LEARNING ABOUT THE URBAN ENVIRONMENT:

A Case Study of Newcomers to Leicester.

Submitted for the degree of
Doctor of Philosophy.

Carol J. Ekinsmyth.

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FOREWORD.

The aim of this thesis has been to gain an insight into the process of environmental learning in adults after a move to a new city. In particular, the research has aimed to discover more about the nature of the influences of certain factors that are thought to be a cause of differential environmental learning between individuals. Principal amongst these factors of interest have been gender, spatial ability, environmental disposition and modes of interaction with the environment.

As a field of concern, the study has fallen within the domains of behavioural geography and environmental psychology (or within what some choose to call 'environment and behaviour' research). As such, the approach has been multi-disciplinary. Most theoretical input into the study has come from the learning and developmental theories of those who have studied child development.

The study has adopted a part-longitudinal, part-cross-sectional framework, in order that the disadvantages of each might be minimized. Four separate field studies have been conducted using groups of individuals who had been living in the city of Leicester for three months, six months, twelve months and three years or more. The three month and three year groups were interviewed only once, but the six and twelve month groups were comprised of the same individuals, thus constituting the cross-sectional element. A total of one hundred and forty-six lengthy interviews were conducted by the researcher over the period of one year.

Respondents have been selected on the basis of their length of residence in the city. Limitations of time and manpower have dictated the sample sizes, which have in turn demanded that certain variables not of primary interest to the present research but which might be expected to influence environmental learning, be controlled. As a reasonably homogeneous group on many of these variables (e.g. age, socio-economic status, life-style, life-cycle stage, and location of place of residence and place of work (and thus activity space)), postgraduate students and new members of academic staff to the University in the academic years of 1985 and 1986 have been chosen as the study population. A random sampling procedure has been adopted for the selection of respondents from this population for the sample groups.

The interview schedules have contained a mixture of questions and tests/exercises which were aimed at eliciting the following information; the personal characteristics of the respondent, macro-spatial ability, environmental disposition and knowledge of the Leicester environment. Previous studies of this nature have concentrated on certain aspects of
environmental knowledge (such as knowledge of distances between landmarks, or knowledge of the layout of the city centre), but this study has adopted a holistic approach aiming to achieve an insight into the acquisition of knowledge in general with all its interacting component parts. Thus the study has concentrated on both the quantity and quality of knowledge, and has questioned respondents on aspects of the city which have ranged from the structure of the city centre, to the nature of local industry and the geographical distribution of the unemployed. Information has been elicited using techniques which included sketch mapping, abstract spatial tests, response to both iconic and aerial photographs and normal questioning.

The resulting data has been coded and compiled into a data matrix which was entered onto a Vaxcluster mainframe computer. The data has been processed using SPSSx.
ACKNOWLEDGEMENTS.

I would like to celebrate at this point. I have finished my thesis and come to write perhaps the most interesting part - the acknowledgements. A little 'ditty' below names those who deserve special mention as people and institutions who/which have featured prominently at some stage or other during the course of my postgraduate student days. On a more formal note I must sincerely give thanks to the following persons:

My thanks first to my Supervisor Gareth Lewis who helped me obtain a grant from the ESRC at the end of my undergraduate days, and who has been an encouragement and support ever since. Another in the Department of Geography who deserves mention is Alan Strachan for his snippets of advice and his car maintainance skills.

My thanks also to one hundred and five postgraduate personages who willingly became the subjects of my research and who were subjected to time-consuming interrogation.

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Finally to these few souls;

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To Loz for camaraderie and 'laffs'.
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To Gilbert Murray for early mornings and late breakfasts,
To the Physics Department for a feeling of superiority,
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To my father for his relentless scepticism,
And to my grandparents for their constant support.
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2.6
LEARNING ABOUT THE
URBAN ENVIRONMENT:

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CHAPTER ONE.

INTRODUCTION.

Environmental knowledge is a requisite for living. Every mobile living creature needs to have some conception of the environment in which it lives in order that it can obtain from that environment those things which are necessary for the sustenance of life. Human beings are no exception to this.

Environments are various and their definition is dependent on scale. Man (in common with other creatures), operates within a variety of different scales of environment, and thus needs a conception of each one. There are no delimiters between one scale of environment and another but rather, there exists a continuum. Rather like different scales of map representation, it is likely that as environmental scale increases, the conceptualization of that environment held by the organism becomes less detailed.

These conceptualizations have come to be thought of as 'internal' (i.e. within the mind) 'representations', and because they contain spatial information, these representations have been commonly conceived by researchers as having the properties of euclidean maps. Thus they have come to be denoted by a number of titles, usually consisting of a pronoun pertaining to the brain (e.g. 'mental', 'cognitive', 'internal') or the environment (e.g. 'environmental', 'spatial'), and a noun pertaining to the conceptualization (e.g. 'representation', 'image', 'map').

Internal representations of environments are thus fundamental to the individual and his or her successful operation in these environments. They are comprised of both an understanding of spatial relations (euclidean geometry) and environmental information. The former is necessary in order to provide the spatial framework within which environmental information can be organized. Without it, representations of the environment would contain the 'what' but not the 'where'. These representations therefore, contain information which has been organized and stored in such a way that it can be retrieved and manipulated to serve the individual in his or her interactions with the environment. That these representations exist, is indisputable; their genesis, character and form are however less well understood.

This study aims to explore the processes by which environmental representations come into being, and the factors which determine their content. As such, the main lines of investigation are the 'nature', the 'content' and the 'genesis' of spatial representations and their determinants.
The study interest is born out of the observation that individuals differ in their ability to derive comprehensive environmental representations. Thus differences in the resulting quality of these representations between individuals is likely to result in differences in their potential utility. As a consequence of this, individuals would vary in their degree of competence in environmental interaction. Individuals with poorly developed representations of environments might be at considerable disadvantage vis-a-vis their more capable fellows. As observation of everyday life would suggest that this is indeed the case, it becomes pertinent to ask what it is that makes some people more capable than others in this respect, and how the less capable might be trained or coerced into improving their ability. This could be especially important in educational contexts where, to date, children are left to develop their ability to 'represent' their environments through necessity and instinct. In the study of the process and proceeds of environmental learning therefore, this thesis aims to establish the causes of differential ability in the development of internal representations of the environment.

The objectives of this study may be summarized here below:

1. To gain greater understanding of the process of environmental learning at the urban scale within a microgenetic framework.
2. To examine the products of this environmental learning in order to gain greater understanding about the nature and contents of cognitive representations of environments.
3. To investigate the differences between individuals in the ability to learn about the environment and produce cognitive representations.
4. To establish the causes for differences between individuals in environmental learning and speculate as to their importance and possible rectification.
5. To employ a framework of analysis and research methodology which conceive of the environment as a whole, rather than a collection of separate parts.

1.1. The Study as Contribution to the Field.

This study has a unique contribution to make to its field of enquiry which might be labelled as any of the following; 'behavioural geography', 'environmental psychology', or 'environment and behaviour research'. It is a study whose aims extend further than those which have gone before it. It undertakes to investigate urban environmental knowledge in its totality, taking into account not only the physical aspects of the environment and their distribution, but also people's knowledge of the social and economic aspects which also affect their lives. It is believed that the understanding which is sought here (and within the field in general) is only achievable within such a broad exploration of environmental knowledge.

Previous studies have attempted to develop an understanding of the differences between
individuals in their cognitive representations, but few have taken this concern a stage further and considered what this means to those individuals and how this situation might be rectified. This study aims to examine individual differences with this interest in mind.

1.2. Subjects and Context.

The study has been carried out in the city of Leicester and thus concerns itself with knowledge of the urban environment. It focuses on a group of postgraduate students and academic staff of Leicester University, the majority of whom had recently arrived in the city and were thus engaged in the process of coming to know a new environment. As a group of people, the subjects were homogenous in terms of their age, status, life cycle stage, lifestyle, educational attainment, intelligence, and residential location within the city. As such, they represented a group who possessed the advantage that much of the possible within group variation (with regard to personal variables) was intrinsically controlled.

1.3. The Study Environment: The City of Leicester.

The knowledge that individuals have about the city of Leicester will be examined in this thesis. It is important therefore to equip the reader with some of his or her own knowledge, so that understanding and interest are maximized. This section will therefore introduce the reader to the Leicester environment with specific regard to its physical structure and its social and economic characteristics. The narrative will focus upon those aspects of the city which the respondents have been questioned upon.

The 1981 census estimated the city's population at 286,000. The north/south extent of the built up area is approximately twelve miles, and east/west extend measures approximately ten miles. The physical fabric of the city is comprised of pockets of urban development which are characteristic of the periods in which they occurred. This discussion will first consider the central area of the city and then the areas radiating away from it.

1.3.1. The Central Area.

Figure 1.1. shows the central area of Leicester. It can be seen that the road pattern in the central area is not a simple one, and thus it might be expected that its configuration would be a source of confusion to the newcomer to the city. The focus of the central area is the Clocktower which is featured towards the centre of Figure 1.1. at the confluence of five shopping streets. Beside this landmark, the Haymarket centre containing the Leicester Haymarket Theatre and an undercover shopping area, is located. The main shopping street, Gallowtree Gate, can be seen to the south of the
FIGURE 1.1.

THE CENTRAL AREA OF LEICESTER.
Clocktower, and to the west of this lies the Market Place which contains a large permanent market. A recent shopping development, St. Martins Precinct, can be seen to the north of the market, and to the south can be seen Town Hall Square and the Town Hall. St. Margarets Bus Station and the Railway Station can be seen respectively on the northwestern and southeastern edges of the central area. The location of these landmarks has been indicated here because they will be the subject of interest in the respondent exercises.

Figure 1.1. also shows that the central area is bounded to the north by the inner ring road (Vaughan Way/Burleys Way/St. Matthews Way), but that its southern extent is less well defined. Charles Street constitutes the major north/south thoroughfare through the central area, and it can be seen that east/west movement is a much more difficult due to the proliferation of traffic restrictions. It could be expected that the one-way restrictions in the central area might strongly influence the car drivers' understanding of spatial relations in the city.

1.3.2. Nineteenth Century Development.

Figure 1.2. shows the areas of nineteenth century development in the city. These are today comprised predominantly of back to back terraces which line the edges of grid-patterned street arrangements interlaced with factory buildings. A brief period of development in the 1960's attempted to rid the city of this fabric and replace it with high or medium density modern dwellings (e.g. the St. Peters and St. Matthews estates), but the greatest proportion of these original dwellings still remain. The quality of this housing is various. Some areas were awarded 'development area' status in the 1970's (not necessary the most needy areas) and have been improved significantly (e.g. Clarendon Park and selected pockets in Highfields). Today, these areas house a large proportion of the ethnic population of the city (Figures 1.5 and 1.6) and have above average proportions of the elderly, first-time buyers and private sector student accommodation.

1.3.3. Inter-war Development.

Inter-war development skirts the nineteenth century fabric and is comprised of two major housing thrusts, private and public housing development. Development principles at the time favoured low density housing in spacious settings of the 'garden-city' philosophy. This is reflected in the morphology of the suburban development of the period, within both the public and the private sectors. The private housing development consists therefore of predominantly semi-detached dwellings arranged along wide streets. It is the public housing development of the period however, which has left such an important mark on the city. Large sprawling council estates remain today
as a legacy of this period of building (e.g. Beaumont Leys, New Parks, Braunstone, Eyres Monsell - Figure 1.3). Comprised mostly of semi-detached dwellings often of substandard structure, these dwellings have fallen into differing states of disrepair and comprise some of the poorest housing conditions in the city. Levels of unemployment are often high in these areas, adding to the general malaise and disadvantage of their inhabitants.

1.3.4. Post-War Development.

Post-war housing development has been piecemeal and various, with periods of urban renewal, and areas of private housing development. Large private housing estates have arisen around the periphery of the city, and this period of development has seen the engulfment of previously separate villages or towns (e.g. Thurmaston, Wigston, Oadby) into the built up area.

1.3.5. General Citywide Morphology.

The urban fabric of Leicester in line with most British cities, is thus comprised of numerous distinct residential areas which stand as a legacy to one hundred years of development. The major road network is centripetal in arrangement with transport arteries radiating away from the central area (Figure 1.4.).

1.3.6. Economic Activity.

The three major industrial activities of the city are engineering, textiles and clothing, and footwear (Table 1.1.). Other important concerns (in terms of numbers of people employed) are food manufacture, chemicals, paper and printing, building materials and wood products (Table 1.1.). Aside from this, and characteristically for a city of its size, large numbers of people are employed in service industries and commerce (Table 1.1.). Industries are located in the city according to their age. The inner area contains many nineteenth century industrial premises and these still operate (usually textiles and clothing manufacturers. Many industrial premises line the canal. Industrial premises which are more space-intensive are located on the city's periphery (e.g. Walkers Crisps and Thorn E.M.I. at Thurmaston, Everards in Soar Valley etc.). In addition, smaller concerns are often located on purpose built industrial estates which are located both within, and on the edge of the urban area.

1.3.7. Recreation in the City.

Leicester is adequately served with recreational facilities. It has two cinemas, three theatres (one of which, The Haymarket, is nationally acclaimed) and numerous restaurants and nightclubs. With regard to sporting activities, the city has seven
FIGURE 1.3.

PUBLIC SECTOR HOUSING.


5a
FIGURE 1.4.
The Arterial Road Network and Major Citywide Landmarks.

swimming pools and many sports centres including the Granby Halls which combines a sports centre with a roller skating rink. For outdoor recreation the city also boasts many large parks (Figure 1.4.).

1.3.8. The Social Characteristics of the City.

Of the 286,000 people who make up the population of Leicester, seventy five per cent have been estimated to be of white origin, twenty two per cent of Asian origin and two per cent of West Indian origin (Leicester City Council, 1984). These figures are represented in Table 1.2. It has been estimated that seventy per cent of the ethnic minority population live in the inner city (Leicester City Council, 1984) which comprises the nineteenth century areas of Belgrave, Spinney Hill and Highfields. Figures 1.5. and 1.6. show the distribution of the Asian and Afro-Caribbean populations. It can be seen that the Afro-Caribbean population are more spatially concentrated than the Asian population (a function of their lesser numbers) in the Highfields area of the city.

Economic well-being in the city also demonstrates some spatial patterning. As a rough indicator of this variable, Figure 1.7. represents the distribution of the unemployed in the city. The areas with highest levels of unemployment at the time of the 1981 census were Braunstone (26%), Saffron Lane (17%), Highfields and Spinney Hill (27%), Northfields (17%), Belgrave (16%) and Beaumont Leys (14%). The locations of these areas are shown on Figure 1.7.

1.4. The Structure of the Thesis.

Chapter Two presents a selective review of the literature in the field(s) and provides a critical account of the theories which abound within it. It considers the fields of behavioural geography and environmental psychology and the relations between them. Emphasis is then given to the concepts upon which studies in the fields are based including ‘learning’ and ‘development’, ‘cognition’ and ‘perception’, and ‘cognitive maps’ and ‘spatial images’.

The research methodology is presented in detail in Chapter Three. Special attention is given to the methods used to extract information from individuals regarding their internal representations, as this is an area of great contention within the field.

Chapter Four examines the personal characteristics of the study population in order that variations amongst them in their personal situations might be realized and incorporated into the analysis to follow.

Chapters Five to Eight present the results of the study. Knowledge of the
FIGURE 1.5.

THE DISTRIBUTION OF THE ASIAN POPULATION.

Source: Leicester City Council, Survey of Leicester (1983).
FIGURE 1.6.

THE DISTRIBUTION OF THE AFRO-CARIBBEAN POPULATION.

FIGURE 1.7.

THE DISTRIBUTION OF THE UNEMPLOYED.


6c
environment is divided into three element groupings for the purposes of analysis, the physical, the economic and the social. These three groupings constitute the subject matters of Chapters Five, Six and Seven respectively. Within these chapters, the analysis seeks to determine what respondents know about the city and how this knowledge progresses with increasing length of residence (environmental learning). Chapter Eight ignores the time dimension as a central concern and concentrates on variation in environmental knowledge as a function of differences between individuals. Thus the personal characteristics of respondents are examined as determinants of environmental knowledge.

Chapter Nine attempts a more holistic approach to the subject of environmental learning and uses the results of the previous chapters to try to develop an overall conceptualization of the environmental learning process.

Finally, Chapter Ten concludes the study by presenting the major findings and considering their implications. The research methodology employed in the study is reviewed, and some suggestions are made for further research.
Table 1.1. EMPLOYMENT OF THE LEICESTER POPULATION.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary and Secondary Sector</strong></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing</td>
<td>0.2</td>
</tr>
<tr>
<td>Energy Generation/Fuel Extraction</td>
<td>1.4</td>
</tr>
<tr>
<td>Mineral Extraction (non-fuel)</td>
<td>0.4</td>
</tr>
<tr>
<td>Chemicals</td>
<td>0.5</td>
</tr>
<tr>
<td>Metal Goods Manufacture and Engineering</td>
<td>11.2</td>
</tr>
<tr>
<td>Electronic Engineering</td>
<td>3.9</td>
</tr>
<tr>
<td>Food &amp; Drink Manufacture</td>
<td>2.5</td>
</tr>
<tr>
<td>Textiles, Footwear and Clothing</td>
<td>16.2</td>
</tr>
<tr>
<td>Timber, Wood</td>
<td>0.6</td>
</tr>
<tr>
<td>Paper Products</td>
<td>2.0</td>
</tr>
<tr>
<td>Other Manufacturing</td>
<td>2.5</td>
</tr>
<tr>
<td>Construction</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Tertiary Sector</strong></td>
<td></td>
</tr>
<tr>
<td>Wholesale Distribution</td>
<td>5.1</td>
</tr>
<tr>
<td>Retail Distribution</td>
<td>9.7</td>
</tr>
<tr>
<td>Hotel &amp; Catering</td>
<td>2.9</td>
</tr>
<tr>
<td>Railways and Transport</td>
<td>2.1</td>
</tr>
<tr>
<td>Postal/Telecommunications</td>
<td>2.7</td>
</tr>
<tr>
<td>Banking, Insurance, Finance, Business Services</td>
<td>6.5</td>
</tr>
<tr>
<td>Public Administration</td>
<td>4.1</td>
</tr>
<tr>
<td>Education</td>
<td>5.3</td>
</tr>
<tr>
<td>Medical</td>
<td>6.6</td>
</tr>
<tr>
<td>General Public Services, Recreation, Culture, Personal</td>
<td>4.5</td>
</tr>
<tr>
<td>Other</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Source: 1981 Census

(N.B. Percentages are based on a 10% sample; "Leicester" is here defined as that area within the City boundary).
Table 1.2.  THE ETHNIC ORIGIN OF THE LEICESTER POPULATION.

<table>
<thead>
<tr>
<th>ETHNIC ORIGIN</th>
<th>NUMBER</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>214,355</td>
<td>74.9</td>
</tr>
<tr>
<td>Asian</td>
<td>63,186</td>
<td>22.1</td>
</tr>
<tr>
<td>West Indian</td>
<td>5,084</td>
<td>1.8</td>
</tr>
<tr>
<td>Chinese</td>
<td>552</td>
<td>0.2</td>
</tr>
<tr>
<td>Mixed</td>
<td>1,387</td>
<td>0.5</td>
</tr>
<tr>
<td>Other</td>
<td>1,444</td>
<td>0.5</td>
</tr>
<tr>
<td>Not Stated</td>
<td>12</td>
<td>0.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>286,020</td>
<td>100</td>
</tr>
</tbody>
</table>

Source:  Survey of Leicester 1983  
(Leicester City Council 1984)
CHAPTER TWO

LITERATURE AND THEORY.

This Chapter aims to present a brief overview of the literature and theory which form the background to this research project. Discussion will progress from the general to the specific, whilst trying to prepare the setting and the stage for the problem in hand. At the general level consideration will be given to the wider field within which the study is couched, that of behavioural geography. In view of several comprehensive and exhaustive reviews of the literature in the field of behavioural geography discussion here will remain brief. Consideration will also be given to the sub-field of environmental psychology where again the literature is abundant and the subject matter is wide-ranging. Attention will then focus upon the literature which deals with the several theoretical constructs and concepts which have provided the framework for this research. These are 'cognition', 'perception', 'development' and 'learning'. Finally the discussion will focus on the nature and development of cognitive maps and their relationships to human spatial behaviour.

2.1. Behavioural Geography.

Confusion over the definitions, meaning and uses of the concepts central to this field have resulted in attendant confusion over what to call the area of enquiry. It has come to be known as 'behavioural geography' because it adopts a behaviouralist approach to the study of geographical phenomena. However, this title although widely known is not universally accepted as the way to characterise the discipline. Some argue that the enquiry is not a sub-field of geography as it has no distinct subject matter, but is instead an approach to geographical investigation in keeping with the behavioural tradition in the human sciences. 'Behavioural Approaches' is the descriptive term often used to signify the methodological stance of the field (Golledge, Brown and Williamson (1972), Bourne (1973), Golledge (1981), Walmsley and Lewis (1984)). The field has also been called 'perceptual geography' (see for example Downs and Meyer, 1978), but possibly due to an increasing understanding of the concept of perception within the geographical community, this title has recently become less favoured than it used to be. Debate about descriptive labels is neither interesting nor useful, so for convenience here, the term 'behavioural geography' is used.

The seeds of behavioural geography were sown in the 1940's, 1950's and 1960's. Its early proponents expressed a concern about the normative models of human behaviour that were influential at the time, such as those of Losch, Weber and Von Thunen. They were centrally concerned with human decision making and resultant spatial
behaviour, and they recognised that "there are many situations in geography in which these descriptive devices or idealizations [those of the normative models] are clearly inappropriate and there is no alternative but to incorporate very specific statements about the cognitive processes involved in the act of decision" (Harvey 1969, 35). To be able to "incorporate very specific statements" about "cognitive processes", such processes had to be studied. Thus geographers began to explore what Wright (1947) described as the "terrae incognitae" in the minds of men. Kirk (1952, 1963) introduced into geography the concept of the 'behavioural environment' as distinct from the objective or phenomenal environment, and so provided behavioural problems with a geographical context. He was also a pioneer amongst geographers in attempting to introduce principles of psychology into the geographical arena (Gold 1980, 36). The concept of the 'behavioural environment' was derived from a psychologist, Kurt Lewin, who was one of the first people to talk about 'perceived space' (he called it 'lifespace') and 'real space' and the gap between them. He considered that as learning proceeded, a person's space got closer and closer to 'real space' (Lewin 1936). Kirk also introduced the principles of gestalt psychology into geographical thinking which was a school of psychological thought developed from research by Max Wertheimer and through the writing of Kohler (1929) and Koffka (1929). The central tenet of gestalt psychology was perception, which constituted a variable between stimulus and response (Gold 1980, 11). As a school of thought, it suffered limitations and the idea of the behavioural environment was to achieve much greater utility once it had shed the overtones of Gestalt theory.

Most effort in the early years of the subject's development, was invested into attempting to understand the outcome of 'cognitive processes' rather than of trying to appreciate the nature of the actual processes themselves. This outcome was man's 'behavioural environment' which consisted of his cognitive representation of space. Various concepts were used to denote these cognitive representations, but the one most often employed was the 'image'. This concept gained acceptance in geographical circles after the work of Bouling (1956) who suggested that individuals over time build up mental impressions of the world (images) which act as the basis for their behaviour in space. These images were not simply derived from physical interaction with the phenomenal environment, but were, rather, much richer impressions gained over the years from an individual's physical and social milieu. The images that constituted man's behavioural environment were to be the explanatory variables in the modelling of man's spatial decision making. This undermined the previous indispensability of the normative assumptions of 'rational economic man', and decisions based on perfect knowledge in isotropic environments.

Economists also questioned the assumptions of the positivists and began to adopt a behaviouralist approach. Simon (1956) forwarded the concept of 'bounded rationality' and Wolpert (1964) found his Middle Sweden farmers to be 'satisficers' rather than
'optimisers', working from a basis of 'imperfect knowledge'. From the outset, the
behavioural approach was strangely policy orientated, and this is reflected in the early
concentration of research effort on natural hazards and people's adjustment to them.
The Chicago school established a reputation in this area, motivated by a desire to
improve floodplain management (White 1945, Kates 1962). This started a stream of
research activity which is still a strong theme in behavioural geography to the present
day (see for example Burton, Kates and White, 1978; Williams, 1979; Whittow,
1980; Palm, 1981; Hanson et al, 1982).

Behavioural geography today is the outcome of this collection of ideas. Gold (1980)
has written of its characteristics:

"It is a branch of inquiry which is intimately concerned
with environmental and social issues, it is strongly
policy-orientated, and recognizes that geographers, as well as
the human subjects of their research, are individuals with a
distinct outlook on the world rather than detached,
value-free observers" (Gold, 1980, 34).

Saarinen and Sell (1980) have listed as the major characteristics of the field: an
increasing integration of disciplines, an emerging cross-cultural component, a continuing
concern for planning and environmental issues, and the development and critical
assessment of theories and methodologies, and they drew attention to a plethora of
research efforts in each category. The diverse nature of these research efforts however
has led to problems as Goodey and Gold (1985) have pointed out when they spoke of
the "blurred and uncertain identity of this field of study" (Goodey and Gold 1985,
587). In fact behavioural geography as a field of study is faced with problems and it
is not without its critics (Bunting and Guelke, 1979).

Many authors have been concerned about the schism that has developed within
behavioural geography between positivist and humanist approaches (Walmsley and Lewis
Humanist thought has arisen from the early writings of Wright (1947), Lowenthal
shared a brief period of proximity in the 1960's, but thereafter developed pluralistically
(Entrikin, 1983). The reasons behind what Meinig (1979) has termed the 'humanistic
upsurge' are first, a firm rejection of the conceptual dichotomies between subject-object
and between fact-value that are held to be features of positivism (Cox and Golledge,
1981) and second, a reaffirmation of the significance of place (Gold and Goodey 1984).
Adherents to this approach are numerous and works include, for example, Tuan
(1979), Gold and Burgess (1982), Eyles (1985). They reject the scientific goals of
replicable and verifiable measurement (Walmsley and Lewis 1984, 7) and concern
themselves with understanding the personal worlds of individuals at a deeper level.
Adherents to positivist and humanist approaches are mutually critical and have "left the field characterized by excessive fragmentation, dispute and conflict (Gold and Goodey 1983, 580). Because of this, courses in behavioural geography and reviews in the literature in the subject have not been able to find "effective frameworks within which to tie together the contrasting perspectives of the humanist and positivist wings of the subject" and have been left with "syllabuses resembling shopping lists of disparate, if interesting, fragments" (Goodey and Gold 1985, 587). Indeed as Downs and Meyer (1978) have stated, there "is no commonly accepted framework within which we can place disparate pieces of work" (Downs and Meyer 1978, 70). The most obvious framework, arranging studies by spectral scale, has been used by Saarinen (1976), Saarinen and Sell (1981) and Walmsley and Lewis (1984) to name but a few. Downs and Meyer (1978) expressed the view that "scale crosscuts too many issues", and instead they selected the empiricist/humanist dichotomy to try to impose order on the subject matter.

With these systems of classification in mind, this study might be placed within the empiricist (or positivist) mode and the meso scale. It is concerned with human spatial cognition and is within the area of overlap between behavioural geography and environmental psychology. This section began with the claim that confusion over terms has been a feature of behavioural geography over the years, and this has led to confusion over what to call the subject. Discussion will now turn to some of these terms which are salient to this study, namely; 'perception', 'cognition', 'development' and 'learning'. All of these are fundamental to the subject matter, but are borrowed from the field of psychology. Traditionally within behavioural geography, these have been misunderstood and misused, and so it is to environmental psychology that we must now turn to consider their correct meanings and usage.

2.2. Environmental Psychology

"The early development of environmental psychology parallels that of behavioural geography" (Gold 1980, 15). Like behavioural geography it was a product of the intellectual currents of the 1960’s, is concerned with environmental behaviour and the world as perceived, is multi-disciplinary in outlook, and is strongly policy-orientated. As a sub-field it aims to broaden the scope of psychology by studying behavioural processes in real-world settings. A series of concepts and methods have been developed to do this and as a result, the field of enquiry has faced problems in application that had been so far un-encountered in laboratory-assisted psychological studies.

A universally accepted definition of environmental psychology has not yet been found. Russell and Ward (1982) have proposed that it is "that branch of psychology concerned with providing a systematic account of the relationship between person and environment" (Russell and Ward 1982, 652). A slightly different emphasis was offered by Itelson
nine years earlier, when he explained that environmental psychology "takes as its subject matter, the entire range of psychological phenomena in direct relationship to the large-scale environment" (Ittelson 1973, 53). Other definitions have indicated a similar focus of interest (see for example Lee, (1976), Proshansky (1976), Canter and Craig (1981), Levy-Leboyer (1982), Heimstra and McFarling (1974), Holahan (1986)). When drawing a comparison between environmental psychology and behavioural geography, Spencer and Blades (1986) came to the conclusion that "geography and psychology are often concerned with the same broad issues, but....geography will tend to be more concerned with pattern, and psychology with process" (Spencer and Blades, 1986, 238). Proshansky et al (1976) have disagreed with this primacy of importance given to process in environmental psychology and they have explained that it is the emphasis on content research rather than process research that is the sub-fields' point of departure from the mainline approaches to psychology (Proshansky 1976, 103).

Disagreement exists over who should be heralded as the originators of the sub-field. Spencer and Blades (1986) have acknowledged Proshansky as one of the originators of environmental psychology and Levy-Leboyer (1982) has heralded the instigators of the field to be Proshansky and Ittelson with their work beginning in 1958 on hospital environments, a Frenchman, Sivaden who worked for the World Health Organisation and Lynch (1960) with his work on city imaging as the instigators of the field.

Environmental psychology grew out of a recognition amongst the above-mentioned researchers that the 'environment' was an important independent variable in the study of human behaviour, as all behaviour takes place in some sort of environment. Additionally, there was a growing awareness amongst environmental manager groups (planners, architects, industrialists, educationalists etc.) that the environments that they were creating were actually exerting important mediating and causative effects on all aspects of human behaviour and human experience. An early example of such concern is the government-promoted work of Ittelson and Proshansky on the architectural design of mental hospital spaces (see Ittelson, 1960). Alongside this concern for deliberately-created environments, there was also an increasing awareness of the environmental effects of man's activities which were not deliberate. Environmental pollution in the form of atmospheric emittants, river and water pollution, noise from aircraft, industry and motor cars were all effecting the human experience, but nobody knew quite how. Thus environmental psychology became a branch of the subject with an interest in the environment (any environment) as the independent variable in human behaviour studies. It was "above all, an applied science since it came into existence because of actual problems" (Levy-Leboyer 1982, 16).

The distinction between environmental psychology and other branches of psychology cannot solely be explained by this consideration of the 'environment' factor. Indeed, other areas of the subject do incorporate environmental factors into their explanatory and
investigatory procedures. The distinction can be most fully appreciated when the necessary differences in methodology are considered. To such purposes, Proshansky (1976) has offered a very good narrative. In his semi-autobiographical review of the subject, he has shown how environmental psychology grew out of a recognition of the important role that 'spaces and places' play in the lives and behaviour of individuals. He has explained that the methodological requirements of this branch of psychology differ greatly from those of the parent discipline, and he has highlighted four of these requirements. First that "there is only one real world to be studied" (Proshansky, 1976, 306) and that nothing short of studying behaviour in the actual, real environment would suffice in this research. Thus the environmental psychologist is released from the experimental laboratory. Second that individual/physical setting relationships must be studied in their totality at the molar level, otherwise the rationality of the approach and research aims are undermined. Third, that behaviour is to be studied in its natural setting by extensive observation and that researchers should be guided in approach by the ethnologist who studies animal behaviour in natural settings. And fourth, the process of studying and observing must not distort or interrupt the situation being studied. Such observations would provide useful guidelines to much research in behavioural geography which often ignores many of these important considerations. Proshansky also threw light on the assumption made in behavioural research that man is consciously aware of most of what he feels and does. He related:

"Our early environmental research revealed to us in no uncertain terms that the individual is mostly not aware of his behaviour and experience in the continuing process of responding to the kaleidoscope of physical settings that he enters and leaves in the course of his day to day existence. Ostensibly, the person knows where he is and indeed he can even describe the physical setting in which he happens to be; but what he often does not know is how he uses his physical setting, that is his movement patterns, sensory adaptations, and even inner feelings (such as stress produced by noise). Of greater significance is the fact that in most instances, the assumed constellation of specific likes and dislikes, preferences and rejections, positive and negative attitudes about these physical settings do not exist- have not been crystallized. There may be and often are some very general feelings and preferences, but these remain inchoate" (Proshansky 1976, 307).

The implications of this for the use of interviews, attitude scales, opinion questionnaires, and other survey forms are that one cannot use such techniques to elicit accurate responses to questions that require the person to crystallize hitherto unknown opinions, attitudes, feelings etc. 'on the spot'. This is another field of expertise in which the behavioural geographer would do well to look to the psychologist for advice. As we have already seen, much behavioural research in geography tries to elicit responses to just these sorts of inquiries. Such methodological issues are discussed further in Chapter Three. Finally, Proshansky has spoken of the importance
of 'time orientation' and 'context orientation' in environmental psychology, and has explained how the individual/environment relationship is never divorced from time nor from the social, societal and cultural milieu surrounding these activities.

In the 1960s, the methodological requirements of environmental psychology represented a very radical departure from the concentration of effort hitherto in highly controlled, laboratory situations. Indeed, not only had much psychological research taken human subjects out of their natural settings, but it had failed to use human subjects altogether, even when trying to find explanations for human behaviour. To the newly converted environmental psychologist therefore, there was a sense of release from a former methodological straitjacket (Proshansky, 1976). This did however also present the environmental psychologist with substantial teething problems, as (s)he had to build a new theoretical and methodological framework if any order or structure was to be imposed upon the new sphere of activity which was indeed far reaching as Heimstra and McFarling (1974) have pointed out:

"Virtually any aspect of the built or natural environment with which man interacts can influence his behaviour and, consequently, could be selected as an independent variable" (Heimstra and McFarling 1974, 105).

Thus, there are many potential independent variables at any scale of environment, from the micro-scale (for example, hospital wards or school classrooms) to the macro or world-scale. Indeed empirical researchers in environmental psychology have taken up the challenge of this diversity to the full. Holahan (1986) has recognized the primary areas of investigation during the 1970's and 1980's to be; environmental assessment, cognitive mapping, environmental stress and spatial behaviour as he noted that the previous three reviews of the field in the Annual Review of Psychology (Craik (1973), Stokols (1978) and Russell and Ward (1982)) had concentrated on these areas. Indeed, a brief consideration of selected research topics will serve as an indicator of the logistical and organizational difficulties a reviewer of the field faces. A list might include special environmental-user groups (e.g. the elderly, handicapped, women (Peterson, Wekerle and Morley, 1978), household and building design (Heft, 1985), environmental hazards (Burton, Kates and White, 1978), conservation (Williams, 1979), pollution (Evans et al, 1982), office, institutional and housing environments (e.g. Ittelson, 1960; Weineman, 1982a, 1982b), crime and architecture (Rand, 1984), crowding and stress (Zimring, 1982), neighbourhood satisfaction and safety (Desai, 1981; Guest and Lee, 1984; Good, 1980; Munro and Lamont, 1985), temperature (Anderson, 1984), noise (Weinstein, 1982), landscape preferences (Domino, 1984; Kaplan, 1985), cognitive mapping (Zeller and Rivizzigno, 1974; Jenson-Butler, 1981), sense of direction (Garling, Book and Lindberg, 1986) and the list might continue. A plethora of writings now exist on the aims, development and theoretical underpinnings of environmental psychology (see for example Craik (1977), Proshansky and Altman (1979), Canter and Craik (1981), Russell and Ward (1982), Stokols (1982),
Levy-Leboyer (1982), Feimer and Geller (1983), Canter, Craik and Griffiths (1984), Holahan (1986) and it is considered here only in respect to its relationship to behavioural geography.

2.3. The relationship between behavioural geography and environmental psychology.

Although methodologically, behavioural geography is not as bold a departure from its parent discipline as environmental psychology has been, it has been faced with precisely the same theoretical and methodological problems as those which have been discussed above. The investigative arena of man/environment relations is the same in both sub-disciplines, as are the focal concerns of environment and behaviour. In both traditions, the diversity of potential research problems and resolutions has been both a source of excitement and an obstacle to the development of an overall theoretical framework. It would seem that psychologists have developed a series of clearer theoretical and methodological statements than have geographers, and that they seem altogether more confident. This may be because the actual problem area is more firmly pitched in their field of expertise. The multi-disciplinarity that both subjects herald as one of their aims should enable development to take place synonymously and uniformly. If these two fields can escape the confines of their disciplines and dispose of disciplinary titles altogether, perhaps multi-disciplinarity might be achieved. Spencer and Blades (1986) however have remarked that cross-disciplinary dialogue has in fact been limited and one-way:

"Behavioural geographers would seem more likely to cite environmental psychology literature (and indeed general psychology) than psychologists to cite geographical research. Indeed, the psychologist's ignorance of such relevant research is sometimes betrayed..." (Spencer and Blades 1986, 237)

Attempts have been made to escape disciplinary labels, and some now refer to the field of interest as 'E and B research' ('Environment and Behaviour'), as a product of the behavioural sciences. The journal entitled "Environment and Behaviour" publishes output from these behavioural scientists and they frequently cite the work of both geographers and psychologists (see for example Kantowitz, 1985). E and B research however is unlikely to replace 'environmental psychology' and 'behavioural geography' as descriptive subject labels because, as Spencer and Blades (1986) have argued:

"Environmental psychologists and behavioural geographers are likely to differ in their approach to ostensibly the same issues, both as a result of their initial training, and their continuing contact with the literature of their parent discipline" (Spencer and Blades 1986, 230).

This should be sufficient to ensure that the two sub-disciplines retain their separate identities. These authors contend that the psychologist is likely to be more centrally concerned with the comparative and developmental approaches, and the differences
between individuals than is the geographer (Spencer and Blades 1986, 235). Also, in considering the differences between the two subjects, Spencer and Blades have related:

"It is our impression that environmental psychology is marginally more applied in its outlook than behavioural geography; it may indeed reflect the origins of the former" (Spencer and Blades 1986, 238).

They have also argued that much environmental psychology research is a response to a practical problem. Geographical research is indeed more usually purely academic endeavour. This may be because the psychological output is more heavily weighted at the micro-space level whereas geographers are traditionally more interested in macro- and meso-spaces, as it might be argued that micro-scale research is easier to apply to policy-making situations than work at larger spatial scales. The authors have also pointed out however, that the geographer's concern with pattern has made their work of greater significance to urban planners than the psychologist's process-orientated studies.

This consideration of the literature will now move to areas which are more specific to this particular study.

2.4. Theoretical Considerations From Psychology

The theoretical underpinnings of the subject matter under scrutiny in this research project are considered in the next section 2.5. In this section concern is for the theory and debate surrounding the concepts which have provided the framework for the study. In the study of behaviour in space, geographers have recognized that the "key intervening variables in man-environment transactions are perception and cognition - the internal mental processes by which individuals sense, perceive, interpret, and make decisions about their environment" (Gold 1980, 19). Models of individual environmental cognition created by geographers centrally involve such concepts as 'perceptual filters' and 'perceptual receptors' (Downs, 1970, 85) or 'cognitive representations', 'cognitive processes' and 'personality variables' (Gold 1980, 42). Obviously these concepts lie firmly within the field of psychology and they have been for this reason, subject to misinterpretation and misuse by geographers. It is my belief that studies such as this, which are centrally concerned with the development of environmental cognition (a process which is mediated by perception) should clearly state from the outset how they wish to interpret these terms, and it is in the psychological literature that the formulations have been sought.

2.4.1. Perception, Cognition and the Environment.

Proshansky et al (1976) have referred to research directed solely at spatial cognition and perception as "the most 'psychological' aspects of environmental psychology"
Proshansky et al. (1976, 102) and they have recounted the changing attitude of psychologists towards the usage of these two terms. Historically, psychology started with cognition and perception sharply defined, but, as they came under closer empirical and theoretical scrutiny the supposed boundary that differentiated the two terms became more and more blurred. Today the terms are used by most researchers in the field almost interchangeably, as "they have developed a tacit agreement that the two are, in some sense, very largely synonymous" (Proshansky et al. 1976, 102). Some do however, prefer to keep the concepts somewhat separate. Moore and Golledge (1976) acknowledge that "the distinctions between perception and cognition fall short of forming a clear dichotomy", but they have attempted to separate the two terms thus:

"The standard criteria for perception are immediacy and stimulus dependency", and "in its most general sense, …cognition refers to the various means of awareness or knowing that intervene between external energy impingements in the present and the past and the entire gamut of human behavioural responses, present and future. Cognition thus subsumes the more specific concepts and sub-stages of sensation, perception, imagery, retention and recall, reasoning and problem solving, and judgement and evaluation" (Moore and Golledge 1976, 6).

