Thus, our techniques for handling complexity are basically unsound.

Yet humankind has for years dealt with, more-or-less successfully, what we now understand to be an amazingly complex environment.

Which might prompt us to ask a question, having got ourselves to our present position, as to whether our current understanding of complexity and measurement is more related to the pragmatics of the descriptions we use than to the way in which we human beings actually think?

Herbert Simon (5) has approached to the edge of this question. He gives an example of missionaries, being pursued by cannibals, reaching their boat. It is (quantified as) an 8 seater (for instance). But there are 9 missionaries. Are they defeated by this? No! They find a way to fit the extra person in: they redefine the boat. I think of this as designing.

The same concern has recently been applied in logics. If you have a 4-seater car, the number of travellers in that car is limited to between 0 (empty and 4 (full). However, we have all, perhaps, fitted 5 people into a 4-seater car (6). It *is* possible, but it is *not* probable. Quantification can thus lead to severe limitations in our conception. To paraphrase Ludwig Wittgenstein, (7) just because something has always happened (*and how do we know that?*) does not mean it always will.

Simon, however, gave us another insight (8). In chessboard reconstruction experiments, he showed that master players could more accurately reconstruct more complex board arrangements

from a short examination than could beginners. This should not be suppri-sing, but it needs some accounting for.

Simon's account was that masters under-stood patterns of relations between pieces, while beginners didn't: so masters could think of several pieces related,as one conceptual unit, while beginners think of the individual pieces by themselves. He called these units of perceptive thought "Chunks". Masters have richer (bigger/fuller/ more complex)chunks than beginners, but the number we all have is roughly the same.

Here we begin, in another way, to think about complexity. Some people's chunks are "larger" than others, and since we can each, apparently, handle the same number of chunks, it follows that as skill increases, the complexity of what we can handle will also increase. This is a straightforward, quantitative argument.

But it is profoundly limited. No matter how skilful we become, the complexity we can handle will be trivial in comparison to the complexity measured, in this manner, of the universe. Even in the-oretical extremis, as in Bremmerman's limit to computability (9), the uni-verse quickly takes over, through combinatorial explosion: A computer of the mass and life of the earth, working at the speed of light could not yet have chosen with absolute cer-tainty the best combination of 5 building materials.

And humans do not think like computers. We, for instance, discard information. If we did not, we would be completely unable to act. And, if we are a little open-minded, and consider chunks and complexity, we may see another possible difference.

There appear to be two possible notions of complexity. Complexity of the trad-itional kind already introduced (which I shall call α-complexity), which is based on the factorising and adding of fixed variables, and another kind, β-complexity, of which chunks are an example, and which I shall now elaborate.

Chunks appear to have α-complexity, and indeed can be measured in this way. In this manner, we can soon define problems that are too complex for humans. But chunks are also "packages" of information, and such packages are things in their own right. The same package may contain more or less things but it is still the same package, and you don't know what it contains unless it was you who put the bits in or it is you who unpacks it. (Compare the example of walking).

This is β-complexity. β-complexity is scaleless. Whereas measures in α-complexity make use of a pre-defined standard, β-complexity re-defines itself.

Two examples may help elucidate this difference. Firstly, consider how to multiply large numbers. A computer will do it exactly (within its range) and fast. If we do it exactly, we are slow (with a few remarkable individual exceptions). But often we use another technique: we round numbers in order to get an answer in terms of orders magnitude (which lets us check the com-puter calculation). We modify our numbers so we can operate quickly. For instance

954 x 731 x 43 = ?

On the computer (i.e. in longhand) - α-complexity:

```
      954
   x 731
  ------
      954
     2862
    6678
  ------
  = 697374
     x43
  ------
    2092122
   2789496
  ------
  = 29987082
```

For order of magnitude - β-complexity:

954 ≈ 1000 $= 10^3$

731 ≈ 750 ($\frac{3}{4}$ of 1000) $= \frac{3}{4} \times 10^3$

43 ≈ 50 ($\frac{1}{2}$ of 100) $= \frac{1}{2} \times 10^2$

add exponents $10^{3+3+2} = 10^8$

multiply $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$

result, a bit less than $\frac{3}{8} \times 10^8$

$= 3.75 \times 10^7$

$\simeq 3 \times 10^7$ or 30,000,000

Notice that the second method can be done fast in the head, while the first can't.

I timed myself doing the sums. The first method, on a calculator, took 10 sec. Doing it by hand took 95 sec. But doing the second, in my head, took only 15 sec. I consider the calculator to be, in this case, a reasonable equivalent to a computer. Clearly the 10 seconds includes my inept button pressing. I suppose the full calculation would have taken about 1 m sec on a micro. But the computer would have to be programmed (which takes time), and a program for the second method is not that simple.

I also timed the participants at the conference. On calculators their average time was 12.0 sec. By hand, they took 90.5 sec, Using the second method required 16.5 sec. See the Appendix.

Secondly, consider a room you know well. You know and recognise the room, but you could probably not list everything in it, though you might notice when something was moved. Nevertheless, it remains the same room (even when re-decorated), and even when a new crack is spotted (is it new of just newly perceived?). (10)

So we see re-definition at work in both β-complexity examples. The use of β-complexity, includes, in part such ideas as lateral thinking, but is more powerful and less arbitrary than that. I can think of the whole of London but I can also think of my front door key-hole there!

β-complexity is constant, while α-complexity may either increase or decrease. But just as we think in chunks - and a more or less fixed number of them (Miller's seven)- we need to think about problems in a way that reflects this. And, at the moment, we hardly bother with such a way, obsessed as we are by quantification. Even in talk about β-complexity we tend to refer back, eternally, to α- complexity.

Yet β-complexity seems more human, more closely related to thinking, and to design. The constant re-definition of the packages of β-complexity is very similar to the act of design, in which activity we are constantly adding in and subtracting ideas and focussing on different aspects. Ideas are incorporated and discarded within a whole. Levels are set up by us where they can be fitted in above or below the one one is working on, as necessary.