Such definitions suggest that perception is simply the process by which the individual becomes aware of a sensory stimulus, but does not include any knowledge that the individual may have already, although it may be mediated by it. Perception is thus a short-lived event and the process by which man cognitizes everything that is external to himself.

Ittelson (1976) in his review of contemporary perceptual theory, has set down several definitive philosophies with regard to 'environmental perception', and it is to these definitions that this work subscribes. For this reason, his arguments will be considered here in more detail. First, he has argued that perceiving is "both phenomenal experience and directive for action". He has claimed that perceiving is a much more complex process than many generations of psychology students were led to believe when they were guided (until recently) by Aristotle's argument that perception was the conscious experience of sensory input. Ittelson regards perception as an individual's source of information about the environment. Traditionally, psychological studies of perception involved presenting the subject with visual stimuli and recording their response. In adhering to this tradition, therefore, environmental perception would be understood to be people's response to environmental stimuli. Additionally, Ittelson has remarked that a stimulus in psychology has been traditionally understood to be "physical energy outside the organism [which] initiates processes, the end product of which is a response wholly determined, and predictable from the nature of the stimulus" (Ittelson 1976, 146). He recited an earlier comment by Stevens that "there is only one problem in all of psychology - the definition of the stimulus" (Stevens 1966, 31). A more usually accepted conception of the stimuli in environmental psychology today is
that the environment presents the individual with an array of stimulus information. This removes the observer (man) from his hitherto passive role as a receiver of stimulation to a more active role as a receiver of and indeed searcher for information. Ittelson argues that if environmental stimuli are conceived as information bearers as indeed they should be, then the processes of receiving these stimuli cannot be separated from wider psychological processes. Additionally, he relates that perception cannot be understood by reference to the stimulus alone "as one of the most remarkable conclusions" of contemporary perceptual studies has been the assertion of the relative independence of perceiving from the stimulus. Thus a person's psychological make up will influence his or her perceptual ability and experiences. He has criticized the 'inadequate assumption' that two isolated systems are involved in the process of environmental awareness - "perception and cognition, with certain fixed and unidirectional contacts between them". Instead, Ittelson has referred to the "growing acceptance of an approach which considers the whole perceptio-cognitive system as part of a larger system whose fundamental function is the processing of information" (Ittelson 1976, 147). He offers three very general conclusions on the nature of perceiving: "First, perceiving is relatively free from direct control by the stimulus. Second, it is inseparably linked to, and indeed indistinguishable from, other aspects of psychological functioning. Third, and perhaps paradoxically, perceiving is relevant and appropriate to the environmental context in which it occurs" (Ittelson, 1976; 149). This final point is born out of studies which have revealed that different types of environments will lead to "perceivers who perceive" in different ways (Ittelson, 1976; 147). This is an important consideration in environmental perception studies when one tries to compare the results of perceptions of environments which differ significantly or have a different contextual utility for the actor (for example a tourist environment or a home environment).

Ittelson has also considered the nature of the environment as it presents itself to the perceiver. He sets out seven properties of 'environment'. First, he shows that in traditional perception studies objects are observed by subjects and that the object is nothing without a subject to perceive it. He argues that in contrast, one cannot be a subject of an environment, "one can only be a participant". This is because environments surround the participant, and he can only explore it. Thus it follows that the "problem of exploratory behaviour, its nature, function, and its relation to the individual's larger purposes, becomes central to the study of environment perception" (Ittelson, 1976; 149). Second, environments are always 'multimodal', presenting information through a concert of sensory modes all at once. Perceptual experiments have "been deficient in their study of multimodal processes and yet these are essential for understanding environment perception". Third, Ittelson has drawn attention to the peripheral information that is always present in an environment, alongside any aspects which may be centrally in focus. Fourth, "environments always provide more information than can possibly be processed" (Ittelson, 1976; 150). Therefore, actors
have to be selective about the information they receive and process. Fifth, "environment perception always involves action" (Ittelson, 1976; 150). Actors can be manipulators of the environment, and so the relationship between the perceiver and the perceived is in a state of dynamic equilibrium. A sixth characteristic is that the environment provides "symbolic meanings and maturation messages", which can serve as directives for action. Finally, "and perhaps most important of all, environments always have an ambience, an atmosphere, difficult to define, but overriding in importance" (Ittelson 1976, 151). Within this 'ambience' category, Ittelson has considered the social aspects of environments as; "environments are almost without exception encountered as part of a social activity.... and environment perception is largely a social phenomenon" (Ittelson 1976, 151). He also considered the aesthetic and systematic quality of environments to be part of their ambience. Of the latter, the Ittelson has remarked:

"The various components and events (accruing to the environment) relate to each other in particular ways which, perhaps more than anything else, seem to characterize and define the particular environment. The identification of these systematic relationships is one of the major features of the process of environment perception" (Ittelson 1976, 151).

Ittelson has heralded the above list of seven characteristics to be "a minimum set of considerations which must be taken into account in any adequate study of environment perception" (Ittelson 1976, 151). Such studies would aim to attempt an understanding of the total environmental experience of individuals and should study the environment in its totality, in all its dimensions, possibilities, contents, meanings etc. The present study attempts to do this after a necessarily modest fashion (the modesty arising from the hugeness of the problem rather than the limits of the study aims). It attempts to take into account all of Ittleson's seven considerations, which is why they have been discussed at such length. A final reference should be made to Ittleson's paper. He has set out what he considers to be the five processes involved in environment perception. These are: 'affect' (emotional response to ambience), 'orientation' (mapping the location of features), 'categorization' (a taxonomy of environmental content, unique and idiosyncratic), 'systemization' (gaining understanding of systematic relationships in the environment) and 'manipulation'. These, he has related, do not function sequentially but rather interact with each other, and the nature of each process is unique to the individual. "The way one views the environment thus is, in a very general sense, a function of what one does in it, including what strategies are used in exploring and conceptualizing it" (Ittelson 1976, 153). Studies in environmental psychology and behavioural geography, as shall be seen later, have often focussed on one or other of these processes. One of the problems with empirical work in environmental perception has been that these processes have been investigated in diverse environments for diverse purposes and for reasons set out in the above discussion, they cannot easily be condensed into an overall theoretical framework as the nature of these processes is so
individual to environments and participants. Thus, various strands of insight abound, but they are contextually incompatible with one another. The only way forward in environmental perception research is to consider all the processes involved in the total perceptual experience simultaneously, and again, this study sets out to do just this.

The narrative in this section has devoted much attention to the ideas of Ittelson (1976), regarding the nature of the perceptual process and the qualities of environments which determine the environmental perception process. It has explored the conjecture that "perception" and "cognition" are largely synonymous processes, and by accepting this opinion, it has considered both environmental cognition and perception in one. It is acknowledged that such a view is held by a great many researchers but not all (see Downs and Stea, 1973; Hart and Moore, 1973; Moore and Golledge, 1976; Craik, 1977). Ittelson (1976) presents a convincing argument against distinguishing between these two terms, but even if there were no theoretical support for the interchangeability of term usage, it would remain a feature of work in the field as its present theoretical state has lagged behind empirical work and the usage of terms in empirical contexts. Terms have been used in the field before they have been adequately defined, and thus the legacy of confusion over which to use remains. It would be difficult now to reimpose a distinction. Indeed, those who do propose that there should be a distinction between these two terms are unable to functionally relate what this should be, except that it is one of "degree" and "focus" (Levy 1970, p251). Clearly such a distinction is unworkable but I would disagree here that it is useless in the context of this area of enquiry. The argument that one cannot distinguish between the concepts of cognition and perception is based upon the methodological problem of separating a person's perceptions from his or her cognitive processes. Indeed, methodologically this is impossible to do as research aimed at eliciting people's perceptions also requires them to cognitize and represent the information that they have in their heads (Figure 2.1.).

Even if the processes of perception and cognition are integrally linked however and impossible to separate, this is not to say that the actual processes themselves do not exist and cannot be differentiated. A person does not 'cognitize' an air of danger, he 'perceives' it; and he does not 'perceive' the spatial relationship between the major roads of a new city, but 'cognitizes' it. Thus we have a distinction in terminology for concepts which are empirically indistinguishable but descriptively and connotationally useful. In Figure 2.1, a conceptual framework is put forward for environmental cognitive processes, and it is to this framework that the author's conception of the field of study and the following research comply. As I see it, the individual acts in a perceived world, the details of which he stores by cognitizing them into an overall framework in his subconscious memory store. This memory store I have called 'cognitized space', and it may be the basis for subsequent routine or habitual behaviour. When actions are required by the individual, the information is retrieved from his cognitized space memory store and represented in his consciousness. Such
conscious retrieval and representation enables the individual to realise the cognitive images, representations and knowledge that (s)he has of the perceived environment; and upon these, (s)he bases his or her conscious decision making and subsequent behaviour. (This is not to say that all behaviour is the result of conscious decision making.) It is not known in what form these cognitive images exist in the memory store, whether they are induced, or whether they are intrinsic in the cognitive process and therefore already in existence irrespective of conscious formulation. One could argue that the conscious representation stage in the cognitive process does not take place at all unless the individual is asked to reveal his or her spatial knowledge, and only then is it necessary as spatial behaviour is more usually based upon subconscious cognitized space. Many criticisms have been levelled at cognitive/perceptual studies for trying to elicit something that does not exist in the form that is required for an individual to reveal it (Bunting and Guelke, 1979). It is my contention that conscious spatial representation does occur when it is required for conscious decision-making and non-routine behaviour. Routine or habitual behaviour would not require conscious consideration and is probably based on subconscious cognitized spatial information. The methodological implications of this conceptual framework will be considered at length in Chapter Three. Suffice it here to say that Ittelson (1976) is correct when he says that perception and cognition are part of the same process and cannot be differentiated. Indeed, they cannot be differentiated outside the individual, but within the individual, the proposed model put forward here suggests that they play different roles within the whole cognitive continuum. Thus, the position in the debate taken here is one of compromise. By so doing, this work can subscribe to Ittelson’s overall framework of perceptio-cognitive processes which, alongside my own model, provides a framework which is workable in the context of this research.

This consideration of environmental perception and cognition has highlighted the fact that they are processes, and as such, possess an inherent time dimension. It is to the consideration of this dimension that discussion will now turn. Brief consideration will also be given in this section to other psychological concepts which are employed in environmental cognition research because they are thought to bear some relation to these processes. These are personality, attitudes and motivation. The following section (section 2.5.) will turn attention to an aspect of perception and cognition that has been alluded to but unexplained, that is, the outcome of these processes. Of course, the processes of perception/cognition are ongoing, but at any one point in time they will have an outcome, consequence and manifestation to the perceiver. This outcome, it is suggested in my model (Figure 2.1.), can be both subconscious (cognitized space) or conscious (mental representations), and they may be similar or different, and both are correctly or incorrectly alluded to variously in the literature as spatial knowledge, environmental knowing, cognitive images, spatial representations, cognitive maps, mental images and mental maps.
2.4.2. The Time Dimension: Development and Learning.

2.4.2a. Development.

Four concepts have been associated with transformations in an organism; growth (physical accretion), maturation (physiological growth), learning and development. In this section, consideration is given to the latter two concepts, a pair that are difficult to differentiate, and like perception and cognition, command a history of controversy associated with their use as descriptive terms. In this study acceptance is given to two definitions which have been forwarded by Hart and Moore (1973):

"Learning involves quantitative changes in the reception and retention of information or subject matter... On the other hand, development implies qualitative changes in the organisation of behaviour. Most often it refers to the situation where the individual changes as a function of interaction between current organisation and discrepancy with the environment.... Thus theories of development are concerned with qualitative changes in structural organisation, whereas theories of learning are concerned with quantitative changes in the incorporation of specific information into structures" (Hart and Moore 1973, 250).

The present research is concerned primarily with environmental learning and thus learning theories have the greatest relevance here. However, the development of spatial cognition is important since, as Downs and Stea (1977) have contended, "development is a necessary (but not sufficient) precondition for learning" and "cognitive development is the development of the capacity for learning" (Downs and Stea 1977, 174). The study of development seeks to understand how people develop a knowledge of space, and how a progression from a low to a high level of spatial organisation is achieved. Thus, an individual's understanding of the concept of space and the dimensions therein (such as orientation, contiguity, distribution, scale and dimensionality) will affect the total amount, and the nature of spatial information that is perceived, cognitized and remembered (Figure 2.2.). Indeed some of the variance in levels of spatial knowledge between individuals who seemingly have had similar environmental experiences could be explained by differences in stages of cognitive development. Thus, development and learning are mutually dependent variables and as such, an understanding of one cannot be fully achieved without consideration of the other.

For analytical frameworks of development in human beings, geographers and environmental psychologists have turned to the work of the developmental theorists. The work of Jean Piaget and colleagues has been an important influence in this respect (Piaget 1954a, 1954b, 1962, 1963, 1968, 1969; Piaget and Inhelder 1967). Other influential developmental theorists are Werner (1948, 1957; Werner and Kaplan, 1963), Bruner (1960, 1964) and Cassirer (1944, 1953, 1955, 1957). Useful reviews of these theories have been provided by Hart and Moore (1973), Downs and Stea
FIGURE 2.2.

THE RELATIONSHIP BETWEEN LEARNING AND DEVELOPMENT.
Theories have been built from observations of ontogenesis (individual development over the life-span) from studies of child development and most theorists have advocated a comparative hypothesis which states that other forms of development, including microgenesis (short-term individual change), pathogenesis (psychopathological change), ethnogenesis (cultural change), historicogenesis (historical change and phylogenesis (evolutionary change) follow broadly similar patterns. This is an important contention in the context of this study as the focus here is the microgenetic development of knowledge about a new city. If such development can be better understood within the context of developmental theory, it is important to consider in briefly here below.

Golledge (1976) has drawn attention to the shortcomings of common conceptualizations of development which assume that all changes necessarily entail progress and that the latter stages of the process of change are necessarily more developed than the former. Instead, he favours a conceptualization propounded by Werner (1948, 1957) to which this thesis also subscribes:

"We may define development as qualitative changes, differences or variations in the organization of behaviour such that what are called more developed stages of behaviour are more differentiated and logically include and hierarchically integrate what then come to be called less developed stages and the behaviours associated with them. Because more developed stages are more organised, include more differentiated possibilities of behaviour, and include all the behaviours associated with lower levels of development, they theoretically are more flexible than lower stages" (Golledge 1976; 145-146)

The developmental psychology of Jean Piaget has received most attention and acceptance from psychologists and other social scientists concerned with cognition. His theories hold that development occurs in distinct sequential stages, each marked by characteristic and identifiable ways of thinking that are qualitatively different. The stages in this evolution he has called the sensorimotor (from birth until eighteen months or twenty four months of age), pre-operational (from twenty four months to seven), concrete operational (from seven to eleven or twelve) and formal operational (from eleven or twelve onwards). Each stage has sub-stages (it is possible that some people never develop all the way along the series) which bring with them different ways of cognitizing information which are necessary for adaption. The process of change from one stage to another involves assimilation (the process by which the individual forms schemata of the outside world) and accommodation (the readjustment of schemata to cope with assimilation). The work of Hart and Moore (1973) and its later refinements (Moore 1976) relies heavily on the developmental theory of Piaget, and it is their general position which is adopted as a framework for this research.

Not all geographers interested in the development of spatial cognition have been so keen
to adopt a Piagetian approach. Downs and Stea (1977) have followed a Brunerian thesis (Bruner; 1960, 1964) which relies heavily on the idea of distinct successive developmental stages, and propounds a theory of integration of the component parts of skilled operations. Bruner suggests that any operation can be broken down into less-skilled component parts, which a young child could perform. Development involves an increasing integration of these component parts into an integrated whole. He has spoken of the coding and processing of information into some sort of representation, which as the child develops, changes from "enactive representation" (a mode of representing past events through motor response), through "iconic representation" (representing past events as they were perceived and imaged) to "symbolic representation" (where things are represented symbolically and abstractly). Each of these modes of representation appears in order through childhood, and they all remain more or less intact throughout life. Piaget suggests a similar representation mode sequence, although his terminology is different. Downs and Stea (1977) have remarked that Piaget and Bruner have not directly tackled the problem of cognitive mapping and as far as its development is concerned, the available data do not yet allow the choice between the Piaget and Bruner views.

The hypotheses of Hart and Moore (1973) and Moore (1976) provide probably the most comprehensive framework for the study of the development of spatial cognition. They take Piaget's principal stages of intellectual development (sensorimotor, pre-operational, concrete operational and formal operational) and propose that they can be systematically related to three distinct stages of increasingly differentiated and integrated cognitive reference systems which they refer to as; (1) an undifferentiated egocentric reference system, (2) a partially coordinated, fixed reference system, and (3) an operationally and hierarchically integrated reference system (Table 2.1). These they also relate to Piaget's three stages of the fundamental organisation of space and construction of spatial relations; topological (understanding of qualitative relations like proximity and separation), projective (relations seen in terms of a particular perspective or point of view like a straight line or triangle) and euclidean or metric (relations seen in a system of axes or coordinates) space. Additionally, Hart and Moore have integrated the ideas of Cassirer (1944), Werner (1948, 1957) and Werner and Kaplan (1963) into their model with the addition of antipodal levels of spatial experience (concrete to abstract, fusion to differentiation, egocentrism to perpectivism). This whole sequence they have represented as a detailed and confusing table which, when deciphered, is an extremely useful model for the analysis of spatial cognition as it integrates a number of mutually supporting ideas (Figure 2.3). Finally, Hart and Moore have even superimposed their hypothesized progression of people's external topographical representations onto the diagram with the developmental sequence from route-based map drawings to survey-type representation (Figure 2.3). Where this is relevant here is in Hart and Moore's further supposition (which is backed by some exploratory empirical testing) that the whole framework can also be applied to the way
A GRAPHIC SUMMARY OF THE DEVELOPMENTAL THEORIES OF CASSIRER & WERNER; PIAGET, AND HART & MOORE.

Developmental Sequence

Integrated Development

CONCRETE

PACIFICATION

Developmental Sequence

DEVELOPMENT

Oniogenes, phylogenesis, microgenesis

morphogenesis, microgenesis

DEVELOPMENT

Evolution of the organism


cognitive sequence

Integration of perception and action

Perceptual space

Abstract symbolic, or contemplative space

Developmental Sequence

DEVELOPMENT

infancy

pre-school

middle childhood

adolescence and beyond

General Intellectual Development

Levels of Spatial Organization

Spatial Relations to be Constructed

Types of Reference Systems

And Topographical Representations

Source: Moore (1976, p.149). Moore (1986) superimposed the three developmental sequences to provide an overall model of cognitive and spatial development.
that adults learn about new spatial environments (Table 2.1).

In the first stage of adult learning about new environments, it is hypothesized that spatial cognition is egocentric and undifferentiated with mental representations held of only those places that are of great personal significance. Information is viewed according to one viewpoint and in terms of its practical significance, with positions located mainly through sequential and topological relations. At the second stage, individuals organize their environments into groups or clusters of elements, but the groups are not related to each other. Groupings are often based upon functional similarity or topological proximities and the use of projective relations like front-behind and left-right. No coordinate system is used to link the clusters. In the third and final stage, an overall system of reference is constructed for the coordination of viewpoints which are no longer tied to the subject's own actions. He or she now has a systematic abstracted reference system and can describe places in relation to this.

Criticisms have been levelled at Moore's contentions that individuals come to terms with large-scale environments in the same way as they do with micro-space (which is the scale at which Piaget based his reasoning), and that adult microgenetic development parallels child development (Gold, 1980). Pick (1976) has suggested an approach which does not rest on the assumption that macro and micro space are cognitized similarly. His ideas are more in keeping with those of Bruner (1960, 1964), and are based on the view that "both cognitive spatial relations and reference systems may develop by incorporation and integration of more and more remote features but do not involve any qualitatively different functions" (Pick 1976, 188). However, developmental theory of the type previously outlined above has been adopted by some to examine large-scale environments (Acredolo, 1976; Beck and Wood, 1976), and it shall be used and examined in the context of the findings of this study in an attempt to ascertain the extent of its general applicability (Chapter Five).

The above discussion has focused on qualitative changes in individual spatial cognition. The focus of this research is more centrally upon quantitative changes through time and the nature of the information which is held. Thus discussion now must turn to theories of learning in general and environmental learning in particular.

2.4.2b. Learning.

Golledge was one of the first to borrow the concept of learning from psychology, bring it into the geographical arena (Golledge 1969; Golledge and Brown 1967) and use it as a basis for research in environmental cognition (Golledge 1969, 1976, 1978, 1981; Golledge et al, 1976). He has defined learning as "the process by which an activity originates, or is changed through responding to a situation - provided that changes cannot be attributed wholly to maturation or to a temporary state of an organism"
In his early paper (1969) he has outlined some learning concepts which he believes to be 'spatially relevant' and therefore of use to geographers. These include the ideas of Lewin (1951) who conceived that the 'gap' between an individual's lifespace (which is perceptual) and physical space (which is actual), is closed by the process of learning; Tolman (1932, 1946) who advanced a theory of 'sign-learning' which hypothesizes that an organism learns about the environment, not by learning movement habits (as other theorists would have it), but by learning the location of paths or places; Guthrie (1942, 1952) who has proposed a learning model of stimulus, response and association which suggests that actions are driven by desire for goal achievement - if a reward for one objective is found in a location then a spread effect of learning will occur in the vicinity of that location; Hull (1964) whose habit formation or reinforcement theory proceeds from the individual undertaking trial and error search behaviours (which are not random but abide by a set of rules already established from past experiences), to a set of fully learned activities (which are seen as the asymptotic response to the environment; and models of environmental learning, most of which functionalize learning as a stochastic process (e.g. Concept Identification Models (Berry et al, 1962; Rushton, 1969; Briggs, 1976; Golledge and Rushton, 1972), Paired Associate Models (Golledge, 1967), Interactance Process Models (Hull, 1964; Simon, 1956) and Avoidance Conditioning Models (Luce, 1959)). Bush and Mosteller (1955) have provided a general review of these models. Geographers interested in environmental cognition have been quick to adopt the concept of learning in their studies because knowledge is not a static phenomenon but ever changing through the processes of learning and forgetting. Little work has been carried out on the latter of these two processes, but learning studies have become common. They mostly deal with the accretion of knowledge into spatial schemas which have come to be known as 'cognitive' or 'mental' maps.

There is one overriding problem which keeps manifesting itself in this review of environmental cognition research. As yet, it has not been addressed as its discussion most fully belongs to the subject matter of the next Chapter. However, this problem is of a conceptual as well as a methodological nature, and its irresolvable nature has constituted a stumbling block for researchers in the field. The problem is that whatever the researcher is interested in, cognition or perception, knowledge, learning or development, there are only two actual things that (s)he can study; human spatial behaviour and man's external representations of his or her environment through verbal, graphic or some other medium (Figure 2.1.). From these, the researcher has to infer the qualities of whichever mental process (s)he is interested in, and thus, although there are theoretical distinctions between these processes, there are no methodological distinctions.

One of the most important concepts for researchers in the field is the 'mental map'. Much confusion has accompanied the use of this term and this will be considered in
the next section. People interested in development and learning have mostly concentrated on the development of mental maps (e.g. Lewin, 1952; Hart and Moore, 1973; Moore, 1976; Beck and Wood, 1976; Downs and Stea, 1977) and the process of knowledge accretion to mental maps through learning (e.g. Lynch, 1960; Golledge et al, 1976a; Golledge, 1978; Appleyard, 1970, 1973, 1976; Stea, 1974; Stea and Blaut, 1973a, 1973b). Their models seem confusingly similar, leaving the field without clear distinctions and infecting the argument of the reviewer with the same malaise. Before considering the major learning models, the topic of mental or cognitive mapping must first be discussed.


2.5.1. The Nature of Cognitive Maps.

Several authors have expressed concern over the unconditional adoption of the concept of cognitive maps and mapping which is evident in some of the literature (Downs, 1981a, 1981b, 1981c; Kuipers, 1982; Bunting and Guelke, 1979; Boyle and Robinson, 1979; Canter, 1977; Rushton, 1979; Saarinen, 1979; Graham, 1976). Even more mistrust has been shown to exist concerning the use of 'mental maps' as a methodology (e.g. Johnston, 1973; Spencer, 1973; Blaut and Stea, 1974; Golledge, 1976; Evans, 1980; Kuipers, 1982) and this will be discussed at length in the following chapter. As a term and a concept, 'cognitive' or 'mental' mapping has been the subject of much interest. Indeed, many have regarded the terms behavioural or 'perceptual' geography and 'mental mapping' as synonymous. As Downs (1981a) has remarked:

"Names [by which to denote a field] can be generated readily by pairing an adjective with a noun. A representative list of adjectives includes environmental, spatial, mental, cognitive, psycho- and perceptual; possible mates range from cognition, perception, knowing, images, maps and mapping, through to geography itself" (Downs 1981a, 99).

Psychologists too have adopted the concept, usually terming it 'mental', 'cognitive' or 'psychological' 'mapping' (Canter, 1977; Milgram, 1972). Concern in this discussion is not for the adjective, but for the noun. What is mapping? What is mapped? How are environments mapped? and most importantly, are environments mapped? Downs (1981a) has drawn the distinction between using the concept of the 'map in the head' as "an expressive metaphor" and as using it as "an explanatory analogy". He has suggested that many have erroneously adopted the idea as an explanatory analogy even though its early proponents most clearly intended its use as a metaphor (e.g. Tolman, 1948). The problem here is both a philosophical and a methodological one: First, do people store spatial information as map-like representations? and second, can these be externally represented? (especially, can they be represented in the form of
sketch maps?). Downs's narrative typifies the view of many who recognize that the map as a metaphor has intuitive appeal and is useful as an expressive tool to those interested in spatial cognition, but that acceptance of the map as the underlying structure of people's representations is "a potentially dangerous rostrum" (Downs 1981a, 101) and that it should not be accepted per se that people actually 'have' maps in their heads (Tobler, 1976; Graham, 1976, 1982; Downs and Stea, 1977; Golledge and Spector, 1978; Evans et al, 1982; Kuipers, 1982).

Cognitive mapping has been defined by Downs and Stea (1977) as an abstraction covering those cognitive abilities which enable one to collect, organize, store, recall and manipulate information about the spatial environment. As such, it utilizes the processes of perception, cognition and representation which are schematized in Figure 2.1. Evans (1980) has attempted to explain how cognitive maps can be distinguished from other cognitive representations of information:

"First, cognitive maps primarily represent spatial relationships among loci. Principles of commutativity and associativity are important criteria for map utility. Second, the representation, although not strictly cartographic, experientially contains some map-like qualities" (Evans 1980, 259).

Evans has expressed the belief that a good cognitive map facilitates movement through the "actual physical setting represented by the cognitive schemata of that space", and that information about location and not just content of space, is a central component of cognitive representations of physical space.

Thus defined, cognitive mapping is what behavioural geographers and environmental psychologists study. There is however, an important distinction between 'cognitive mapping' as process and 'cognitive maps' as products. Theoretically, the product of the process is the internal representation 'in the head' or the 'cognitive map'. It is this 'map in the head' which has commanded much debate in the field, as it may or may not be map-like, and much research has aimed to prove or disprove the validity of the 'map' as metaphor (e.g. Kuipers, 1982). As to whether or not the representation is map-like, debate is rather worthless. What matters is that people do store information about the environment and that these are functional in man-environment interaction. To dismiss the intuitive appeal of the map as metaphor is to impose greater problems of expression and comprehension within the field of study. Kuipers (1982) suggests that the "atlas" is "a far more sophisticated metaphor" than the map because it allows for both discontinuity between the areas mapped, and for changes in the scale of representations. Such debate is surely irrelevant to the major problem at hand, which is to find out what people know about their environments. It is important to realise Downs's (1981c) contention that language has structured our thought in the discipline, and the use of the word 'map' has made us believe that these representations are maps.
A further source of confusion surrounds the concept of the 'mental map', and it is the product of a lack of accepted definition over the term. Some have used the term to denote researcher-compiled aggregate preference surfaces (Gould 1967, 1970, 1973; Gould and White, 1968; Donaldson, 1973; Johnston, 1972b; Jackson and Johnston, 1982). Individual spatial preference is a value-related component of the mental map, and labelling it as a 'mental map' is like labelling the exhaust system of a car, a 'car'. Another source of confusion has been the practice amongst some researchers of equating people's sketch maps of the environment with their mental maps, and labelling these sketches as such (e.g. Pocock, 1976). Golledge (1981) has drawn attention to this problem, arguing that sketch maps often have inconsistent geometry and scale, and that a lot of research has been directed into the suitability of using euclidean principles to elicit people's mental maps (Tobler, 1976; Richardson, 1979; Golledge and Hubert, 1982). He emphasizes that "cognitive maps are not just the pencil and paper sketches that all too many believe to be the case" (Golledge 1981, 1330).

Instead, the 'mental map' is a term used synonymously with 'cognitive image' or 'mental representation' to denote all the information that the individual holds about the environment. As such it may or may not be map-like.

2.5.2. Images and Spatial Schemata.

Traditionally, the term 'image' has been synonymous with the term 'cognitive map' (Boulding, 1956; Lynch, 1960). Indeed terms like 'image' and 'spatial schemata' have presented another terminological problem to a field of study which is already overridden with them. Boulding (1956) has used the term 'image' to denote a person's known subjective world. As such, the mental or cognitive map is a part of the image (Downs and Stea, 1973). Lloyd (1982) has argued that the image is in fact, just the conscious appraisal of a part of the 'world in the head'. Similarly, Kosslyn and Swartz (1977) have conferred that "images are spatial representations that occur in active (short-term) memory", and that they are "not simply retrieved" but "generated from more abstract representations in long-term memory" (Kosslyn and Swartz 1977, 270). Tuan (1975) has defined the image as "something that we see when the environmental stimuli do not appear to justify it" (Tuan 1975, 208). Thus the contention is that the image is the consciousization of the contents of mental schemata and that it can supposedly represent an environment at any scale.

A 'spatial schemata' is thought to be the framework upon which both past and present environmental experiences are organized and accommodated (Lee, 1976; Tuan, 1975; Gold, 1980). Gold (1980) has suggested that the differences between images and spatial schemata are that images require such concentrated attention that they make one temporarily oblivious to current sensory information, whereas spatial schemata and the may be employed almost subconsciously.
The relationship between spatial schemata and the mental map is even less clear. For the purposes of this study, the spatial schemata is thought to be the organizing framework into which is placed the mental map (O'Keefe and Nadel, 1978). Much work has been carried out which claims to examine environmental images, spatial imagery and spatial schemata. Whether it is definitional confusion or methodological difficulties in disentangling one aspect of mental cognition from another, the enquiries of such studies are remarkably similar to those which claim to be studies of 'mental maps' or 'cognitive representations'. Again, the definitional and terminological cloud obscures direction in the field.

2.5.3. Determinants of Cognitive Mapping: Psychological Variables.

There are two issues that should be discussed under this heading. First, what are the determinants or influencing factors impinging on the process of cognitive mapping? and second, what are the determinants of individual cognitive mapping ability? Research efforts aimed at answering the first of these questions will be discussed in the next section (section 2.5.4.). Those aimed at the second of these questions have concentrated on the mental factors which could be supposed to influence an individual's ability to cognitize new environments (Bryant, 1984). Many have argued that personality will affect cognitive mapping or environmental learning (Irving, 1975; Sonnenfield, 1976; Beck and Wood, 1976a, 1976b; Craik and McKechnie, 1977; Carroll, 1978; Bryant, 1982; Walmsley, 1982; Potter, 1984). Some have extended this hypothesis to argue that people may well have a distinct 'environmental personality' or 'environmental disposition' (Sonnenfield, 1969a, 1979b; Beck and Wood, 1976; Taylor 1979; Potter, 1984). Sonnenfield (1979b) has argued that "consistent environmental personality types" can be identified such that they are "found among all populations, regardless of the contrast in cultural values otherwise distinguishing them, and regardless of the contrast in environments they occupy" (Sonnenfield 1979b, 97). The rationale behind this is that as Walmsley (1982) has directed, "environmental dispositions are closely related to personality traits" (Walmsley 1982, 279). Walmsley (1982) has extended the argument by proposing that work should extend the efforts in "personality theory from questions of how individuals relate to themselves and to others, to questions of how they relate to the environment" (Walmsley, 1982; 279).

Personality traits have been identified by psychologists which taken collectively, indicate certain personality types. (Stagner, 1974). The introversion/extroversion dichotomy has received most attention from researchers of mental mapping (Walmsley, 1982). Work has focused on how the introversion/extroversion personality type influences for example, regional preference structures (Walmsley, 1982), size of personal space (Porteous, 1977), preferences for housing types (Cappon, 1970), adolescents' learning of London (Beck and Wood, 1976), and consumer behaviour in relation to spatial cognition (Potter, 1984). So far, the results of such enquiries have been encouraging. For example,
Walmsley (1982) found that the seven personality traits said to comprise the introversion/extraversion classification (activity, sociability, risk-taking, impulsiveness, expressiveness, reflectiveness and responsibility) did offer quite high degrees of explanation for the regional preference structures of Australians. Potter (1984) on the other hand, found no clear relationship between introversion/extroversion and shopping behaviour, and similarly, none between shopping behaviour and spatial cognition. However he has argued that there are still strong grounds for the supposition that 'distinct environmental personality types' do exist (Potter 1984, 32). An attempt has been made in the present research to categorize the personality types of subjects into three classes depending on how exploratory they were in an environmental context. It was considered that this facet of an individual's personality would be most important in determining their ability to learn about a new environment. How this was attempted will be discussed in Chapter Three. The idea of using an introversion/extroversion classification was dismissed for the logistical reason of trying to minimize the time-requirements that the interviews would make of the respondents. I argue here that the 'exploratory' character dimension will accrue a measure of environmental disposition which is most relevant to the context of this research.

Intelligence is another psychological variable which might be supposed to influence mental mapping. This study had overcome the issue of individual intelligence differences by selecting as subjects, postgraduates. It is accepted that intelligence and IQ will vary even within such a study population, but the variability has here been controlled to an acceptable level. Geographers and environmental psychologists in general, have tended to ignore the intelligence issue, but a great number of studies have been carried out within the traditional areas of psychology which have examined the relationships between intelligence and IQ, and cognition and memory (Carroll, 1976, 1978; Cohen and Sandberg, 1977; Sternberg, 1977). Other researchers have addressed the slightly different issue of spatial memory (Garling, Book and Ergezen, 1982).

The affective component of personality has also received attention in attempts to account for differences between individuals in cognitive mapping. Variables such as emotional involvement with the environment (Walmsley, 1974), the affective qualities of landscapes (Russell and Pratt, 1980; Feimer, 1984), landscape evaluation and attitudes (Lieber, 1977; Gold, 1980; Kaplan, 1982), and motivation (Evans, 1976) have been examined in this context. Environmental stress has received attention as a factor which may influence how environments get mapped (Evans, 1982; Evans, 1984; Cohen et al, 1986). The stressors which have been examined within the field, have ranged from noise pollution (Weinstein, 1982), to air pollution (Evans, Jacobs and Frager, 1982), ambient temperatures (Anderson, 1984) and residential density (Heft, 1985). Whilst affective factors may be viewed as important determinants of cognitive mapping ability in phenomenological studies, they were considered not to be important in the context of a
quantitative study such as this.

A psychological variable which has been incorporated into the present study is ‘sense of direction’. This is considered in detail in Chapter Three (section 3.3.5b).

2.5.4. The Microgenesis of Cognitive Maps.

The growth of cognitive maps has been a subject that has interested numerous researchers. If one is to understand more about the content and form of cognitive maps, it is important to know exactly how they come about. At the ontogenetic developmental level, research has focused upon changes in cognitive processes and children’s growing awareness of space. At the microgenetic level, the conceptual border between developmental and learning studies becomes more vague. Microgenesis can be defined as change in an individual following an event in his or her life, brought about by learning or acquisition of new knowledge. Thus, a study of the growth of the cognitive maps of individuals of a city which they have recently moved to, is a microgenetic study. The division between the structure of those maps (changes brought about through development) and their content (changes brought about through learning), is functionally inseparable, and researchers have tended to concentrate on the whole product and both processes.

Some researchers have directed their attention to people’s navigation aids in new environments (Hart and Moore 1973; Siegel and White 1975). The rationale behind this focus is that people new to a city will need to quickly build themselves a framework of spatial relations from which to navigate themselves through the new area, and thereby acquire knowledge of it. This initial framework will determine an individual’s pattern of exposure to parts of the environment, and thus his or her learning about it. Thus, it is of fundamental importance to the understanding of the nature of urban cognitive maps. Most discussion on this topic has been concentrated within an on-going debate regarding whether people’s initial spatial frameworks are landmark or path dominant. Lynch (1960), was one of the first to offer opinion on this subject. He hypothesized that people more familiar with a city relied primarily on specific landmarks for navigation and orientation, and less on paths and regions which served as early learning frameworks. A similar position has been advocated by Appleyard (1970, 1976), Devlin (1976) and Kuipers (1978, 1982). Conversely, others have argued that their empirical evidence supports the claim that the relative position of landmarks are learnt first (Hart and Moore, 1973; Siegel and White, 1975; Evans, Marrero and Butler, 1981; Garling, Book and Ergezen, 1982). Evans et al (1981) have forwarded an ‘environmental learning model’ which suggests that human beings mutually learn the relative position of landmarks in space:

"Exact landmark location emerges as a function of increasing path interconnection among initial anchor points."
As more routes are filled in between these points, the exact locus of each point is fine-tuned, since fewer alternative loci are possible given the dual constraints of interlandmark position and spatial relationships with the emerging path network (Evans, Marrero and Butler, 1981).

The environmental learning model of Evans, Marrero and Butler, implies that anchor points are used for cognitive map development. This is consistent with the "anchor point" hypothesis advocated first by Lee (1964), and further stressed by Briggs (1972) and Golledge and Spector (1978). Their ideas are based upon the developmental theory of Piaget (Figure 2.3) which, when applied to urban cognitive maps, implies that a map will grow from an egocentrically-orientated scheme to a full euclidean and geometrically coordinated representation. Golledge and Spector (1978) have hypothesized;

"there exists a continuous movement from an egocentric state where the centre of the world is the subject's own environments and spatial relations are known at best topologically, to a more abstract view of the complete system which is partial, distorted and somewhat ambiguously defined, but where the geometry and morphology of the environment are coordinated and are known at least partially, to each individual" (Golledge and Spector, 1978).

This position on microgenetic development has been criticized by many as it is based on the assumption that microgenetic developmental sequences parallel ontogenetic sequences (Sonnenfield, 1982), and as such, make no allowances for the influence in adults of previously acquired spatial understanding and transfer learning from one environment to another (generic knowledge). Indeed, it seems more reasonable to suppose that the 'inferential structuring' of cities occurs where adults suppose that a city's spatial structure will be similar to those already encountered in other cities, and that these "unconscious personal rules about environmental relationships" (Appleyard 1970, 115) will greatly determine the growth and structure of urban cognitive maps in new settings.

Sympathetic to the anchor-point hypothesis, but offering a model with considerable intuitive plausibility, Golledge (1978) in his environmental learning model suggests that this learning is built around conceptions of nodes and the links between them (Figure 2.4.). He argues that a newcomer to a city will immediately identify with primary nodes of personal significance which are normally his or her home, workplace and nearby shopping facilities. The routes between these primary nodes will become known and thereby, become his or her primary links (Figure 2.4a.). Spillover effects occur in the regions of the primary nodes and links, and secondary nodes (places of secondary importance i.e. other shops, services, friends houses) will become established (Figure 2.4b.). As searching and trial and error behaviour acquires greater coverage, an individual will acquire a coordinated knowledge of a wider area which comprises a hierarchy of paths and nodes based on the original framework (Figure 2.4c.). The model is generalized by defining places in an environment that will have a high
FIGURE 2.4.
AN ENVIRONMENTAL LEARNING MODEL - GOLLEDGE (1978).

A. Skeletal path relations

B. Nodes, paths and neighbourhoods

C. Nodes, paths, neighbourhoods and linkages

probability of being defined as primary nodes by large subsets of the population. Such a node set, Golledge hypothesizes "should provide the anchors for cognitive representations of the environment for a significant part of the population" (Golledge 1978, 81). The size of an individual's node-path set will reflect the amount of knowledge that the person has and will determine their mental distortion of spatial reality. The assumptions of the model are therefore;

"that a large-scale environment such as an urban area becomes known as a collection of parts. These parts consist of a hierarchical node set, and areas of various scales and with various degrees of generalization. The paths, nodes and areas are linked together through the concept of spatial relations so that some type of comprehensive understanding of the external environment is sustained by the individual" (Golledge 1978, 82).

In another paper, Golledge and Spector (1978) have argued that these hierarchical structures are fundamental to our understanding of urban cognitive maps.

Many writers including Carr (1965), Carr and Schissler (1969), Winkel, Maleck and Thiel (1969), Milgram (1970, 1972), Zannaras (1973), Zeller and Rivizzigno (1974), Allen, Kirasic, Siegel and Herman (1979), Evans, Marrero and Butler (1981), McGill and Korn (1982), Holahan and Sorenson (1985), have proposed environmental learning models which follow similar lines. They are mostly concerned with spatial or sequential dominance in cognitive maps, or with defining environmental cues which serve as aids to environmental learning. This study, which focuses on the microgenetic growth of cognitive maps of new urban areas, aims to examine the applicability of the model posited by Golledge (1978), and the applicability of using a developmental framework based on Piaget's ontogenetic sequence for adult learning. Additionally, the study aims to discover the sequence of change in the dominant elements in mental maps (if such a sequence actually exists), and whether paths or landmarks (sequential or point elements) are more important during certain stages in the learning process. This last aim requires qualification as it is based on the assumption that adults actually do progress through identifiable 'stages' as they learn more about urban areas (Downs and Stea, 1977). This study aims to determine whether these 'stages' can be identified or whether individual environmental learning is so idiosyncratic as to make it inappropriate to speak of stages at all.

To end this consideration of the huge volume of theoretical literature on environmental learning, I shall propose my own model of cognitive map development. First it is necessary to consider a factor which has so far, remained undiscussed, but which is nevertheless very important. This factor is scale of environment. Mental maps comprise information about environments at many different scales and it would seem reasonable to suppose that, just like real maps, the larger the scale, the less detailed the map will be. This study is concerned with the meso-scale, and as such
concentrates on the urban environment. However within this, the city can be conceived as being comprised of many different scales of environments; the local or neighbourhood scale, the city centre scale, the citywide scale and the city-region scale. Various empirical studies have focused on all of these. This study concentrates on the city of Leicester at two scales: the city centre and the citywide. The model proposed by Golledge (1978) will be examined at the citywide scale. The following conceptualization offers a model for examining the development of cognitive maps at the city centre scale.

Individuals progress through four loosely defined stages of understanding of spatial relations. At stage one, the initial understanding of spatial relations between landmarks evolves from a knowledge of the links between them. Any suggestion that landmarks are the dominant elements of the learning process at the beginning, I would argue here, ignores the logistics of locomotion. Individuals have to know a route before they can get to a landmark. In the first stage therefore, an individual builds up an elemental knowledge of the main thoroughfares with an understanding of a small number of key landmarks that (s)he will find along the way. The cognitive representation is route (sequential) dominant. During stage two, the individual learns about more and more landmarks that (s)he will find along the skeletal road framework learnt in stage one. Perhaps one or two more paths will be added to the conceptualization, but the main growth is one of points (landmarks). Here neither paths nor points are the dominant elements. In stage three, the landmarks known, and new landmarks which a person needs to find, serve as anchor points for more links to develop around them. In this stage, landmarks are the superior elements, and locational spillover effects will secure learning in the areas around the major landmarks (Golledge, 1978). The learning of new links will increase the accuracy of an individual's perceived landmark location (Evans, Marrero and Butler, 1981). Finally, stage four represents an asymptotic level of knowledge where individuals possess an integrated framework of landmarks, paths and their interrelations 'in their heads'. Neither sequential nor spatial elements are dominant at this level, but people's free-recall sketch maps are likely to reflect the use of either a path or landmark based framework, which is due to their spatial comprehension rather than differences in spatial knowledge. This model will be tested against the empirical evidence arising from the present study.

2.5.5. The Relationship Between Urban Cognitive Maps and Behaviour.

Although the underlying aim of work in this field is to help in the understanding of the link between the subjective personal world of the individual and his or her spatial behaviour; as yet, work has accomplished a deeper understanding of the 'world in our heads', but it has failed to make the leap between this and subsequent behaviour (Golledge, 1981; Evans, 1980). In fact, within certain areas of cognitive mapping
studies, the relationship has been examined in reverse, that is, how behaviour has
affected the acquisition of cognitive maps. Applied studies in psychology and economic
geography have come closest to establishing a link between these two conceptual
domains. The influence of cognitive maps on people’s behaviour in small-scale
environments has been under the jurisdiction of psychologists. Within geography,
decision-making models have arisen that attempt to predict behaviour from the basis of
incomplete knowledge in cognitive maps. These have been most numerous and fruitful
in the field of agricultural and marketing geography (Huff, 1960; Hudson, 1976;
Jarvis and Mann, 1977).

Such a paucity of ideas on the relationship between cognition and behaviour, is a
reflection not of the failure of research in the field, but of the effects of the
methodological hurdles which need to be overcome before any such links can be
established from empirical research. These methodological problems will now be
discussed in Chapter Three.
Table 2.1. A GENERAL FRAMEWORK FOR THE DEVELOPMENTAL ORDERING OF COGNITIVE REPRESENTATIONS.

I. Undifferentiated concrete egocentric
This level includes primitive symbolic representations characterized by:

a. Lack of differentiation, i.e., all information is assimilated to one undifferentiated viewpoint and differences and variability in the subject matter are not recognized.

b. Complete egocentrism, i.e., an exclusive conception of all information from one's own egocentric point of view.

c. Predominance of concrete references, i.e., systematic relations among the elements of the representation are lacking.

d. Lack of overall organization i.e., systematic relations among the elements of the representation are lacking.

II. Differentiated and partially coordinated into fixed subgroups.
This level includes intermediate symbolic representations characterized by:

a. Differentiation without integration, i.e. differences and variability are recognized and aspects of the representation are differentiated from each other but are not integrated into an overall structure.

b. Partial decentering but partially continuing egocentrism, i.e. decentering from own point of view on some but not all aspects and subsequent centering or focusing on some aspects from other points of view.

c. Concrete and abstract references, i.e., some aspects seen in strictly concrete terms while others are seen in abstract terms.

d. Partial coordination into fixed subgroups, i.e., some but not necessarily all information is brought together into partial subgroups, such that the organization of this information within different subgroups is at a higher level than the organization or partial coordination between subgroups.
Table 2.1. (Cont'd.)

III. Operationally coordinated and hierarchically integrated.
This level includes highly organized representations characterized by:

a. Differentiation and hierarchic integration, i.e., aspects and points of view are clearly differentiated from each other and are integrated into an overall structure.

b. Complete decentering and coordination, i.e., decentering from own point of view on most aspects and subsequent coordination of multiple points of view.

c. Predominance of abstract references, i.e., subject matter information and resultant aspects of the representation are seen in abstract terms.

d. High degree of overall organization, i.e. most information is brought together into subgroups and the subgroups are hierarchically integrated into an abstractly conceived structure wherein the subgroups are subordinated to the total organization of the representation.

Source: Moore (1976, 154)
"If images are important we should find some way of measuring them. Even a rough measure of a significant variable is better than a precise measure of something that does not matter" (Saarinen 1979, 465).

CHAPTER THREE.

METHODOLOGY.

This Chapter will provide an overview of the research methodology employed in this study. It is divided into two sections. The first gives consideration to the philosophical and methodological problems which are inherent in the field of environmental cognition research, and the second offers a description and discussion of the methods used to extract information from people regarding their cognitions of the environment.

3.1. Problems in Environmental Cognition Research.

Spatial representations are hypothetical internal entities (of which people may or may not be aware), and their nature can only be inferred from some kind of 'externalized' or 'extracted' manifestation. The task of eliciting the contents of the mind, by way of such a manifestation raises difficult philosophical as well as methodological issues. Is it really possible for example, to elicit what is in the head without changing its nature? And, if spatial representations exist in a form that the owner is not aware of, will not the very task of having to crystallize hitherto unknown opinions, attitudes, feelings, spatial relations etc. 'on the spot' alter those very things that the researcher seeks to identify? This introduces the question as to whether or not we can elicit what is in the mind at all?

Bunting and Guelke (1979) launched an attack on behavioural and perceptual geography using as their ammunition some of the uncertainties stated above. In their opinion the field of enquiry has "failed as a sub-discipline of geography because of its fundamental, if implicit, assumptions." They continue, "the assumption that readily identifiable environmental images exist in people's minds and that such images can be measured simply and accurately is open to serious question" (Bunting and Guelke 1979, 460). Similarly, they raise their doubts about the suitability of the interview as the tool for collecting information from individuals because; "there is nothing one learns in the course of living that would justify accepting that people can or will readily reveal the real thoughts behind their activities to outside researchers" (Bunting and Guelke 1979, 461). Philosophical debate in this area is destined to continue, as there are no answers to the questions which are posed within it. For this reason, it will serve no purpose to continue it further here. It is important to be aware of these questions,
but where there is conviction that the subject matter of the field is important as an aid to the understanding and prediction of human behaviour, then there is a need to try to study it. As Saarinen (1979) argued: "Even a rough measure of a significant variable is better than a precise measure of something that does not matter" (Saarinen 1979, p465).

There are three well accepted basic methodological problems in the study of the cognition of large-scale environments (Golledge, 1976; Golledge and Stimson, 1987). First, what methods can be used to extract meaningful information from individuals about their environments? Second, within what frameworks should the information be reported once it has been extracted? Third, how can the information and measurements best be analysed so that the results are correctly interpreted? Each of these problems will be discussed here in turn:

3.1.1. Methods Used To Extract Information From Individuals About Their Environments.

If there is doubt in the field as to what exactly researchers are trying to measure, there is even more doubt about how exactly to measure it. It is very difficult to design a methodology for the study of something that is hypothetical to the extent that its form is unknown. Indeed, methodological problems are inherent in work which aims to uncover 'what is in the head', as the very process of trying to extract the information necessarily alters its form. This would account for the present indecision amongst researchers in the field as to the use of methods, and the continual searching for new methods either newly developed or borrowed from other disciplines. Some have seen this as a great weakness in the field, a view that Bunting and Guelke (1979) have articulated as follows:

"Probably the most basic problem in perception research concerns the lack of any acceptable standards or criteria against which such elusive mental phenomena as environmental images and preferences can be evaluated and checked. Lacking any obvious or direct verification methods, some geographers have fallen into the trap of adopting the notion that anything that can be measured in one way or another must be real and accurate. Little consideration has been given to the philosophical and methodological tenets that underlie the issue of measuring mental images. Indeed, no consensus exists among researchers about the terms of their measurement techniques and no concentrated attempt has been made to develop a standardized methodology" (Bunting and Guelke 1979, p454).

In fact, much past and current work in the area of environmental cognition has been concerned with developing ways and means of externally representing what is within people's minds (Moore and Golledge, 1976). Different theoretical points of view and different perspectives have produced a considerable variety of methods for extracting
environmental information from individuals and for externally representing it in such a way as it can be viewed and analysed by other people. In defence of behavioural geographers from the Bunting and Guelke (1979) critique, Downs (1979) has argued;

"Development necessarily involves considerable trial-and-error; it is a long process. It is worth noting that the rigorous guidelines for measurement in psychological testing are the product of seventy years of development" (Downs 1979, p470).

Golledge (1976) has classified the tremendous variety of methods that have been developed into four categories depending on the nature of their attempts to externalize environmental information; (1) experimenter observation in naturalistic or controlled situations; (2) historical reconstructions; (3) analysis of external representation - participatory activities; and (4) indirect judgemental tasks. The following discussion will take each of these in turn and examine the problems associated with their use:

1. This involves the experimenter observing or tracking behaviour in actual or simulated environments and making inferences from this behaviour about the cognitive information and processes that are needed to undertake this behaviour. The word 'behaviour' here is perhaps a little misleading, as adherents to this approach do not always (or even often) observe normal behaviour, but rather, they observe the subjects solving some problem that they have set them. Such approaches necessarily involve small samples, and they may involve activity in the large-scale environment, or they may involve the use of models of environments, maps, diagrams or some sort of role playing. A recent study carried out by Walmsley and Epps (1988) in the town of Armidale, Australia, affords a good example of this type of approach. They devised an experiment which would examine respondents' orientational ability. A sample of people of mixed age were blindfolded and driven on a circular route to another part of the town. At their destination they were asked to leave the bus and, still blindfolded, point in the direction of the place where they had boarded the bus. Subjects' responses were then recorded by the experimenters. An advantage of this type of experiment carried out in a real-world setting is that it does not require the subject to perform additional cognitive operations such as scale-reduction, and the pretence of being in a situation that (s)he is not really in. Watching people find solutions to realistic problems in the real environment is in fact, arguably the nearest the researcher can come to observing real life spatial problem solving behaviour whilst still performing a specific replicable and controllable experiment. The last two points are very important. Some studies in this area have aimed to observe real behaviour by tracking peoples' everyday movements through space (Marble, 1967). This is logistically very difficult and it assumes that the knowledge that their movements are being tracked will not influence the subject's behaviour in any way. The problem with such observational techniques in supposedly real-life settings is that the observer,
although being able to 'see' the behaviour in question, is left to make considerable inferences about the reasons and motives behind the behaviour and thus, unless (s)he asks the subject for reasons/motives (and thus interferes with the behaviour), the problems of analysis (and the risk of drawing the wrong conclusions) are great. Other studies have similarly attempted to elicit real-life spatial behaviour by asking people to make diaries of their movements or participate in some other self-report technique. Such approaches obviously suffer from the additional problems of possible inaccuracy in the self-reports (due to forgetting or the subconscious omitting of certain things).

2. The "historical reconstruction" approach has been used mainly in the study of environmental perception. Adherents to this approach have argued that people's cognitive images of their environment can be understood from studying previously written material. This material may have been written whilst the writer was experiencing that environment or based upon his/her memory of that environment. Such an approach has the advantage of having no possibility of experimenter-interference in the recall of the environment. However, interference from other sources is great. For instance, most studies of this nature have focused on the works of fiction writers (see for example Tuan, 1978) who distort their descriptions and uses of environments for 'poetic' or 'dramatic' effect. There was certainly no compulsion on these authors at the time of writing for their work to contain any element of accuracy or 'truth'. Similarly, it is unlikely that these authors were in any way 'representative' of their contemporaries of the time (indeed, most evidence suggests the reverse), and thus, it is questionable whether their accounts of places based on their personal experiences are representative of a shared societal image.

3. The analysis of external representations of cognitive information involves the researcher asking the subject to produce an 'external' representation of the information contained in their mind. From these 'external' representations, the researcher can then determine both the amount and nature of information held, and the cognitive processes that are required to contain and reproduce this information. Common devices used to extract these representations include verbal and written reports, sketches, freeflowing conversations, and map and model making. These devices have been used in a variety of ways, and have involved the activity either at the time of perceiving or interacting with the environment, or at a later date in an interview or laboratory situation. They have concerned themselves in the main, with what individuals know and do not know about their environments. It is inferred either that what is not said (or drawn) is not known, or that what is not pointed out is of relative insignificance to the individual (see for example Lynch, 1960; Appleyard, 1970; Devlin, 1976). This of course, may not be the case. Other studies have been concerned primarily about whether or not the subject is able to perform the task that is set them, and how they actually carry it out (Moore 1973a, 1975). This kind of approach can determine stages of cognitive development of the individual and the cognitive processes required to undertake
such tasks. All these approaches suffer from problems associated with the abstract nature of the tasks themselves, interviewer interference in the cognitive processes (e.g. subjects possibly having to organize information into a different form to that which previously existed so that it can be externally represented) and possible differences between individuals in their ability to remember, verbalize aspects of their knowledge, draw, or perform modelling tasks, which will account for some of the variation in the resulting representations.

4. Finally, indirect judgemental tasks require respondents to reveal information about their cognitive internal representations of environments in response to tasks that aim to acquire this information in a less direct manner than those of the above. These approaches aim to uncover latent information about environments, and by doing so they supposedly do not suffer from the problems of information alteration in the same way that the direct exercises do. An example of such an approach is an experiment where subjects are asked to select from a list a number of adjectives that best describe an area, and the resultant list is then taken to be indicative of that subjects' knowledge of, and feelings towards that place. Such approaches make use of techniques such as semantic differential scales, repertory grid and multidimensional scaling procedures (see for example Golant and Burton, 1976; Harrison and Sarre, 1975). They rely heavily on indirect designs and inferential procedures and as such, fall most heavily within the domains and expertise of psychologists.

It has been seen above that all existing methods used to elicit knowledge of the large-scale environment have inherent problems associated either with their methods of extraction or the high level of inference which is required in their analysis. However, as Bunting and Guelke point out;

"...no approach is really capable of meeting the challenge of the determined philosophical skeptic" (Bunting and Guelke 1979, 460).

The methods that have been adopted for this study are discussed in greater detail below (section 3.2). The problem of inference from the results of these methods will be addressed in greater detail in section 3.1.3.

3.1.2. Frameworks of Analysis.

It has been seen above that there is a plethora of methods which could be used in the study of environmental cognition. There are also many frameworks that can be adopted for its analysis, and these are usually determined by the explanatory variables that the researcher chooses to use in the search for differences between individuals and/or groups. Work in the field has been directed at the solution of diverse problems as researchers have not been solely concerned with environmental cognition per se, but rather have investigated the factors which influence its development and
acquisition (see Chapter Two). Thus, the whole range of factors that could account for differences between people in their knowledge and abilities in the environment have been explored in previous research and each has required a different overall research design.

A major source of contention in the field is over the 'quantification' of analysis of differences between individuals and groups. Individuals are often grouped together in studies of environmental cognition, and their spatial representations are reported in the form of the group aggregate (see for example Gould and White, 1974). Some investigators have reported that spatial representations reported in the form of group aggregates are adequate (Magana, Evans and Romney, 1981) whilst others have argued that this is not the case (Ewing, 1981; Mackay and Olshavsky, 1975).

Aggregate data is a reasonably accurate reporting tool if errors are systematic and shared by all respondents in the group, however, random or idiosyncratic error is eliminated by group averages. Where the research design aims to discover possible variation between groups (for example within a developmental or learning framework), this effect is not an important consideration. However, some would argue that this framework of analysis is unsuitable for certain other investigations, and that it has led to possibly spurious conclusions. For example, many studies have compared group knowledge of the environment against 'reality', and often, they have found very high degrees of correspondence between the two (see for example Canter, 1977). Ewing (1981) has shown that very different conclusions could have been drawn if the results had been viewed at the level of the individual.

3.1.3. The Interpretation of Results.

Possibly the most constraining problem that research in the field of environmental cognition faces at the present time is the interpretation of the results accrued by the method chosen to elicit the information. This problem has been highlighted by studies which have tried to establish some convergent validity between the different techniques of information gathering. Newcombe (1983) has provided a brief review of such studies and has concluded;

"...studies that have looked at dependent variables in an effort to establish convergent validity have had mixed outcomes. Although some have been successful, the overall picture is that different techniques frequently reveal different results" (Newcombe 1983, 296).

It is easy to become downhearted when the results of two tests that are supposedly measuring the same thing disagree, and the logical conclusion that neither result is therefore accurate, seems all too unavoidable. This has been the fate of many studies in the field, and the weapon of many of its critics. However, as Newcombe has
pointed out, this effect is not necessarily the consequence of poor methodology and spurious results. Instead, there is very little understanding at the present time amongst the practitioners of research in the field, as to what exactly the methods employed are measuring. Indeed, the probability is that each method used measures a slightly different aspect of a respondents' spatial ability and knowledge of the environment. It is in the quest for an understanding of the exact nature of the demands on cognitive operations that the methods place, that research effort should be directed in the next few years. This is because it is this ignorance that is preventing research efforts in the field from making significant advances. Newcombe (1983), when considering the lack of convergent validity within the results of various methods used in the field, came to a similar conclusion:

"If we are able to predict when and why various methods should show differential distortions as a result of environmental and subject variables, however, the "failure" to establish convergent validity is seen in a whole new light. Different results with different measures become facts to be explained in future investigations of spatial processing, "clues" to the nature of spatial cognition" (Newcombe 1983, 298).

It might be expected that the body of psychological theory could help to relieve the field of this problem. However, psychologists engaged in the study of the cognitive processing of information (information-processing) are in almost as much confusion over which methods to use and which frameworks of analysis to adopt for work in this area as geographers are. They do have a history of psychological testing however, and are unquestionably in a stronger position to make sense of the measurements that these tests produce than are geographers at the present time. This position is not however, as Carroll (1976) has pointed out, as strong as it should be:

"What is still needed is a general methodology and theory for interpreting psychometric tests as cognitive tasks...." (Carroll 1976, 30).

Once there is a greater level of understanding about the exact nature of the cognitive tasks that researchers are asking their subjects to perform, environmental cognition research will be at last free from the shackles of its present methodological indecision. It will become clear which methods to use in which circumstances, and the establishment of an accepted methodology will be within reach.

The final section in this Chapter will outline the research procedure, methodology and framework of analysis employed in the present research.

3.2. The Research Design.

The stages of the research design can be divided into six component parts:

1. General methodological approach.
2. The study environment.
3. The study population and sampling frame.
4. The time periods.
5. The interview schedules.
6. The analysis.

3.2.1. General Methodological Approach.

This study was conceived as a quantitative investigation of the environmental learning patterns of newcomers to Leicester. Three groups of newcomers were to be interviewed after varying lengths of time in the city, and compared against each other and against a 'control' group who had been in the city for three years or more. Interviews were to contain a mixture of questions pertaining both to the personal characteristics of the subjects, and their environmental knowledge. The interview schedules were also to contain some tests for subjects to perform. The methods used to elicit information in the study were to be various, in order that cross-comparison and validation could be made between the results of these methods, and so that the study would not be subject to the disadvantages and shortcomings of any one method (a problem which characterizes much work in the field). Given the difficult nature of enquiry in this area, these shortcomings (which will be discussed later in this chapter) are often considerable.

The analysis of the results has been structured in such a way as to determine the differences between the four groups of respondents, so that changes in environmental knowledge with increasing length of residence might be recognised. The personal variables have also been examined for their contribution to the observed differences between respondents. The question as to whether within-group variation was greater than between-group variation has been addressed, in an attempt to discover whether other variables can be found to be more 'responsible' for the observed differences between people than length of residence.

The study has adopted neither a cross-sectional nor a longitudinal approach exclusively, but rather, it has combined the two approaches. The reasons for this will be discussed in section 3.2.4.

3.2.2. The Study Environment.

The city of Leicester provided an ideal venue for the study (see Chapter One). It is a city which is large enough to present a challenging task to the newcomer who needs to learn how to 'operate' within it, yet it is not so large that it cannot be appreciated, with time, as a functional whole. As such it is fairly typical of British cities. Its primary road structure is centripetal in spatial layout, with the city centre
providing the focal point of all the major routes.

For the purposes of assigning respondents to residential areas in the city, the researcher divided the built up area into thirty-four separate residential areas and assigned each a numeric identifier. The delimitation of areas was carried out with reference to ward-boundaries as a guide, but it very often did not correspond to these. This is because the researcher was anxious to divide the city in terms of likely neighbourhood activity spaces and like-social groups. Thus delimitation was carried out with the aid of the researcher's knowledge of the social areas and major roads of the city. The researcher's own knowledge of the city was most extensive in the southeast sector, which was the sector where accurate delimitation was the most important (as the majority of respondents lived here). The delimitation of areas therefore, presented no problem and is shown in Figure 3.1.

The city was also divided into ninety degree sectors using north-south and east-west lines as the delimiters. Thus four sectors; southeast, southwest, northeast and northwest resulted. It seemed that this method would produce the most realistic delimitations with regard to the respondent-image of the city (and his or her activity patterns), as most respondents could be classified as living in the southeast sector (Figure 3.2.).

A fuller description of the characteristics of the city has been given in the Introduction and is therefore, not necessary here.

3.2.3. The Study Population and Sampling Frame.

The selection of a study population was to prove difficult. Ideally, a study such as this should incorporate a wide cross-section of the general population so that the results obtained would be fully representative of that general population. However, in reality, the resources are never available for such coverage. Failing this, the researcher has to limit the scope of the study and concentrate on a certain group (or groups) of people. In the present research, the aim of the study was to identify the role of a particular factor in the process of environmental cognition (e.g. length of residence). For this reason, the other factors that could possibly contribute to differences between people needed to be controlled as much as it was possible. It was necessary that the study group was therefore as internally homogenous as possible so that the variable under scrutiny could be isolated. In this way, the research design could approach the conditions of a laboratory experiment.

With the above considerations taken into account, as well as the logistics of finding large numbers of people who had lived in Leicester for an exact period of time, the body of academic staff and post-graduate students at Leicester University were chosen as
the study population. This choice offered a number of advantages that would outweigh the obvious disadvantage that it was a group which was unrepresentative of the general population as a whole. First, they were an extremely homogenous group in terms of a number of variables; age (all between twenty one and thirty five years of age), educational attainment (which would indicate a fairly standardized level of intelligence - a factor which is important in any study of learning), life-cycle stage (all were single people), life-style, place of work and place of residence (almost all respondents were located in the southeast sector of the city). The personal characteristics of the study group are considered in detail in Chapter Four. Suffice it here to say that it would in fact be very difficult to find another such internally homogenous group of people. Furthermore, as a study of environmental learning, what better group of people to take than the people who are likely to be the most residentially mobile in society? Another advantage that this group had to offer was that they all moved to the city at the same time (at the beginning of the academic year). This ensured that the logistics of interviewing people after the same period of residence presented few problems.

Respondents were selected from the population on the basis that they had been part of the previous academic year's intake, and that they hadn't lived in Leicester at any time before. A list was obtained of all such people and was divided into two sub-lists on the basis of gender. A random system of selection was operated on both lists using a random numbers table so that equal numbers of males and females were selected (although this was not always possible since males strongly outnumbered females). This selection procedure was carried out twice to obtain the respondents who constituted the three month, six month and twelve month groups. Table 3.1. gives the population size and the sampling fractions attained. (Postgraduates enrolled on the PGCE course were not included in the study.) The four year group were more difficult to find. They were selected on a similar basis to the above from a list which showed the previous university of each person. People were randomly selected from those who had previously studied at Leicester. As they were the most difficult to find, only fourteen respondents constituted this group. This is admittedly a very small sample, but as this group was to act as the control, it was considered that this would not present problems as far as the validity of results was concerned. The other groups numbered forty three, forty eight and forty one (Table 3.1.). In each case, fifty people had been approached, so the refusal rates were fourteen, four and eighteen per cent respectively. In the twelve month sample, the loss of seven respondents between their first (six month) and second (twelve month) interviews was due to the fact that they could not be contacted during the second interview period.

The nature of the material being collected in the interviews, and the considerable length of time that each interview took to complete (average time of fifty minutes), meant that the numbers of people in each sample group had to be limited to fifty or less. Small samples are common in work on environmental cognition, as the in-depth nature
of the material being collected, together with the complications associated with its analysis (particularly the qualitative interpretations that are required) necessitate such a design unless the resources of time and labour are endless. The samples (with the exception of the control group sample) achieved in this research are large enough to allow valid statistical analysis and a degree of confidence in its results.

3.2.4. The Time Periods.

The time periods for the interviews were semi-arbitrary and selected on the basis that they should be well spread across the first year of residence. Respondents were to be able to answer the same set of questions regardless of their length of residence, so the first round of interviews could not be undertaken until the 'youngest' group had been in the city for a reasonable period of time. Three months of residence in the city seemed a reasonable time period after which the first set of interviews could be carried out. The next round of interviews were carried out after respondents had been in the city for six to seven months. It was considered that at this stage of the learning process, the three months between the first and second rounds, would be enough to show a difference between the groups. Finally, twelve months seemed to be a sensible time period for the third set of interviews. The control group were to have been in the city for three years or more because this was the length of residence of people in the city who had previously studied at Leicester University and who appeared on the list of postgraduates and staff.

There are several methods of conducting learning studies over time. Clearly, in order that development through time can be assessed, measurement needs to be taken and compared against previous measurement. The researcher has the choice as to whether (s)he adopts a longitudinal or a cross-sectional approach. A longitudinal approach concentrates on a single individual or group of individuals, and involves repeated assessment of their development through time. Some would argue that this is the most reliable method of assessing learning as changes in knowledge or ability between assessments are attributable to learning rather than differences between the individuals themselves. The cross-sectional approach takes different groups of people who are at different stages in the development process. As such, it relies upon the selection of like-groups whose only differences from each other are their current stages in the learning process. Thus in studies of child development, five, six and seven year olds may be studied simultaneously, and differences between them attributed to differences in age rather than differences between the subjects. This approach therefore, relies heavily on the success of the sampling design in selecting groups of individuals who are the same as each other on every attribute but stage in the development process.

Both methods of approach have associated advantages and disadvantages. The
longitudinal approach could be heralded as the most accurate, as changes between the time periods in the same individuals should be attributable to learning. However, this approach could suffer from considerable interviewer-interference in the learning process, particularly if the period of time over which learning is charted is relatively short (as in most microgenetic studies). This is especially the case if the measurements which are taken need to be identical for the purposes of comparison. With the current restraint of the embryonic state of test development and the lack of a clear understanding about the exact nature of what the tests are actually measuring, the need for identical tests for comparison purposes is ever-great. Another disadvantage of the longitudinal approach is that its’ operation requires the amount of time over which the effects need to be charted. Thus the present study, under this frame, would have taken three years to complete. Clearly in most circumstances, time limitations necessitate the adoption of alternative approaches.

The cross-sectional approach overcomes the difficulty of lengthy time requirements by studying different groups of people who differ on their lengths of experience in the topic context. This is only appropriate when the subjects of the study are groups rather than individuals, and where the researcher can be satisfied that the sample groups are taken from the same population (and thus are similar to each other on every criteria apart from length of experience). Laws of probability would dictate that this latter requirement can only be met if the researcher is dealing with very large samples. Such a reality is therefore at odds with the necessarily small sample nature of work in environmental cognition. Thus researchers in the field of cognitive development and learning are faced with a paradox.

The present study has adopted a part-longitudinal/ part-cross sectional design on the grounds that the problems associated with both would be minimized if exclusive use was made of neither. The three-month group were interviewed once only as it was considered that it would be these respondents who would be most impressionable and therefore, the most likely to have their learning processes ‘altered’ by the interview. The six and twelve month groups constituted the longitudinal element. In order to overcome interview-interference as much as possible, the six month interviews were slightly different to the twelve month interviews. Thus the contents of the interview schedules (discussed in section 3.2.5), were not standard across all four interview groups. Certain questions and tests could not be administered more than once to the same respondent, and thus needed to be adapted or removed from either the six or the twelve month schedule. The three-year (plus) group were interviewed once only, and they were asked the same questions (with a slight variation on some of the personal criteria) as the three and twelve month groups. The problem of between-group variation on personal factors is present in this research due to the small samples. This can be satisfactorily overcome if careful attention is given to the discovery of the nature of these differences, and with the incorporation of methods of controlling for the
influence of these variables from the ensuing statistical analysis (section 3.2.6).

3.2.5. The Interview Schedules.

Three different questionnaires were used in the elicitation of information for this research. These were necessary because the differing nature of the four length of residence groups rendered some questions pertinent to one group but inappropriate to another. In particular, the schedules for the twelve month group (who were being re-interviewed) required several omissions of questions/exercises that had already been asked/administered at the six-month stage. Similarly, several of the background questions were inappropriate for the three year (plus) group interviews.

Each interview schedule comprised a mixture of questions which aimed to elicit the personal characteristics of respondents with regard to their activity spaces, activity patterns, environmental nature and experience, mobility and other variables which could affect environmental learning; and a combination of questions and tests which aimed to elicit the extent of the respondent's environmental knowledge and ability. These questions and tests made use of both verbal and graphic response techniques. The contents of the interview schedules can be classified into eight categories depending on the nature of the information that they were designed to elicit and the measurement technique used: 1. Background information. 2. Self-ratings. 3. Personality measures. 4. General city knowledge (Verbal response). 5. Sketch maps. 6. Spatial ability tests. 7. Orientation tests. 8. Photographs. The following discussion will consider each of these categories in turn:

3.2.5a. Background Information.

Each interview began with questions which aimed to discover the personal characteristics of the respondent. The major categories of enquiry here were gender, present residential situation, previous residential experience both within Leicester and elsewhere, life-style, activity patterns and environmental nature. All of these categories of personal characteristics could be expected to play a role in environmental learning. This information was therefore collected so that the effects of these variables could be explored and incorporated into the final conceptualization of the environmental learning process. Questions were in both open-ended and pre-coded form, depending upon which was the most appropriate. All questions were administered in an interview situation and the answers were recorded by the researcher. The average interview length was forty five minutes.

3.2.5b. Self-Ratings.

At the completion of the background questions, respondents were asked to rate
themselves on a five-point scale, on their knowledge of Leicester as a whole, and some of its attributes. Subjects were asked ‘how well’ they knew the city, and the five-point scale which they were asked to use ranged from ‘very well’, through ‘average’ to ‘not well at all’. This five-point scale was designed to be compatible with the rating scales used by the researcher to rate the performance of respondents on their performance in the knowledge tests. Respondents were asked to make these ratings for their city knowledge in general, and for their knowledge of the following five attributes: shopping areas, the housing stock, the distribution of ethnic groups, leisure facilities, and industry. The titles given were no more specific than this. They were asked to make these ratings in relation to knowledge that they would expect that they should have after their particular length of residence period.

These questions were incorporated into the interview schedules so that broad comparisons could be made between self-assessed knowledge and actual performance in the knowledge tests. Obviously, self-rating is idiosyncratic as there are no absolute limits against which ratings can be made. However, responses are indicative of the character of the individual, and their attitude towards their environmental knowledge in general. For these reasons, these questions were included in the interviews. They were placed in the interview schedules before any of the assessment tests so that a respondent’s assessment of his or her performance in the tasks would not influence the rating given.

3.2.5c. Personality measures.

Previous research has found that accurate mental representations of the environment are not obtained spontaneously, but rather they are the product of a sustained effort and repeated trials in the environment (Kozlowski and Bryant, 1977; Garling, 1980; Evans, Marrero and Butler, 1981). For this reason, dispositional differences (with regard to the environment) were here considered to be an important aspect of the attainment and effective use of mental maps. Differential interest in the environment between individuals should result in differentials in cognitive maps and as a corollary, differential environmental ability. It is thus important that a study of environmental knowledge incorporates some measure of environmental disposition.

Dispositional differences are likely to be a function of certain personality characteristics (LaGrone, 1969; Irving, 1975; Bryant, 1982) and they will mediate an individual’s interaction with the environment. It was therefore considered that environmental disposition was important in the context of this research and it thus needed to be measured. Three questions were included in the interview schedules which aimed to do this. In each case, the respondent was given a scenario and asked to imagine him- or herself in that situation. They were then given three possible responses to that situation and were asked to indicate which of the three most closely approximated
the response that they were likely to make. In each case, the three responses represented a 'highly exploratory' response, a 'semi-exploratory' response and a 'passive' response. An example of this type of question is given below:

You are in a new city for an afternoon on your own and you have just arrived by train at the station where you must make your connection later. You have time to kill, do you:

(a) Make your way to the central area following signposts or asking people, making sure that you memorize the route back.

(b) Decide to explore the city and start walking in a direction that takes your fancy, knowing that you will easily find your way back because you always can.

(c) Make your way to the nearest coffee shop or place to eat or sit, and pick up a newspaper or book to read for a couple of hours.

In the case of the above question, response (b) represents the highly exploratory response, (a) the semi-exploratory response and (c) the passive response. The other two questions are given in the questionnaires in Appendix One. Respondents scored three points for a 'highly exploratory' response, two points for a 'semi-exploratory' response and one point for a 'passive' response. The scores for the three questions were then aggregated and respondents were assigned to one of the three environmental disposition groups according to whether their aggregate score was eight or nine (highly exploratory), six or seven (semi-exploratory) or five or less (passive).

It is not suggested here that a person's degree of exploratoriness is the only facet of personality that will influence his or her interaction with the environment. It was thought however that this would be a fairly reliable measure of environmental disposition as it is likely to be the activity manifestation of this disposition. A similar division of individuals into environmental disposition groups was attempted by Beck and Wood (1976). Their resulting categories (also numbering three) 'rangers', 'mixers' and 'fixers' correspond closely to the categories used here. The questions asked served as an adequate alternative to the observation of real behaviour which would be the only other way in which the researcher could attempt to classify people on this criteria. It is believed that responses were in most cases honest, and the task of assigning oneself to one of the avenues of action was found to be easy by most of the respondents (which would indicate that these avenues were realistic for most respondents). Thus in this way, the researcher was able to assign respondents to a three-point classification based upon their degree of interest in the environment i.e. environmental disposition.

In order to assess the degree of exploration undertaken in the study environment, respondents were asked whether they had 'actively and deliberately explored' both the 'city centre' and the 'rest of the town'. These questions proved to be not very useful in differentiating people on the degree of interest that they had shown in the
Leicester environment. This was because the majority of respondents (sixty three per cent) had explored the city centre (but this may not have been the outcome of an interest in the environment rather than a need to find a particular city function or functions), and only thirteen per cent had explored the rest of the city. A cross tabulation of the environmental disposition variable against these exploration questions did not produce significant results although differences could be observed between the three disposition groups.

Also related to environmental disposition is sense of direction and geographical orientation ability (LaGrone, 1969; Kozlowski and Bryant, 1977; Bryant 1982). The nature of this relationship is not yet well understood, in particular it is pertinent whether environmental disposition is a determining influence on sense of direction, or sense of direction is a determining influence on environmental disposition. In effect, the relationship is likely to operate in both directions. Sense of direction or orientational ability could be expected to exert an influence on the acquisition and development of cognitive maps given the dependence of individuals on this skill for effective interaction with the environment.

A study carried out by Kozlowski and Bryant (1977) demonstrated that when people are asked to make an assessment of their sense of direction ability, they do so in an accurate an honest fashion. When asked in an interview situation to assess their sense of direction on a seven point scale, almost everyone readily gave an assessment, and from these self-assessments the researchers were able to accurately predict respondent ability to point to unseen familiar locations (Kozlowski and Bryant, 1977). Although having a poor sense of direction may be undesirable, individuals with a poor sense of direction were found to report this deficiency with reasonable accuracy. Little or no evidence was found for self-deception or the deception of others regarding this ability. Thus for the purposes of this research, a self-rating scale of an identical nature to that used by Kozlowski and Bryant (1977) was used (although the wording of the question was different) in order to elicit individual variation in sense of direction. Respondents were asked how they would rate themselves on a seven point scale which ranged from 'very good' through 'average' to 'very poor', on their sense of direction ability. Respondents were shown a prompt card with the scale marked upon it for the purposes of this question. No problems were experienced by respondents in answering this question which would lend support to the contention that people are very aware of their orientational ability (Kozlowski and Bryant, 1977).

3.2.5d. General City Knowledge (Verbal Response Questions).

Several verbal response questions were included in the interview schedules in order to elicit the level of respondent knowledge about selected aspects of the city. These were suburban shopping opportunities, residential areas, the social dimensions of the city,
industrial structure and recreational opportunities. The nonverbal response questions also measured city knowledge and these will be considered later in the Chapter. This discussion will consider the nature of these verbal response questions and will relate how the answers to these questions were analysed.

Respondents were presented with a list of suburban shopping centres and were asked to indicate which of the centres they would (a) be able to find quickly on a street map, and (b) be able to name (or visualize) five shops in. The list comprised twelve areas which were located throughout the built-up area, although it was by no means an exhaustive list of shopping opportunities because the length of the list had to be restricted in order that respondent interest could be maintained. In this way therefore, the list was subject to selection bias. It was compiled with the help of three people who had lived in Leicester for many years. They were asked to make a list of suburban shopping facilities which they could think of. The researcher then combined the lists (which were similar) to arrive at a selection of places that she thought included the 'key' places and those which were most likely to be known. It is believed that place selection bias is not a problem in this question because all respondents lived within the same city sector and thus, the included places were of equivalent distance from the homes of everybody in the sample.

It was considered important in this question to determine not only whether the respondent had heard of a place, but whether (s)he knew where it was located in the urban area. Respondents were asked whether they would be able to quickly find the shopping area on a street map (given that to find something quickly on a street map, knowledge is needed regarding its general location in the city). In certain instances a question such as this would be inappropriate, as it is probable that some people's ability to find a place might be impeded by their inability to use a map. However, it was considered that for the present sample of highly educated individuals, this was unlikely to present any problem. Indeed, whilst undertaking the interviews, the researcher did not become aware of a problem of this sort. All respondents understood the task that was being requested of them quickly and easily.