This is in sharp counterdistinction to α-complexity, with its (pseudo) absolute units and relationships (after all, someone defined them), where the combinational explosion rapidly makes for α-complexity far beyond human capabilities. In β-complexity, re-definition of the packages leads to a constant complexity, in which, however, we may unwrap or enfold ever more α-complexity. It is very much a gestalt (wholes/parts), and the problem is the same: our methods are all to do with an α-complexity approach.

This is the problem that I referred to, and to which I don't have any answer. But it seems to me to be central. We need to know how we think, and to describe that process in a manner that is sympathetic to it, rather than contra-

dicting it, and which is supportive of design. We need to examine how we think to produce that knowledge, but not by using techniques that, themselves, make certain sorts of thinking necessary, or which lead to particular interpretations as we do so often now, and as the Research Councils demand we do.

The problem is: how do you study β-complexity not in terms of, nor forcing it to revert to α-complexity? And what is the relationship between α- and β-complexity?

Working with Mike Robinson, I hope to explore this. (11)

But where does this leave us, in building assessment?

I have asserted that the β-complexity process is similar to the design process. Indeed, I would argue that the poverty of our classical understandings of design can probably be attributed to our insistence on using α-complexity as a way of approaching the study.

But Building Utilisation Studies are carried out using α-complexity approaches, with the familiar problem of the vast complexity of information produced and the difficulty of using such information in designing.

If the purpose of Building Utilisation Studies is to assist in the improvement of buildings, it has a question to resolve: is it possible to use this information to make a good building through α-complexity approach and presentation? Although that may not be what Building Utilisation Studies are about.

If α-complexity is not thought to be a useful way of describing for design, however, the information needs to be either re-jigged, if that is possible or re-made, in terms of β-complexity.

I believe, for a number of psychological and numerical reasons, the answer lies in re-jigging for a β-complexity approach. This means a change in approach and method needs to be explored, just as do the true natures of, and contrasts and relations between α-complexity and β-complexity.

A number of people working in Building Utilisation Studies and assessment have already started. I have tried only to explain the change that is needed, and why that is so. For me, the α-complexity approach is like a one armed bandit. It packages everything up, and while it may occasionally produce a jackpot, the partition into units and numbers leads, in the long run, to impoverishment. It is the "problem" of pure science (2), but, even more, it is the problem of the pseudo-sciences that forgot their purpose and are obsessed by quantification as justification and legitimation: that pseudo-science is, indeed, a one-armed bandit, and like the punters, in assessment and Building Utilisation, we are hooked, always hoping for the big one.

APPENDIX

QUESTIONAIRE DISTRIBUTED AT CONFERENCE

Name ..... Occupation.....

Please carry out the following calculations, in the order given, and time yourself doing them. Any written work should be carried out on this sheet.

a) 954 x 731 x 43 (approx/order of magnitude)

Secs: (Ta)

b) 954 x 731 x 43 (exact, not on a calculator)

Secs: (Tb)

c) 954 x731 x 43 (calculator)

Secs: (Tc)

---

d) Do your answers to (b) and (c) agree? yes/no

If no, which do you believe? (b)/(c)

e) How accurate is your answer to {(a) in comparison to (b) % {from (Ta)/(Tb)} (c) % {from (Ta)/(Tc)}}

Summary of Data (including author's)

Subject	Ta	Tb	Tc	error $\frac{Ta}{Tb}$	error $\frac{Ta}{Tc}$	b/c agreement
1	52	110	10	in sig	in sig	N
2	5	120	no ans	9 % *	9 %	Y
3	10	90	15	9 % *	9 % *	Y
4	15	120	30	in sig	6 %	N
5	15	90	13	6 %	6 %	N
6	20	70	5	11 %	11 %	Y
7	15	60	5	7 %	7 %	N
8	10	60	10	(information too confusing)+		N
9	8	90	10	18 %	17 %	N
10	15	95	10	in sig	in sig	Y
Mean	16.5	90.5	12.0	7.2 %	6.5 %	
SD	11.4	19.8	4.0			

Notes

27 forms were issued and 10 returned
"insignificant" errors are taken as less than 1%, and are counted as 0 in calculating the mean.
* Extra 0 added in to calculation by accident, disregarded in these calculations
+ Alternative answers given to calculation Ta
All who did not get an agreement between the answers in calculations b) and c) believed their calculators rather than their own calculations. In all cases they were "correct" in their belief. What dominance, the machine!

NOTES

(1) Miller's paper "The Magical Number Seven, plus or minus Two" (Psychological Review, 63 no 2, 1956, also found in Psychology and Communication, Penguin, Harmondsworth, 1967) starts off "For some time now, I have been bugged by a number". He uses a wide range of examples to show how humans tend to associate things in sevens (or, rather, in a range of from five to nine). What is important is not the value of this number, but rather that there is such a number.

(2) Some years ago, I analysed the act of walking into a series - and I agree this analysis is somewhat arbitrary - of physical actions to be completed in taking a step (Glanville "The Concept of an Object and the Object of a Concept" (1978), presented at 4 EMCSR, Linz). My description went:

TO WALK

1. Stand upright with the weight on both feet
2. Lean forward, to lose your balance
3. Raise one foot off the ground
4. Place raised foot on the ground in front of you, to regain balance
5. Push with back foot
6. Lift back foot off ground
7. Do you want to stop? If so go to 11, if not continue
8. Move back foot past line of body
9. Place (former) back foot on the ground in front of you
10. Go to 5
11. Move back foot into line of body
12. Place (former) back foot on the ground below you and in line with the other foot.

My argument, from this, was that, what with keeping balance, unlevel floors, direction, obstacles to be avoided, etc. there was far too much to keep in mind, according to Miller's Magical Number Seven, for us to learn to walk by simply coordinating thoughts. And that is without considering problems of physical strength. Looking at babies falling over, and their incredible expressions of concentration, merely brings this out. So I asserted that, in learning to walk we gradually compose in more and more of the actions as an ever expanding composite thought (concept) that becomes, eventually, that we refer to as walking. This description was accepted as accurate by the only non-crippled adult I have met who had to learn to walk: a student who had lost this skill following a motor accident.