Respondents were also asked to indicate whether or not they could name or at least visualize five shops located in each respective shopping area. If they replied in the affirmative, they were asked to name them to the researcher. This was included as a measure of familiarity with the shopping area, which was considered to be as important as knowledge of the existence of the facility. This is a different facet of environmental knowledge and one which was considered here to be important. There is obviously a very great functional difference between awareness of the existence of a place and familiarity with it. Cognitive representations are comprised of information which differs qualitatively with regard to its clarity, and thus some information is used by the individual as a basis for activity and some isn't.
The question was administered verbally and responses were recorded by the researcher on the interview sheet. There is no reason to believe that respondents gave false responses in order that they might appear more or less knowledgeable than they actually were. It is indeed unlikely that deliberate mis-reporting is a problem at all in this research as people were generally wary of the fact that they were going to be asked to complete some tests during the course of the interview in which, if they had given previously misleading responses, their performance could contradict these responses. Under such circumstances, it was far 'safer' for individuals to be honest rather than to be 'caught out' at a later point in the interview. Indeed, little evidence was found during the interviews of any dishonesty, as actual performance in the tests usually reflected self-reported knowledge in the questions.

The results of the suburban shopping centre question were coded in a number of ways. The researcher was mainly interested in the spatial distribution of the known and familiar shopping areas. Thus the locations of these shopping areas were recorded according to the city sector(s) in which they are located (e.g. northeast, northwest, southeast, southwest or a combination of some or all of these). Given that the division of the city into sectors was fairly arbitrary (the sectors above were chosen because most respondents lived in an area which could be described as southeast Leicester), and thus proffer no reason to suppose that any relationship between these knowledge will exist, the location of known and familiar shopping areas was also recorded according to sectors which moved in compliance with the location of the respondent's residence. A ninety degree sector was centred over the central point of the respondent's residential area (which was calculated by balancing a paper template of the residential area on a compass-point and recording the point of balance) and the location of both the known and familiar shopping areas were recorded according to whether they fell within the respondent's own residential sector, an adjacent sector, the non-adjacent sector or any combination of these. This measure would thus, possibly give a more accurate picture of sectoral bias in cognitive information than the arbitrary 'fixed' sectors. (In actuality, it made little difference as respondents lived within such a short distance of each other.) Thus the locations of the known and familiar shopping areas were recorded in relation to both a fixed and a moving sectoral model of the city.

It was also considered important that some sort of distance measure was incorporated into the analysis of this question. This would enable comparison of respondents according to the distances away from their places of residence that these known and familiar shopping areas were. It would also allow comparison between the distances away from places of residence of the known shopping centres to those of the familiar shopping areas. If significant differences were found, this would demonstrate that care needs to be taken when asking people questions which aim to elicit the extent of knowledge, and that the conclusions drawn can be very much dependent on the nature
of the question asked. It would also show that knowledge of a place does not necessarily imply functional significance and that a proportion of the contents of cognitive representations may not necessarily influence behaviour (a point often overlooked in studies of cognitive maps).

The distances between the central point of the residential areas of each respondent and the central point of each shopping area were measured. It is accepted that the central point of a residential area was sometimes at some distance to the respondent’s place of residence. Similarly the division of the city into residential areas was semi-arbitrary (section 3.2.2.) and a different division would have produced slightly different results. However, it was thought that the residential areas were small enough to realistically reflect neighbourhood activity and to overcome the possibility of considerable error creeping into the analysis at this point. The measurement of distances between actual place of residence and the shopping areas was rejected on the grounds that it would have been unnecessarily time-consuming.

The distances of each shopping area that the respondent knew and was familiar with were added together and then divided by the total number to arrive at a mean distance score. This mean distance was then recorded in the data file. Thus in the analysis of this shopping centre question, the researcher was not so much concerned with the number of shopping areas known, as the nature of those shopping centres in spatial relation to place of residence. Finally at the coding stage, respondents were awarded a score according to the degree of both their knowledge of, and familiarity with suburban shopping centres.

In order that some idea might be gained about respondents’ knowledge of residential areas in the city, a list of five such areas was compiled and subjects were asked to give a description of each of the five. The areas included in the list were chosen for their distinctiveness in terms of their social composition and for their location. The five included Oadby (middle-class, postwar suburban expansion - southeast Leicester), Belgrave (inner city nineteenth century development, very high proportions of the population of Asian extraction - north Leicester), Beaumont Leys (post-war council housing, recent private development and modern shopping centre - north Leicester), Braunstone and New Parks (relatively deprived and run-down inter-war council housing estates - west Leicester). A fuller description of these areas is given in section 7.1.

Respondents were given no instructions other than to describe these areas, and they were given no indication as to how they should describe them. This is because the researcher was interested in both a person’s ability to describe each area, and the way that each area was described with respect to the words and sentiments used, and the characteristics of the areas that people chose to pick on. Thus it was important that respondents were given no clues as to how they might describe the areas. If, in the
interview the respondent asked as they sometimes did, what sort of description was required, they were told that they should describe the area in whichever way they felt was most appropriate. It was originally intended that responses to this question be recorded on audio tape, but after several interviews, it became obvious that it was possible for the researcher to record the answers verbatim on the interview sheet due to the brief nature of most descriptions.

Answers to the residential area description questions were coded in two ways. First, respondents were classified according to the areas that they were able to describe correctly. The decision as to whether or not a description was 'correct' is obviously not one that the researcher can easily make given the idiosyncratic nature of environmental perception. Thus a description was only deemed 'incorrect' if it became obvious to the researcher at the time of interview that the respondent was describing the wrong area. In practice this was easily detected and verified at the time of interview, and was fairly uncommon. This question therefore gave a measure of the number of residential areas that a respondent was able to describe, and the identity of those areas.

Responses were also coded according to the nature of the description given. This was achieved through the classification of the words used and the overall sentiment of the sentence into one of seven categories; (1) social, (2) physical/morphological, (3) aesthetic/evaluative, (4) functional/opportunity, (5) financial, (6) subjective emotional, and (7) a combination of these. These categories were chosen after careful study of the type of responses given. The results of this question would therefore provide an indication of both the knowledge and opinions of respondents regarding some of the residential areas of Leicester.

The residential area descriptions were designed to provide the researcher with some idea of respondent knowledge about the social geography of the city. There was also a need for a more direct approach to the elicitation of this information. Three minority groups were chosen as the subject of inquiry in the social questions. These three groups, the Asian and Afro-Carribean populations (as the most significant ethnic-minority populations in the city) and the unemployed, were groups of people who displayed some obvious distribution in the city. A description of the distributions of these populations is given in sections 7.2 and 7.3 and in Figures 1.5, 1.6 and 1.7.

The aim of the minority-group questions was to determine the extent of respondent-awareness of the location of these people in the city. To aid their responses, and to impose a spatial framework on the question, respondents were shown a map of the city divided into named residential districts (Figure 3.3) and were asked to indicate where they would expect to find the highest concentrations of the three minority groups. Answers were recorded on the interview sheet. Careful consideration
FIGURE 3.3.

LEICESTER'S RESIDENTIAL AREAS.
-THE SHOW-CARD FOR THE SOCIAL GROUP QUESTIONS.
was given at the time of design to the wording of this question. This was because
the question was dealing with an emotive subject in a way that those unfamiliar with
social science inquiry, might possibly interpret as racist. Indeed to some, the very
consideration of the distribution of ethnic groups is an admittance of population
differentiation, and therefore a racist statement. It is very difficult to overcome such
suspicion. The researcher needs to take care both in the wording of the question,
and in its execution at the time of interview (this was obviously easier in the present
case where the researcher undertook all of the interviews). To offend the respondent
with one question might mean the termination of the interview, or at least the
termination of interest and effort on the part of the respondent. There was little
problem experienced at the time of interview with this question. Most respondents
obviously understood its relevance and the spirit in which it was included. Only one
refusal to answer the question was received.

Answers to the minority group questions were coded according to the residential areas
mentioned. Respondents were then awarded a score from a five-point scale ranging
from 'very good' to 'very poor' which reflected the accuracy of their response. Respondents were also asked whether they had ever considered the social make up of
the city in these spatial terms before. This was asked in order that the researcher
might determine whether the understanding of the spatial distribution of minority groups
was consciously or subconsciously obtained. A geographer or sociologist new to a city
could be expected to consciously address the question, but does the 'normal' migrant
conceive of the social make up of an environment in the same way? If (s)he does
not, then the process of extracting the information from respondents will obviously
change the nature of the internal representation, as it will cause the respondent to
contemplate and give structure to information which (s)he might never otherwise do.
The salient philosophical and methodological question here is whether this bringing of
the information into consciousness will alter the individual's subsequent behaviour, or
would the knowledge in its subconscious and differently-organised form have precipitated
that same behaviour anyway? In other words, does the extraction process change the
nature of the information that the respondent has, and will this then modify behaviour?

The question asked in the interview, therefore attempted to elicit whether or not the
question on ethnic-minority distribution was discovering previously thought about
information, or whether it was altering the nature of the information that it wished to
portray. The answers to the question showed that fifty-seven per cent of respondents
had consciously thought of the city in these terms before and forty three per cent had
not (section 7.2.). There was no difference between these two groups of people in
the accuracy of their answers, but those people who had thought in such terms before
were found to be more confident about their knowledge of the distribution of minority
groups than those who had not. This shows that in some cases, the asking of the
minority-group question had required respondents to reorganize the nature of their
information. A fuller discussion of the implications of this finding is given in Chapter Seven (section 7.2.).

Respondents' knowledge of the industrial structure of Leicester was also measured. They were asked to indicate the nature of the city's 'main' industries (a question that they were left to interpret in any way that they pleased). Responses were recorded on the interview sheet and post-coded into one of seven different categories. They were also awarded a score for performance in this question. Respondents were also asked to indicate where they thought these industries were located. Responses to this question were coded according to the nature of the answer. There were three main types of answer given; (1) typological e.g. 'along the canal' or 'on the edge of town'; (2) the naming of a specific area; (3) the naming of a specific works or estate. Some respondents gave a mixture of answers, and many could not attempt an answer at all. Answers were also given a score on the five-point scale which was adopted throughout this research so that performance on different questions could be compared (section 3.2.6). Thus the industry questions elicited information on both the nature and quality of respondent knowledge, of both the character and location of industry in Leicester.

The final set of questions to be considered in this section are those which pertained to respondent knowledge of the recreation facilities in the city. Three different types of recreation facility were chosen for inclusion in the questions. These were urban parks, swimming pools and indoor sports facilities, and they were chosen on the grounds that these were facilities which are visually obvious in the urban environment and therefore, would be those which would be known by an individual who possessed a comprehensive knowledge of the city. Knowledge of the more culturally-orientated recreational facilities (e.g. cinemas, theatres, museums) could be determined from the orientation and photograph exercises and therefore, questions about these did not need to be included here.

In three separate questions, respondents were asked to give the names of any swimming pools, parks and indoor sports facilities that they knew of. Answers were recorded and coded to elicit two different types of information. First, to represent the location of the facilities mentioned in relation to the place of residence of the respondent (thus making use of moving ninety degree sectors so that respondents could be distinguished according to whether their knowledge of recreation facilities was confined to their own city sector, an adjacent, a non-adjacent or a combination of sectors). This would give a measure of the spatial spread of recreational information, and would allow comparisons to be made between the different types of facilities. Second, the number of facilities mentioned in each category was recorded, and respondents were awarded a score according to this number. This would provide a measure of the quantity of recreation-facility knowledge that is held. An aggregate score was also awarded to each respondent for his or her performance in all the recreation questions collectively.
Thus it can be seen that the questions which were designed to elicit the level of
general city knowledge of the population were various in terms of subject-matter and
approach. They were designed to elicit not simply the amount of knowledge held by
respondents at any particular time, but also the nature of that knowledge. Attention
will now turn to a technique that was used to determine amongst other things, the
amount and nature of knowledge that respondents held about the central area of the
city.

3.2.5e. The Free-Recall Sketch Maps.

Free-recall sketch maps have been extensively used in cognitive mapping research to
'externalize' the mental image (e.g. Lynch, 1960; Appleyard, 1969, 1970; Ladd,
Pocock, 1976; Pocock and Hudson, 1978; Murray and Spencer, 1979). The
technique requires the subject to produce a map of whichever environment is the
concern, on a blank piece of paper with little instruction other than to note on it any
features that (s)he considers to be important. From such maps it is claimed, the
researcher can deduce much information pertaining to the respondent's 'view', 'image'
or knowledge of the environment.

Much discussion has revolved around the uses and misuses of sketch maps in spatial
cognition research. Many have argued that sketch mapping as a tool is flawed, and it
has indeed proved to be one of the most controversial issues in the field. A brief
discussion of the advantages and disadvantages of the technique will follow.

Proponents of the sketch mapping technique would argue as I do here, that the
technique has the obvious advantage of dealing with spatial information in a spatial
way. There are other ways of requesting external spatial representations of spatial
information from individuals, but these are more difficult to administer, and sometimes
suffer from being more abstract in nature (e.g. modelling). Thus the sketch map is a
simple technique which is easy to administer, and it also delivers a considerable
amount of information quickly. This final point is important as Murray and Spencer
(1979) have pointed out:

"Mental mapping techniques may be flawed, but they do
reflect differences in the skill of cognizing the environment
which could only otherwise be brought out by laborious
interview or questionnaire techniques" (Murray and
Spencer 1979, 389).

The sketch map also allows the respondent great freedom of choice over what to
include and what not to include in their representations. In research which has used
this technique to date, the consequences of this have been used as a source of
additional information, as it is generally believed that the respondent will include on his
or her map, those contents of the environment which have the most significance to them. Thus, the presence or absence of certain environmental elements has been considered to have a certain significance by many researchers who have used this technique (e.g. Lynch, 1960). The wisdom of making such inferences from the presence or absence of elements on a sketch map will be discussed later. The important point here is that, unlike other methods of external spatial representation (e.g. modelling), the respondent is completely free to choose what is included on the map. A final benefit of the sketch map is that it is an intuitively pleasing tool, especially to the geographer who is used to seeing the environment represented in such a way.

The primary claim of those who would criticize the use of sketch maps as a technique of spatial information elicitation and analysis, is that sketch maps might misrepresent the cognitive map for one or all of a number of reasons. These will be discussed in turn.

First, although the respondent is invited to undertake a free-recall mapping exercise, and the technique minimizes intrusion by the researcher, the exercise does impose a general filter on the individual's information store (Pocock, 1976). This is because the response is constrained to the physical attributes of the environment, and even then, to those attributes which are 'mappable'.

The most often levelled criticism of the sketch mapping technique, is the claim that the quality of a sketch map is reliant on the graphic ability of the drawer (Spencer, 1973; Tobler, 1976). As a result, certain idiosyncrasies in the map may be due to graphic inability rather than a conviction on the part of the drawer that the environment is similar to this portrayal. Research conducted by Murray and Spencer (1979) reached the following conclusion:

"...the subject's basic drawing ability is significantly related to the level of organization, mode of indicating features and level of complexity of features indicated on the maps" (Murray and Spencer 1979, 391).

Thus, it would seem that this might be a very real shortcoming of the sketch mapping technique if the aim of the map is to derive information about the accuracy of a respondent's cognitive representation of the environment. Indeed, many studies have used this technique for such inquiries (e.g. Matthews, 1980), and I would argue here that this is likely to lead to spurious findings. A slightly different consideration with regard to graphic ability is that, it is possible that people will draw on their maps those elements of the environment which are easy to draw, rather than those which have some special significance to them or which feature most prominently in their cognitive representations. Thus inferences made about the importance of elements included on the map may be spurious.
As well as depending on graphic ability, the construction of a sketch map also depends on the individual's conceptual ability, particularly with regard to his or her understanding of, and ability to use, symbolic language. Reiser (1972) and Spencer (1973) have indicated that differences in social class are to be found between the most and least proficient map-drawers, and this may be one determinant of conceptual ability. Indeed, Spencer (1973) is critical of the mental mapping technique on the grounds of its low yield among some sections of the population.

Spatial ability is another aspect of individuals' ability which may affect the construction of a sketch map, as maps involve the spatial operations of orientation and scale reduction. Thus the resulting map may not accurately represent the cognitive image but might rather be merely consistent with an individual's poor grasp of the concepts of space.

Limitations of space on the paper (Pocock, 1972) and time to draw the map, may also affect the final map. A piece of paper which is too small (because the scale which the respondent chooses is larger than usual) may encourage a less extensive map than that which might otherwise be drawn. Similarly, the respondent may rush his or her map in an interview situation omitting much detail which could be added. The researcher would then conclude from such a map that the respondent either does not know any more detail, or does not consider it important enough to include on the map. The instructional set will also determine which aspects of the environment are elicited or emphasized (Pocock, 1976). For example, requests for a map of a city as it is subjectively experienced, as it really is, or as it appears to a visitor, will elicit three different kinds of representation (Craik, 1970).

A respondent might also forget certain things about the environment during map-drawing and again, the researcher might infer that what is not there is not important. Drawing a map is a recall exercise and thus is subject to memory. Because of this, the resulting map may bear little resemblance to the mental image which governs behaviour.

A criticism which is often levelled at the use of free-recall mapping is that, as a direct method of representation, it forces the consciousisation of hitherto unknown or differently organized material, which may involve the changing of the nature of this material (and perhaps also subsequent behaviour). Thus the researcher, by requesting the map, does not leave the mental representation intact and may not gain an accurate impression of its former state.

The drawing sequence might be an important indicator of the importance that respondents attach to different elements of the environment. Thus the features drawn first could be suspected to be those which feature most prominently in the respondent's
mental representation. Unless some sort of recording procedure is used which records the sequences of map construction (and this is something that has only rarely been attempted) this potentially useful information is lost.

Finally, and perhaps the most difficult problem to overcome associated with these maps is that of the interpretation of the maps once they have been drawn. Free-recall sketch maps have been requested from respondents in attempts to address a variety of different questions about the nature of spatial cognition. The ways in which the resulting maps have been analysed and interpreted have been as various as the issues which their interpretations have wished to address. The issues have ranged from concern about the accuracy of spatial information (Tobler, 1976; Richardson, 1981; Gale, 1982; Waterman and Gordon, 1984), to the content of cognitive maps (Appleyard, 1970; Francescato and Mebane, 1973), the relative importance of environmental features in cognitive maps (Lynch, 1960), styles of spatial representation (Moore, 1973a, 1973b, 1975), microgenetic learning about the environment (Blaut and Stea, 1969, 1971; Orleans, 1973; Devlin, 1976), ontogenetic development of the spatial image (Tilly, 1967; Howell, 1969; Anderson and Tindal, 1971; Matthews, 1980, 1984), memory for the environment (Carr and Schissler, 1969), and emotive issues like the feeling for 'neighbourhood' (Eyles, 1968).

Those elements or aspects of the sketch maps which are of interest to the researcher vary according to the nature of the research problem. Thus sketch maps have been examined both quantitatively and qualitatively; for their content, their accuracy, their portrayal of the spatial relations between environmental features, their predominant style, the predominant elements that appear on them, their complexity, their comprehensiveness, their spatial extensiveness, and their sophistication. As a result of this, and combined with the fact that the analysis of such various and idiosyncratic creations is very difficult, no accepted methodology exists for the analysis of these sketch maps. Most importantly therefore, observations, inferences and conclusions made by the researcher in their analysis, can never escape the subjective. Studies based on the exclusive use of free-recall sketch maps therefore, can never be entirely conclusive (at least not to the satisfaction of anyone but the researcher him/herself). This is probably the most difficult problem which surrounds the use of the otherwise intuitively appealing sketch map.

The following will discuss the employment of free-recall sketch maps in this research, and will relate how most of the above-mentioned problems associated with the technique have been overcome.

Free-recall sketch maps have been used in this research to indicate something of the nature and complexity of people's cognitive images of the environment at different stages in the residence process. In particular, it was considered interesting to find out
whether any regular changes in mapping style or content could be observed with increasing length of residence. If such changes could be found then evidence would exist for the changing nature of cognitive maps with increasing length of residence as all the other factors influencing map form would not have changed over the length of residence period. The sketch maps would also provide some manifestation of respondent’s internal representations which would be almost totally free from interference from the researcher. Respondents were given the following instructions:

‘On this blank piece of paper, could you please draw a map for me of Leicester city centre. You may ask me any questions that you wish. Please put on your maps features such as roads and major landmarks and any other relevant information. Could you tell me what you are drawing whilst you are drawing it.’

They were handed an A4-sized sheet of blank paper and a black felt-tipped pen. Additional paper was available if it was needed. The respondent’s narrative of the drawing process was recorded on audio tape so that the drawing-sequence could be studied later. Similarly, the recordings contained any questions that the interviewer was asked, and any reactions that the respondent made to the map that (s)he was producing (such as embarrassment at its inaccuracy due to drawing ability). Thus in this way, an extra source of information about the sketch map was collected which could in part overcome the problem of differences in graphic ability since where the spatial relations between objects were badly misrepresented due to graphicy inabilities, the respondent would usually mention it. Similarly, the use of the tape recorder provided the researcher with a record of the sequences of map production. Nobody objected to the use of the tape recorder, and it was soon forgotten once switched on. The actual machine used was very small, so as to minimize its intrusion.

After the map was drawn, the researcher also asked the respondent whether (s)he had drawn it from a bird’s eye perspective, or whether (s)he had engaged in a mental journey through the environment in order to remember its content and structure. Answers to this question were usually consistent with the researcher’s own observations of the drawing style. They were recorded on the interview sheet so that information regarding the respondent’s perspective on the environment would be held.

Problems of differential conceptual ability (e.g. the ability to understand and use the symbolic language necessary for maps) were not thought to apply in this research, due to the similarities amongst respondents in their educational backgrounds and attainment.

Most of the other problems which have been mentioned above in association with the sketch mapping technique were overcome in this research in the uses that they were put to. It was considered both erroneous and meaningless to analyse the maps for the accuracy of environmental representation, and no measurements of distances or directions between objects were made. Neither was the inference made that what did not exist
on the sketch map was either not important to the respondent, or not known. Instead, the researcher was interested in what the map could relate about the principal constructs of the internal spatial representation, especially with regard to the dominance of sequential elements (e.g. paths) or spatial elements (e.g. nodes, areas) (Appleyard, 1970; Pocock, 1976). It is undoubted that the inferential leap here between the elements emphasized on the map and the predominant elements 'in the head' is a great one; but it does seem intuitively reasonable to suspect that the predominant organizing spatial elements in the cognitive representation will remain intact when that spatial representation is converted onto paper. This is indeed, not a very great supposition when it is compared to those of researchers who would base their conclusions about the entire contents and nature of the spatial image on the free-recall sketch map (e.g. Lynch, 1960). Thus the predominant elements of the map were recorded as either 'spatial' or 'sequential'. The classification was made independently by three people, and the modal answer was taken in each case. The classification proved to be very clear-cut, with disagreement emerging amongst the classifiers very rarely.

The complexity of the sketch map was used as an indicant of the comprehensiveness of spatial knowledge. Maps were classified using a modification of a scheme originally devised by Appleyard (1970), but further modified by Pocock (1976) and Murray and Spencer (1979). This comprised two elements; first, the predominant style of representation e.g. sequential or spatial as above; and second, the level of complexity. A simple threefold division of maps into 'low', 'medium' or 'high' complexity was made. Thus the three classifiers were asked to divide the maps into one of six groups; 'spatial low', 'spatial medium', 'spatial high' or 'sequential low', 'sequential medium' or 'sequential high'. The classification process again caused little problem, as high degrees of agreement were obtained between classifiers. In order to make the classification, the classifiers were shown a modified version of Pocock's system (Figure 3.4.).

The maps were also classified according to the initial anchor point used in their construction (e.g. the first feature drawn on the paper), which was obtained from the audio recordings. Also, whether the spatial perspective whilst drawing the map was from a plan-view or from a mental journey through the environment (which often yielded a different result from the post-analysis of the appearance of the map on the spatial-sequential dimension - suggesting perhaps that spatial perspective is separable from and different to element predominance in cognitive representations.

The nature of the elements recorded on the maps were also noted. Elements were grouped according to a classification used by Strachan (1986) which included the following; retail, office, industry, wholesale, transport and parking, education, entertainment, places of worship, residential and vacant. To this was added three
Source: A modification of the system adopted by Pocock (1976).
68a
classes, 'monument', 'commercial service outlet' and 'civic facility/public administration'. The number of different classes of elements included on the map was recorded in order that a measure of the diversity of reported information might be achieved.

The type of shop recorded was also considered to be important. Thus shops were classified according to their nature in a system devised by the researcher (e.g. multiple non-food, multiple food, individual or service outlet) and their size (large or small net sales area - where 'large' was considered to be anything over five hundred square feet). The location of the recorded shops was also noted. Roads were classified according to their importance and primacy in a system developed by the researcher. Six categories of roads resulted:

1. Major shopping streets in the commercial central area.
2. Secondary shopping streets - major.
4. Major feeder roads to central area.
5. Smaller roads and lanes around central area.
6. Smaller roads and lanes at distance from central area.

Clearly, a number of the terms used in the classification are open to interpretation (e.g. 'at distance from'), but this didn’t present a problem because the researcher classified all maps according to her own understanding of them. Each road in the central area was then classified according to this system. Maps were then classified according to the type of roads that the plotted shops were located on.

The number of plotted landmarks was also recorded. Thus anything which was drawn on the map but which wasn’t a linear feature was counted. Sometimes, this was difficult to determine, but the subjective nature of the interpretation here was overcome by the fact that the interpreter was always the researcher, and therefore the criteria used in the interpretations was consistent. Finally, the number of road sections drawn on the map was also recorded so that a measure of the complexity of the represented path network was achieved. A 'road section' was considered to be a stretch of road between two junctions, or a stretch which is 'floating' at one or both of its ends (i.e. not attached to anything).

Thus the sketch maps delivered a good deal of information regarding the possible nature and content of respondent’s internal representations of their environment.

3.2.5f. The Spatial Ability Tests (Plotting and Connectivity).

Two types of test were used in this research to examine respondents’ knowledge of the spatial arrangements of the various physical elements of Leicester. As such, these tests
also tested respondent spatial ability. The idea for the tests arose from two considerations. First, that a measure was needed of the accuracy of respondents' spatial knowledge (as the sketch maps were deemed unsuitable for this purpose), and that this required the elicitation of knowledge in some sort of spatial form. And second, that the assumptions of those who would claim that early cognitive maps are either landmark (spatial) dominant (e.g. Lynch, 1960; Appleyard, 1970, 1976; Devlin, 1976) or path (sequential) dominant (e.g. Hart and Moore, 1973; Siegel and White, 1975) needed to be tested; namely, the assumption that the relative location of landmarks can be understood in the absence of a path network (Evans, Marrero and Butler, 1981). In a similar vein, Kuipers (1982) concluded that topological relations such as connectivity, order and containment are represented (or at least retrieved and manipulated) separately from the metrical relations of distance and direction. Such a view holds that it should be possible to store a topological relation between two places in the absence of any understanding of the metrical relation between them. This interpretation gains support from the developmental studies of Hardwick et al, 1976; Hart and Moore, 1973; Siegel and White, 1975; and form studies of individual differences (e.g. Lynch, 1960). A hypothesis which has been forwarded to explain this is that storage and retrieval functions for distance and direction are developed by the child years after the storage and retrieval functions for connection, order and containment (Kuipers, 1982). Might this same developmental sequence proceed at the microgenetic level?

It was decided that two spatial tests should be devised which would separate topological and metrical knowledge (and therefore ability), thus enabling the researcher to determine whether, (a) this separation of spatial concepts could exist in cognitive representations (therefore denying the 'map in the head' as a reasonable metaphor - Kuipers, 1982), and (b) if it does, then does the relative proficiency of respondents at one type of test over the other change with increasing length of residence?

Thus, a spatial test and a topological test were devised. It was decided that the tests should be carried out at two scales of environment so that it might be determined whether the processes under observation are dependent on, or invariant with, environmental scale. Thus, the two chosen scales were the city centre (comprising the commercial central area), and the 'citywide' (which comprised the whole of the built-up area).

The metrical component of spatial understanding and knowledge was to be tested via an exercise which required the respondent to plot symbols (representing given landmarks or places) on an A4-sized sheet of paper which had a one-inch grid marked on it and within this, two symbols representing two well-known landmarks. These symbols representing the landmarks were positioned such that they accurately represented the metrical relationship (at a given scale and orientation towards true north) which exists
'on the ground'. The grid was given in order that respondents would have some metrical guidance (Figures 3.5a. and 3.5b.).

Respondents were asked to plot the other symbols (numbering six and five for the city centre and citywide tests respectively) on the paper, using the pre-plotted landmarks as indicators of orientation and scale. This test was devised in preference to a method used by Kozlowski and Bryant (1977) which required only directional judgements from respondents. The test used in this research required both distance and directional judgements, as they are required in real-life orientation situations. It was thought that the successful completion of this test, would provide the necessary, but not the sufficient, evidence to support the possibility of the separation of metrical and topological relations in the cognitive representation. It is hereafter referred to as the 'plotting exercise'.

The topological component of spatial knowledge was then examined by presenting the respondent with another A4-sized sheet, but this time with the grid removed and the symbols used in the metrical exercise, plotted on it correctly (see Appendix). Respondents were then required to draw on the sheet, the interlinking roads along which one would pass in order to get from one of the plotted landmarks to another. This test was again given to respondents at both scales of environment. It was considered important to find out whether this test was found to be any more difficult or easy to perform than the metrical (or plotting) test. This test is hereafter referred to as the 'connectivity exercise'.

These tests were administered after (but not directly) the sketch mapping exercise, so that respondents were not completely 'cold' to the idea of 'putting pen to paper'. This was considered important when the interview schedules were being drawn up, as the tests could appear quite daunting to the respondent. Similarly, to minimize boredom and repetition, the city centre tests were separated from the citywide tests by the residential areas question. It was the experience of most respondents that, although at first the tests appeared daunting, once they were attempting them, they were found to be much easier than they had originally anticipated. Respondents were urged to plot and draw in only those symbols and roads which they could make reasonable judgements about (thus guessing was not allowed). This is because, inferences would be drawn from the results of these tests which would suggest the nature of spatial representations, and guesses could lead to erroneous conclusions being drawn.

The advantages of the devised spatial tests were that they could be used to test the accuracy of spatial knowledge (in a way that the sketch maps could not), because they were standardized in terms of content, scale, and orientation. Thus accurate measurements could be made of the inaccuracies which resulted. Similarly, the tests did not rely on respondents' drawing ability and would thus supplement the validity of
THE CITY CENTRE PLOTTING EXERCISE.

KEY

+ Clocktower

■ ABC Cinema

▲ Railway Station

■■ Haymarket Centre

□ Market Place

● Town Hall Square

▲ Odeon Cinema

○ St. Margareta Bus Station
THE CITYWIDE PLOTTING EXERCISE.

KEY

City Centre (Clocktower)
University
Oadby
Wigston
Abbeypark
Highfields/Evington rd/East Pk rd junction
Royal Infirmary
results derived from the sketch maps. From the results of the tests also, it would be possible to discover any predominant spatial images held by the sample population which departed from the 'real-world'.

Attention will now turn to the methods used in the analysis of the completed tests. The plotting exercises will be considered first. Nine different items of information were extracted from the completed connectivity exercises and these will be considered in turn:

In order that a summary measure might be obtained of the relative positioning of the respondent-plotted landmarks and that this might be compared to the correct positioning, a mean-centre measure was used. This involved the calculation of the coordinates of each plotted point, and the subsequent averaging of both the x- and the y- coordinates to derive a coordinate which lay at the metrical centre of all the other points. Coordinates were taken with respect to the one-inch grid which was present on the plotting sheets. Comparison of the plotted mean-centre with the actual mean centre of the landmarks, would give a measure of the accuracy of the orientation-relations between the respondent-plotted symbols (although not the distance relations as the mean centre measure is independent of scale). Two measures were recorded of the relationship between the plotted mean centre and the actual mean centre: First the distance (in tenths of an inch) of the plotted mean centre from the actual mean centre - which would give an indication of the degree to which the plotted symbols were wrongly plotted; and second, the directional distortion of the plotted mean centre from the actual (recorded as an eight-point compass direction) - which would give an indication of the directional bias of the plotted symbols.

It has been mentioned above that the mean distance estimate is independent of scale, and therefore that it would not discover any inaccuracy in the degree of dispersion of the plotted symbols. Rather like the standard deviation from the mean, the mean centre has a standard distance measure which can be used to summarize the spatial spread of points. This was calculated for each completed exercise and subsequently recorded according to whether the measure was higher than, equal to, or lower than the actual standard distance of the accurately plotted points. This measure therefore, would report the degree of departure of the overall plot from an accurate scale (or dispersion of landmarks). A record was also made of the magnitude of the departure from the accurate dispersion, by the recording of the difference between the plotted and actual standard distance in tenths of an inch.

Respondents were urged to plot only those symbols whose location they knew. A check was made after the respondent had completed the exercise that none of the plotted symbols were complete guesses. Any that were, were highlighted and disregarded at the analysis stage. The number of symbols that the respondent was able
to plot was recorded. Then the accuracy of the plotted location of each symbol was measured and recorded in two ways; first the number of symbols located within ten millimetres of the actual location of that symbol, and second, the number within twenty five millimetres of the actual location.

It was also considered important to discover whether the plots displayed any predominant directional rotation of landmarks, thus suggesting a rotational/orientational distortion in the cognitive image. It might be the case that the symbols were consistently too far to the right or left about a central point, rather than haphazardly misplotted. Thus plots were classified according to whether there existed a predominant directional rotation or not; and if there did, then the nature (in thirty degree stages e.g. 'less than thirty degrees to the left', 'between thirty and sixty degrees to the left' etc.) of that rotation.

Finally, respondents were awarded an overall subjective score for each plotting exercise which rated their performance on a five point scale. The scale ranged from 'excellent', through 'average' to 'very poor' in a manner consistent with all the other rating scales used in this research.

Four measures were taken from the connectivity exercises. First, the number of symbols which were accurately connected by a path to another symbol was recorded. Second, the number of accurate road segments (defined as a stretch of road between two junctions or with one or either end 'floating') drawn on the plot were counted and recorded. Third, the identity of the landmarks which could not be connected was recorded. And finally, respondents were awarded an overall score for their performance in the connectivity tests, on a scale exactly similar to the one used in the plotting exercises so that comparisons between the two could be made.

Thus, the plotting and connectivity exercises will allow the examination and comparison of respondent knowledge of the metrical and topological relations of the Leicester environment, as well as provide a measure of their current spatial/orientational ability within the city. Another method which has been employed to examine their orientational ability and spatial knowledge will be discussed in the following section.

3.2.5g. The orientation/direction questions.

It was decided that alongside the more abstract tests discussed above, a method should be employed which simulates a task which people are sometimes required to undertake in 'real life' situations. Thus respondents were asked to imagine that they were standing in a particular location in Leicester's central area, and that a person had approached them asking for directions to a particular place. They were then asked to give that person the directions that they required, and their answers were recorded on
audio tape. Respondents were asked four of these questions in total, two from each of two starting points (the six-month group answered slightly different questions at this stage so that they would not be asked exactly the same at the twelve month stage). Their success at performing the tasks was recorded in one of three ways: (1) That they were able to give directions, following the most direct route between the two places, easily. (2) That they were able to give accurate directions, but they offered an indirect route. (3) That they had no idea, either by giving the wrong directions, or not attempting an answer. The respondent's performance in the four tasks combined was then summarized in an overall score, consistent with the normal scoring system. These questions have only been analysed in the above way for the purposes of this research. The tape recordings however, contain a wealth of information regarding the features of the visual environment that respondents' used as orientation aids, and these could form the basis of an interesting side-issue.

The direction tasks have provided the research with additional information regarding the abilities of people at spatial orientation in the urban environment at different lengths of residence. They also had the advantage of providing respondents with a 'realistic' spatial problem to solve.

3.2.5h. The Use of Photographs.

Rieser (1972) noted that the use of the "photographic stimuli mode, has been limited, probably because it is time consuming, expensive and presents difficult problems of control" (Rieser 1972, 23). He continued that it is difficult to know what the respondent is responding to when (s)he is presented with a photograph for identification. Swinburne (1967) has shown the great variations that light intensity, brightness, weather, aspect, perspective and camera angle can have on the photographic image produced. The results of this study have indeed shown that aspect, perspective and even seasonality can effect the recognition rates of a familiar landmark or place (see Chapter Five). However, it was decided that photographs should be employed in this research as a stimulus tool, as the problems mentioned above can be assumed to be constant for all respondents. Photographs were therefore, used in this research in three different ways. These will be discussed here in turn:

Three sets of individual shots of well-known landmarks in both the city centre and the rest of the urban area were shown to respondents who were asked to identify the subject of the photograph, and say whether they (a) knew where the subject was and (b) would know how to get there. They were asked the additional two questions because people could often make educated guesses about the identity of a place without knowing where it is located, and as these questions aimed to determine the spatial extent of knowledge, such a situation would produce erroneous conclusions. The six-month respondents were shown slightly different photographs so that they would not
see the same ones again at the twelve month stage. The photographs that the other three groups were shown are represented in Figures 3.6. and 3.7. The number of accurately identified photographs, both at the city centre and the citywide scale, was recorded, and respondents were awarded an overall score for their recognition of all the photographs combined.

Two aerial photographs which represented two distinct parts of the central area (Figures 3.8. and 3.9.) were also shown to respondents. Subjects were told that they represented parts of the city centre and were asked to point out to the interviewer, any features in the photographs that they recognized. Responses were recorded on audio tape, and thus the researcher gained a record of the length of time taken by the respondent to orientate him or herself to the contents of the photograph, any problems that (s)he experienced (which were verbally communicated) in carrying out the task, and those features which were recognized. These photographs required a lot more effort on the part of the respondent than the iconic shots. First, respondents were often viewing the city centre from an aerial perspective for the very first time, and thus it required the process of orientation to this perspective. And second, the recognition of familiar places from a totally new angle was required, and this was often experienced as being very difficult. As such however, the results of these photograph questions would offer some insight into the orientational ability of respondents, as well as the quantity of their spatial knowledge. The number of recognized features was recorded, and respondents were awarded a score according to their performance in the two questions.

Finally, four sets of sequential photographs were shown to respondents which depicted four journeys from one place in Greater Leicester to another. The photographs (numbering between six and eight per journey) were mounted in an album alongside a number and an arrow which indicated the direction that the journey was to proceed along, at each point depicted in the photograph. The journeys took the respondent through areas in north, south, east and west Leicester respectively. These questions aimed to determine the ability of respondents to both recognize parts of the urban area, and to interpolate from a known point along a route to a destination. All the routes started in places which were familiar to respondents, and thus, even if the respondent did not recognize a shot, it should have been possible to make an educated guess as to its location. Thus, the sequential photographs constituted another way of determining the comprehensiveness and flexibility of respondent knowledge of the citywide environment.

The results of the sequential photograph questions were classified according to the nature of the photographs recognized in each journey (e.g. ‘end location not known’, ‘first half only known’), and then an overall score was awarded to each respondent according to his or her performance on all the journeys combined.
FIGURE 3.1.
THE DELIMITATION OF RESIDENTIAL AREAS.
FIGURE 3.2. THE DELIMITATION OF CITY SECTORS.
FIGURE 3.6.

THE CITY CENTRE PHOTOGRAPHS

1. The Guildhall.

2. St. Martins Shopping Precinct
3. The Market Place

4. The Post Office
5. St. Margarets Bus Station.

6. The Cinecenta
9. Victoria Parade

10. The Prison
FIGURE 3.7.

THE CITYWIDE PHOTOGRAPHS.

11. Alliance & Leicester Building Society

12. The Racecourse
13. Asda Superstore

14. The Post House Hotel
15. Saffron Lane Sports Track

16. The Polytechnic
17. The Magazine

18. Leicester City Football Ground
19. Leicester Tigers Rugby Ground

20. The Jewry Wall
21. Abbey Park

22. The Royal Infirmary
FIGURE 3.8. The Market Place and Gallowtree Gate
Thus, the photograph questions used in this research were intended to add a wealth to the information collected on individual spatial cognition and learning, using a different method, and thus adding to the overall comprehensiveness of the study. They also elicited information which could not have been achieved via any other means.

3.2.6. Data Analysis.

The information which resulted from the interviews was coded in the manner indicated in the above discussion and entered into a data matrix which comprised one hundred and forty six cases of five records per case. This data matrix was then entered onto a Vaxcluster mainframe computer. Several sub-data matrices were also used where data was organised in a different way, and these were also entered onto the computer. The data was analysed using SPSSx, a statistical package. The range of statistical tests at the disposal of the research were limited, due to the nature of the data (most of which was nominal data). However, two tests (besides the normal descriptive statistics) proved to be particularly useful; Chi Square Analysis and Analysis of Variance, both of which test for significant differences between groups of data. The first is concerned with differences between the frequencies of occurrence of classed data, and the second is concerned with differences between the mean values and standard deviations of groups of cases. These tests were operated using the ‘crosstabs’ and ‘breakdown’ commands in the SPSSx programme. Results have been considered as ‘significant’ where they have exceeded the 0.05 per cent level of significance; and in all cases, they have been quoted with the level of significance achieved. In some cases, small sample numbers have resulted in situations where tests of statistical significance should not strictly be used. In these cases never the less, tests have been used so that they might indicate the likelihood of relationships which could be proven to be present if the sample numbers were larger. Thus in these cases (and this almost exclusively concerns the three year (plus) group), statistics have been used as ‘indicators’ rather than as attempts to ‘prove’ that relationships exist. It is recognized in these cases that this is not an ideal situation.

The analysis has involved two stages; first the analysis of environmental knowledge and ability by length of residence, and second, the analysis by the personal characteristics of the study population. In order that an accurate impression be gained of the influence of one of these variable types on environmental learning, the influence of the other often had to be controlled. This was necessary when it was the case that for example, a personal variable was found to be strongly related to length of residence. Straightforward analysis of the influence of this variable on knowledge, might suggest a relationship when that relationship is in fact, wholly attributable to the effect of length of residence. In such a case, the influence of length of residence has been controlled so that the true relationship between the personal variable and knowledge could be

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revealed. This has been achieved either by controlling the influence of the variable within the statistical test (where possible), or by weighting the variables. Detailed analysis of multicollinearity between the different independent variables considered in this research therefore needed to be undertaken so that such relationships in the data could be understood, and corrective steps could be taken.

In the above consideration of the data collected in the interview schedules, it was noted that respondents were awarded a score for their performance in each of the knowledge tests and questions. The scores were taken from a five-point scale which ranged from 'very good' to 'very poor'. It was intended that these scores would allow comparison of respondent performance on different aspects of city knowledge. The rating scales used, although subjectively administered, were realistic in their reflection of the ability ranges of respondents. Thus, they have been used in this research to compare respondent ability in and knowledge of the different aspects of the urban environment, at different length of residence stages. The rating scales have also been used in the examination of the effects of personal variables on environmental learning (usually in the form of group aggregate data - Chapter Eight), as the great number of these variables rendered it impossible to examine the nature of knowledge in greater depth.

3.2.7. Conclusion.

Attention in this chapter has been given to the methodological problems which characterize the field of environmental cognition research. It has been seen that these problems can be divided into three broad groups; the elicitation/representation of mental maps/knowledge, the interpretation of the representations, and their subsequent modes of analysis. Subsequent discussion has described the methodologies employed in the present research, and the measures which have been undertaken to overcome these problems. Attention will now turn to the results of the study.
Table 3.1. THE SAMPLE GROUPS.

<table>
<thead>
<tr>
<th>Length of Residence</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in Sample</td>
<td>43</td>
<td>48</td>
<td>41</td>
<td>14</td>
</tr>
<tr>
<td>Population Size.*</td>
<td>148</td>
<td>130</td>
<td>130</td>
<td>45</td>
</tr>
<tr>
<td>Sampling * Fraction.</td>
<td>29%</td>
<td>37%</td>
<td>32%</td>
<td>31%</td>
</tr>
<tr>
<td>Approximate Sampling Fractions. **</td>
<td>16%</td>
<td>20%</td>
<td>17%</td>
<td>31%</td>
</tr>
</tbody>
</table>

* Sampling fractions excluding those individuals whose previous places of study were unknown.

** Sampling fractions including those individuals whose previous places of study were unknown.

N.B. The sample populations were calculated by taking the total number of individuals who were October starters (546 for three month and three year (plus) samples) (including known new staff) and deducting part-timers (130), Leicester graduates (78), PGCE students (70), and those of unknown previous universities, polytechnics and colleges (120). Similar figures applied for the six and twelve month groups.
Information regarding the personal characteristics and situations of the respondents in the study groups was selectively gathered with regard to its relevance to the process of environmental learning. Certain personal factors have been posited in the literature as having strong causal links with the process of environmental learning. These are age (e.g. Piaget, 1960), sex (Gilmartin and Patton, 1984), residential history (Devlin, 1976), degree of exposure to various media channels (Gold, 1980), 'environmental disposition' of the individual (Beck and Wood, 1976) and sense of direction (Kozlowski and Bryant, 1977). Such variables, alongside geographically based information such as location of residence and personal spheres of activity, provide the data for the comparison of individuals and groups, their environmental learning, and the factors which may influence it. This chapter seeks to set the context for the study of one hundred and five individuals by highlighting some relevant aspects of their personal situations.

For the purposes of this study, it was important that the four sample sub groups were as similar to one another as possible (see Chapter Three). This was because the study aimed to attribute differences found between the four sample groups to time and learning, and this would not have been possible if personal factors could be suspected to play a differentiating role. Thus the analysis which follows in this chapter attempts to establish the success of the sampling design in achieving between-group homogeneity.


4.1. Demographic Variables.

Ontogenetic studies of environmental cognition concentrate on age and consequent developmental stage as the major determining variables of knowledge. Respondents in this study were all aged between twenty one and thirty five (the majority being below the age of twenty five), and thus due to this standardization, age was a factor which was not important in the context of this research. Another factor which may be important in the development of cognitive representations of the environment, is life-cycle stage. Once again, in the context of this research, this variable was standardized, and so not important here. Such standardization was important, as it ensured that activity patterns amongst respondents were fairly similar. This is because people were not
required by family commitment to travel regularly to a place in the city with a dependent (e.g. to school or somebody else's place of work), a factor which would contribute a source of variation between subjects.

Respondents were almost equally divided between male (fifty four per cent) and female (forty six per cent). This equal division was also the case within each sample group with the exception of the three year (plus) group (Table 4.1.) for which unfortunately, it proved difficult finding females who were postgraduates and who had been in Leicester for three years or more (see Chapter Three). It will be seen later (Chapter Eight) that gender might be an important determining variable in environmental cognition, and thus, it was important that the sexes were represented as equally as was possible.

4.2. Residential Variables.

4.2.1. Place of Residence.

The residential locations of respondents showed a high degree of clustering in the southeast sector of the city. Ninety one per cent of the sample group lived in the residential areas neighbouring the University or the northwest-southeast axis of the London Road (A6 - Figure 4.1.). Of the remaining nine per cent, only one person lived in a different city sector. Some of this clustering is due to the location of the University residences in the areas of Knighton and Oadby (Figure 4.1.) as thirty eight per cent of respondents were resident in University accommodation at the time of the interview. Proximity to the University would undoubtedly be the major factor accounting for the spatial clustering of those not resident in University property.

Respondent place of residence varied between the four length of residence groups. This difference was found to be statistically significant at the 0.01 level of significance. (Chi square). The modal locations for the three month group were the Halls of Residence (28%) and Highfields (26%); for the six month group these were Clarendon Park (23%) and Knighton (31%); for the twelve month group, Clarendon Park 39% and Knighton (17%); and for the three year (plus) group, these were Clarendon Park (29%) and the Halls of residence (29%). Despite these minor differences however, locational unity within the whole group was great, and this was seen to be a highly desirable situation in the context of a study such as this. This is because locational bias will lead to information bias in cognitive maps (Adams, 1969), and this would represent a problem if the respondents were scattered widely throughout the city.

Here, locational bias will be prevalent in the results, but uniform. Had time and logistics allowed, it would have been desirable to take another such spatially concentrated and homogenous group who were located in a different city sector (although it is doubtful that such a group exists within the city of Leicester) so that
FIGURE 4.1.
THE RESIDENTIAL LOCATIONS OF RESPONDENTS.

CITY CENTRE

HIGHFIELDS

Univ ersity

STONEYGATE

CLARENDON PARK

KNIGHTON FIELDS

KNIGHTON

HALLS OF RESIDENCE

KEY:
Percentage of sample
0 - 8
9 - 14
15 - 20
21 - 25

Scale 0 1
mile

80a
comparisons might be made between them on the nature of their developing urban area knowledge.

4.2.2. Tenure and the Search for a Residence.

The high proportion of University accommodation occupants in the total sample group (thirty eight per cent), had significant implications with regard to the amount of environmental searching that respondents had undertaken. This was because obtaining a place in university accommodation involves little more than a phone call or written application, and certainly requires no active interaction with the environment. It will be seen later (Chapter Eight) that search activity for a residence can affect the acquisition of environmental information. When University-accommodation respondents were asked if they had considered any other sort of accommodation before moving into university residences, so few in this tenure category replied in the affirmative that it was unnecessary to pursue this consideration further. Some respondents in the 'university accommodation' group however, were using this tenure category only in the short-term, whilst they searched for somewhere to buy or rent, and thus they had engaged in search activity.

Respondents were asked how much time in total they had spent looking for accommodation. Forty four per cent of both the three month and the six month sample groups had spent no time at all searching for accommodation. Amongst the twelve month group, seventy three per cent had searched for accommodation at some time, as almost half of this group (forty six per cent) had changed residence between the six- and the twelve-month interviews. Such a high degree of intra-urban migration is atypical, and thus the study population might be expected to differ from the general population on this criteria and any of its consequences. Whether or not the amount of time spent searching for accommodation in the city has any affect on environmental knowledge, will be seen in Chapter Eight.

Fifty three per cent of the sample population lived in privately rented accommodation, and nine per cent lived in their own homes (Table 4.2.). Not surprisingly, as length of residence increased, the proportion of people who were homeowners rose from zero (three month group) to twenty one per cent (three year (plus) group).

4.2.3. Residential History in Leicester.

As expected, as length of residence increased through the sample groups, the number of different residential districts in which respondents had lived also increased (Table 4.3.). After two months in the city, ninety five per cent of respondents had only lived in one residential district. This figure had decreased to eighty per cent after six months, forty four per cent after twelve months and only seven per cent after three
years or more. Similarly, after three years, twenty nine per cent of people had lived in four different areas, and fourteen per cent had lived in five or more. Nobody from the other three sample groups had lived in more than three districts. These results again demonstrate the high intra-urban residential mobility of the study group. Obviously, it could be expected that these differences between the four sample groups might have some effect on knowledge. More significant however, is whether or not people had lived in a different city sector as this would constitute a greater deviation from the norm. Nobody in the three month group had changed sectors. This figure was two per cent amongst the six month group, twelve per cent amongst the twelve month group and twenty nine per cent amongst the three year (plus) group. As these proportions only amount to seven per cent of the total sample group, it is difficult to attempt any statistical analysis.

4.2.4. Previous Residential History.

It might be the case that learning about an environment becomes progressively easier with practice (Chapter Eight). If this were the case, the number of different environments that a person had lived in (i.e. the number of moves that they had undertaken) would influence his or her learning ability in Leicester. People were asked how many ‘towns, cities or villages’ they had lived in (for a period exceeding three months) before the age of eighteen, after the age of eighteen, and in total (Chapter Three). Almost fifty per cent of the sample group had changed residential environment before the age of eighteen. After the age of eighteen, the modal number of moves undertaken by respondents was ‘three or four’ (fifty three per cent of the sample). The four sample groups did not differ significantly on this variable (Figure 4.2.).

4.3. Geographical Activity Patterns.

The concept of ‘activity space’ has long been central to studies in behavioural geography (Chombart de Lauwe, 1952; Hagerstrand, 1969). It refers to the space in which an individual’s activities are carried out. In its simplest form, the activity space of an individual would be an area embracing home, work, shopping and leisure locations, and the term is used here in this context, although it has been suggested that a hierarchical ordering of activity spaces (e.g. ‘familial space’, ‘neighbourhood space’, ‘economic space’, and ‘urban sector social space’) would provide a more realistic model of spatial behaviour (Chombart de Lauwe, 1952).

It was important for the purposes of this research that the activity spaces of respondents were as homogenous as possible. The following sections will therefore examine the elements of respondents activity spaces in order that the degree of homogeneity achieved in the sample might be discovered.
FIGURE 4.2.

PREVIOUS RESIDENTIAL EXPERIENCE.

(a) The number of places that respondents had lived in between the ages of five and eighteen.

(b) The number of places that respondents had lived in between the ages of eighteen and the present.

(c) The total number of places that respondents had lived in.

KEY:

Length of Residence
- All Groups
- 3 Months
- 6 Months
- 12 Months
- 3 Years plus
4.3.1. Workplace.

Alongside place of residence already considered in the previous section, place of work is an important component of an individual's activity space. As respondents were selected on the basis of their involvement with the University, it was not surprising to find that this was the primary work location of everybody interviewed. Respondents were asked how much time they spent at their primary work location (the University) and twenty-five per cent of the sample worked somewhere other than the University; three per cent for less than a quarter of the time, and twenty-two per cent for between a quarter and a half of their total working time. One-fifth of the total sample group had embarked upon a two-year M.A. course in Social Work, half of which is carried out on 'placement' somewhere other than the University. These people were consequently found to have more expansive activity spaces than most of the other respondents, and it might be expected that they should have a correspondingly broader knowledge of the city. Fortunately, social workers were evenly distributed between the four length of residence groups, and thus should not influence between-group comparisons. The secondary work locations of respondents were scattered throughout the city (city centre (42%), 'same city sector as residence' (11%), 'other city sector excluding north Leicester' (33%), and 'north Leicester' (14%)). The numbers of individuals falling into each category were too low for detailed statistical inquiry to be carried out into the effects of this variable.

4.3.2. Shopping.

An individual's 'regular activity space' is delimited by the extent of his or her regular activity habits. Most single people have to spend some time each week shopping for necessities. These repeated activities tend to become habitual after an initial period of exploration to find a place which satisfies most needs. People, in this context tend to be satisficers rather than maximizers. Maximizing shopping behaviour may take place for high order items which are only bought occasionally, or, if the grocery shopping trips can be made less frequent by bulk buying. Where shopping is frequently carried out however, satisficing behaviour will provide the individual with one of a small number of locations which he or she normally frequents. Grocery shopping amongst this sample group, was normally carried out either in the city centre (30% of the total sample), 'own residential areas' (33%), or 'another residential area within the same city sector' (36% - Table 4.4). Only three people out of the whole sample travelled into another city sector to carry out their grocery shopping. Differences between the sample groups were found to be significant at the ninety-five per cent level of significance (Table 4.10.) The four year+ group showed a preference for the city centre, and none of them shopped in their own residential areas; the eight month and twelve month groups preferred their own areas and the modal shopping locations for two month group was 'somewhere else in their own city sector' (Table 4.4).
Shopping habits were, despite this, fairly standardized since almost all of the shopping locations reported were tightly clustered in the south east sector of the city. Furthermore, of those who purported to shop somewhere other than their own residential sector or city centre, a large number frequented shops which were ‘en route’ from home to the University (this is excepting those respondents who lived in Halls of Residence in Oadby, most of whom shopped in Oadby and since this is arguably their ‘residential area’, they have been discounted here). There thus seemed to be a very strong centripetal force at play, as only eight per cent of all respondents travelled outwards to carry out their grocery shopping. (Of these eight per cent, only two respondents did not have a motor car, so it is likely that the shopping behaviour of the sample group is one typical of a group without personal transport, and that a ‘normal’ group of city residents may show different patterns.) This of course will restrict a person’s activity space to a city centre/work/home sphere, with place of residence constituting the furthest point away from the city centre that a person frequently visits. The implications of this in the context of knowledge are obvious, and later in the study, it will be seen whether or not such observations are significant (Chapter Five).

So far in this chapter, the argument has assumed that the city centre is an integral element of a person’s activity space. It has been seen that thirty per cent of respondents normally carried out their grocery shopping in the city centre, but apart from this, no evidence has been forwarded to support the claim for such city centre eminence. For this reason, and because many tests of city centre knowledge were to be administered to respondents, people were asked how often they visited the city centre. Sixty nine per cent of the total sample said that they visited the city centre at least once per week, and twenty five per cent visited it twice or more times per week. Such frequent visiting patterns can be explained by the fact that at the time of the second interview, some of the Social Workers were on placements in the city centre. Thirty five per cent of the four year+ group visited the city centre less than once per fortnight, which is a greater proportion than is found amongst any other group. This may reflect a reduction in tendency to visit the city centre as duration of residence in a city becomes greater, or may simply be the misleading product of a small sample. A Chi Square statistic was calculated to examine possible differences between males and females in the frequency of city centre visiting. The statistic was not significant at the ninety five per cent level, showing that differences were not great. A similar test for differences between the four sample groups showed that there was not a statistically significant difference between the city centre visiting habits of their members. This finding conflicts with the observations made above on shopping habits and with the evidence provided in Table 4.5. This is because it was necessary to combine the categories into three larger groups (those visiting; [1] more than once per week, [2] once per week, and [3] less than once per week) to comply with the stipulations of the Chi Square test. No more detail is needed for the purposes of this
study, and it is sufficient here to say that broadly speaking, the four sample groups did not differ on this variable.

4.3.3. Recreation.

Recreational activities might also be expected to take an individual into other areas of the city. Respondents were questioned about their recreational activities and these were considered to be significant if they took the person outside his or her 'normal' activity space. Each respondent was asked how many 'regular' (defined as once per fortnight or more) recreation activities they partook in, and these were recorded only if they involved travel outside their own residential area, or outside their own city sector. Seventy eight per cent of the sample group had no regular activity outside these zones, with the three month group showing least involvement (only twelve per cent partaking in any regular recreation activity outside their own residential area), and the six month group showing the most (thirty one per cent recreating outside their own residential area - Figure 4.3.). Only one per cent of respondents partook in more than one recreation activity in a different residential area to their own. With regard to recreation activities outside their own city sector (delimited by moving sector boundaries - see Chapter Three), only five per cent of the total sample group had one regular venue, and one per cent had two (Figure 4.3.). Such findings support the earlier observation that the activity patterns of the respondents were very highly standardized and localized around their home areas and the University.

4.3.4. Conclusion: The Geographical Activity Patterns of Respondents.

It has been seen in this section that the 'activity spaces' of the study population were very highly standardized, and that they almost without exception, included that part of the southeast sector of the city between respondents' places of residence, the University and the city centre.

4.4. Life-style.

4.4.1. Predominant Mode of Travel.

Since environmental experience is gained through travel from one place in the city to another, it would seem reasonable to expect that the predominant travel mode of an individual will affect his or her experience, and therefore knowledge, of the environment. Furthermore, some travel modes require active wayfinding on the part of the traveller, and others allow the traveller to adopt a completely passive role. Ownership of a car or bicycle will allow the individual greater mobility within the urban area. It is also possible that the car driver gains a different perspective of the urban area than the pedestrian, as (s)he is restricted by one-way systems and other
FIGURE 4.3. RECREATION ACTIVITIES.

The number of recreation activities that respondents partake in.

(a) Outside their city sector.

(b) The number of recreation activities that respondents partake in.

Length of residence:
- 3 years plus
- 12 months
- 6 months
- 3 months
- All years
traffic restrictions. If the environment is experienced predominantly through this mode therefore, a distorted conception of the spatial relations between places in the city might result.

For these reasons, respondents were asked whether or not they had access to a car, and what form of travel constituted their predominant mode of travel around the city. Sixty per cent of respondents were not vehicle owners (Table 4.6.). Thirty four per cent owned a car and a further six per cent had taken driving lessons in Leicester or had intermittent use of a vehicle in the city. Chi Square analysis showed that there was not a significant difference between the four sample groups on this variable. However, as length of residence increased across the four groups, the proportion of car drivers rose steadily from twenty seven per cent amongst the three month group to fifty per cent amongst the three year (plus) group. This can be explained by the fact that there was a slight difference between the four groups in their mean respondent ages. Respondents in the three year (plus) group were generally older than those in the other groups and were thus more able to afford to run a car.

The predominant travel mode of respondents was elicited by asking respondents how they travelled to their work and leisure activities. As few respondents partook in regular leisure activities, the 'travel mode to work' variable was the only one which produced useful results. Forty three per cent of the sample group walked to work, twenty three per cent cycled, and sixteen per cent travelled by car. A Chi Square statistic to test for differences on this variable between the length of residence groups, could not be calculated here, due to low frequencies of occurrence in certain classes. However as Table 4.7. demonstrates, differences between the four length of residence groups did exist. Walking to work became less common as length of residence increased (an observation which cannot be explained by the residential location of the groups) and cycling became more common with increasing length of residence. Chapter Eight will examine the relationship between travel mode and environmental knowledge so that the effects of these differences on respondent knowledge can be understood. No statistically significant differences were found between males and females on this variable.

4.4.2. Exposure To Secondary Information.

So far in this Chapter, discussion has only considered those activities which might influence and delimit an individual's activity space. Other activities however, can influence an individual's exposure to the environment as exposure can either be direct (i.e. interaction with the environment) or indirect (i.e. secondary information sources such as written publications, television etc.). The secondary sources which were considered to be potentially most influential in the context of the Leicester environment were local newspapers, local books, and local radio. Leicester has a local evening
newspaper (the 'Leicester Mercury') as well as several free weekly trade newspapers, and two local radio stations (B.B.C. 'Radio Leicester' and 'Leicester Sound'). All of these concern themselves with local affairs and thus expose the reader or listener to a wide variety of local information. Respondents were therefore asked if they ever read the 'Leicester Mercury' or a free newspaper, or listened to local radio. Figure 4.4 presents the results of these questions.

With regard to newspaper readership, respondents differed widely across the four sample groups. The percentage of respondents who reported to read local newspapers 'often', rose steadily from twenty three per cent amongst the three month group, to fifty seven per cent amongst the three year (plus) group. It would seem that interest in the local press increases with lengthening residence (Figure 4.4a.) and as a result, exposure to information through this media channel can also be assumed to increase. A Chi Square test showed that there was a significant difference (0.001 level of significance) between length of residence and tendency to read local newspapers. There was not a significant difference between the four length of residence groups and their tendency to listen to local radio however, as only sixteen per cent of the total sample said that they listened to local radio, and fifty six per cent of respondents said that they had never done so (Figure 4.4b.). Gender was examined as a variable which might explain the differences between radio and press participation habits, but no significant differences were found between males and females on these variables.

When asked if they had ever read any written publications about Leicester, sixty seven per cent of respondents said that they had not. The remaining thirty three per cent had read tourist information (thirteen per cent) or books related to their academic disciplines (eleven per cent) and exposure to written publications was not found to differ significantly between the four sample groups.

4.4.3. Frequency of Overnight Stays Away From Leicester.

It can be the case with newcomers to areas of single status, that their social ties with previous residential locations remain greater than those that develop in the new environment. It could be expected that this might be especially true amongst migrants who only expect to live in the city for a brief and limited period. It might be the case therefore, that some respondents (perhaps particularly the short-stay (one-year) MSc. students) will not learn about the city as quickly as others because they spent much of their leisure time in a different environment. For these reasons, respondents were asked how much time they spent away from the city. Almost twelve per cent of the total group were found to go away from Leicester 'every weekend (or almost)', but the majority of respondents were found to 'go away' about 'once per month'. No difference was found between the length of residence groups and their habits in this respect (Chi Square) so it can be concluded that this will not be a determining factor.
FIGURE 4.4.

EXPOSURE TO SECONDARY INFORMATION.

Respondents (%)

(a) The Leicester Mercury.

(b) Local Radio.

- All Groups
- 3 Years plus
- 6 Months
- 12 Months

Length of Residence
in knowledge differences between the four groups.

4.4.4. Expected Length of Stay in Leicester.

It is here proposed that expected length of stay in an environment, will affect an individual’s interaction with that environment. A proportion of the respondents in the study population were only expecting to live in Leicester for the duration of a twelve month course (nineteen per cent), and it could be supposed that they might take less interest in certain aspects of the city than longer-term residents. Problematically, due to the nature of the sample groups, the number of short stayers was disproportionately high in the three month group (Table 4.8.). The relationship between expected length of stay and knowledge will have to be explored before the implications of this difference can be understood. The three year (plus) group were not asked this question as it was considered irrelevant for them.

4.5. Personality.

Certain features of an individual’s personality are likely to influence his or her knowledge of the environment. These are ‘environmental disposition’, and ‘sense of direction’ which, although not strictly an element of personality, is a factor which is in part determined by it (Chapter Eight). Measures of these two elements were taken (Chapter Three) and the findings will be reported below.

4.5.1. Environmental Disposition.

Respondents were divided into three groups according to whether they were ‘very exploratory’, ‘semi-exploratory’ or ‘passive’ in new environmental contexts. The distribution of respondents on this variable is given in Figure 4.5. The majority of respondents were classified into the ‘semi-exploratory’ group (forty one per cent), but a large proportion were classified as ‘very exploratory’ (thirty four per cent). No difference was found between the four length of residence groups on this variable and neither were differences found on the bases of gender.

4.5.2. Sense of Direction.

It has been suggested that ‘sense of direction’ is related to environmental disposition (Kozlowski and Bryant, 1977). When respondents in this research were asked to rate their sense of direction on a seven-point scale, sixty five per cent rated themselves as ‘above average’, sixteen per cent awarded themselves an ‘average’ rating, and eighteen per cent rated themselves as ‘below average’ (Figure 4.6.). An observed difference between the four length of residence groups on this variable, was not found to be statistically significant. Differences were found on this variable however between males
FIGURE 4.5.
‘ENVIRONMENTAL DISPOSITION’.

Environmental Disposition

Respondents (%)

0 20 40 60 80 100

Very Semi-Passive

Exploratory Exploratory

Very Semi-Passive

Exploratory Exploratory
FIGURE 4.6.
SENSE OF DIRECTION.
and females. Males were found to rate their sense of direction more highly than females (Table 4.10.) and a Chi Square test found a significant difference between the ratings of these two groups (significant at the 0.01 level).

4.6. Conclusion.

It has been the aim of this Chapter to examine the personal characteristics of the individuals who are the focus of this research, with a particular view to determining the degree of similarity that has been achieved amongst these individuals. It has been seen that both between-group and within-group variation is slight, and this is the result of the sample groups being selected from a limited and fairly homogenous population. Here is a group of people who live, work, shop and enjoy free time in the same areas of the city, who are of roughly the same age and who are in similar personal situations (both economically and socially).

Differences between the four length of residence groups have been found to exist for place of residence (but these were only differences of adjacent residential areas), place of grocery shopping (but again, all areas were restricted within the southeast sector), and their local press reading habits (readership increased as length of residence increased) (Table 4.10.). These minor differences have been shown to be unimportant in the context of this study.

Possible gender differences on these personal variables have also been examined and the only statistically significant relationship found was between gender and self ratings of sense of direction.

The personal situations of the individuals included in the sample groups were thus highly standardized. Using such a group of individuals therefore, the study can advance to explore knowledge acquisition in the urban environment because differences in knowledge levels are likely to be due to differences in length of residence rather than differences in demographic, economic, social or geographical situation. The validity of this supposition will be further examined in Chapter Eight.
### Table 4.1. THE SEX OF RESPONDENTS (%)

<table>
<thead>
<tr>
<th>Sex of Respondent</th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>54.1</td>
<td>53.5</td>
<td>52.1</td>
<td>48.8</td>
<td>57.0</td>
</tr>
<tr>
<td>Female</td>
<td>45.9</td>
<td>46.5</td>
<td>47.9</td>
<td>51.2</td>
<td>43.0</td>
</tr>
</tbody>
</table>

### Table 4.2. ACCOMMODATION TENURE (%)

<table>
<thead>
<tr>
<th>Tenure</th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University</td>
<td>38.4</td>
<td>41.9</td>
<td>45.8</td>
<td>24.4</td>
<td>42.9</td>
</tr>
<tr>
<td>Privately Rented</td>
<td>52.7</td>
<td>58.1</td>
<td>43.8</td>
<td>63.4</td>
<td>35.7</td>
</tr>
<tr>
<td>Own Home</td>
<td>8.9</td>
<td>-</td>
<td>10.4</td>
<td>12.2</td>
<td>21.4</td>
</tr>
</tbody>
</table>
Table 4.3. THE NUMBER OF LEICESTER RESIDENTIAL DISTRICTS THAT RESPONDENTS HAD LIVED IN. (%)

<table>
<thead>
<tr>
<th>No. of Districts</th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67.1</td>
<td>95.3</td>
<td>79.2</td>
<td>43.9</td>
<td>7.1</td>
</tr>
<tr>
<td>2</td>
<td>26.7</td>
<td>4.7</td>
<td>20.8</td>
<td>53.7</td>
<td>35.7</td>
</tr>
<tr>
<td>3</td>
<td>2.1</td>
<td>-</td>
<td>-</td>
<td>2.4</td>
<td>14.3</td>
</tr>
<tr>
<td>4</td>
<td>2.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>28.6</td>
</tr>
<tr>
<td>5</td>
<td>1.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Table 4.4. USUAL PLACE OF GROCERY SHOPPING. (%)

<table>
<thead>
<tr>
<th>Shopping Location</th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Centre</td>
<td>29.5</td>
<td>30.2</td>
<td>25.0</td>
<td>24.4</td>
<td>57.1</td>
</tr>
<tr>
<td>Own Residential area</td>
<td>32.9</td>
<td>25.6</td>
<td>39.6</td>
<td>43.9</td>
<td>-</td>
</tr>
<tr>
<td>Own Sector excluding own residential area</td>
<td>35.6</td>
<td>41.9</td>
<td>33.3</td>
<td>29.3</td>
<td>42.9</td>
</tr>
<tr>
<td>Other City Sector</td>
<td>2.1</td>
<td>2.3</td>
<td>2.1</td>
<td>2.4</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 4.5. FREQUENCY OF VISITING THE CITY CENTRE

<table>
<thead>
<tr>
<th></th>
<th>4 times per week</th>
<th>2-3 times per week</th>
<th>Once per week</th>
<th>Once per Fortnight</th>
<th>Less than once per Fortnight</th>
<th>Hardly ever</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>9.6</td>
<td>17.8</td>
<td>50.0</td>
<td>13.0</td>
<td>8.2</td>
<td>3.4</td>
</tr>
<tr>
<td>3 Months</td>
<td>-</td>
<td>23.3</td>
<td>44.2</td>
<td>27.9</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>6 Months</td>
<td>8.3</td>
<td>16.7</td>
<td>58.3</td>
<td>6.3</td>
<td>8.3</td>
<td>2.1</td>
</tr>
<tr>
<td>12 Months</td>
<td>22.0</td>
<td>12.2</td>
<td>43.9</td>
<td>9.8</td>
<td>7.3</td>
<td>4.9</td>
</tr>
<tr>
<td>3 Years (Plus)</td>
<td>7.1</td>
<td>21.4</td>
<td>35.7</td>
<td>-</td>
<td>28.6</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Table 4.6. DRIVING IN LEICESTER (%)

<table>
<thead>
<tr>
<th></th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No driving in Leicester</td>
<td>59.6</td>
<td>69.8</td>
<td>60.4</td>
<td>53.7</td>
<td>42.9</td>
</tr>
<tr>
<td>Car Owner</td>
<td>33.6</td>
<td>25.6</td>
<td>33.3</td>
<td>39.0</td>
<td>42.9</td>
</tr>
<tr>
<td>Had driving lessons in Leicester</td>
<td>2.7</td>
<td>2.3</td>
<td>2.1</td>
<td>2.4</td>
<td>7.1</td>
</tr>
<tr>
<td>Sold a Vehicle since being in Leicester</td>
<td>3.4</td>
<td>-</td>
<td>4.2</td>
<td>4.9</td>
<td>7.1</td>
</tr>
<tr>
<td>Intermittent use of a vehicle</td>
<td>0.7</td>
<td>2.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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Table 4.7.  TRAVEL MODE TO WORK.

<table>
<thead>
<tr>
<th>Mode</th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>15.8</td>
<td>9.3</td>
<td>14.6</td>
<td>22.0</td>
<td>21.4</td>
</tr>
<tr>
<td>Bus</td>
<td>8.2</td>
<td>11.6</td>
<td>2.1</td>
<td>12.2</td>
<td>7.1</td>
</tr>
<tr>
<td>Cycle</td>
<td>23.3</td>
<td>18.6</td>
<td>18.8</td>
<td>29.3</td>
<td>35.7</td>
</tr>
<tr>
<td>Walk</td>
<td>42.5</td>
<td>55.8</td>
<td>47.9</td>
<td>26.8</td>
<td>28.6</td>
</tr>
<tr>
<td>Combination with car</td>
<td>1.4</td>
<td>-</td>
<td>2.1</td>
<td>2.4</td>
<td>-</td>
</tr>
<tr>
<td>Combination without car</td>
<td>8.9</td>
<td>4.7</td>
<td>14.6</td>
<td>7.3</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Table 4.8.  EXPECTED LENGTH OF STAY IN LEICESTER

<table>
<thead>
<tr>
<th>Length</th>
<th>ALL</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-12 Months</td>
<td>20.5</td>
<td>39.5</td>
<td>10.4</td>
<td>12.2</td>
</tr>
<tr>
<td>13-18 Months</td>
<td>2.3</td>
<td>7.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>19-24 Months</td>
<td>23.5</td>
<td>4.7</td>
<td>33.3</td>
<td>31.7</td>
</tr>
<tr>
<td>2.1-3 Years</td>
<td>43.2</td>
<td>44.2</td>
<td>41.7</td>
<td>43.9</td>
</tr>
<tr>
<td>7 Years</td>
<td>5.3</td>
<td>4.7</td>
<td>6.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Indefinite</td>
<td>5.3</td>
<td>-</td>
<td>8.3</td>
<td>7.3</td>
</tr>
</tbody>
</table>
Table 4.9. DIFFERENCES BETWEEN MALES AND FEMALES ON THEIR SELF-RATINGS OF SENSE OF DIRECTION (%)

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>77.8</td>
<td>50.0</td>
</tr>
<tr>
<td>Average</td>
<td>13.0</td>
<td>20.5</td>
</tr>
<tr>
<td>Poor</td>
<td>9.3</td>
<td>29.5</td>
</tr>
</tbody>
</table>
### Table 4.10. SIGNIFICANT RELATIONSHIPS OF CHI SQUARE.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Chi Square Statistic</th>
<th>Degrees of Freedom</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Length of residence x place of residence</td>
<td>17.98</td>
<td>6</td>
<td>0.0063</td>
</tr>
<tr>
<td>2. Length of residence x place of grocery shopping</td>
<td>12.85</td>
<td>6</td>
<td>0.0455</td>
</tr>
<tr>
<td>3. Length of residence x readership of the 'Leicester Mercury'</td>
<td>22.33</td>
<td>6</td>
<td>0.0011</td>
</tr>
<tr>
<td>4. Own Rating of sense of direction x sex of respondent</td>
<td>9.13</td>
<td>2</td>
<td>0.0104</td>
</tr>
</tbody>
</table>
CHAPTER FIVE.

PHYSICAL ELEMENTS OF THE URBAN AREA.

This Chapter aims to explore people's knowledge of the physical make up (structure and morphology) of cities in an attempt to throw light upon first, the process of environmental learning and second, the development of the cognitive structures which synthesize the accumulating knowledge which is the outcome of this learning. The latter objective is important in the context of this study because environmental knowledge cannot be viewed purely as a collection of tangible facts that can be verbally communicated by the subject to the researcher. Instead it is the result of experiences which manifest themselves into a developing understanding of the complexities of the spatial relationships between the elements of the urban area. This type of knowledge cannot be expressed as facts in answer to direct questions in the way that the information for the analysis of knowledge of the economic and social attributes of the urban area has been collected (see Chapters Six and Seven). The complex nature of knowledge of the physical structure of the urban area needs to be considered within a holistic framework that examines both the information that respondents have, and the way in which that information is stored.

In order that knowledge of the physical elements of the urban area can be studied, these elements need to be classified in some way. In the study of the physical elements of the city, Carter (1981) has argued that;

"It has now become convention to break down the complexity of townscape into three component parts; street plan or layout, architectural style or build, and function or land-use. These are closely interrelated and indeed their separation in academic studies has led to gross distortions of reality" (Carter 1981, 142).

In terms of this study, such a delimitation is not helpful since individuals do not make delimitations based on such technical criteria. Therefore in this study, for the purposes of measuring knowledge, the urban area has been viewed as containing the following attributes; content (e.g. landmarks, places, orientation aids) and structure (e.g. spatial relationships between objects - direction, distance and connectivity). Urban area cognition involves accumulating knowledge on each of these components and organizing this knowledge in a way that will aid effective interaction with the environment. Research and debate have focussed on the acquisition of knowledge of city morphology and this Chapter considers some of the hypotheses that have arisen from previous studies (e.g. Devlin, 1976; Golledge, 1978). Much of this previous work has focussed on one particular aspect of city structure cognition (e.g. distance between objects) and
their findings have accordingly been as narrow as their design. In addition, as Carter (1981) points out, the artificial separation of these elements has led to 'distortions of reality', and spurious conclusions about the nature of cognitive maps have resulted. As has already been mentioned, this Chapter adopts a more holistic approach in an attempt to minimize both the chances of such failings, and the necessarily abstract nature of the subject matter. Chapter Nine further develops the issues raised here within an even more holistic frame when it considers city knowledge as it is experienced and used with all its interacting component parts.

The following Chapter is comprised of six sections. The first section provides an overview of the theory surrounding the hypotheses being reviewed here. The remaining sections then present the results under the following headings: 'Landmarks and Nodes', which will examine respondents' knowledge of landmarks and places in the city; 'Orientation and Direction', which will investigate respondents' understanding of the relative locations of landmarks in space and their understanding of the geometry of the urban area; 'Distance Estimation', which will consider the perception of distance between urban landmarks and places; 'Topological Relations', which will be concerned with respondents' knowledge of the road links between urban landmarks; and 'The Organisation of Spatial Knowledge', which will investigate the nature of the mental frameworks into which knowledge of the urban area is assimilated.

5.1. Theoretical Considerations.


Lynch (1960) hypothesized that people who are familiar with a city rely primarily on specific landmarks for navigating and less on the paths and regions that served as early learning frameworks. Similar arguments have been forwarded by Appleyard (1970, 1976) and Devlin (1976). Conversely, both Hart and Moore (1973) and Siegel and White (1975), have postulated that landmark learning precedes path elaboration. This is in concordance with the 'anchor point hypothesis' of Lee (1964), Briggs (1972) and Golledge and Spector (1978), which states that people new to a city will rely on key landmarks as initial orientational aids and will build their cognitive maps around these. Evans et al (1981) also found this, and they have suggested in their environmental learning model that:

"...human beings initially learn the relative position of landmarks in space. Exact landmark location emerges as a function of increasing path interconnection among the initial anchor points. As more routes are filled in between these points, the exact locus of each point is fine tuned, since fewer alternative loci are possible given the dual constraints of interlandmark position and spatial relationships within the emerging path network" (Evans et al 1981, 86).

This Chapter will endeavour to discover which, if either, of these general positions is
correct. Do paths serve as the early building framework or do landmarks?

There is an assumption in the hypotheses of those advocating variations on the 'anchor point hypothesis' that the relative location of landmarks can be understood in the absence of paths. If this were true, then people should be able to plot landmarks without the paths between them. Kuipers (1982) suggested that topological relations such as order and containment are represented (or at least retrieved and manipulated) separately from metrical relations of distance and direction. Such a view holds that it should be possible to store a topological relation between two places in the absence of any metrical relation between them. This interpretation gains support from the developmental studies of Hardwick et al (1976), Hart and Moore (1973), Siegel and White (1975) and from Lynch's study (1960). Respondents' ability to do this has been tested in this research in two plotting exercises which have involved respondents plotting key landmarks on blank paper with the guide to scale and orientation being two pre-plotted landmarks. The resultant plots have been analysed for plotting accuracy in terms of both the absolute and relative locations of points. The reasons for using these plotting exercises were threefold. First, to see if such an abstract task was possible for people so that the idea of landmark dominance in early cognitive organisation could be supported or discredited. Second, to see if there was any variation over time in people's ability to perform such a task, and so draw some conclusions on which elements serve as early learning frameworks. Third, to compare the results of the landmark plotting exercises with those of the route plotting exercises (which were also undertaken by respondents), in order that ease of task might be established both for the whole sample and at the varying length of residence stages. If one task was found to be easier than the other at one time period, and the reverse were found at another, evidence would exist for the support of one of the two aforementioned theoretical stances. These plotting exercises were designed at two scales, the city centre and the citywide, so that any differences in ability at different scales would be discovered. This was necessary as much work in this area has been based on the assumption that environmental learning proceeds in a way which is invariant with scale of environment. Such an assumption has not been tested empirically, so the present research attempts to consider possible differences, despite the fact that its design is not such that will produce anything other than observation on this issue. The merits of, and problems associated with the plotting exercises have been considered in Chapter Three.