(3) In a lecture given at the AA in February 1983, Lehmann demonstrated that the complexity of many current computer programs is such that they are impossible for humans to understand, beyond the bounds of reasonable logical certainty, and not even analysable in terms of machine failure. See also remarks later in this paper on complexity.

(4) This is a matter of provability. For a mathematician, a random number is one that cannot be described in a simpler way (ie, there is no pattern in it) - see Chaitin, G, "Randomness and Mathematical Proof, Scientific American, May 1975. But you cannot prove that, because you have not yet found a simpler description, there is not one, any more than you can prove that because, let us assume, no one has found the Loch Ness Monster, there isn't one. In "Occam's Adventures in the Black Box" (Glanville, in Lasker, (Ed)" Applied Systems and Cybernetics" Vol II, (1981, Pergamon, Oxford), I argued that the same holds for the concept of "simpler", itself, since its degree of being simpler must depend upon an unprovable simplest.

(5) The Cannibals and Missionaries example is taken from Simon's "Models of Discovery, and other Topics in the Mathematical Sciences"((1977), Boston Studies in the Philosophy of Science, 54). In this book Simon, recognising that complexity is a widely used by scarcely examined concept, undertakes one of the first, but few serious analyses of it.

(6) This notion was first put into mathematical expression by Zadeh (the father of fuzzy set theory) in an invited lecture to the Fourth European Meeting on Cybernetics and Systems Research, Linz, 1978. I do not know how much further he has carried his work.

(7) This assertion comes from the "Tractatus Logico Philosophicus" (Wittgenstein, 2nd Ed, 1966, Routledge and Kegan Paul, London), and with it, Wittgenstein banishes the whole inductivist argument of Mills about the truth of scientific knowledge. I suspect that this remark was much in Wittgenstein's mind when he wrote, in the introduction, that he thought he had solved all problems of philosophy.

(8) Simon's chess experiments (with Newell) are renowned in the areas of artificial Intelligence and Cognitive studies. Perhaps the best general statement of his views can be found in "The Sciences of the Artificial" (Simon, 1968, MIT Press, Cambridge).

(9) Bremmerman ("Complexity and Transcomputability" in Duncan, R and Weston-Smith, M, (Eds) "The Encyclopedia of Ignorance" (1977), Pergamon Oxford) has argued that, because in a digital computer we must have two distinct values, there must be a maximum theoretical computing rate, based on the certain transmission of a minimum unit of energy (ie photon). From that limit, Beer "Brain of the Firm" (1972), Allen Lane, London) has shown that the computing power of the Earth-as-Solid-Computer, over its lifetime, is 10^{90} bits. Alexander ("Notes on the Synthesis of Form", 1964, Harvard University Press) demonstrated that there were 10^{20} possible combinations of chemical elements to make building materials. In my "A Cybernetic View of Education and a View of Cybernetic Education" (Glanville, Cybernetic, forthcoming), I elaborate and extend these arguments to show that it is thus theoretically impossible to compute the best combination of 5 possible building materials ($10^{20\,5} = 10^{100} < 10^{90}$)

(10) This is exactly what is entailed in Piaget's dynamic unit of concept building - object conservation - see, for instance "The Child's Conception of Reality" (1955, Basic Books, New York). The Child (and we adults, too) learn to construct concepts with many different perceptions (eg"Mummy"). Such conserved objects can continue to grow, just as our room is still our room, even when we incorporate the crack.

(11) Robinson and I are putting together a proposal to the U.S. Army Research Institute, to explore α- and β- complexity in terms of team decision making between men and machines. This paper forms part of that proposal. We will hope to provide some answer to the question posed about α- and β- complexity, and their measurement. If we do find an answer, it will have profound effects on the method of Building Utilisation Studies vis a vis Design.

(12) I have argued (Glanville "Why Design Research" in Jacques, R and Powell J (1981) "Design; Science: Method", Westbury House, Guildford) that Science is a branch of Design, and not (cf Oxford Conference, Ulm etc) vice versa. Scientific experiments are designed, and so is knowledge.

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX J

"Motivation."

Unpublished Manuscript.

MOTIVATION

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1982

MOTIVATION

Outline

This document presents a reflexive teaching technique used with architecture students in which (aspects of) their perception of space and means of representing it were used to generate the design of an exhibition. The reasons for using it are explained and justified, and its form is laid bare so that other potential uses can be identified.

In 1979 & 80 I taught with Annetta Pedretti a course at the Architectural Association School of Architecture in London punningly called MOTIF 8. This was a design project intended to exploit each student's way of perceiving and representing architectural space, using an interior site (Inigo Jones' St. Paul's Church, Covent Garden, 1979) and an exterior site (Bedford Square, 1980) as a source to design an exhibition displaying each student's perception and representation as the exhibit (the project was intentionally extremely reflexive). While there were significant differences in the project on each run, these are not important here. This document is an account of an experimental teaching technique and some of its uses.

In order to explain the project I must first go into a little background psychology. Although a lot of work has been done in Environmental Psychology (e.g. Canter & Lee, 1974.) little of it has been concerned with either how designers (architects) perceive or design space. But my research (Glanville 1976) shows that, whereas the environmental psychologist isolates variables in the environment, when we perceive a space we do so wholistically and not in terms of such parts: and when we design we explore through a sort of private conversation with pencil and paper (amongst other things). Much of design, at least in architecture, cannot , I believe, be thought of in terms of the tightest fitting together of all the isolated variables and functions, as would for instance be done using normal problem-solving techniques.

All this is germane when it comes to teaching architecture. The act of design is a private conversation, starting without much and wandering one is not quite sure where. This makes both the setting and the teaching of projects rather hard - the teacher is, in many ways, more ignorant even than

the student, surely an unusual phenomenon to our Western Mind! The process of this conversation (into which the teacher may enter, with care) is one students are rarely prepared for in their previous education and which requires much critical self-reflection, becoming aware, through this conversation,of one's thought processes and means of exploring them through their expression. Hence one gains the control to amplify one's skill (attempts to teach architecture by rote strengthen this point in that they have failed with all but the most talented whom it appears cannot be stopped anyway.) Truly, practice makes perfect!