The free-recall sketch maps have also been analysed to throw light upon the anchor-point/path debate. They have been classified in compliance with a system developed by Pocock (1976) which groups maps according to their spatial or sequential dominance (Figure 3.4.). A change may be detectable between the different length of residence groups.
5.1.2. Changes In The Cognitive Organisation Of Knowledge With Time.

Researchers interested in the development of environmental knowledge have paid particular attention to the cognitive-developmental theories of Piaget and Werner, and their colleagues. These are based upon observations of ontogenetic development in the individual from birth through to maturity, and they try to explain the cognitive progression from a state where knowledge is minimal and actions are instinctual, to one where the organism has a complex store of known things and behaviour is based on this knowledge. Piaget (1954a; Piaget and Inhelder, 1956) have theorized that microgenetic development parallels ontogenetic development, and have claimed that his developmental sequence is equally applicable in microgenetic studies. Research formulated to explore this hypothesis in an environmental context has generally lent support to this claim (Hart and Moore 1973; Appleyard 1969, 1970; Devlin 1976; Beck and Wood 1976). Figure 2.3. presents the central tenets of Piaget's developmental theory in diagrammatic form. The hypothesis to be tested here is whether the person progresses from a stage where his spatial awareness is egocentric and undifferentiated and his free-recall maps are drawn in a route-based fashion, to a stage where he has a coordinated euclidean construction of the environment and his free-recall sketch maps are survey-based, demonstrating a high level of understanding of the relationship between the different parts of the urban area (Figure 2.3.). This is clearly an enquiry which is not easy to empirically substantiate, and nothing more than very general conclusions will be drawn in this respect.

5.1.3. Generic Knowledge About Cities And Its Role In Environmental Learning.

Devlin (1976) postulated that generic knowledge about cities in general might play a role in cognitive adaption to new localities. Several researchers have suggested that there is a prominence of a grid configuration in people's cognitive maps (Lynch 1960; de Jonge 1962; Tzamir 1975; Evans et al 1984). Evidence in support of this hypothesis can be searched for in people's free-recall sketch maps and in the information about known places that several of the survey questions elicit. If it were found to be true that people superimpose a grid configuration onto known areas, it would be possible to suggest the likely effects that this would have on behaviour. It would be interesting to find out (if the maps do reveal a tendency towards a grid configuration) whether this is a function of applying a learned set of rules about cities in general, or whether it is simply due to a tendency to 'good figure' (Pocock 1976). Research carried out by Waterman and Gordon (1984) has supported this idea with the discovery of a tendency to generalize shape into simple geometric forms. They also found that people tended to foreshorten north-south lines and exaggerate east-west distances. As yet, it is unknown whether these distortions in revealed mental maps represent a real distortion in mental image, a cognitive framework for dealing with
environmental information, or simply a tendency to simplify drawings.

5.2. Landmarks and Nodes.

Figure 1.1. provides a simplified map of Leicester's city centre. Marked on the map are the prime nodes and landmarks as defined by the author. This section will explore the extent to which people are aware of these landmarks and nodes, which are the most significant to them, and how landmark significance changes through time. The findings will be presented under the heading of the technique used to elicit the information, and a summary at the end of this section will draw some overall conclusions.

5.2.1. The Free-recall Sketch Maps.

Chapter Three has drawn attention to the dangers of inferring too much from the presence or absence of environmental features in people's free-recall sketch maps. Much past research has focussed on elements which are absent from maps and inferred from this that they are also absent from a person's knowledge. The construction of a free-recall sketch map necessitates a process of discrimination and selection, the drawer has limited time and may only put down what (s)he feels is most important. The instructions given before the exercise may also influence features which are plotted. With these considerations borne in mind, the landmarks and nodes drawn on the maps of the Leicester respondents can be studied. (Some examples of respondents' sketch maps are given in Figure 5.20.).

The first point/feature drawn on the sheet of paper (called here the 'initial anchor point') is considered significant as it is a point in space that people have chosen to orientate their map to. It is suggested here that this point is of great importance in a person's cognitive map and that it is probably the major orientational anchor point for their spatial image of the area concerned. Forty three percent of all respondents used the Clocktower as their initial anchor point. This is an obvious choice of orientational anchor point as it lies at the junction of five major streets in the centre of the central business district. This landmark is also of great locally-defined significance, featuring in most visual imagery concerning Leicester (e.g. postcards, local book sleeves, tourist information leaflets). For findings consistent with Piaget's ontogenetic learning sequence, we would expect to find a change with increasing length of residence, from a predominance of egocentrically defined initial anchor points (perhaps a place often visited) to the locally important Clocktower. This hypothesis is only slightly supported by the findings (see Figure 5.1.), although there does appear to be a difference between the three and six month samples and the other groups, consistent with the hypothesis. People living in Leicester for less than one year were
FIGURE 5.1.
SKETCH MAPS - INITIAL ANCHOR POINTS BY LENGTH OF RESIDENCE.
more likely to define their own anchor points ('other' category) than the other groups. This observation was not found to be statistically significant and thus the hypothesis has to be rejected.

The maps were found to have a modal group of between seven and ten landmarks plotted on them (thirty per cent of all respondents). These landmarks were classified according to a system derived from Strachan (1985), into thirteen element classes (Chapter Three). The average number of plotted classes of elements was 4.4, and the classes were most commonly shops, entertainment (theatres and cinemas), service outlets (banks, restaurants), monuments and transport termini. The mean number of plotted classes rose steadily from 3.9 (three month group), to 4.5 (eight month) and 5.0 (twelve month). This figure then fell to 4.2 for the four year (plus) group. It is suggested that this fall and apparent contradiction to the hypothesis that spatial knowledge increases with time, is a function of an increase in selectivity with regard to elements chosen for inclusion on the sketch map as availability of information increases.

The actual number of plotted landmarks rose from a modal group of ‘7 to 10’ after three months (forty four per cent) to ‘11 to 15’ after six months (thirty one per cent) and twelve months (thirty seven per cent) to ‘21+’ after four years (thirty six per cent). Thus, although the number of element classes decreased with an increase in environmental experience, the actual number of landmarks plotted increased between the one and four year stages (Figure 5.2.). The difference between the four groups on number of plotted landmarks was found to be significant at the 0.001 per cent level of confidence (Table 5,8.). It is interesting that the greatest change appears to have occurred after the one year stage rather than before it as the learning model here discussed would have predicted.

Retail outlets were the landmarks most commonly plotted on peoples' free-recall sketch maps. The maps displayed an overall predominance of multiples with large floorspace (e.g. Marks and Spencer, Boots). Of the four out of five people who plotted shops on their maps, less than one per cent did not include a large multiple outlet. Many respondents also included individual shops and service outlets (e.g. banks, cafes). There was very little difference between type of plotted retail or service outlet and length of residence. Few respondents plotted landmarks on anything other than the primary roads in the city centre (see Chapter Three for road classification system). Here again, little difference was found between the four length of residence classes.

5.2.2. The Plotting Exercises.

The justifications for, and formulation of the plotting exercises were discussed in Chapter Three. These exercises have been used to explore respondents' ability to conceptualize the relative locations of selected city landmarks and places in the absence of the connecting routes between them. The exercises were presented to respondents at
FIGURE 5.2.
THE NUMBER OF LANDMARKS AND ELEMENT CLASSES DRAWN - BY LENGTH OF RESIDENCE.

KEY:
- Number of classes of elements
- Number of plotted landmarks (modal group midpoint)
two geographical scales; the city centre and the whole city in order that the supposition that environmental cognition/learning is a scale-independent process could be examined. Respondents' success at performing these tasks will be analysed here with a view to discovering whether there are differences in ability with environmental scale.

This section will concern itself with the nature of the landmarks themselves with regard to their location and visual prominence, and the ability of respondents to plot them with any reasonable certainty of locating them correctly. In the following section on orientation, the spatial relationships between the landmarks will be examined.

Table 5.1. shows the percentages of respondents who were unable to make an attempt to plot the landmarks at both the city centre and the citywide scales. At the general level, it was observed during the interviews that people were more daunted by the task at the citywide scale than at the city scale, despite the fact that they were asked to perform the citywide task second and so had already had practice at thinking in the required abstract way. When plotting the landmarks, they were generally more confident at the city centre scale. It is suggested here that the smaller the spatial scale, the easier it is to cognitize spatial relations between points. This idea will be tested in the next section when plotting accuracy is examined.

In the city centre exercise, respondents were given a sheet with the Clocktower and the ABC Cinema plotted on it and asked to add the other landmarks (Figure 5.3.). It has been seen in the previous section that for many people, the Clocktower is the landmark about which their cognitive map of the city centre is organised. Consistent with this therefore, the Clocktower was used in this exercise as the central point of the plot. The other landmarks included in the city centre exercise were chosen for their functional significance, visual prominence and spatial spread about the Clocktower. Table 5.1. shows that few respondents experienced problems in plotting the Railway Station, the Haymarket Centre or the Market Place. All three lie on the main route from the University and South Leicester to the city centre. More difficulty was experienced with Town Hall Square, The Odeon Cinema and St. Margarets Bus Station. Town Hall Square lies to the west of the main route from the University and is a prominent feature although it could be missed if one never strayed from the main shopping streets. Many respondents (especially in the three month group) claimed not to know where the Town Hall was, although when they were told, they had often seen the building and the square but had not ever labelled it as the Town Hall. It would seem that very often newcomers to a city are disinterested in acquiring knowledge in the first instance that is of no immediate use to them. It is not until later in their stay that they begin to develop a knowledge encompassing 'less useful' items of information. The Odeon Cinema was a landmark which all groups found difficult to plot. It was described by many as being "over the back" and it appeared to be in a hazy area in people's minds. This may be because The Odeon is not
FIGURE 5.3.

THE CITY CENTRE SYMBOLS PLOTTED CORRECTLY.

KEY

† Clocktower
■ ABC Cinema
△ Railway Station
▌ Haymarket Centre
□ Market Place

● Town Hall Square
▲ Odeon Cinema
○ St. Margarets Bus Station
located on one of the primary routes in the city centre, but is instead on a small back street in a run-down area of old textile mills. This landmark can however, be seen from the two major routes leading to the south of the city (Granby Street and Charles Street). St. Margarets Bus Station is a very prominent landmark located on Burleys Way, which constitutes the northern part of Leicester's inner ring road. This is another landmark that a fifth of respondents could not locate. It would seem that the respondent group rarely ventured into areas to the north of the Clocktower. A later exercise will reveal that many respondents knew that the bus station was 'somewhere' to the north of the Clocktower, but when asked to explain how to get there, they very often would not give the shortest and most obvious route (section 5.7.2).

At the citywide scale, respondents were presented with a sheet with the Clocktower (city centre) and the University plotted on it. They then had to add another five points to the plot (Figure 5.4.) which represented the location of five given places, four of them chosen for their significance in southern Leicester and the fifth (Abbey Park), included as a prominent area in the north of the city (see section 3.2.5f.). Table 5.1. shows that Abbey Park caused most problems in this exercise since just over half of all respondents were unable to identify its location. Indeed after three months in the city, only one quarter of people were able to estimate the location of this landmark. After three years in the city, fourteen per cent of respondents were able to determine the park’s location, which is still a relatively low percentage in view of its size and functional significance (the annual highly popular ‘City of Leicester Show’ takes place there). In other words, it is clearly evident that urban knowledge can be highly spatially restricted to one’s own city sector. Length of residence is just one factor that can influence the spatial extent of a person’s environmental knowledge however, and the other possible factors are examined in Chapter Eight.

Oadby and Wigston are former villages on Leicester’s southern periphery which have become engulfed by urban sprawl to form two suburbs which are now part of a district council. Leicester University has strong links with Oadby as most of the student Halls of Residence are located there. However, these generally house the undergraduate community and few of the more senior members of the university have occasion to go there. Table 5.1. shows that almost a quarter of the three month sample could not plot the location of Oadby, and after twelve months in the city, ten per cent of respondents could still not perform this task. These are quite high percentages considering that Oadby is located in the southeast sector of the city. It would seem that spatial knowledge is not just restricted sectorally in a city, but that areas further out from the city centre than one’s own residence can also be unknown. Wigston, located directly south of the city centre was less well known than Oadby. This is because most of the respondents in the survey lived in areas bordering the A6 (London Road) which is the arterial road between the city centre and Oadby. Fewer
FIGURE 5.4.

THE CITYWIDE SYMBOLS PLOTTED CORRECTLY.

KEY

+ City Centre (Clocktower)
■ University
△ Oadby
□ Wigston

 Abbey Park

Highfields/Evington rd/East Pk rd junction

Royal Infirmary

103a
people lived adjacent to the A50 (Welford Road) which leads to Wigston.

Evington Road/East Park Road junction was well known. This junction was selected for inclusion in the exercise as it can be regarded as a central place in Highfields (an area where many of the respondents lived (fifteen per cent). The Royal Infirmary caused more problems. Many were aware that Leicester has three large hospitals and they had to be told which the Infirmary was. Located on a large one-way system with no obvious geometric links with the University or the residential areas of southeast Leicester, many people had difficulty in plotting this landmark. Table 5.1. shows however, that most people were able to attempt it.

The above discussion has shown that interviewees generally responded well to the plotting exercises and in most cases, they were able to make an educated estimate of the location of the landmarks and places at both scales. The accuracy with which they performed this exercise will be looked at in section 5.3. At both scales and in all cases, there was a very clear relationship between proportions of the groups that could plot the landmarks and their length of residence in Leicester. Many of these relationships were found to be statistically significant (Table 5.2.). The strongest relationships were found for the landmarks that respondents found the most obscure, with the longer length of residence groups having significantly more members being able to plot them. It is also evident that on the whole, respondents were slightly more successful at the city centre scale than at the citywide scale, and that the ability gap between the length of residence groups was greatest at the latter scale. This observation can be investigated further in the next subsection.

5.2.3. The Photographs.

The use of photographs in this research has been described in Chapter Three. This section will consider respondents' success at identifying the individual photographs of various landmarks in the urban area. The photographs were divided into three sets:

The first set comprised ten selected shots of city centre landmarks (Figure 3.6.); the Guildhall, St. Martins shopping precinct, the Market Place, Central Post Office, St. Margarets Bus Station, the Cinecenta, the British Telecom building, The Grand Hotel, Victoria Parade and the Prison. The locations of these landmarks are plotted in Figure 5.5.

The second set comprised twelve selected shots of citywide landmarks (Figure 3.7.); the Alliance and Leicester Building Society Headquarters, the Race Course, the Asda superstore, the Post House Hotel, Saffron Lane sports track, the Polytechnic, the Magazine, Leicester City Football Ground, the Rugby Ground, the Jewry Wall (Roman remains at St Nicholas Circle), the abbey ruins in Abbey Park and The Royal
FIGURE 5.5.

THE LOCATIONS OF THE CITY CENTRE ICONIC PHOTOGRAPHS.
Infirmary. Figure 5.6. shows the locations of these landmarks. This and the first set were shown to the three month, twelve month and three year (plus) interview groups. Respondents were asked to identify the places and indicate whether or not they would be able to get to each of them.

The third set comprised ten selected shots of places in the city centre; Gallowtree Gate, Horsefair Street, Charles Street (north), bottom of New Walk, Charles Street (south), Lee Circle, Haymarket, Belgrave Gate, the junction of King Street/Wellington Street and the Guildhall. This set was shown to the six month group only. The results of these photo-recognition tests will be looked at here, first at the aggregate level and then at the individual level so that comparisons between landmarks can be made.

Figure 5.7. (graph a) shows the success rates for recognition of the city centre photographs. The six month sample results are included in the figure because although not strictly comparable, they were shown equivalent photographs and significant trends can be loosely observed. Both a Chi Square and an Analysis of Variance test revealed that there was a statistically significant difference (0.0000 level of significance) between the length of residence groups on their photograph recognition (Table 5.8.). Chi square tests performed for each individual photograph revealed many significant differences between the length of residence groups (Table 5.3.). Success ranged from a mean of 6.77 photographs recognised for the three month group, to 8.59 for the twelve month group and 9.29 for the three year (plus) group. The six month group recognised an average of 6.58 of their photograph set. This is slightly lower than the three month group's average and can be explained by the fact that their set featured slightly more obscure shots.

Respondents were also asked to describe the location of the places in the photographs. Often they were unable to do this, even when they were able to identify the subject of the photograph. Additionally, it was not unusual for respondents to be able to identify the location of the photograph, but be unable to say what it was. Figure 5.7. (b,c and d) shows that for the three month and the twelve month groups, photograph subject recognition was slightly higher than knowledge of the location of the subject. However, the three year group demonstrated the reverse situation. The differences between these are too small to derive any hypotheses from these findings, and before drawing any conclusions, it will be seen whether the same observations can be made from the citywide photograph set. First, the success rates of respondents in recognising each individual photograph will be briefly considered.

Figure 5.8. provides a comparison between the ten city centre photographs with regard to the ability of respondents to identify and locate their subjects. It can be seen that difficulty was experienced most frequently with the photographs of the Guildhall, the
FIGURE 5.6.
THE LOCATIONS OF THE CITYWIDE ICONIC PHOTOGRAPHS.

[Map of Leicester showing numbered locations]
FIGURE 5.7.
RECOGNITION RATES FOR THE CITY CENTRE ICONIC PHOTOGRAPHS - BY LENGTH OF RESIDENCE.

(a) All Groups.

(b) 3 Month Group

(c) 12 Month Group

(d) 3 Years plus Group

KEY:

- - - - - 3 Months
- - - - - - 12 Months
- - - - - - - 3 Years plus

Photographs Recognised
Location Known

105b
FIGURE 5.8.
KNOWLEDGE OF THE INDIVIDUAL CITY CENTRE ICONIC PHOTOGRAPHS.

Respondents (%)
Cinecenta and the British Telecom building (Figure 3.6. photographs a, f and g). These were three of the more obscure photographs. The Guildhall is located in an area of the city centre which is not visited by many people. The Cinecenta used to be Leicester's third cinema but it closed whilst interviews were being undertaken. Consequently, none of the three month group had ever known the Cinecenta as a functional landmark, and asking them to identify this landmark was a rather more esoteric exercise than it was for the other groups. The British Telecom building is located on Charles Street near the railway station. It is a building that most of the sample would have passed many times on their journey out of the town centre. However, the photograph was taken from the right hand side of the building and not from the left, which is the view that most people would get of the offices on their journey. In many cases, this confused people and they were unable to identify it. This suggests that the images of the environment that people have 'in their heads' might often be like photographic stills, and as such, be inflexible when it comes to viewing a scene/building from a new angle or in any form which differs from the image. Another example of this will be seen later, where many of the three month sample had difficulty in recognising a photograph of University Road (the road that the University is located on) because it was taken in the summer when the trees lining the road were in full leaf. This group, having only arrived in the city in October and having never seen the road in this state, experienced difficulty in adjusting their image to accommodate the photograph.

Figure 5.8. also shows that in four of the ten cases, more of the respondents could indicate the location of the subject of the photograph than could name it (for The Guildhall, St. Martins shopping precinct, British Telecom and Victoria Parade). This is an indication that spatial images can be stored without linguistic processing, as the subject obviously recalls the landmark, and its' location, but cannot name it as (s)he has either forgotten its' label, or (just as likely), never knew it in the first case. In the case of most of the landmarks represented in the photographs, fewer respondents could actually find their way to the landmarks than knew where they were. This apparent contradiction can be explained by the fact that areas in a person's mental map are often hazy and discontinuous (Pocock, 1972); and even though the location of a landmark within an area may be known, the person may experience difficulty in getting to that area in the first place. This draws the discussion into the realms of connectivity between the elements of the city, the subject of section 5.8. The alternative situation is to be aware of the general location of a landmark, but experience difficulty in finding its exact location in the field. It was obvious from the data that this is also a common occurrence.

A statistically significant difference between the three length of residence groups and their photograph identification was found for the St. Martins precinct, the Cinecenta, the British Telecom building and the Grand Hotel (Table 5.3.). These photographs were
those which either the three month group performed particularly badly on (e.g. the Cinecenta and the British Telecom building), or the three year (plus) group performed particularly well on (e.g. St. Martins precinct and the Grand Hotel). With the exception of the Market Place, Victoria Parade and the Prison, a significant difference was found between the three groups in their ability to locate and find their way to the landmarks in the city centre photograph set, with ability increasing with lengthening residence.

Figure 5.9(a) shows how successful the three groups were at recognising the citywide photographs. Again a very clear difference is evident between the three length of residence groups (significant at the 0.0000 level - Table 5.8.). The figure shows that nobody in the three month group could name more than eight of the twelve landmarks. The twelve month group achieved a maximum of eleven recognised landmarks, and so only in the three year group was there a respondent who could name all twelve. Graphs b,c and d in Figure 5.9. show the differences between respondents’ success at first recognising the landmarks and second, at locating them. It can be seen that these success rates for each task, do not differ to as great an extent as the city centre success rates did. Figure 5.10. gives an indication of why this might be the case. Here, the average percentage of photographs in each set that each sample group was able to recognise and locate are plotted so that comparisons can be made. The differences between the sample groups is striking. It is also clear that these differences are most extreme for the citywide photograph set. It would seem reasonable to conclude from this that the recognition and naming of landmarks precedes detailed knowledge of where they are or how to get to them; and that knowledge of city centre landmarks precedes knowledge of significant citywide landmarks. After moving into a new urban area therefore, an inhabitant may quickly develop an equivalent knowledge of the city centre to longer term stayers (after about a year - Figure 5.10.) but a more general knowledge of the city will only develop after a considerable period of time (the three year plus group only demonstrated an average of a seventy per cent success rate at citywide photograph identification), if at all. This last consideration is important. A model built from these observations will predict eventual knowledge breadth and a final plateau stage where learning is gradual and relatively undetectable. However there is no reason to suppose that everybody will reach each stage of development, and indeed, developmental studies have shown otherwise (Piaget and Inhelder 1956; Moore, 1976).

A comparison of respondents success rates for each photograph is given in Figure 5.11. It can be seen that with the exception of the Leicester City football ground, the recognition and knowledge of the location of the twelve featured landmarks from the citywide set (photograph set two) was relatively low. Particularly obscure to respondents were the Magazine, the Asda superstore, Saffron Lane sportstrack, the Polytechnic and Abbey Park. Even the three year (plus) group often had proportions of over half
FIGURE 5.9.
RECOGNITION RATES FOR THE CITYWIDE ICONIC PHOTOGRAPHS
- BY LENGTH OF RESIDENCE.

(a) All Groups
(b) 3 Month Group
(c) 12 Month Group
(d) 3 Year plus Group

KEY:
- 3 Months
- 12 Months
- 3 Years plus
- Photographs Recognised
- Location Known

Number of photographs
FIGURE 5.10.
THE MEAN NUMBER OF PHOTOGRAPHS RECOGNIZED AND LOCATED - A COMPARISON BY LENGTH OF RESIDENCE.

KEY:
- City Centre Scale - Recognition
- Location
- Citywide Scale - Recognition
- Location

Length of Residence

Percentage of Photographs

3 Months 12 Months 3 Years plus
FIGURE 5.11.
KNOWLEDGE OF THE INDIVIDUAL CITYWIDE ICONIC PHOTOGRAPHS.
their number not recognising these landmarks. With the exception of three landmarks (the Magazine, the Leicester City Football ground and the Abbey ruins) a statistically significant difference between the three length of residence groups was found on their ability to identify the subject of the photographs (Table 5.3.). Figure 5.11. also shows that in the case of four of the landmarks (the Polytechnic, the Magazine, the Rugby Ground and the Infirmary), more people again, were able to indicate their location than could give them a label. It is interesting that all these landmarks are located on the northern stretch of the inner ring-road, and people had obviously passed them and remembered them without ever knowing their identities or functions.

Respondents received a subjective score for their performance on the photograph questions. Figure 5.12. shows the differences between the distributions of scores between the groups. The three month group demonstrate a positive skew towards a rating of 'poor', the twelve month group a normal distribution with almost half of their number receiving a score of 'average', and the three year group is negatively skewed towards 'good'. This, together with the previous discussion these results have shown clearly that there is a direct relationship between knowledge as revealed by photograph recognition, and length of residence.

5.2.4. Conclusion.

This consideration of respondents' knowledge of landmarks and nodes in the city has discovered clear relationships between knowledge and length of residence. It has also demonstrated that knowledge of the city is often highly spatially restricted to that part of the respondent's residential sector which lies between the city centre and place of residence (with the areas beyond often being unknown). This restricted knowledge has also been seen to differ with scale of environment, as respondent knowledge of the city centre has been found to differ less across length of residence groups than knowledge of the city as a whole. It would appear that early learning arises out of necessity and is functionally based. It might be that it is not until this 'necessary' learning is accomplished (and immediate needs are fulfilled) that less 'useful' knowledge is accreted.

5.3. Orientation and Direction.

The metrical relations of direction and distance will be considered in this and the following section. Fundamental to a person's success in operating in any environment is his or her spatial orientation. Orientational ability has come to be known within the literature as 'sense of direction'. There has been a long tradition of attempts to examine the extent of, and differences in, orientation ability, both in geography (Howe, 1931) and in educational psychology (Lord, 1941). More recently, the suggestion has been made that spatial orientation is an innate ability rather than one which is learned. Baker (1980, 1981) has argued that human beings have the ability to interpret the
FIGURE 5.12.
OVERALL MEAN GROUP SCORES FOR THE ICONIC PHOTOGRAPH EXERCISES - BY LENGTH OF RESIDENCE.

(a) Three Months.

(b) Twelve Months.

(c) Three Years Plus.
earth's magnetic field in the same way that migrating animals and birds do; thus enabling them to 'sense' direction of travel and return to the point of origin of a journey. Walmsley and Epps (1988) have carried out a similar experiment in the Southern hemisphere and have come to the same conclusion as Baker. Females were found to have a greater ability than males, but adults were no better than children which they argued, supports the hypothesis that sense of direction is an innate ability.

The present research does not attempt to challenge this hypothesis, although it does doubt the reliability of the supposition that because school-age children (aged between six and fourteen) were no worse than adults at the spatial task, that sense of direction is innate. Indeed, if this ability were learned, it could have been learned in the first six years of life and such an experiment would not detect this. This section accepts that whether acquired or innate, human 'sense of direction' is a real phenomenon, and as such, it acts as a determinate of spatial ability and environmental learning.

Kozlowski and Bryant (1977) have investigated the role of sense of direction in the performance of direction tests. They asked people to assess their own sense of direction skills on a seven point scale ranging from 'very good' to 'very poor'. They found that the better a person's self estimate of sense of direction, the better their performance on the direction task. A second task, testing their distance estimation ability showed no relationship to sense of direction rating. A final experiment to discover how well self-reports of directional ability could predict spatial performance in a novel environment found that, at initial exposure to the novel environment, there was no difference between good and bad sense of direction people, but as experience progressed, good sense of direction people improved significantly whereas bad sense of direction people did not. This led the authors to conclude that, far from having an extreme facility for orientation and one that involves little work, good sense of direction people must (a) be trying to orientate, or (b) have more than a single experience in order to be better than other people. The authors have suggested therefore that 'sense of direction' is a conscious process rather than a subconscious ability, and that people who are good at it, know they are good at it and take a pride in being so. This brings the discussion into the realms of what the author has chosen to call 'environmental nature'; that is, a person's conscious psychological disposition towards the environment. Several researchers have examined this concept in the light of environmental ability (e.g. Beck and Wood, 1976; Bryant, 1982).

The present research postulates that a person's environmental learning will be influenced both by his or her 'sense of direction', and by his or her 'environmental nature' (viewed as comprising of an individual's interest in the environment, his or her pride in his or her environmental knowledge and ability, and the degree to which (s)he is exploratory by nature). Apart from a brief mention here, the discussion of environmental nature will be confined to Chapter Eight. However, sense of direction
will be considered below.

In a similar fashion to the above mentioned study by Kozlowski and Bryant (1977), respondents in this research were asked to rate their sense of direction ability on a seven point scale which ranged from 'very good', through 'average' to 'very bad'. Kozlowski and Bryant found that this was a reliable method, as re-rating by respondents three months later, achieved a correlation between answers of +.93 (df=49). As is to be expected there was very little difference found in this research between the self-ratings of the different length of residence groups. The three year group were slightly more confident about their ability than the others, and it is suggested that, rather than this being a reflection of any ability difference between the groups, it is more likely to be a function of the greater confidence that this group felt in facing the interview. The difference however was slight, and no statistical relationship was found. Figure 4.6. has shown the distribution of the self-ratings for the whole sample group. It can be seen that respondents were on the whole, very confident about their directional ability, with sixty five per cent rating themselves as above average and only eighteen per cent considering themselves to be below average. Unfortunately, it is not known whether or not such confidence is typical of the general population as a whole. A very strong relationship was found between self rating of sense of direction and 'environmental nature' (significant at the 97% level - Table 5.8.). Table 5.4. shows the relationship between these two variables when the seven-point scale is reduced to a three-point scale. It shows that four out of five people who rated themselves as above average on sense of direction, were found to be 'very exploratory' by environmental disposition' (the method used to classify respondents by 'environmental disposition' has been outlined in Chapter Three). Conversely, half of the below average group were found to be 'passive' (such a label implies that a person is unlikely to explore a new area and will only learn new things about an environment by mistake or out of necessity). These findings generally lend support to the hypothesis that directional ability is related to a person's character, particularly that part which takes pride or otherwise in environmental knowledge and ability. It also supports the ideas of Kozlowski and Bryant (1977) that sense of direction is a conscious and deliberate process.

The results of both the plotting exercises and the aerial photograph exercises can be studied to elicit some information about human orientational processes. The following discussion will investigate the roles of length of residence and (self-assessed) sense of direction in determining performance in orientational tasks.

5.3.1. The Plotting Exercises.

Previous discussion has focussed on the number of landmarks that respondents were able to plot in the plotting exercises. Here, the actual plotted location of the symbols
will be considered in an attempt to discover whether or not there is any pattern to the distortions and misplacements. Collective plotting inaccuracy was measured by using a spatial statistic known as the mean centre. This statistic estimates the centre of gravity of a distribution of points from the known location of those points. Thus the mean centre of the correct distribution of points was calculated (here referred to as the ‘actual’ mean centre), and will be compared to the mean centres of respondents’ plots (the ‘calculated’ mean centre). The degree to which the calculated measures deviate from the actual, will give an indication of the distortion of reality that the plots reveal. This distortion can be considered in terms of both the directional distortion (thus offering some clues to respondents’ conceptions of orientation), and the distance distortion of the mean centre. The latter will be considered in most detail in the following section.

It can be seen from the graphs in Figure 5.13. that the predominant directional distortion of the mean centre of respondents’ city centre plots was a westerly one. In the sample group as a whole, thirty eight per cent of respondents distorted their plots in a westerly direction, thirteen per cent in a southwesterly direction and sixteen per cent in a northwesterly direction. This means that for some reason, people tended to plot the landmarks further to the left of the page than they should have done. This suggests an exaggeration of east-west distances which lends support to the findings of Waterman and Gordon (1984). Figure 5.13. shows however that this tendency is not uniform throughout all length of residence or orientational ability groups. Indeed the tendency appears to be stronger the longer a person has lived in Leicester and the more competent their sense of direction skills, although no statistically significant relationships were found. The distorted mean centre was most commonly between eleven and thirty millimetres from the actual mean centre (sixty one per cent of the sample group), so the distortion was often considerable in distance terms. It is important to consider whether this directional distortion is simply a westerly one, or whether it involved any sort of rotation. In seventy four per cent of plots a predominant directional rotation could be detected, and this was most often a rotation of between zero and sixty compass degrees to the left (fifty three per cent of all plots; sixty nine per cent of rotated plots). Very little difference was found between the length of residence groups on this, although the tendency to rotate the landmarks appeared to become stronger with increasing length of residence and with increasing sense of direction competence. There is an apparent anomaly here. These results would seem to suggest that orientational error increases with increasing familiarity with a place and with higher levels of orientational ability. All other results so far have suggested in line with intuition, that error should diminish in these cases. Anderson and Tindall (1972, 6), reported from their findings that orientation was "highly varied and seldom compass (north) orientated". They concluded that orientation tended in the direction of the city centre or primary path leading away from the home. Similar findings have been reported by Porteous (1971), and Pocock (1972b). Pocock offers an
FIGURE 5.13.

DIRECTIONAL DISTORTION OF THE MEAN CENTRE
(CITY CENTRE) - BY:

(a) Length of Residence.

North
-70

Northwest
-50

-30

Northeast

KEY:

--- 3 Months

--- 12 Months

--- 3 Years plus

(b) Sense of Direction.

North
-70

Northwest
-50

-30

Northeast

KEY:

--- 3 Months

--- 12 Months

--- 3 Years plus

Southwest

South

Southeast

Southwest

Southeast
experiential explanation for the discarding of conventional orientations and postulates that the mental organisation of the city may become subverted to a particular orientation. The findings here reported can go one stage further than this. They are consistent with the results of the above studies, and there is evidence to suggest that the mental organisation of the city does become subverted to a particular orientation, and that over time, this orientation becomes more universal and persistent amongst people living in the same part of the city. This is in support of Pocock's (1972b) experiential explanation of this finding. The suggestion that orientation tends in the direction of the city centre, along a primary route from the homeplace can also be supported by these findings. The city centre plots and the free recall sketch maps (see Figure 5.20.) reveal that there was a tendency amongst the sample group to use London Road/Granby street as their major orientational cue. This is the primary route between southeast Leicester (where the majority of respondents lived), and the city centre. As such it is a southeast/northwest aligned road, but it was rationalized by most respondents as a north-south running route. (N.B. Even though routes were not involved in the plotting exercises, two of the symbols involved are located on this main route, and thus its alignment had to be considered by respondents whilst they were carrying out the exercise.) Using this route as the major orientational aid, with this mistaken compass-alignment, plots and maps tended to have a westerly distortion and a predominant rotation to the left.

It is important to consider the citywide scale plots before discussion of these findings is drawn into conclusion. Here again, a predominant westerly distortion of the mean centre of the plots was evident. Fifty eight per cent of all respondents drew plots whose mean centres were distorted in a southwesterly, westerly or northwesterly direction. Figure 5.14. shows that differences between the length of residence and sense of direction groups were not evident at this scale. Commonly, the distance of the plotted mean centre from the actual mean centre was not as great as in the city centre plots, although it was still considerable (fifty eight per cent of plots with a distance distortion of between eleven and thirty millimetres). A predominant directional rotation was only evident in forty one per cent of the plots, but of these again, eighty five per cent were rotated between zero and sixty degrees to the left. There was found to be an increase in tendency to rotate the plots with increasing length of residence (thirty three per cent of the three month group revealed a rotation, compared to fifty seven per cent of the three year (plus) group). Similarly with sense of direction, a difference was evident (though again not statistically significant), with only seventeen per cent of the below-average ability group displaying a rotation, and forty six per cent of the above average group doing so. These results are not quite so strong in their support of the postulations discussed above, although they do tend in that direction.

Respondents experienced greater difficulty in carrying out the citywide exercise than the
FIGURE 5.14.
DIRECTIONAL DISTORTION OF THE MEAN CENTRE (CITYWIDE) - BY:

(a) Length of Residence.

(b) Sense of Direction.

KEY:

--- 3 Months

--- 12 Months

--- 3 Years plus
city centre exercise. They seemed to find it more difficult to cognize direction and distance between the landmarks. This means that the margins for error were wider and this is reflected in the lesser degree of conformity in error between plots. The 'below average' sense of direction group produced the most widely different and haphazard plots which would suggest that; first, the method of self-assessment of sense of direction is a reasonably reliable one, and second, that these people may not develop an orientational system at all which would account for their poor sense of direction. Orientational ability certainly seems to play a causative role in city knowledge accumulation and spatial ability. It would also seem that for most people, an orientational system is formulated, which is based on the primary route between home and the city centre, and which as such, may not be compass-point directed. In order that this postulation might be proved conclusively, a study of citizens living in another city sector would need to be carried out and the results inspected for evidence of a different predominant rotation and orientational alignment.

5.3.2. The Aerial Photographs.

Before this consideration of orientation and direction is concluded, brief attention will be given to the outcome of the aerial photograph exercises with respect to any light that they might throw on this subject. Figures 3.8. and 3.9. show the photographs that respondents were asked to respond to. They were required to point out any landmarks or places in the photographs that they recognised, but they were not told where the photographs were taken, or what their subjects were. Both photographs were of areas in the city centre. The first, and the easier of the two featured the Clocktower, the Market Place, Town Hall Square, the Town Hall, the Haymarket Centre and the major shopping streets of the central area. Slightly more obscure, the second photograph featured the Haymarket Theatre, Charles Street, Lee Circle and Humberstone Gate.

These aerial photograph exercises are regarded as relevant to this section because they are primarily tasks in orientation. This is because, once any particular landmark had been recognized, people needed to use their knowledge of the spatial relationships between points to search for other places that were known. Inability to do this would signify the lack of an integrated and spatially coordinated mental representation of the environment, and an inability to orientate to a location that was not of the respondents own choosing. Particularly interesting in these exercises therefore, was the respondent who recognised one landmark only, because this would represent an inability to interpolate known spatial relations from an unfamiliar perspective.

The results of the first photograph exercise show a slight improvement in ability with increasing length of residence. Thirty five per cent of all respondents recognised all the major landmarks (almost sixty per cent of the three year group). The other sixty five per cent of respondents found the exercise more difficult, with forty per cent
recognising just a few landmarks, and twenty three per cent recognising the Clocktower only. The latter group did not include any respondent from the three year (plus) sample group. Only two per cent of respondents could recognise no landmarks at all.

When results are considered by orientational ability, it can be seen that the above average group performed the best, with over half (fifty three per cent) recognising all the major landmarks and only ten per cent recognising one or less. Fifty per cent of the average and below average groups recognised only one landmark, demonstrating an inability to infer the location of other places from the known location of one. This represents a very real inflexibility in the cognitive maps of these individuals, because the majority had previously managed to translate their knowledge of the relative location of these landmarks onto paper in both the free recall mapping exercise and the plotting exercises, yet they could not adapt their knowledge to solve this problem.

As expected, the second aerial photograph caused more problems. Thirty seven per cent of the sample group could recognise no landmarks at all (none of these were in the three year group), and had no idea what the subject of the photograph was. Sixteen per cent could recognise one landmark only, and only twenty per cent (fifty per cent of the three year group) could identify all the major features. There was found to be a strong statistical relationship between length of residence and success in this exercise. No significant relationship was found between sense of direction and performance on this test although everybody who recognised all the major features was in the above average group. Similarly, seventy five per cent of the below average group recognised nothing. Respondents were awarded an overall rating ranging from very good to very poor (five point scale), for their performance in these aerial photograph tests. A statistically significant difference (0.05 level) was found between the varying length of residence groups with rating improving with increasing length of time spent in the city (Table 5.8.). The difference between the performance of the above average group and the average and below average groups (aggregated) was also found to be statistically significant (0.04 level). The average and below average groups differed little from each other.

5.3.3. Conclusion.

In this section, evidence has been found in support of the supposition that orientational ability (conceived for the purposes of this investigation as sense of direction), is a deliberate and semiconscious process. A strong relationship between sense of direction and 'environmental disposition' has been found, and it would seem that people are generally well aware of their orientational/environmental ability. A predominant orientational distortion was found to exist amongst the sample group, which was a function of the general rationalizing of the major northwest/southeast aligned arterial road (which comprises the route between the respondents' homes and the city centre) to a
north-south alignment. A causal relationship between length of residence and spatial orientation was found to be present, with a particular orientational distortion becoming increasingly more universal with increasing length of residence. Similarly, those with an ‘above average’ sense of direction have been found to adopt common directional distortions in their spatial representations at an earlier stage in their stay, than those with a lesser ability. Finally, evidence was found for inflexibility in spatial representations, where a change of spatial perspective (i.e. an aerial perspective) rendered some incapable of translating their knowledge of the relative location of landmarks to the required situation. This inflexibility was found to be attributable more to length of residence in an area (experience), than to sense of direction (ability), although the latter was found to be an influencing variable.

5.4. Distance Estimation.

The distinction between distance and direction in cognitive processing may be nonexistent. Certainly the distinction here has been drawn for reasons of convenience rather than from the conviction that they are separable processes. In many studies of spatial ability, researchers have drawn this distinction and over the past twenty years, distance estimation ability as a separate entity has been a subject that has interested researchers and one that has, perhaps mistakenly, been used too freely as an indicator of environmental cognition, knowledge and ability in general (e.g. Pocock and Hudson 1978; Day 1976; Briggs 1976).

In his consideration of cognitive distance, Briggs (1976) identified three groups of factors which may influence distance cognition:

"1. Subject-centred factors in which cognized distance may be a function of the characteristics of the individual, such as age or sex.
2. Stimulus-centred factors in which cognized distance is a function of the characteristics of the points between which distance estimates are obtained, of the environment in which these places are embedded, or of the routes linking them.
3. Subject-stimulus-centred factors in which cognized distance is influenced by interactions between the subject's familiarity with and the evaluation of the locations or the routes linking them" (Briggs 1976, 326).

Each of these types of factors have been used in the past in attempts to explain distance cognition. A high degree of variance in distance estimates has been a characteristic finding of all experiments of cognitive distance, and according to Briggs (1976) this is a function of the interaction of the above factors. Some evidence has been found for the supposition that familiarity with the environment influences distance estimation accuracy (Lee 1970; Golledge, Briggs and Demko 1969), but the relationship is unclear (Cadwallader 1976). In terms of stimulus-centred factors, a common finding has been that subjects exaggerate distances between place of residence
and the city centre, and underestimate distances away from the city centre (Golledge, Briggs and Demko 1969). Lee (1970) has however, produced a contrary finding from a study in Dundee where he found that the more attractive the destination, the shorter the estimated distance. On the basis of this evidence, he argued that distances are deferentially estimated according to the attractiveness of the final destination and thus he concluded that goal attractiveness (valence) is likely to be an influencing factor.

A complicating factor in distance estimation studies is the relationship between distance and time. Many theorists believe that time and space cannot be separated. Piaget (1969a) argued that the concept of time derives from the concept of space; and more recent evidence indicates that the concept of space is also influenced by the development of time concepts (Levin et al, 1978). Indeed Piaget (1966, 1969a) found that young children interpret duration in terms of distance and visa versa, indicating that these concepts are still undifferentiated at an early age. The relationship between the concepts of space and time has not usually been examined in the large-scale environment (e.g. Siegler and Richards, 1979; Richards, 1982; Levin, 1977, 1982; Acredolo and Schmid, 1981; Piaget, 1969). Herman, Roth and Norton (1984) carried out a piece of research in the large scale environment which was concerned with whether the time taken to traverse a space could affect the distance estimates of children (ranging between the ages of seven and sixteen). In their experiments they found no evidence that distance estimates were affected by the amount of time taken to traverse them. Additionally, they found an absence of a developmental effect. The relationship between distance and time conceptions is a side issue to this particular research, and no effort has been made to empirically explore it. It is important however, to be aware of current thought on the subject, in order that peoples’ distance conceptions be best understood.

In his consideration of spatial imagery, Stea (1969) chose to consider what ‘distance’ may be, by comparing it to laws of metrical space. He claimed that the cognitive image was grounded in metrical space if the following held true:

1. \( d(a,b) \geq 0; \ d(a,b)=0 \) if, and only if \( a=b \).

2. \( d(a,b) = d(b,a) \).

3. \( d(a,c) \leq d(a,b) + d(b,c) \).

Where; \( d(a,b) \) is equal to the distance between \( a \) and \( b \).

He proposed that the ‘image world’ may not be metric at all and cites a study which suggests that cognitive distances are ‘non-commutative’ (that is, the distance between \( a \) and \( b \) is not perceived as the same as the distance between \( b \) and \( a \) (see also...
Pocock, 1978). Failure of condition three would mean that a less direct route may be conceptually shorter than a more direct one. The mercator projection of the world for example would lead one to believe that the shortest path between the USSR and the USA would be across the Atlantic and Europe. This suggests that spatial images may not be grounded in euclidean space and brings to light the question of whether they should be analysed as such (Golledge and Hubert 1982; Kuipers 1982). If there is a departure in spatial imagery from euclidean metrics, then it is interesting to discover the form that the departure takes and the reasons for it.

Golledge and Spector (1978), asked people to estimate the relative locations of city landmarks in a way similar to the plotting exercises employed in this research. They considered that in order to "make such estimates at the urban scale, individuals must assimilate and reorganize a vast amount of information and experience" (Golledge and Spector 1978, 410). Trips between the individual landmarks may not have been made by respondents and so approximating "these distances involves incorporating and synthesizing spatial information, often involving interpolation, extrapolation, and perhaps organizing cognitized information in new ways" (Golledge and Spector 1978, 410). The plotting exercises in this research required the Leicester respondents to undertake such a task, and their distance estimation ability can be examined by considering the plotted distances between the points. This can only be done at the aggregate level as the plotting exercises were not specifically tests of distance estimation. An estimate of the 'standard distance' between the plotted points has been made, which can be compared to the actual standard distance between the landmarks. This will show the degree to which the landmarks were perceived to be nearer to, or further away from, each other at the aggregate level. These can be examined at both the city centre, and the citywide scales.

At the city centre scale, the plots displayed a predominant underestimation of the distance between the landmarks. This was reflected in standard distances which were lower than the actual standard distance between the points (eighty per cent of all respondents). The degree to which these distances were underestimated was often considerable (modal class of twenty one to forty milimetres less than the actual standard distance). No real difference was found with increasing length of residence. This suggests that in respondents' cognitive images of Leicester city centre, the distances between landmarks are perceived to be less than they actually are. Perhaps this is suggestive of a tendency for people to underestimate intra-urban distances. At the citywide scale however, the reverse was found. Here, seventy per cent of plots demonstrated higher degrees of landmark dispersal than is actually the case, and again the difference was considerable (most often between eleven and thirty milimetres higher than the actual standard distance). Thus respondents overestimated the distance between places at the citywide scale. It would seem therefore, that distance cognition is subject to different forces at different scales of environment. Time taken, and travel mode
necessary to traverse the distance may be two such forces. At the city centre scale, respondents were estimating distances that they knew they could travel quickly by foot. These were also journeys that they were likely to have undertaken. At the citywide scale, the respondents were more usually estimating distances that they had not actually traversed, that would require a car, bus or bicycle as a travel mode, and that might be subject to traffic congestion. No significant differences were found between car drivers and non car drivers at either scale, so it seems unlikely that predominant travel mode around the city is an influencing variable in this case. In this research, as in other studies of distance estimation, little explanation can be offered for the apparent difference in distance cognition at the two differing spatial scales. The lack of unanimity in the results of this and previous studies is probably due both to the complicated nature of the interacting contributory factors, and to the differing methodologies employed to elicit the information (Phipps 1979). It may also be difficult to gain accurate measurement of distance cognition if people do not possess images of the world based on euclidean geometry (Cadwallader 1979; Golledge and Hubert 1982).

5.5. Topological Relations.

Kuipers (1982) postulated that topological relations are treated quite differently from metrical relations in a person's cognitive image. He noted that however distorted a person’s description of an environment was (either verbal or graphical), there was "a strong element of topological invariance...the sequence (of places) was normally correct" (Kuipers 1982; 203). Possible explanations for this, and further consideration of Kuiper’s argument will follow in the next section. This section will explore respondents knowledge of the topological relations between nodes (landmarks, places and areas). This is a component of environmental cognition that has been little examined as an entity. So far this Chapter has examined landmarks and nodes, and the directions and distances between them without reference to the paths that link them. Here, respondents’ knowledge of the paths that link these nodes will be examined with reference to several tasks that they were asked to perform.

5.5.1. The Connection Exercises.

These exercises required respondents to draw the routes which link the landmarks that were plotted in the plotting exercises. They were handed a sheet with the symbols correctly plotted and requested to add the paths between them. The exercise was undertaken at two scales, city centre and citywide. The resulting drawings were examined for the number of symbols (landmarks/places) that were accurately connected, the number of accurate road segments (defined as a stretch of road between two junctions or places, or with one unconnected end) drawn and the nature of the
At the city centre scale there was found to be a strong relationship between the number of symbols connected and length of residence. Ninety per cent of the three year (plus) group were able to accurately draw the connecting paths between all the plotted landmarks. This figure was fifty per cent for the twelve month group and only seven per cent for the three month group (Figure 5.15(a)). The mean percentage of symbols connected by each length of residence group were 61.3 (three month group), 81.0 (twelve month group) and 98.8 (three year plus group). The relationship was found to be highly statistically significant (anova - 0.0000 level, Table 5.8.). Also significant was the relationship between length of residence and the number of accurate road segments plotted (anova - 0.0000 level, Table 5.8.). The means for the three month, twelve month and three year (plus) groups respectively were, 5.9, 8.6 and 12.8. This therefore demonstrates a clear progression of knowledge with lengthening residence. The landmarks that respondents experienced most difficulty in connecting were the Odeon (twenty two per cent of respondents could not connect this) and St. Margarets Bus Station (thirty two per cent could not connect this). Most of the respondents in these categories came from the three month group. Generally success rates were high in this exercise, with few landmarks having more than ten per cent of respondents in any group unable to connect them. It would seem that this exercise was easier to perform than the plotting exercise (see section 5.8.). On overall rating for performance in this exercise, there was a strong relationship between length of residence and performance. The modal rating for the three month group was 'poor' (thirty seven per cent), for the twelve month group it was 'average' (thirty four per cent), and for the three year (plus) group, it was 'good' (fifty per cent).

The relationship between length of residence and ability to connect the symbols was found to be similarly strong at the citywide scale (Figure 5.15(b)). The mean percentage of symbols connected rose from 48.6 (three month group), to 60.0 (twelve month group) and 92.9 for the three year (plus) group. These percentages are lower than those for the city centre exercise, showing that respondents generally found it more difficult to draw the road links between places at this scale. The difference was least for the three year (plus) group, suggesting that detailed knowledge of the path network at the city wide scale develops less fast than the same knowledge at smaller scales of environment. The differences between the groups in mean values for the number of accurate road segments drawn also support this conclusion (statistically significant at the 0.0000 level - anova). The mean varied from 4.1 after three months in the city, to 5.1 after twelve months, and rose steeply to 11.1 after three years or more.

Rates for inability to connect the individual landmarks were much higher at the citywide scale, although few problems were experienced by the three year (plus) group.
FIGURE 5.15.
ABILITY TO CONNECT THE CITY CENTRE AND CITYWIDE LANDMARKS
- BY LENGTH OF RESIDENCE.

(a) City Centre Scale.

(b) Citywide Scale.

KEY:
- - - - 3 Months
- - - - 12 Months
- - - - 3 Years plus

Number of Landmarks Connected
Respondents had most difficulty connecting Abbey Park (north side of the city - sixty eight per cent), and less, but still considerable difficulty with Wigston (forty two per cent - Figure 5.16.). The latter is located five miles due south of the city centre at the end of the Welford Road. This road passes the University, linking it to an area where many students live, and is consequently well known. It is interesting that so many respondents were unaware of the destination of this road. This will be discussed further in section 5.5.3. Again, there was a statistically significant relationship between length of residence and overall rating received for the citywide connection exercise (anova - 0.0000 level, Table 5.8). The modal ratings reflect the lower performance of respondents on this task than the city centre task. They were 'very poor' for the three month group (forty five per cent), 'poor' for the twelve month group (fifty one per cent), and 'good' for the three year (plus) group (thirty six per cent). These results will be interpreted more fully in section 5.8. in relation to current theory on the organisation of spatial knowledge.

5.5.2. The Direction Tasks.

In order that respondents' knowledge of the connections between places be best elicited, a second test which was different to the connectivity exercises was administered. Interviewees were asked to imagine themselves in particular locations in the city centre, and asked for directions to another place in the city centre. Direction sequences were recorded on audio tape and analysed afterwards for ease of undertaking task and directness of suggested route to the destination. The resulting recordings contain information regarding the orientation problems encountered and the environmental cues which were used to solve these tasks. Four direction sequences were asked of respondents, the first and second originated at Town Hall Square and the third and fourth, at the Railway Station. Routes one and four were the most straightforward. The former involved travelling along two roads with one left hand ninety-degree turn. As Table 5.5. reveals, the majority of respondents directed the imaginary person along this route with ease. It also shows that there was a marked difference between the success rates for the four tests, and between the length of residence groups.

It is interesting that where respondents were unable to give directions easily, the longer they had lived in the city, the more likely they were to try and to give an indirect, but often still a correct route. This shows that they have a richer field of knowledge to rely upon and make spatial inferences from. Quite often the suggested route would be much longer than the shortest path route, demonstrating an inability to apply simple geometric principles to spatial problem solution. This was particularly evident in the suggested routes between Town Hall Square and St. Margarets Bus Station. Such findings also support the view that vast areas of nothingness exist in peoples' mental maps which act as perceptual barriers between known places. Circuitous routes around these will be taken by people, using the path structure that they know rather than
FIGURE 5.16.
INABILITY TO CONNECT THE CITYWIDE LANDMARKS
- BY LENGTH OF RESIDENCE (%).

KEY:
- 3 Months
- 12 Months
- 3 Years plus
exploring for new routes. It is likely that such behaviour is most common in people with poor sense of direction and a 'passive environmental disposition', and will continue until such a time as the route needs to be taken regularly and a more direct route is searched for.

5.5.3. The Sequential Photographs.

Figure 5.17. maps a to d, show four routes radiating from locations in inner Leicester, to places in outer Leicester. Each route passed through a different sector of the city (north, south, east and west). Along each route, photographs were taken at key places (shown by the numbers - see Figure 5.17.). Respondents were told that they were going to be shown "a set of photographs depicting a journey from one place in Leicester to another", and they were asked to "identify the starting point, the destination and as many of the photographs along the journey" as they could. Each photograph had an arrow beside it indicating the direction that the traveller was going. This exercise was intended to highlight peoples' route awareness at the citywide scale, as well as constitute a test of respondents' ability to infer the location of places from incomplete knowledge. For instance, if a route was recognised and the place that it leads to was known, were people able to guess the end location based on this knowledge, even though they did not recognise the end photograph?

Photograph Set One was routed from Belvoir Street in the city centre, along Welford Road to Wigston shopping centre (total trip length of about five miles). Respondents should have been fairly familiar with the middle parts of this route as it passes the University and constitutes the major arterial road through Clarendon Park and Knighton Fields (an area where many respondents lived). The earlier and latter stages of the route would probably be less familiar. Recognition rates varied greatly between the different length of residence groups. Sixty four per cent of the three year (plus) group recognised all the photographs (nine in all). This figure was considerably less for the other two groups (4.7% - three month; 17.1% - twelve month group). Of those respondents who could not identify all the photographs, thirty per cent did not recognise the last half of the set. These people generally did not know that Welford Road leads to Wigston, even though the road signs along the part of the route that they did recognise indicates this; and buses travelling along this route usually have "Wigston" stated as their destination. Nine per cent of respondents did not recognise the end photograph but correctly guessed its location. Many respondents in the three month group were only able to identify one or two of the shots, and often these were in the middle stretch of the journey.

Photograph Set Two depicted a journey from University Road to Narborough Road, heading in a westerly direction (total trip length of approximately two miles). It passes through an area that some students live in and is thus an area that University
FIGURE 5.17.
THE LOCATIONS AND ROUTES OF THE SEQUENTIAL PHOTOGRAPHS:
(a) JOURNEY ONE.
FIGURE 5.17. continued.

THE LOCATIONS AND ROUTES OF THE SEQUENTIAL PHOTOGRAPHS:

(b) JOURNEY TWO.
FIGURE 5.17. continued.

THE LOCATIONS AND ROUTES OF THE SEQUENTIAL PHOTOGRAPHS:

(c) JOURNEY THREE.
FIGURE 5.17. continued.

THE LOCATIONS AND ROUTES OF THE SEQUENTIAL PHOTOGRAPHS:
(d) JOURNEY FOUR.
members may have had cause to visit. Again, recognition rates varied greatly between the groups. Fifty six per cent of the three month sample recognised only one, two or no photographs. Fewer than ten per cent recognised all nine shots. This figure was forty four per cent for the twelve month group, and sixty four per cent for the three year (plus) group. On the whole, this route was better recognised than the first.

Route Three began at the University and ran around Victoria Park to Evington Road and on into Highfields, terminating at Spinney Hill Park (Figure 5.17c). The total trip length was approximately two miles. Highfields is an area where many of the respondents lived (15%) and thus should have been well known by the study population. Indeed, the first part of the journey was well recognised, although it was interesting that a few respondents from the three month group had difficulty recognising the photograph of University Road because they had never seen the trees lining the route in full leaf as they were in the shot. The last half of the photographs caused more problems, with thirty three per cent of the sample being unable to locate any of the shots beyond the junction of Evington Road and East Park Road (44% of three month sample). People in this category were not only those who did not live in Highfields. This supports an earlier claim that knowledge is not purely sectorally biased, but that ignorance also extends to areas in the same city sector but further out from the city centre than one's own place of residence (section 5.4.2). Such ignorance however is reduced with increasing length of residence.

Journey Four extended north from the city centre along the Melton Road through the residential area of Belgrave. Of the four routes, this area was the furthest away from the home areas of the respondents. However, respondents were on the whole, better able to identify this route than they were the first route (33% recognised all seven photographs). This would seem to contradict the thesis of sectorally-based information. A reasonable explanation for this finding would seem to be that Belgrave is a distinctive area, being the place of major concentration of the Asian population. It is lively and vibrant and possesses a distinct atmosphere. The shops along the Belgrave Road are predominantly Asian (both food and non-food) and thus the photographs of the area were distinctive. If the respondent had been in the area, (s)he would be able to recognise it easily. Having said this, recognition levels for this journey were not universally high. Only fourteen per cent of the three month sample recognised all the photographs and for the twelve month, and three year (plus) groups, this was forty six and fifty seven per cent respectively.

It can be concluded from the above that the nature of the environment itself can affect knowledge. The distinctiveness of an environment or the features within it, will affect whether or not a person remembers it. This factor undoubtedly accounts for some of the variability in place recall and the discontinuous nature (in spatial terms)
of environmental knowledge. It has also been seen that on the whole (and similar to
the findings from the direction tasks considered above), people were unwilling or unable
to make spatial inferences about the destination of routes that they knew only in part.
In some cases this would have only required a consideration of the metrics of space.
It would seem reasonable to assume that people are also unable to make inferences
based on incomplete knowledge in their day to day lives, and thus are considerably
restricted by the geographical limits of their spatial knowledge.

5.5.4. Concluding Comments.

The above discussion has revealed some evidence to suggest that an understanding of
topological relations in a city precedes an understanding of metrical relations. First, the
connection exercises were undertaken with more ease than the plotting exercises; and
second, people often gave directions along circuitous routes when trying to explain how
to get from one place to another, showing that they had learnt a few routes in the
city centre without understanding the metrical relations between the places. This is
consistent with the hypothesised ontogenetic developmental sequence of Piaget (1963) and
will be discussed at length in the next section. The sequential photographs highlighted
the fact that people's cognitive maps often include parts of routes without any
conception of where they come from or go to. This is probably related to how
exploratory a person is and the other aspects of environmental nature. Finally, the
distinctiveness of the environment has been identified as an important factor in
environmental learning and place recall.

5.6. The Organisation of Spatial Knowledge.

Questions have arisen in the literature about whether the development of knowledge of
the environment is a matter of quantitative accretion or of qualitative change. Do all
people organize knowledge in basically the same way? and does the same person at
different times or in different environments organize knowledge in the same way? such
that differences between people or variations within the same person are primarily a
matter of the amount of knowledge? Moore (1976) has stated that "there is now clear
and ample evidence that not only do people differ and change in the amount of their
knowledge of the environment at different times, but also that they differ and change in
terms of the way they organize what they know; that is, they give different structures
to knowledge at different times in development" (Moore 1976, 144). Structure is
necessary because organisms cannot synthesize information without giving order to it; it
is the way that they give this order to knowledge that is the subject of this section.

There are many examples in the literature of attempts to determine structures of
environmental knowing. As early as 1913, Trowbridge published his work on
egocentric versus democentric reference systems and Shemyakin et al (1962) concerned themselves with route-based versus survey-based mental maps. Other researchers have considered current developmental theory and tried to find evidence in people's knowledge of organisational stages compatible to the stages outlined (see for example Piaget, 1954; Hart and Moore, 1973; Moore, 1973a, 1973b, 1975). The developmental theories of Piaget and Werner and their relevance to this work have been discussed in Chapter Two and at the beginning of this Chapter (see section 5.2). They will be considered here in the light of the research findings.

This section is comprised of three subsections which mirror the three areas of debate set out at the beginning of the Chapter. The ideas will be reconsidered in the light of the analysis reported above and the further results to be presented.


This subsection considers the route/node dominance debate outlined in section 5.1. Is there a switch from a dominance of paths in the early organisation of spatial knowledge to a dominance of nodes? or is the reverse true? or is there an initial path dominance which eventually becomes a dominance of neither element at the group level (as the model forwarded by the author in Chapter Three has suggested)? or are there no detectable patterns of this nature at all?

It would seem that the relative location of landmarks can be understood in the absence of the path network. Respondents were asked to plot the location of landmarks in the absence of their interconnecting paths, and were able to do this (in most cases) with reasonable degrees of accuracy (section 5.5.). This finding does not contradict Kuipers' contention that metrical relations are stored "or at least retrieved and manipulated" (Kuipers 1982, 205) separately from topological relations, but neither is it sufficient evidence to prove it. It suggests that landmark dominance in early cognitive maps is possible; because the short-stay respondents do not experience any great difficulty in carrying out the plotting exercises. At this point it is necessary to investigate variations in ability in the plotting and connectivity exercises by length of residence, in order that changes over time in the dominant elements in cognitive maps might be discovered. This can be done by comparing the overall scores received by respondents for their attempts at the exercises. After this, the free-recall sketch maps will be examined for comparability of results.

5.6.1a. The Plotting and Connectivity Exercises.

There are four important questions to be asked of the plotting/connectivity exercises in the light of the path/node dominance debate:
1. Did respondents perform similarly at the plotting and connectivity exercises?

Figure 5.18 (a and b) shows the distribution of individual scores for the two exercises at both the city-centre and the citywide scales. The shadings represent the number of respondents in the category. If the scores for both exercises were perfectly correlated (i.e., respondents received the same score for both exercises), the boxes straddling the diagonal would be the only boxes with a shading. It can be seen that scores were not well correlated at either scale of environment. Some respondents fell into boxes at distance from the line showing that the difference in their performance on the two tests was considerable. This suggests that the exercises required a different spatial skill for successful completion, perhaps supporting the idea that metrical and topological relations are separate. When the distribution of individual scores is examined by length of residence, it can be seen that the variability in performance on the two tests was equally wide for all groups. There was also found to be little difference between scale of environment on this criteria.

2. Are there any changes in the nature of ability with increasing length of residence shown by the city centre plotting and connectivity exercises?

Table 5.6 gives a comparison between the ratings received for the city centre plotting exercises and those received for the connectivity exercises by length of residence. It can be seen that at the three month stage, there was little difference between respondents' ability to perform each exercise (although a slight bias towards the plotting exercises was in evidence). However by twelve months, respondents were on the whole, slightly more competent at the connectivity task than the plotting task. This could be held as an indication of slight route bias in cognitive organisation at this stage. After three years or more in the city, respondents were much more competent at the connectivity task than the plotting task, and thus the topological bias appears to have grown stronger between this and the previous stage. However, with little research into tests of spatial ability to rely upon, it would be dangerous to draw conclusions on the basis of these results alone. It is not clear whether variation in success at these tasks is due to real ability differences or differences in the relative ease of task. Thus, the free-recall mapping exercise will later be considered to throw light upon this problem.

3. Are changes in cognitive organisation with increasing length of residence invariant with environmental scale?

Table 5.7 gives a comparison between the ratings received for the plotting and connectivity exercises at the citywide scale. It is clear that the change from equal ability at both tasks to a topological bias with increasing length of residence evident at the city-centre scale, is not evident at this scale. Instead, there appears to be a node dominance in cognitive maps at the three month stage, with respondents receiving generally higher scores for the plotting tasks than the connection tasks. After twelve months the plotting bias still remains; but after three years, ability appears to have evened out, with a slight bias towards topological information. This difference between scales of environment might be a function of the relative differences...
FIGURE 5.18.
RELATIVE PERFORMANCE ON THE PLOTTING AND CONNECTIVITY TESTS:
A COMPARISON.

(a) City centre plotting scores versus connectivity scores.

(b) Citywide plotting scores versus connectivity scores.
in the time scales through which development occurs. Knowledge progression at the citywide scale might be slower and thus the stage of topological bias found in the three year (plus) group at the city centre scale, may not yet have been reached at the citywide scale. Such a conclusion would need to await further empirical investigation. It can be concluded that scale of environment would appear to affect the results of this comparison, and that changes in cognitive organisation are dependent upon scale of environment. This may not only be a function of the different time scales involved, but may also be attributable to different processes which occur in the amassing of environmental information at these different scales. The end result at both scales was topological bias in environmental information and ability, although the degree of bias after three years differed between environment scales.

4. Was there a relationship between those landmarks/places that could not be plotted and those that could not be connected? There was a very high correlation between ability to plot and connect the individual landmarks. Generally, between two and ten per cent of respondents could do one but not the other, but there seemed to be little overall pattern that could reveal whether plotting or connecting was found easier. St. Margarets Bus Station, Wigston and Abbey Park were plotted by between fifteen and twenty per cent of respondents who could not draw the road connections between them. The Town Hall and the Odeon had the highest numbers of respondents able to draw the road connections even though they couldn’t first plot their location. No overall pattern emerged.

5.6.1b. The Free-Recall Sketch Maps.

The free-recall sketch maps will now be examined with reference to the path/node debate. These were classified according to a system developed by Pocock (1976) and modified by the author (Chapter Three - Figure 3.4.). It divides maps into two classes according to whether they are spatially or sequentially biased. This is based on the relative predominance of either type of element and the division, although subjective, is generally clear-cut. Some examples of the sketch maps produced by the Leicester respondents are given on Figure 5.19., and these illustrate this point very well. Figure 5.20. shows that there was a very clear difference between the short-stay respondents (three month group) and those respondents who had been in the city for six months or more. There was a very strong sequential bias in the sketch maps of the three month group (72%), which then faded to a near 50:50 split between spatial and sequential maps after six months in the city; a trend which appears to continue thereafter. This would seem to suggest that, at the city centre scale (there is no data for free-recall mapping at the citywide scale), early cognitive organisation is sequentially based, which might gradually change to a spatial dominance or might remain (but perhaps might become less pronounced as environmental knowledge increases) as the predominant construct for spatial information organisation. These findings are consistent
FIGURE 5.19.
SOME EXAMPLES OF THE FREE-RECALL SKETCH MAPS DRAWN BY RESPONDENTS.
FIGURE 5.20.
SPATIAL AND SEQUENTIAL ELEMENT DOMINANCE IN FREE-RECALL
SKETCH MAPS - BY LENGTH OF RESIDENCE.

KEY:
- Spatial
- Sequential

<table>
<thead>
<tr>
<th>Length of Residence</th>
<th>Spatial</th>
<th>Sequential</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Months</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>6 Months</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>12 Months</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>3 Years plus</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>
with the model of environmental learning which was proposed by the author in Chapter Two (page 37) although they do not reflect each of the four proposed stages. The factors which determine whether a person's primary cognitive constructs are sequential or spatial after six months in the city, will be examined in Chapter Nine. Factors worthy of attention in this context might be for example, 'environmental nature', 'predominant travel mode' and 'sex of respondent'.

It would appear that the results of the two sets of exercises (plotting/connectivity and free-recall sketch mapping) contradict one another. The city centre scale plotting/connectivity exercises suggest that people develop from having equal ability in an environment at topological and metrical tasks, to having greater ability at the former with increasing length of residence. The free-recall mapping exercises suggest that a bias towards sequential elements in urban area cognition is present in people after three months in the city, but that by six months, people are evenly split between sequential and spatial element dominance. Rather than helping to answer the path/node dominance debate, these results have shown that empirical findings resulting from inquiry into these processes are very much dependent on the methodology employed to discover them. This is a problem that will hinder discovery in research into environmental cognition until its methodology is better understood. At present, a great many techniques are employed without a clear understanding of what they are actually measuring. The two methods used in this research might have measured different aspects of cognition. The plotting/connectivity exercises aimed to measure respondents' ability to perform these abstract tests. However, without knowledge of the solution strategies employed/required to complete these tests, it can only be supposed that topological and metrical solution strategies were employed. If this were not the case, then the results need to be interpreted in a different way. Similarly, free-recall sketch maps have been claimed by many researchers (as they are here), to elucidate element predominance in cognitive maps, but they may simply reflect a respondent's liking for a certain type of sketch. In a similar fashion to the above, the apparent differences in results achieved by research aimed at answering the path/node debate are probably due to differences in methodology and those aspects of environmental cognition that they are knowingly or unknowingly measuring.

As a final attempt to throw light upon this debate, respondents were asked whether they drew their free-recall sketch maps from a birds-eye (plan) perspective, or whether they engaged in a mental journey through the areas that were being mapped whilst they were drawing. The theory was that if the map was drawn in "plan" view, it could be supposed that the cognitive image of the area was spatially biased; and a sequential bias could be deduced from a journey-based drawing (Shemyakin et al, 1962). This was probably the most reliable technique of all for answering this question, as people were asked directly what they were doing, rather than the researcher attempting to draw inferences after the event from the results of their
activity. All length of residence groups were found to have more respondents using a 'plan' construction for their drawing activity (spatial bias). The proportion of people falling into this category was around sixty per cent for those living in the city for one year or less, and rose to seventy per cent for the three year (plus) group. Differences between the groups were not statistically significant. Thus, it would appear from this that a spatial bias is most likely to be prevalent in people who have lived in an area for three years or more, but that there may be an increase in the predominance of this with increasing length of residence.

5.6.1c. Conclusion.

The incompatibility of the results from the various methods used here to try to establish the sequence of structural element dominance in developing cognitive maps have rendered this enquiry inconclusive. They have however, made clear the fact that attempts to answer this question will need to first develop a methodology which measures precisely what it is supposed to measure. In such an area of enquiry as this, this may never be possible. Finally, it is necessary to point out that attempts to empirically support a particular side of the debate in question, and the resulting conclusions are dependent upon the time scale that is selected. The literature uses such loose terms as 'early cognitive maps', which are open to question as to what 'early' actually means. Here, the early stage is three months after a person moves into the new area; but very different results may have been achieved if the 'early' group had for example, comprised a group who had only been in the city for four weeks.

5.6.2. Changes in the Cognitive Organisation of Knowledge with Time.

The question set out in section 5.2 was whether a person progresses from a stage where his or her spatial awareness is egocentric and undifferentiated, and his or her free-recall maps are drawn in a route-based fashion, to a stage where (s)he has a coordinated euclidean construction of the environment and his or her free-recall sketch maps are survey-based, demonstrating a high level of understanding of the relationship between the different parts of the urban area. Whether or not individuals progress through developmental stages which parallel the ontogenetic sequence suggested by Piaget (1954a) and colleagues is a question which is pursued throughout this research. It has already been seen from the above that respondents were not found to progress from a stage where their cognitive maps were route-based to one where they were survey-based. However, maps were also classified according to their degree of complexity (defined by the number of routes and nodes and the nature of their interconnections - Pocock, 1976), and there was found to be a strong relationship between length of residence and complexity (significant at the 0.0002 level of confidence - Table 5.8.). Figure 5.21. shows the proportions of respondents whose maps were
FIGURE 5.21.
FREE-RECALL MAP COMPLEXITY - BY LENGTH OF RESIDENCE.

(a) 3 Months

(b) 6 Months

(c) 12 Months

(d) 3 Years plus
classified as ‘low’, ‘medium’ and ‘high’ by length of residence. It can be seen that there was a marked change from lower to higher levels of map complexity with increasing length of residence. The differences between the groups in overall scores for all the tests aimed to examine people’s knowledge of the physical structure of the city (i.e. the direction tasks, and the individual, sequential and aerial photographs), have been found to be significant (chi square, 0.01% level). This supports the notion that people’s knowledge of new areas changes both quantitatively and qualitatively with time, from a collection of partial and undifferentiated material to a spatially coordinated frame of reference. These changes are from lower to higher levels of cognitive organisation with increasing length of residence. The nature of this change however, and the resulting cognitive organisation of spatial information cannot be commented upon here.

5.6.3. Generic Knowledge About Cities.

In Section 5.3. it was noted that Devlin (1976) has postulated that generic knowledge about cities in general might play a role in cognitive adaption to new localities. In her research she found that people rapidly formed cognitive maps of a new town, and she concluded from this that her "participants had prior knowledge of cities in general which they were able to call on in coming to understand this particular town" (Devlin 1976, 66). Generic urban information, she claimed, leads to expectations of the locations of certain functions and their groupings; and a mental path template will help to aid quick understanding of the pattern of the road network. For the purposes of this research, generic knowledge was assumed to be a function of a person’s previous environmental experience. (It is accepted that this is a very crude measure and that it is based on the intuitive supposition that environmental experience is a determinant of generic knowledge). Thus, respondents were asked how many different settlements they had lived in before and after the age of eighteen. This was then cross-tabulated against free-recall map complexity. No difference was found between people with high and low levels of environmental experience at the three month stage (which is the time when it might be expected that this factor would be at its most influential), or at the other time periods with the exception of the six month group. This group did demonstrate an increase in map complexity with an increase in environmental experience (although the relationship was not statistically significant). It seems strange that this is the case at only one time period. A possible explanation is that in the early stages of environmental learning, learning is rapid and environmental experience as a factor is not able to differentiate speed of knowledge accretion. Similarly, after a year, everybody has had a chance to reach a stage of gradual knowledge accretion. Between these two periods, knowledge is steadily accumulated and factors such as ‘environmental experience’ have a chance to influence the speed with which the cognitive image develops. Further research on this idea would need to be undertaken before it is used as an explanation for the above finding. It is just as likely that the findings reported here are purely attributable to random error.
Newcomers to a city may superimpose a mental grid over a new area, and structure their mental maps of the new locality upon this. This is another form of generic knowledge about cities that people may bring to a new learning situation. Lynch (1960), de Jonge (1962), Tzamir (1975) and Evans et al (1984), have suggested that there is a prominence of a grid configuration in people’s free recall sketch maps. The suggestion has been developed by Waterman and Gordon (1984) following their discovery that people tend to generalize shape into simple geometric forms. There was a tendency for people to generalize shape in their free-recall sketch maps of Leicester. As has been seen before, roads were often generalized into north-south and east-west running lines, with the consequent junctions tending towards right angles. This tendency is evident both from the free-recall sketch maps and the plotting/connectivity exercises which tends to suggest that it is not simply a tendency to simplify drawings that is being found, but a very real phenomena in the organisation of cognitive maps. The directional and orientational distortions evident in the plotting exercises have shown how routes, and the places located along them are rationalized into a north-south/east-west grid configuration. The tendency to do this increased amongst respondents with increasing length of residence in the city (see section 5.5.), which suggests that if this is a mental construct derived from generic knowledge about cities in general, it takes people a while before they can fit the street pattern of the new area to this grid template. Such rationalized, geometricity in mental maps has been found to exist at both the city centre and the citywide scales of environment; and it is suggested here that they must affect the spatial behaviour of the people that hold them.

5.7. Conclusion: Learning about the Physical Composition of the Urban Area.

This Chapter has aimed to explore people’s knowledge of the physical makeup of Leicester in an attempt to throw light upon both the process of environmental learning and the development of the cognitive structures that contain the accumulating knowledge. A holistic approach has been adopted which has considered all aspects of this knowledge, although it was broken down into five major component parts and further sub-divided (where necessary) within each subsection. Three major themes have run through the Chapter and have been specifically addressed in section 5.6. These were the spatial/sequential dominance debate (see section 5.1.1.), the applicability of ontogenetic developmental theory to microgenetic learning (section 5.1.2.), and generic knowledge of cities and its role in environmental learning (section 5.1.3.). The discussion has brought several methodological problems into focus which are addressed below:

It is here contested that certain methodological problems are inherent in work which aims to uncover modes of cognitive organisation. As yet there has been no agreement reached on methodology to be used in the pursuit of a greater understanding of the cognitive processes which accompany environmental learning. The problem is twofold:

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First, there is the difficulty of trying to discover modes of cognitive organisation by examining their outcome (i.e. spatial behaviour, performance in tests etc.). There is obviously no other way to try to gain an understanding of these cognitive structures; but the interpretation of these outcomes is subject to error both in its translation from the brain to some manifest form, and in the interpretation then given of this manifest form by the researcher. It was seen in section 5.8. that empirical findings resulting from inquiry into cognitive processes are very much dependent on the methodology employed to discover them, and that many of the apparent contradictions in the results of research in the field may be attributable to differences in the methodology employed. Second, a set of tests are required that measure exactly what they are supposed to measure and that can be generally accepted and agreed upon by all workers in the field. Before this is possible, the nature of the spatial skills that are required to carry out various spatial tasks, both in the field and in the test situation need to be established. Work soon to commence at the National Foundation for Educational Research (NFER) aims to achieve this, and to go on to develop a set of tests which will measure spatial ability. These may be applicable to studies of this nature. Until such a set of 'tools' exists for this type of enquiry, the field will continue to be characterized by conflicting evidence and inconclusive results.

A study such as this can discover what people know, but because of the methodological deficiencies discussed above, it can not as yet conclusively determine how people structure what they know, which will in turn influence what people will learn (and therefore know). It is believed that knowledge acquisition is dependent on the presence of a cognitive structure (or method of cognitive organisation) within which to assimilate the new information. This could also be viewed as a person’s ability to cognitize information. A problem of interpretation could also exist where an individual’s lack of knowledge is interpreted as an inability to cognitize information rather than the lack of his exposure to that information in the first place. It is important that the researcher in the field is aware of these possible problems in order that interpretational error is minimized. If these methodological problems are realised, enquiry can determine the amount and nature of environmental knowledge that an individual holds and it is possible from these findings, to make inferences about the nature of the cognitive frameworks that contain and structure this knowledge.

Knowledge of the physical composition of the urban environment was seen to increase significantly between the four sample groups included in this study. There was a very clear improvement in ability at all tasks with increasing length of residence. The degree of improvement however, was not found to be constant between the various tasks. In some exercises there was less of a difference between the length of residence groups (showing that very quickly, people had reached a level of knowledge in the urban area that was equivalent to that of the three year (plus) group), than in others where learning had proceeded at a slower rate. Differential rates of learning
over time, will be examined in more detail in Chapters Six, Seven and Nine.

The rate of environmental learning and the cognitive processes that accompany it have been found to be dependent on, and variant with, environmental scale. The results of the plotting and connectivity exercises were more prone to error at the citywide scale than they were at the city centre scale. Respondents obviously found these exercises more difficult when applied at the larger scale of environment. Some of this difference can be accounted for by the fact that respondents may have greater knowledge of urban structure and content at the city centre scale. Some however was due to the different demands the two scales make on cognitive processing; with the metrics of the small-scale environment seemingly easier to recall (and perhaps also cognize), than those of the large. An example of this was seen in section 5.5, where distances between places were commonly underestimated at the city centre scale, and overestimated at the citywide scale.

Urban knowledge has in most cases been found to be highly restricted in spatial extent, both sectorally (i.e. respondents knowing their own ‘city sector’ to the exclusion of the rest of the city), and concentrically (with respondents often unaware of the nature of areas in their own sector that were further out from the city centre than their own area of residence). This was found to be the case for all length of residence groups, but this effect did decline in intensity as length of residence increased (thus the degree of spatial restriction of knowledge decreased). The extent to which personal mobility affects this will be examined in Chapter Eight.

Spatial ability has been seen to be in-part a function of a person’s character; especially that part of his or her character that has been termed here ‘environmental nature’. It has been contended that people differ in the extent to which they take notice of their environment and enjoy their interaction with it. Some people were found to be keen to understand the spatial relationships between places in the urban area, and thus consciously attempt to acquire orientation in a new place quickly. These people are generally proud of their orientational ability, and would rate their ‘sense of direction’ highly. This orientational ability or sense of direction would seem to play a causative role in differential knowledge acquisition between people. It would also seem to determine a person’s success at making spatial inferences about the location of places based on existing incomplete knowledge (something that a newcomer to an area has to do in order to find new places/routes etc.). Many respondents were found to be either unable or unwilling to make these spatial inferences, and thus would be the people who would learn slowest about their new environments. The ability to make spatial inferences also increased with increasing residence as the comprehensiveness of the information that these were based on became greater.