It was specifically to these processes of perception and representation that we were directing ourselves in the two MOTIF 8 projects. Could we make them more explicit for the students to examine and learn from them?

I had already carried out an experiment in what I called "Controlled Viewing". I allowed students to view a room for various periods of time from two seconds to 15 minutes, and then asked them to draw the room from memory. The group then made an exhibition of the drawings and assessed how long a viewing each drawing represented. While there were many uncontrollable variables, the expected result that viewing times would be apparent from the drawings did not hold up. This was hinted at in a previous experiment, the "Blindfold Survey", in which blindfolded students tried to visualise and draw a room they had been in, with no success. But when, later, allowed to view it their instant response was "Gosh" (both in Glanville 1977). And another point of interest in the "Controlled Viewing" drawings was that often, when uncertain of a detail,the students would invent "wrong" ones of their own.

It occurred to me that there was potential in this, around which I structured a design project. If students drew a space without much present visual information, they made assumptions about some aspects of that space that would be proved "wrong" when compared to drawings made within that space. These "wrong" assumptions could express certain personal spatial motifs (hence the title of the project), the results of years of spatial perception. And, indeed, these differences did exist in all cases - even those of the most talented students.

But, as well, it was possible to ask the students to reflect on how they were drawing - the tactics they used to represent these spaces. For instance, did they "set up" the room, and then draw all the windows followed by all the reveals and all the glazing, or did they draw each window complete, one at a time? The self-conscious reflection on how they drew could perhaps illustrate a way in which they explored space through drawing.

We got each student to try to record or reconstruct their tactics. We could not do this very scientifically since we had no means of recording this (although I do hope to do an exact research project on this eventually), but we did collect their own accounts which, because they were intentionally personal, are not statistically analysable but nevertheless interested us. The students could record some, at least, of how they had drawn. And they found they could recognise in their records and their drawings something about how they explored space.

The question was how could we use this material in order to design a new space, amplifying each student's skill? How could the students use this understanding to motivate (ah, yes) for a design?

The argument I have proposed is that the "tactics" that the students recognised in their drawings are ways of exploring the representation of spatial understandings. But I have also argued (Glanville 1982a) that architectural designers act through drawing - that a drawing is not really a representation of an idea or concept but rather ideas and drawings interact, allowing the designer to develop his design through alternating internalisation and externalisation: a conversation with himself. Thus, a drawing is not a record of a fixed external reality but is the exploration of perceptions and the creation of new realities: Recreation is Creation (or as von Foerster 1981 said "Representation should be called Presentation."). Thus the tactics are ways of exploring and creating space.

How can such tactics be overtly used as a means of design? For what sort of function might they provide a purpose - a brief? And what about the personal spatial motifs and their integration? My problem was to set a project for the students to answer that answered these questions.

The solution we arrived at, which I believe to be one solution but by

by no means necessarily the only one, was to ask the students to design a processional exhibition that displayed how they had understood the original space. This was intended to show, to visitors to the exhibition, just how the original space could be seen - though, of course, it could be seen as could the exhibition by any viewer other than the designer (and, possibly, his teacher or another participant in the project) in an entirely different and possibly generatively novel manner. Thus, the exhibition was to be of a way of seeing (cf Berger 1972) a space: the tactics of the drawings were to provide a pathway for exploring the space, the motifs, the individual perceptions of personal spatial elements that were first explored and then re-designed to form the exhibition material as expressing the individual personal and growing understanding of space. The whole to be a new revealing experience, designed from the designer's experience(s) of the original space. This is, of course, reflexive in the extreme (about which I shall talk in a moment, and which I consider to be essential to the processes I am involved in describing). In other words, the designer's brief was to show how, from his learning to experience a space, others could so learn, too. The building, made up from the language (van Schaik & Glanville 1982) of personal motifs was to display the tactics of the drawings as a set of path(s) the visitor could follow through the building.

And what were the motifs? These were determined by looking at the controlled viewing and on site drawings and comparing them to find the "errors" in the controlled viewing drawing. These were taken to be the personal spatial motifs, the personal associations and inventions of the student when he was not sure what he had seen but needed to draw something.

So there we have it: the exhibition hall, with a (set of) path(s) through it that reveal a process of exploring space, made of and filled with the designer's personal motifs taken from the "errors" in the controlled viewing drawing. (Now you see why I put "errors" and "wrong" in inverted commas.)

But it is, of course, a design itself, the product of a design process, which as I have argued (e.g. Glanville 1980) is itself,generally, a process of discovery and surprise, often meandering way off its original course, and quite rightly so. So we have not only a reflexive process, but one in which the understanding of this reflexive process is applied to itself in order to create

something new (see Glanville 1982b). In this way, the workshop experiment cannot be scientifically evaluated (although I have argued (Glanville 1981) that science should be seen as a special case of design, rather than design ever being expected to be scientific). This does not worry me at all: if they learnt a little (which they are better qualified to judge than I), if they enjoyed themselves, if they designed something decent or even awful but from which they could learn (no matter how far their design varied from the original intention), then we succeeded. After all, the purpose behind the whole project was education, and design tends to "take off" with a life of its own.

There must be, I imagine, many other conditions - educational and other - in which such a doubly reflexive method could be used, for instance, participation design, the imaging of a community, or any form of self-help. But this I leave to others to decide, although I should be very glad to hear of further uses and developments.

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Appendix

I append some photographic prints of one of the designs that was developed in this project, and the post-rationalised source material. The original drawings were in colour.

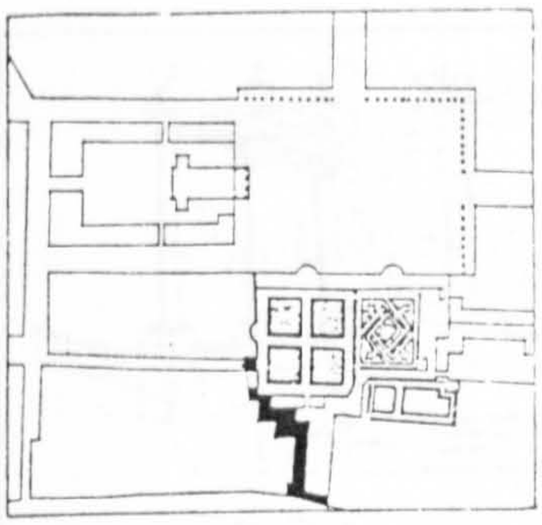
ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

APPENDIX K

"Motif 8."

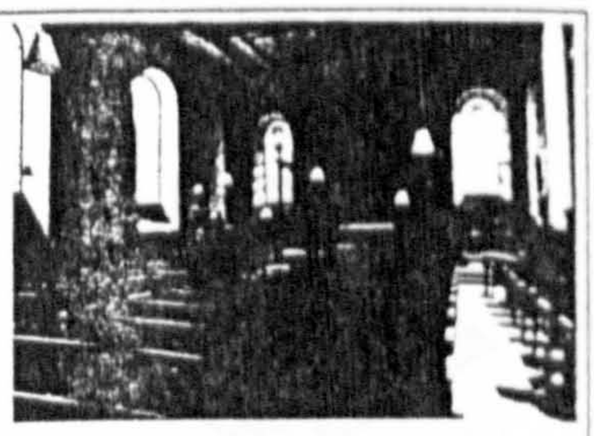
From:
"Projects Review 1978 - 9", Architectural Association School of Architecture, London, 1979.



m8

MOTIF 8: A HOUSE FIT FOR A KING

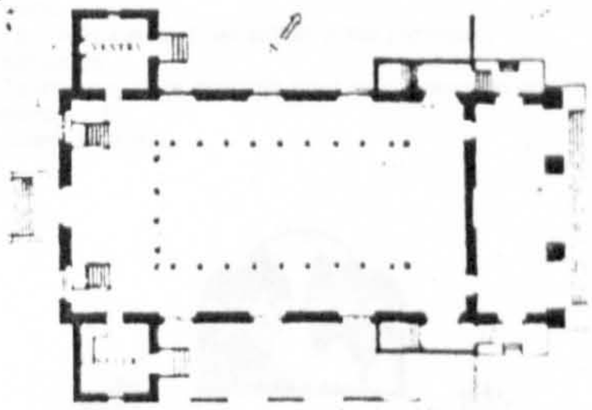
MOTIF 8 was a one-term inter-unit design workshop that exploited individual spatial perceptions and understandings of their execution and representations to generate new design programmes to be resolved and realised. It was supported by an associated lecture course, 'The invention of reality', which discussed the view that reality is how we invent it, and which lead to assorted submissions.



MOTIF 8 – Process description

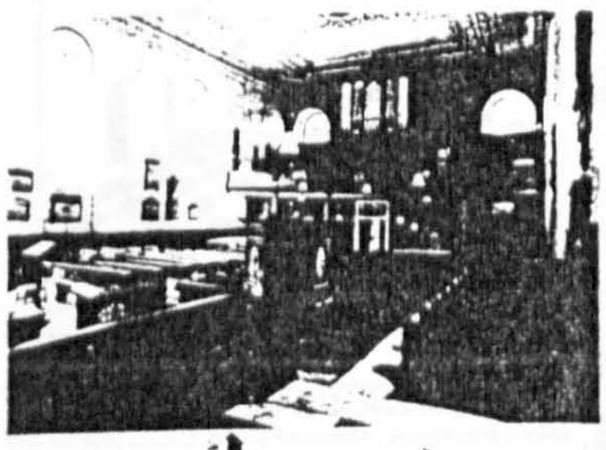
A. Observations to make a brief

1. Draw, from the image you have that is based on a glimpse, as thorough, complete and detailed a drawing of a space as you can manage. Make a record of how you draw – what you did first, your strategy.
2. Draw, equally thoroughly, completely and with as much detail, the same space, but this time while in the space. Make another record of how you draw.



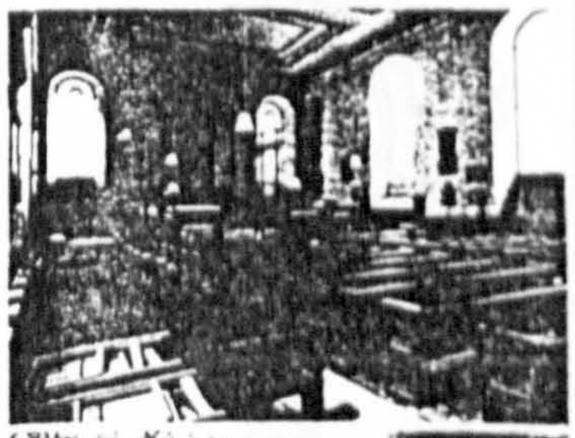
B. A brief that is a course for action

1. Your two drawings and your two strategies reflect some aspects of how you understand and represent space: this is an exploration. We will design, using this information, a new space. This space is to reflect how you explored the space in your drawings, as shown in your strategies, and is to be based on spatial motifs found in your drawings.
2. Take the strategies and make a brief from them for a space to be explored or that will consciously reveal itself.
3. Isolate spatial motifs by comparing the difference between your two drawings, in order to discover what you invented and what was there.



C. A scenario enacted

1. Think of how this space will be used, of its ceremony. This is its scenario. It is the scenario of a stage-set, of a palace, of a house fit for a king. It is also the scenario of the original building.
2. Design this space. There is no disrespect here, the existing building is a re-construction, a re-design.
3. Present this so that these processes are clear: all processes – the process of your perception, of your exploration, of your brief and scenario and of your space.



'The invention of reality' course

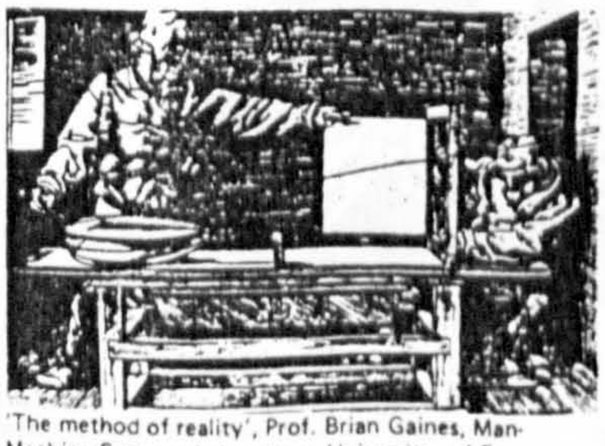
MOTIF 8 was attended by

Patrick Beale
Paul Chapin
Julian Cripps
Janet Digby
Charles Dunnett
Christopher Egret
Michael MacNamara
Michael McKnight
Jamileh Manoochehri
Irenee Scalbert
Mark Simmonds
Jose Wilmot

with

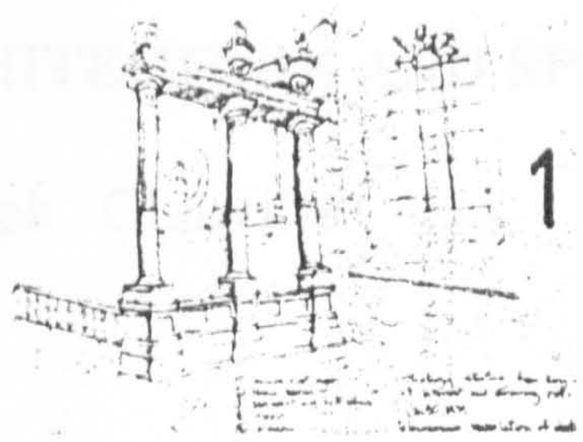
Annetta Pedretti
Ranulph Glanville

'The perception of reality', Prof. Richard Gregory, Brain and Perception Laboratory, Bristol University.



'The method of reality', Prof. Brian Gaines, Man-Machine Systems Laboratory, University of Essex.

'Descriptions and realities', Dr. Ruth Kempson, School of Oriental and African Studies, London University.



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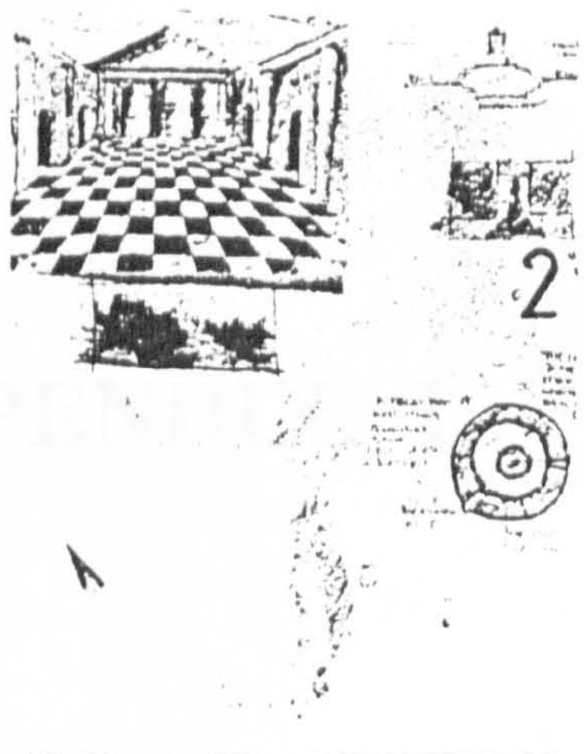

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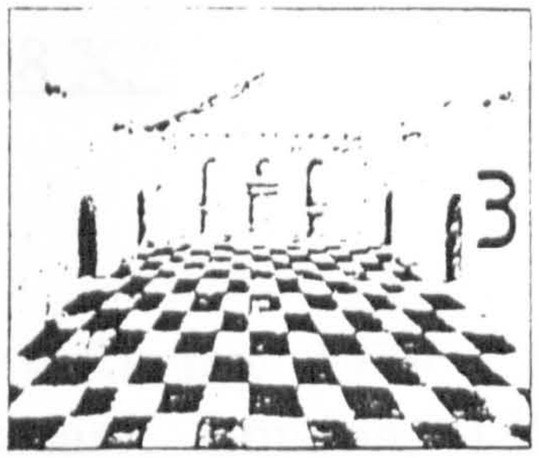
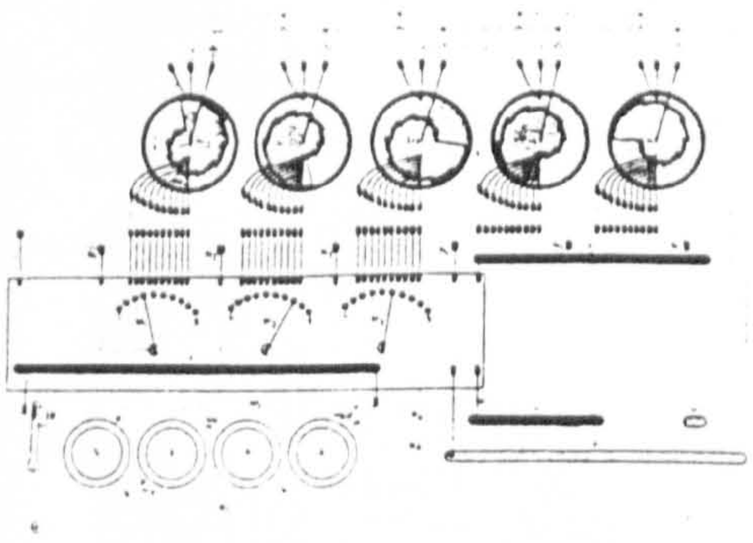


3

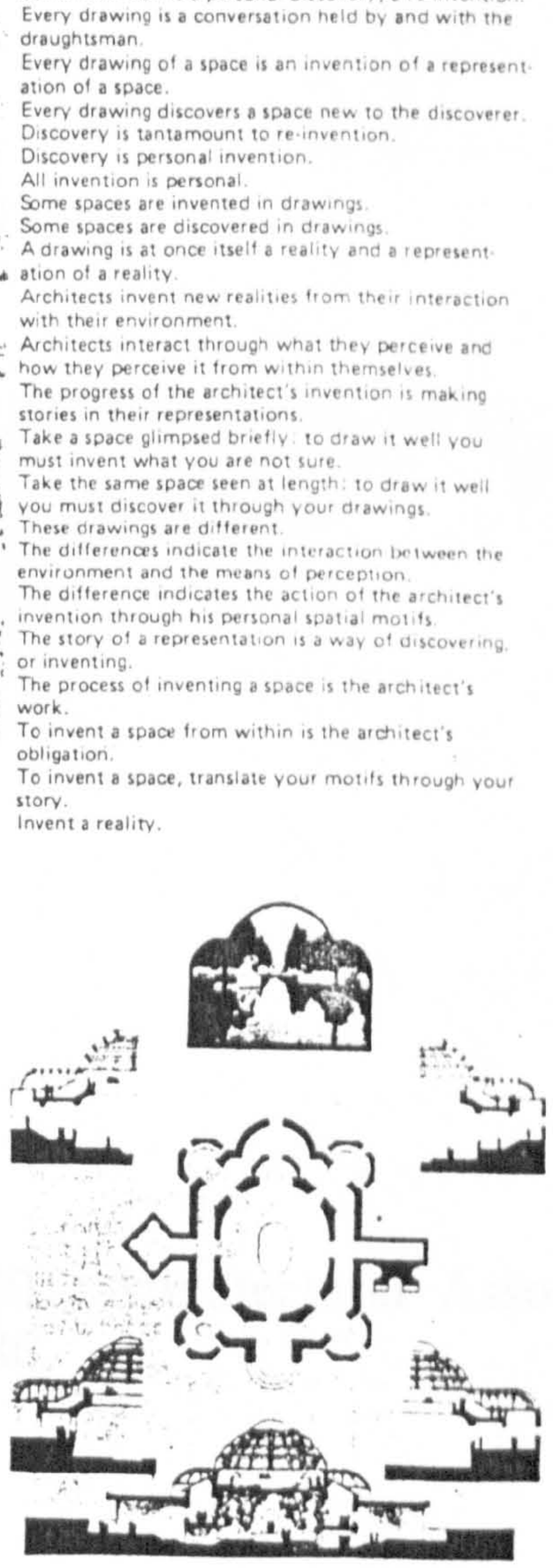
St Paul's Church, Covent Garden was built by Inigo Jones in the 1630s and was burnt down in the 1780s. The present church is a re-invention. Architects invent, re-invent and discover spaces. St Paul's can still be invented. Invent a palace (church) fit for a king (god), from your own processes of discovery, of invention of your own motifs of that space.



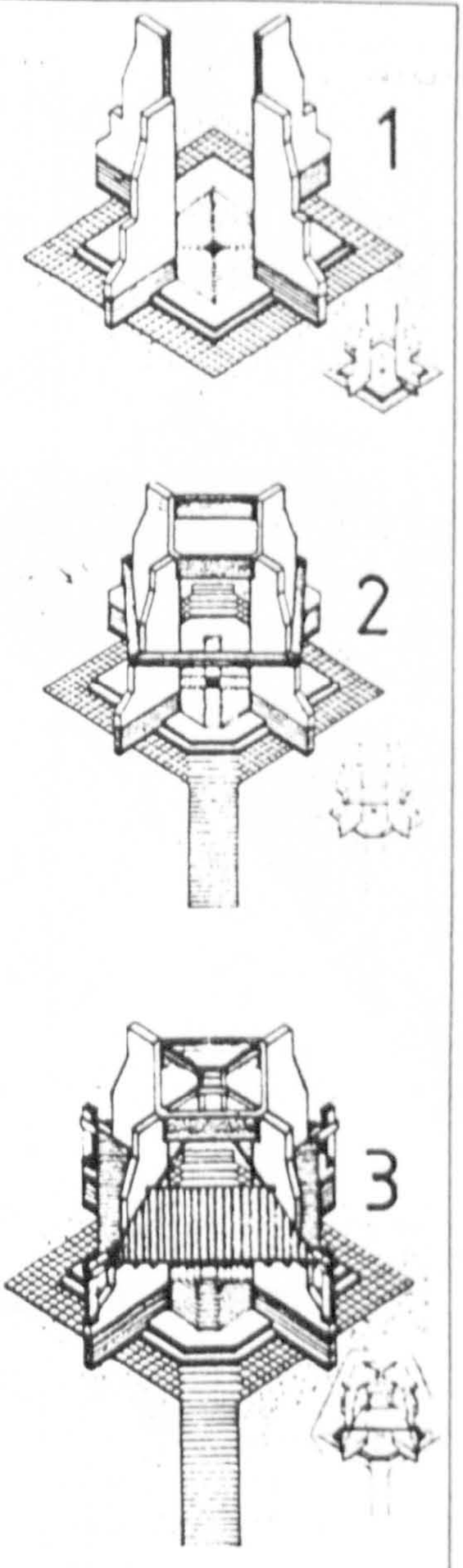
'The inventions of reality', Prof. Eric Laithwaite, Department of Heavy Electrical Engineering, Imperial College of Science and Technology.

MOTIF 8: a brief written after the event

Architects invent realities.
Every drawing is an invention.
Some invention is a personal discovery, a re-invention.
Every drawing is a conversation held by and with the draughtsman.
Every drawing of a space is an invention of a representation of a space.
Every drawing discovers a space new to the discoverer.
Discovery is tantamount to re-invention.
Discovery is personal invention.
All invention is personal.
Some spaces are invented in drawings.
Some spaces are discovered in drawings.
A drawing is at once itself a reality and a representation of a reality.
Architects invent new realities from their interaction with their environment.
Architects interact through what they perceive and how they perceive it from within themselves.
The progress of the architect's invention is making stories in their representations.
Take a space glimpsed briefly: to draw it well you must invent what you are not sure.
Take the same space seen at length: to draw it well you must discover it through your drawings.
These drawings are different.
The differences indicate the interaction between the environment and the means of perception.
The difference indicates the action of the architect's invention through his personal spatial motifs.
The story of a representation is a way of discovering, or inventing.
The process of inventing a space is the architect's work.
To invent a space from within is the architect's obligation.
To invent a space, translate your motifs through your story.
Invent a reality.



'The control of reality', Prof. Alfred Locker, Department of Theoretical Physics, Technical University of Vienna.



'The evaluation of reality', Sir Geoffrey Vickers.

ARCHITECTURE AND SPACE FOR THOUGHT

Ranulph Glanville

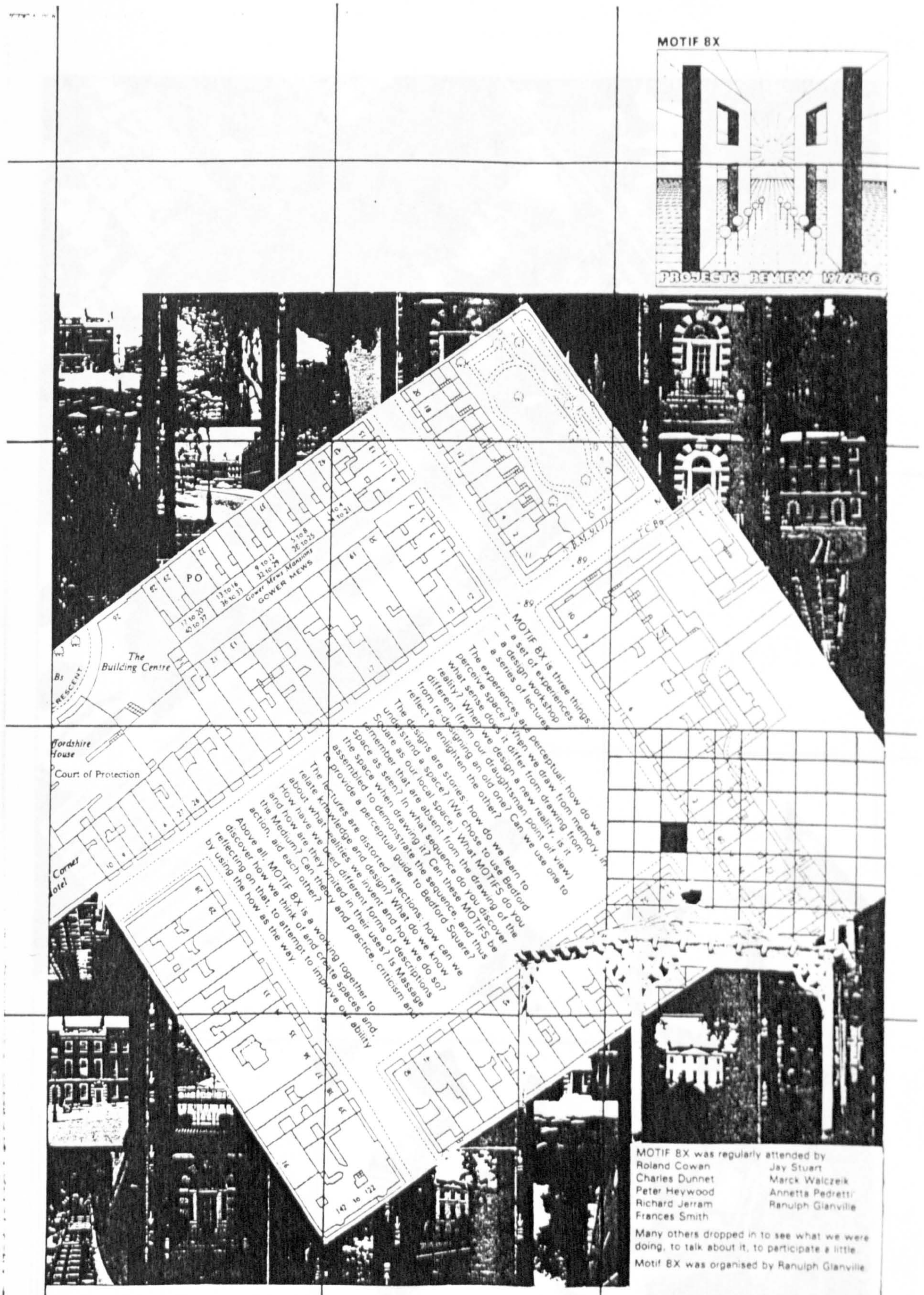
APPENDIX L

"Motif 8 X."

From:
"Projects Review 1979 - 80", Architectural Association School of Architecture, London, 1980.

MOTIF 8X

PROJECTS REVIEW 1977-78



MOTIF 8X was regularly attended by

Roland Cowan	Jay Stuart
Charles Dunnet	Marck Walczeik
Peter Heywood	Annetta Pedretti
Richard Jerram	Ranulph Glanville
Frances Smith	

Many others dropped in to see what we were doing, to talk about it, to participate a little.

Motif 8X was organised by Ranulph Glanville.


Lectures
The Lecture series that accompanied MOTIF 8X was called 'Description, Invention, Reality'. It was concerned with the way in which how we can represent things both limits and yet provides a framework for our invention and experience. Hence description affects invention affects reality, and reality affects invention affects description. There were 8 lectures.
1. 'Pictorial Representation and Criticism', Richard Wollheim, Department of Philosophy, University College, London.
2. 'Designing a Way Out. Describing the Invention of a Reality', Christopher Jones, Imaginary Rock Foundation, London.
3. 'Psychiatric Disorders – inventing a Reality from a Description', John Greeves, Department of Psychiatric Medicine, St. Bartholomew's Hospital, London.
4. 'The Geometry of the Mind' – Scientific Diagrams & Medieval Thought', Michael Evans, The Warburg Institute, London University.
5. 'Theatrical Space & Invention: the Medium', Jonathan Miller, National Theatre Company, London.
6. 'Feedback in Language & the Arts', Sir Ernst Gombrich, the Warburg Institute, London University.
7. 'The Use of Architecture in the Art of Memory', Dame Frances Yates, the Warburg Institute, London University.
8. 'Mapping Realities', Ranulph Glanville, School of Architecture, Portsmouth Polytechnic.
"History as she is harped.
Rite words in rote o