People were also found to rationalize the spatial relations between places by
'good-figuring' both their internal representations of space (which was deduced from the fact that this finding consistently arose from the tests whatever their nature) and their free hand drawings. Thus the road system of the city was rationalized to a simple north-south coordinate system, and junctions were commonly rationalized to right-angles. Such geometricity was found to exist at both the city-centre and the citywide scales of environment. It also was found to become more persistent within a group with increasing length of residence. Thus, this process of rationalization became standardized to a 'common perception' and was obviously learned. Similarly the tendency to exaggerate east-west distances became stronger with time.

Several other observations can be made about the nature of 'cognitive maps' from the results of the analysis presented above. None of these are novel findings, but are important because they lend support to previous findings of a similar nature. First, that people are selective in their gathering and retention of environmental information, such that what is learnt, is a personal selection of information from a whole range of stimuli that the individual is subject to as (s)he interacts with the environment. Second that 'cognitive maps' are fairly inflexible and that if they are relied upon to solve a problem that is perhaps novel to them, they can fail to be of use even though the information required to solve the problem is contained within them. An example of this was seen when respondents found it difficult to orientate themselves to an aerial photograph, when previous evidence had shown that the part of the city portrayed in the photograph was well known to them. Similarly, it has been found that the 'images' that constitute a part of the cognitive map can also be inflexible to the extent that they resemble photographic stills which cannot be rearranged to make sense if the subject of the image is seen from a different angle or perhaps, in a different light. This represents a very real inflexibility in the cognitive 'image'. Third, the distinctiveness of the physical environment has been found to affect the development of cognitive maps, with the more distinctive elements of the city being learned most quickly. This is in support of Lynch's (1960) concept of 'visibility'. Finally, mental maps have been found to be spatially discontinuous, comprising of known areas intermingled with 'hazy' areas of uncertainty which can act as perceptual barriers and lead to distortions in the image.

This Chapter has concentrated solely on people's knowledge of the physical characteristics of the urban area. Chapters Six and Seven will now go on to consider the acquisition of knowledge about the economic and social attributes of the city of Leicester.
### Table 5.1. Respondents Unable to Plot the City Centre Landmarks. (%)

<table>
<thead>
<tr>
<th>Landmark</th>
<th>Whole Sample</th>
<th>3 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway Station</td>
<td>5.2</td>
<td>12.0</td>
<td>2.1</td>
<td>-</td>
</tr>
<tr>
<td>Haymarket Centre</td>
<td>2.1</td>
<td>2.4</td>
<td>2.5</td>
<td>-</td>
</tr>
<tr>
<td>Market Place</td>
<td>1.0</td>
<td>2.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Town Hall Square</td>
<td>19.0</td>
<td>31.0</td>
<td>12.5</td>
<td>-</td>
</tr>
<tr>
<td>Odeon</td>
<td>25.0</td>
<td>43.0</td>
<td>15.0</td>
<td>-</td>
</tr>
<tr>
<td>St. Margaret's Bus Station</td>
<td>20.0</td>
<td>31.0</td>
<td>12.5</td>
<td>7.1</td>
</tr>
</tbody>
</table>

### Table 5.1. Respondents Unable to Plot the City-Wide Landmarks. (%)

<table>
<thead>
<tr>
<th>Location</th>
<th>Whole Sample</th>
<th>3 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oadby</td>
<td>15.0</td>
<td>24.0</td>
<td>10.0</td>
<td>-</td>
</tr>
<tr>
<td>Wigston</td>
<td>24.0</td>
<td>36.0</td>
<td>18.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Abbey Park</td>
<td>52.0</td>
<td>74.0</td>
<td>43.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Evington Road/ East Park Road</td>
<td>7.0</td>
<td>14.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Royal Infirmary</td>
<td>19.0</td>
<td>31.0</td>
<td>12.5</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 5.2. RELATIONSHIPS BETWEEN LENGTH OF RESIDENCE AND ABILITY TO PLOT THE:

(a) CITY CENTRE LANDMARKS:

<table>
<thead>
<tr>
<th>Landmark</th>
<th>Significance (Chi Square)</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway Station</td>
<td>0.03</td>
<td>Yes</td>
</tr>
<tr>
<td>Haymarket</td>
<td>0.84</td>
<td>No</td>
</tr>
<tr>
<td>Market Place</td>
<td>0.52</td>
<td>No</td>
</tr>
<tr>
<td>Town Hall Square</td>
<td>0.02</td>
<td>Yes</td>
</tr>
<tr>
<td>Odeon</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>St. Margarets Bus Station</td>
<td>0.05</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(b) CITY-WIDE LANDMARKS:

<table>
<thead>
<tr>
<th>Location</th>
<th>Significance</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oadby</td>
<td>0.05</td>
<td>Yes</td>
</tr>
<tr>
<td>Wigston</td>
<td>0.04</td>
<td>Yes</td>
</tr>
<tr>
<td>Abbey Park</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Evington Rd/East Park Rd</td>
<td>0.05</td>
<td>Yes</td>
</tr>
<tr>
<td>Royal Infirmary</td>
<td>0.02</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 5.3. STATISTICALLY SIGNIFICANT RELATIONSHIPS BETWEEN LENGTH OF RESIDENCE AND ICONIC PHOTOGRAPH RECOGNITION. (CHI SQUARE)

<table>
<thead>
<tr>
<th>City Centre Photographs</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Martins Shopping Precinct</td>
<td>0.0000</td>
</tr>
<tr>
<td>The Cinecента</td>
<td>0.0000</td>
</tr>
<tr>
<td>British Telecom</td>
<td>0.0083</td>
</tr>
<tr>
<td>The Grand Hotel</td>
<td>0.0087</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City-Wide Photographs</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alliance &amp; Leicester Building Society</td>
<td>0.0416</td>
</tr>
<tr>
<td>The Race Course</td>
<td>0.0525</td>
</tr>
<tr>
<td>ASDA</td>
<td>0.0338</td>
</tr>
<tr>
<td>The Post House Hotel</td>
<td>0.0000</td>
</tr>
<tr>
<td>Saffron Lane Sports Track</td>
<td>0.0022</td>
</tr>
<tr>
<td>The Polytechnic</td>
<td>0.0002</td>
</tr>
<tr>
<td>The Rugby Ground</td>
<td>0.0006</td>
</tr>
<tr>
<td>The Jewry Wall</td>
<td>0.0278</td>
</tr>
<tr>
<td>The Royal Infirmary</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
Table 5.4.  THE RELATIONSHIP BETWEEN SELF-ASSESSMENT OF SENSE OF DIRECTION AND ENVIRONMENTAL DISPOSITION. (%)

<table>
<thead>
<tr>
<th>Environmental Nature</th>
<th>Good</th>
<th>Average</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Exploratory</td>
<td>81.8</td>
<td>15.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Semi-Exploratory</td>
<td>59.3</td>
<td>16.9</td>
<td>23.7</td>
</tr>
<tr>
<td>Passive</td>
<td>33.3</td>
<td>16.7</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Table 5.5. PERCENTAGES OF RESPONDENTS GIVING DIRECTIONS WITH EASE.

<table>
<thead>
<tr>
<th>Route</th>
<th>3 Months</th>
<th>12 Months</th>
<th>3 Years (Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Town Hall Sq. - Clocktower</td>
<td>58.1</td>
<td>73.1</td>
<td>100.00</td>
</tr>
<tr>
<td>2. Town Hall Sq. - Bus Station</td>
<td>16.3</td>
<td>46.2</td>
<td>35.7</td>
</tr>
<tr>
<td>3. Railway Sta. - St. Martins</td>
<td>16.3</td>
<td>57.7</td>
<td>64.3</td>
</tr>
<tr>
<td>4. Railway Sta. - Town Hall Sq.</td>
<td>60.5</td>
<td>76.9</td>
<td>92.9</td>
</tr>
<tr>
<td>Modal overall Rating</td>
<td>Average/Poor</td>
<td>Good</td>
<td>Very Good</td>
</tr>
</tbody>
</table>
### Table 5.6. Overall Ratings Received by Respondents in the City Centre Plotting and Connectivity Exercise by Length of Residence. (\%)}

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>V.Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a. 3 Month Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plotting</td>
<td>-</td>
<td>7</td>
<td>26</td>
<td>40</td>
<td>28</td>
</tr>
<tr>
<td>Connectivity</td>
<td>2</td>
<td>5</td>
<td>28</td>
<td>37</td>
<td>28</td>
</tr>
<tr>
<td><strong>b. 12 Month Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plotting</td>
<td>5</td>
<td>15</td>
<td>44</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>Connectivity</td>
<td>7</td>
<td>27</td>
<td>34</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td><strong>c. 3 Year (+) Gp.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plotting</td>
<td>-</td>
<td>36</td>
<td>57</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Connectivity</td>
<td>29</td>
<td>50</td>
<td>21</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Table 5.7. Overall Ratings Received by Respondents in the City-Wide Plotting and Connectivity Exercise by Length of Residence. (\%)

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>V.Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a. 3 Month Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plotting</td>
<td>-</td>
<td>5</td>
<td>45</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Connectivity</td>
<td>-</td>
<td>2</td>
<td>26</td>
<td>26</td>
<td>45</td>
</tr>
<tr>
<td><strong>b. 12 Month Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plotting</td>
<td>15</td>
<td>15</td>
<td>22</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>Connectivity</td>
<td>2</td>
<td>2</td>
<td>27</td>
<td>51</td>
<td>17</td>
</tr>
<tr>
<td><strong>c. 3 Year (+) Gp.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plotting</td>
<td>21</td>
<td>21</td>
<td>50</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Connectivity</td>
<td>21</td>
<td>36</td>
<td>29</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>Variables</td>
<td>Level of Significance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Number of sketched landmarks x length of residence.</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Overall ratings for iconic photographs x length of residence.</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sense of direction x environmental disposition.</td>
<td>0.0255</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Aerial photograph 2 - feature recognition x length of residence.</td>
<td>0.0004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Overall scores for aerial photographs x length of residence.</td>
<td>0.0038</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Number of City Centre symbols connected x length of residence.</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Number of City Centre road segments drawn x length of residence.</td>
<td>0.0005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Overall rating for City-wide connectivity exercise x length of residence.</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Sketch map complexity vs. length of residence.</td>
<td>0.0002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.B. See also Table 5.2 and Table 5.3 for significant statistical relationships.
CHAPTER SIX.

ECONOMIC AND COMMERCIAL ELEMENTS OF THE CITY.

This chapter will explore respondents' knowledge of the economic and commercial elements of the city of Leicester. The previous chapter was concerned with the morphology or form of the urban area and as such, focussed on what people know about the observable and the inanimate elements of the city. This and the following chapter focus on what Herbert and Thomas (1982) refer to as the 'derivative' aspects of cities, which are "the people and their activities who occupy urban space and provide it with its dynamism" (Herbert and Thomas 1982, 15). The present chapter is concerned with the functional elements of the city (i.e. the activities which provide its residents with a living), and Chapter Seven will be concerned with the social elements (the nature of the residents themselves).

The aim of this chapter is to discover more about the quantity and quality of knowledge that relative newcomers to a city have about its economic functions, and how this knowledge is acquired over time. Three specific economic functions are concentrated on here and they constitute the three sections which follow. First, the industrial (manufacturing) function. What do migrants to Leicester know about the nature and location of industry in the urban area? and how quickly do they acquire an understanding of this aspect of the city's composition? Second, the retailing function. How aware are people of the shopping facilities in the urban area? Is knowledge highly spatially restricted? and how does this develop over time? Third, the recreational function. What do people know about the recreational opportunities available to them?

Knowledge of these elements will here be related to length of residence in the city so that learning patterns can be established. What aspects of the economic elements of cities are learned first? and how much broader is the knowledge of somebody who has lived in the city for three years than that of somebody who has only been resident for three months? Knowledge is also related here to the activity spaces of individuals in order that the degree of spatial restriction to knowledge, imposed by movement patterns within the city, can be determined.


The nature of the manufacturing base of the city of Leicester was outlined in Chapter One. It was seen that the three major industrial groups in the city are engineering, textiles and clothing, and footwear. Other important concerns (in terms of numbers of
employees) are food manufacture, chemicals, paper and printing, building materials and wood products (Table 1.1.). There was found to be low level of awareness of the nature of the manufacturing activities carried out within Leicester amongst the study population. Respondents in the three month, six month and three year (plus) sample groups were asked to name Leicester’s main industries. The twelve month interviews did not contain this question as the interviewees had answered it at the six month stage and may have consciously sought the answer in the intervening period between the two interviews. Twenty six per cent of the three month group and twenty three per cent of the six month group had no idea. The activities most often mentioned by those who did give an answer were hosiery, textiles and clothing manufacture. Also mentioned were footwear and engineering which are also correct. The three year (plus) group were most successful at correctly identifying Leicester’s main industries, sixty four per cent naming two correctly and twenty nine per cent naming three. (These figures were 26% and 5% respectively for the three month group, and 38% and 6% respectively for the six month group) Respondents were given an overall score for their performance on this task. Only three per cent of the whole sample group received a rating of 'excellent' and only eleven per cent received a rating of 'good'. Figure 6.1. shows that the three year (plus) group performed the best on this test, although the difference was not found to be very great (and was not statistically significant).

Respondents were also asked to state the location of the industries that they had mentioned. Answers were classified into three groups depending on whether the description of location was typological (e.g. 'edge of town', 'city centre' etc.), area specific (e.g. a particular named area) or works specific (e.g. a specific works or factory mentioned). Many respondents did not know anything about the location of industry in Leicester. This was however, a difficult question as industry in Leicester is not obviously concentrated anywhere, but is instead spread throughout the urban area according to its nature. The traditional textile, hosiery and knitwear industries are still located within the nineteenth century urban fabric which surrounds the city centre and spreads furthest to the north (Belgrave) and east (Highfields/Spinney Hill/Humberstone). Many of the other industries (e.g. footwear, electronics and light engineering) are located on the urban fringe on freestanding sites or modern industrial estates. Smaller manufacturing concerns are located within the built-up area on small industrial estates.

Forty per cent of the total sample group could not attempt to answer the question on the location of industry. Half of these were people who had been able to say what Leicester’s main industries were. It was clearly not a subject that had been addressed by many respondents before. A typological answer was the most difficult to give as it requires greater knowledge of an area than does a mere statement of an industrial area or site seen. Only eighteen per cent of respondents (roughly a quarter of those who attempted an answer), gave a typological answer. This type of answer was more
FIGURE 6.1.
KNOWLEDGE OF THE LOCATION AND NATURE OF INDUSTRY IN LEICESTER (MEAN GROUP SCORES) - BY LENGTH OF RESIDENCE.

Rating

<table>
<thead>
<tr>
<th>V. Poor</th>
<th>Average</th>
<th>V. Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Length of Residence

- 3 Months
- 6 Months
- 3 Years plus

KEY:

- . . . . . . Nature of Industry
- . . . . . . . . Location of Industry
common amongst the three year (plus) group (43%), than the six (29%) or three month (12%) groups which suggests a gradual broadening of knowledge with increasing length of residence. This is also evidence of a move in the cognitive processing of spatial information from an egocentric (i.e. a site seen) to a global perspective (i.e. the ability to describe an aspect of the environment in an abstract way without necessarily, reference to personal experience). The three year (plus) group were more successful generally at this question. Only seven per cent of the three year (plus) group were unable to attempt an answer, which is a much lower proportion than was found in the other two groups. Most commonly in the three month and twelve month groups, respondents named areas of the city where they believed industry was located (over half of those who attempted to answer the question named a particular area or areas). Only four per cent of respondents named a specific works or plant.

Figure 6.1. also shows the scores that respondents received for their performance in describing the location of industry in Leicester. It can be seen that there was a marked difference between the three and six month length of residence groups and the three year (plus) group. This was found to be statistically significant (0.00 level - Table 6.3.). Thirty six per cent of the three year (plus) group received a rating of 'excellent'. The equivalent figures were two per cent and zero for the three month and six month groups respectively. It is interesting that the scores received by these latter two groups did not differ to any great extent, suggesting that knowledge of the industrial component of cities is something that develops slowly and hardly changes at all between three and six months in an area. This will be considered again in Chapter Nine, and the personal factors which may influence the development of this knowledge are considered in Chapter Eight. Besides these, the low level of awareness of the industrial make up of the city might be due to the fact that Leicester's industry has a 'low profile', with few large firms, and that they have a scattered distribution rather than an obvious concentration. Furthermore, it might be possible that the sample of individuals from the academic world may have a lower awareness of this aspect of the city than the 'average' city inhabitant. Finally, all respondents lived in the southeast sector of the city, where industry is sparse. Differences in learning patterns between this and the other elements examined in this chapter will be considered in section 6.4. below.

6.2. The Shopping Environment.

In an attempt to find out the extent of people's knowledge of the shopping opportunities located outside Leicester's city centre, respondents were given a list of selected neighbourhood shopping centres and were asked to indicate which they would; (a) be able to find quickly on a street map (which would indicate a person's knowledge of the shopping centre), and (b) be able to recall five shops (which would indicate the degree of their familiarity with the centre). The locations of the shopping
centres included in this question are shown in Figure 6.2. Answers have been analysed in relation to the location of the respondents’ place of residence, thus enabling the relationship between place of residence and the spatial spread of information to be examined. All four length of residence groups were asked this question. It was hypothesised that as length of residence increases, the spatial spread of information will increase to include knowledge of areas at distance from, and in a different sector to, a respondent’s own place of residence. Particularly interesting in this context is the time scale over which such changes occur if indeed, they do occur.

All but one respondent in the three month group knew the location of at least one of the shopping centres. Figure 6.3(a) shows the location of the known shopping centres in relation to place of residence for the four length of residence groups. Respondents’ answers were classified according to whether they contained shopping centres in; (a) their own city sector only, (b) their own and one other adjacent sector, (c) their own and both adjacent sectors, or (d) more than two sectors including the non-adjacent sector. The residential ‘sectors’ referred to here were worked out by even centring a ninety degree section on the central point of each respondent’s residential area. Thus, the sector moved according to the location of the respondent. As the classification moves from (a) to (d) above, the spatial extent of knowledge increases, and thus if the above hypothesis were true, one would expect the cumulative frequency lines to become more heavily weighted towards the right-hand side of the diagram the longer the length of residence of the respondent group. It can be seen from Figure 6.3(a) that when the three month group is compared to the other three groups, this is indeed the case. The observed difference between the four groups was found to be highly statistically significant (0.0002 level of significance - Chi Square - Table 6.3.). However, it can also be seen that the difference between the groups was not considerable after the six month stage. A Chi Square test showed that there was not a significant difference between the length of residence groups and the spatial spread of their information once the three month group had been removed from the analysis. This suggests that the acquisition of a level of knowledge about the suburban shopping environment equivalent to that of a person who has lived in the area for three years or more is relatively rapid, occurring during the first six months of residence. After this time the growth rate slows down. Other aspects of urban knowledge have so far been seen to develop over much longer time spans. However, these results have to be treated with caution because knowledge levels are only being compared in each case to the three year (plus) group’s knowledge levels. This is a perfectly valid comparison but it must be remembered that these knowledge measures are relative and not absolute. This does not mean that the research is unable to show when different types of learning occur. The conclusion here is that people learn most of the knowledge that they will ever have about the existence of and location of suburban shopping centres in their first six months in the city.
FIGURE 6.2.
THE LOCATION OF THE SUBURBAN SHOPPING CENTRES.
FIGURE 6.3.
THE LOCATION OF KNOWN AND FAMILIAR SHOPPING AREAS IN RELATION TO PLACE OF RESIDENCE - BY LENGTH OF RESIDENCE.

(a) Known Shopping Centres.

(b) Familiar Shopping Centres.

KEY:

- — — — — — — — — — — — 12 Months
- — — — — — — — — — — — 3 Months
- — — — — — — — — — — — 3 Years plus

Increasing spatial spread of information

Own sector One adjacent sector Non-adjacent sector +
It was also found that the statistically significant differences between the four length of
residence groups did not exist for non-car drivers, but only for car drivers. This
shows that as length of residence increases, the knowledge of suburban shopping centres
of car drivers increases much more rapidly than the knowledge of non-car drivers.
Given the latter group's greater mobility this is not a surprising finding, and it will be
considered in greater detail in Chapter Eight.

Figure 6.3(b) shows the location (in relation to their own residential sector) of
shopping centres that the respondents were familiar enough with to be able to recall
five of the shops located within them. It can be seen that the pattern was very
different when people were asked to indicate how well they knew a shopping centre
rather than simply if they knew where a place was. Familiarity with shopping centres
was far more spatially restricted to respondents' own residential sectors than was
knowledge of their location (fifty three per cent of the total sample group were only
familiar with shopping areas in their own residential sectors). There was also not so
much variation between the four length of residence groups (see Figure 6.3.) and the
differences were not found to be statistically significant. This shows that in the sample
group, there was only a slow development in familiarity with shopping centres outside
respondents' own residential sectors with increasing length of residence, even though
awareness of the existence of these shopping opportunities did increase. It could be
supposed that this familiarity, again could be very much dependent on access to a car
or bicycle. However, when results were broken down by whether or not respondents
had access to a car, this variable was found to have no effect on changes in
familiarity levels over time, as the knowledge of car-drivers did not increase significantly
between the four length of residence groups either. This shows that familiarity with
shopping areas is only likely to occur in areas that are nearest to place of residence,
unless the shopping area satisfies some need that cannot be satisfied at a nearer
destination. This is of course, consistent with the classic assumptions of the normative
models of shopping centre destinations.

The mean distances of known and familiar shopping centres from respondents' places of
residence by length of residence group are given in Table 6.1. It could be expected
that mean distances would increase with the increasing length of residence of the
respondent group. Table 6.1. shows that this was generally the case, although the
relationship is not so clear for the familiar shopping areas where the three month
group actually had greater proportions of respondents with higher mean distances than
the six month group. Differences between the length of residence groups were found
to be statistically significant for the familiar shopping centres and not significant for the
'location-known' shopping areas. There was also found to be a statistically significant
difference between the mean distances of shopping centres known and those that the
respondent was familiar enough with to be able to name five shops in (0.00 level of
significance - Table 6.3.), with the latter being much lower than the former. It can
be seen from the table that the increases in mean distance with increasing length of residence are steady.

The mean distances for both the known and the familiar places ranged between one and two miles, indicating fairly restricted spheres of knowledge. The difference between the shortest and longest length of residence groups in both cases was approximately 0.4 of a mile. (Obviously the actual spatial dispersions of the places included in the list limit the possible mean distances from respondents' place of residence). These results have to be treated with caution because they are not necessarily measures of the 'amount' of knowledge. This is because for example, the mean measure would be large if the respondent only knew one shopping centre that was located at distance from his/her place of residence; whereas another respondent knowing this and three closer shopping centres would receive a lower mean distance. However in practice, knowledge tended to be cumulative away from the place of residence, so that near places were known if further places were, and this was not really a problem here.

Respondents were awarded a score for their performance in the shopping centre questions based this time, on the number of shopping centres identified in each case (see Figure 6.4.). For both centre (location) knowledge and familiarity there was found to be a statistically significant relationship (0.000 level of significance) between length of residence and overall score received (Table 6.3.). The longer the length of time spent in the city, generally, the better was the score that the respondent received. Thus, even though for the location measure, the spatial spread of information did not increase significantly with length of residence, when the number of centres that were familiar were considered, knowledge was seen to increase. It can also be seen that, as already noted, the periods of greatest change in knowledge appeared to differ between the 'knowledge of location' and 'familiarity' measures; with it being between three and six months in the city for the former, and between twelve months and three years for the later. This is another example of differences in methodology affecting results, and emphasizes the importance of establishing the nature and quality of knowledge in studies such as this rather than just the quantity. It can be concluded that a quantitative increase in knowledge of suburban shopping centres occurs quite quickly after moving to a new urban area, but it is much longer before there is a qualitative change and the places become well known.

6.3. Opportunities For Recreation in the City.

This section concentrates on respondents' knowledge of the outdoor and sporting recreation facilities in Leicester. Three aspects of outdoor recreation and sports were chosen as elements of the urban area that people should become aware of with increasing length of residence. These were swimming pools, parks and sports facilities. Respondents were asked to make a list of facilities that they knew existed under each
FIGURE 6.4.
PERFORMANCE ON THE SHOPPING CENTRE QUESTIONS (MEAN GROUP SCORES) - BY LENGTH OF RESIDENCE.

Rating

V. Poor  Average  V. Good
0  1  2  3  4

3 Months
6 Months
12 Months
3 Years plus

KEY:
- - - - - - - - - - - Known areas
- - - - - - Familiar areas
of these three categories. Answers were classified according to their location in relation to a ninety degree sector around the respondent's place of residence (see Chapter Three). This would give an idea of the spatial spread of information that could be related to and compared with, the spread of shopping centre knowledge (section 6.2.). Respondents were also given a score according to the number of different places/facilities mentioned under each category. These questions were only asked of three length of residence groups, as it was thought that it would be possible that the twelve month group could have deliberately sought the information before their second interview. Thus this group are not included in this analysis.

Figure 6.5. shows the spatial spread of respondents knowledge of the three categories of recreation facilities. The curves represent the cumulative frequencies of respondents' answers, and thus a convex/horizontal curve is indicative of a poor spatial spread and a concave/vertical curve, of a wide one. It can be seen that in all cases, there appears to be a difference between the three length of residence groups, with the spatial spread of information increasing with increasing length of residence. A Chi Square test showed that these differences were statistically significant in all cases. The graphs also show that there was usually a proportion of respondents who could not name any facilities at all, and that this was most common amongst the three month group. It is also evident from Figure 6.5. that knowledge of general sports facilities was the least comprehensive amongst all length of residence groups.

It is clear from Figure 6.5. that differences in knowledge between the groups vary for each category of recreation facilities. It would seem for example, that knowledge of general sporting facilities, equivalent to that of a person who has lived in a city for three years or more is developed in individuals after six months in the city. However this is not to say that individuals learn about sporting facilities quicker than they do swimming pools or parks, as the only comparison here is against the knowledge of three year (plus) residents which is not a fixed or absolute level. Instead, it would seem that the level of knowledge that people in the sample group have about the sporting facilities in the city is low. It is expected that this type of knowledge is very much dependent on the interests of the respondent, and that people associated with the University will have a less comprehensive knowledge of general facilities in the city than their non-university counterparts, as they have access to their own sports facilities. Here therefore, is one instance where the sample group cannot be taken as representative of the population as a whole.

Respondents also received scores for the amount and spatial extent of their knowledge of recreation facilities in Leicester. The scores for each class of facility are represented in Figure 6.6. The differences between the groups were found to be statistically significant in all cases, showing a very clear progression of knowledge with increasing length of residence. The figure also shows that respondents had least

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FIGURE 6.5.
THE SPATIAL SPREAD OF KNOWLEDGE OF RECREATION FACILITIES
- BY LENGTH OF RESIDENCE.

(a) Swimming Pools Known.

(b) Parks Known.

(c) Sports Facilities Known.

Increasing spatial spread of information

KEY:

--- 3 Months

----- 6 Months

------------- 3 Years plus

Length of Residence
FIGURE 6.6.

MEAN SCORES FOR RECREATION KNOWLEDGE
- BY LENGTH OF RESIDENCE.

Rating

V. Good     Average     V. Poor

Pools

Parks

Sports facilities

Overall

KEY:          Length of Residence
            ————  3 Months
            ·······  6 Months
            ·······  3 Years plus
knowledge about the general sports facilities in the city (e.g. sports halls) and were most aware of the swimming pools. Also knowledge of parks in the urban area was generally found to be poor which is perhaps surprising given their relative abundance and the size of area that they occupy.


Aggregate knowledge levels for each length of residence group can be compared against the knowledge level of the three year (plus) group for each of the elements discussed. This will provide a crude measure of the degree to which knowledge has been accumulated by each group as a proportion of the knowledge that they would be expected to have accumulated after three years in the city (and thereafter; as it is expected that knowledge growth after this stage is minimal). Table 6.2. presents this comparison. The mean scores of each length of residence group have for each class of element have been divided by the mean scores of the three year (plus) group to achieve a measure of the proportion of the three year knowledge that they have. Thus, the higher the proportion, the closer they are to the three year (plus) knowledge level, and a proportion of one hundred would signify a level equivalent to the three year group level. It should be stated that these are not measures of the amount of knowledge held of a particular element relative to the other elements; but are instead measures of the amount of knowledge that groups have relative to a level that they could be expected to achieve after three years in the city. The table shows that the nearest that any group gets to having an equivalent amount of knowledge to the three year is the twelve month group on their knowledge of the location of shopping areas (81.5% of the knowledge of the three year (plus) group). The table clearly shows that differential learning takes place. This can be seen from the fact that the increases in the knowledge proportions take place at different times and in different amounts between the various elements. For example, the growth in familiarity with suburban shopping areas seems to take place over the longest time span, with little change in evidence between the three month and six month stages. Between the six month and twelve month stages, there appears to be a doubling of knowledge on this criteria, but even at the twelve month stage, knowledge is only sixty seven per cent of the level that it could be expected to attain after three years. Also knowledge about the location of industry would appear to advance more slowly than the other types. After six months in the city, people appeared to have come less far along the path to a level of knowledge equivalent to the three year sample on this than the other criteria (forty two per cent of the three year knowledge level). At the three month stage, elements for which knowledge was most equivalent to the three year group were the "nature of industry" and knowledge of parks. As has been discussed above, this is likely to be the effect of low ultimate levels of knowledge about these elements of the city (i.e. the three year group knowing little about these elements themselves), rather than the fast accumulation of this type of knowledge on arrival in the city. Greatest
changes between the three month and the six month stages, can be seen to occur in the knowledge of the location of shopping areas (a rise from 39% to 77% of the knowledge that they could be expected to ever achieve) and the knowledge of general sports facilities (35% to 74% of the three year knowledge levels). It will be interesting in Chapter Eight to use these mean group measures to search for the personal factors which influence within group variations in these patterns of knowledge acquisition. To summarize these patterns of knowledge acquisition, the length of residence groups can be taken in turn:

After three months in the city, respondents were found to know more about the nature of industry relative to the three year (plus) group, than its location. Their knowledge of the location and existence of the various shopping centres dotted throughout the urban area was poor relative to the three year group (39% of their knowledge), and their familiarity with these was even poorer. Knowledge of the recreation facilities in the city averaged around forty per cent of the knowledge of the three year group. By six months, knowledge of the nature of industry had increased only slightly to seventy one per cent of the three year level, and the location of industry was still little known. Knowledge of the location and existence of suburban shopping areas had more than doubled over the previous three months to seventy seven per cent of the three year level. Familiarity with these shopping areas was still low, having hardly advanced during the intervening period even though knowledge of their existence had advanced so greatly. Knowledge of the recreation facilities in the city had also advanced considerably to around sixty seven per cent of the three year level. Differential learning patterns will also be examined in relation to the social elements of the city in Chapter Seven.

6.5. Conclusion: Knowledge of the Economic Elements of the City.

The aims of this Chapter were to investigate the differential learning rates of people with regard to the economic and commercial attributes of the city. This has involved a twofold line of inquiry; first, to look at differences between the length of residence groups so that the degree of knowledge broadening with increasing length of residence could be established; and second, to look at differences in rates of learning about each individual attribute. In this investigation, both the quantity of knowledge and the nature of this knowledge have been considered, with the latter being especially related to place of residence so that the degree of spatial restriction imposed upon knowledge by movement within the city could be determined.

It has been seen that in the case of most of the economic elements considered here, there was a statistically verifiable growth in both knowledge quantity and quality over the three year period (Table 6.3.). Knowledge was seen to become more comprehensive and more spatially extensive between the three month and the three year
length of residence stages. However, the individual rates of acquisition of the differing knowledge elements differed in terms of the time-span over which they were developed. For some city attributes, knowledge levels quickly assumed a degree of comprehensiveness that were nearing comparability to those of the three year (plus) group (e.g. knowledge of the nature of industry, the existence of suburban shopping areas and knowledge of the general sports facilities in the city). For others, the development of knowledge was seen to take place over much longer time periods (e.g. the location of industry and familiarity with suburban shopping centres).

It has been seen that there was generally a low level of awareness amongst respondents about the nature of the manufacturing activities of the city and that even less was known about the location of these industries. Respondents had obviously not consciously addressed this subject before. When attempting to answer the question on the location of industry, respondents were found to be more likely to consider the problem from a global perspective the longer their length of residence in the city, and an egocentric perspective was common amongst the shorter length of residence groups. Knowledge of the location and nature of industry was thus seen to develop over a fairly long time period.

Knowledge of shopping facilities in the urban area was found to be acquired over a much shorter time period. There was however, a difference between knowledge of the location of suburban shopping centres and familiarity with them, with the latter being far less developed at all length of residence stages. This has significant implications for the use of methodology in the elicitation of levels of knowledge, and these have been discussed.

With regard to knowledge of recreation facilities, respondents have been found to have a generally poor level of knowledge about the general sports facilities in the city, although this knowledge was seen to improve with increasing length of residence. Knowledge of parks has also been found to be poor.

The analysis presented here has focussed in the main on group averages, and no account has been taken of knowledge variation within the groups and the factors that may be accountable for this. Indeed, if within-group variation was found to be greater than between-group variation, then the grounds for interpretation based on the length of residence variable would be dubious. The possibilities of this are explored in Chapter Eight, when other factors which could explain individual variation in knowledge levels are examined, although it is here contended that the relationships between knowledge levels and length of residence have been found to be so strong in most cases, that any other variable is unlikely to be able to explain more of the variation than the length of residence variable.
Chapter Seven will explore respondents' knowledge of the social attributes of Leicester within much the same framework as was adopted here. All the varying "classes" of elements examined in the thesis will be considered together in Chapter Nine.
Table 6.1. Mean Distances of Known and Familiar Shopping Centres from Respondents' Places of Residence.

<table>
<thead>
<tr>
<th>Length of residence</th>
<th>Mean distance to known places</th>
<th>Mean distance to familiar places</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Months</td>
<td>1.58</td>
<td>1.01</td>
</tr>
<tr>
<td>6 Months</td>
<td>1.67</td>
<td>0.92</td>
</tr>
<tr>
<td>12 Months</td>
<td>1.76</td>
<td>1.15</td>
</tr>
<tr>
<td>3 Years (+)</td>
<td>1.98</td>
<td>1.43</td>
</tr>
</tbody>
</table>
Table 6.2. KNOWLEDGE OF THE ECONOMIC ELEMENTS OF THE CITY AS A PROPORTION OF THE THREE YEAR (PLUS) GROUPS' KNOWLEDGE LEVELS.

<table>
<thead>
<tr>
<th>Element</th>
<th>3 Years+</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of Industry</td>
<td>100</td>
<td>65</td>
<td>71</td>
<td>-</td>
</tr>
<tr>
<td>Location of Industry</td>
<td>100</td>
<td>41</td>
<td>42</td>
<td>-</td>
</tr>
<tr>
<td>Location of shopping areas</td>
<td>100</td>
<td>39</td>
<td>77</td>
<td>82</td>
</tr>
<tr>
<td>Familiarity with shopping areas</td>
<td>100</td>
<td>22</td>
<td>29</td>
<td>67</td>
</tr>
<tr>
<td>Knowledge of swimming pools</td>
<td>100</td>
<td>44</td>
<td>66</td>
<td>-</td>
</tr>
<tr>
<td>Knowledge of parks</td>
<td>100</td>
<td>52</td>
<td>65</td>
<td>-</td>
</tr>
<tr>
<td>Knowledge of sports facilities</td>
<td>100</td>
<td>35</td>
<td>74</td>
<td>-</td>
</tr>
<tr>
<td>General recreation knowledge</td>
<td>100</td>
<td>40</td>
<td>67</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 6.3. SIGNIFICANT RELATIONSHIPS OF CHI SQUARE AND ANOVA.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge of the location of industry x length of residence.</td>
<td>0.0000</td>
</tr>
<tr>
<td>2. Location of known shopping areas x length of residence.</td>
<td>0.0002</td>
</tr>
<tr>
<td>3. Location of known shopping areas - car drivers - x length of residence.</td>
<td>0.0365</td>
</tr>
<tr>
<td>4. Spatial spread of familiar shopping areas x length of residence.</td>
<td>0.0419</td>
</tr>
<tr>
<td>5. Score for shopping centre knowledge x length of residence.</td>
<td>0.0000</td>
</tr>
<tr>
<td>6. Score for shopping centre familiarity x length of residence.</td>
<td>0.0000</td>
</tr>
<tr>
<td>7. Location of known swimming pools.</td>
<td>0.0157</td>
</tr>
<tr>
<td>8. Location of known parks.</td>
<td>0.0002</td>
</tr>
<tr>
<td>9. Location of known sports facilities.</td>
<td>0.0005</td>
</tr>
</tbody>
</table>
CHAPTER SEVEN.

THE SOCIAL ELEMENTS OF THE CITY.

In this chapter, respondents' knowledge of the social elements of Leicester will be explored. Social and cultural variation in urban populations tends to express itself in terms of a spatial distribution. A process of clustering of like people in cities resulting from habitat selection and choice of particular environmental quality occurs, so that the city becomes a set of areas of different groups which tend to define themselves in terms of 'us' and 'them'. The clustering process is based on perceived homogeneity, differing interpretations of environmental quality, lifestyles and defences against overload and stress (Rapoport, 1977). The reasons for this clustering are numerous, but are typically those of mutual help within homogenous populations, assimilation, urbanisation, the preservation of institutions, lifestyles and the economic forces that ensure that choice of residential location within the city is limited to all but the very rich. Thus social differentiation within a population has a physical expression in the city in terms of a distribution which is both semi-permanent through time and well recognised by the population themselves. Indeed perception of urban social differentiation will influence spatial behaviour in terms of the definition of activity patterns and home range etc. Similarly, as Rapoport (1977) has pointed out;

"the location of people in the city, and the nature of their networks and activity patterns (which are related to location of areas) affects their knowledge of the city and hence how they use it" (Rapoport 1977, 273).

Thus, 'social elements' of the city are here considered to be the variables of social differentiation that characterize the urban population and have physical expression through the aerial clustering of like groups of people. Thus these variables may be religion, ethnic origin, wealth, class, creed, life-style, age, life cycle stage or any other social variable that is important enough to distinguish whole groups from the 'rest' of the population. In reality, these variables are often related to each other.

In the context of the city of Leicester, the main grouping variables are ethnic origin (where there is a high degree of clustering amongst both the Asian and the Afro-Caribbean populations (Figures 1.5. and 1.6.)), and economic wealth (which also ensures that age and life-cycle variables are also found to possess a distinct distribution) which works through the mechanism of the housing market. Thus large council housing estates form distinct areas within the city, as do the nineteenth century inner urban areas, the interwar semi-detached dwellings and the postwar private developments (Figure 1.2.). Each contain specific types of people who are thus clustered according to their occupations and positions in the social hierarchy. For the purposes of analysis here, these social elements have been divided into three categories...
that will each in turn form a subsection of this chapter. These are social areas, ethnicity and economic well-being. An attempt has been made in each case to elicit the level of knowledge and understanding of the spatial distribution of these social variables that respondents have, so that it can be determined whether or not there are differences between the length of residence groups, and between the variables themselves. The measures employed to do this rather let down the grand titles that they are here reported under, as time constraints in the interview schedules made it necessary to keep inquiry to a minimum. However, each result has a contribution to make to the discussion.

7.1. Social Areas in the Urban Mosaic.

This section aims to explore respondents’ knowledge of the economic divisions within the population, in the context of the characteristics of the residential areas that contain them. Respondents were asked to describe five of Leicester’s residential areas: Oadby, Belgrave, Braunstone, New Parks and Beaumont Leys. They were given no indication as to how they were to describe these areas and on what criteria. The areas included in this exercise were chosen on the basis that they were relatively distinct and well known by some social criteria. A brief description of each area will follow:

Oadby is the most affluent residential area in Leicester and is well known as such. It is located on the southeast periphery of the urban area (the only area of the five that is located in the respondents’ own residential sector), and having once been a separate village, it has been engulfed by sprawling suburbia over the past forty years. Its housing is a mixture of very large expensive properties and cheaper more modern estate housing of an upmarket nature. There are very few council owned properties in Oadby.

In contrast, Belgrave is comprised of nineteenth century, small, terraced properties which now house Leicester’s most concentrated Asian community. It is located to the north of the city centre at a distance of about one mile. The proportion of the population of this area that are of ethnic origin was estimated in 1985 to be around seventy five per cent (Leicester City Council (1985). As part of the oldest urban fabric, a high proportion of properties are lacking basic household amenities. However, as the main focus of the Asian community, Belgrave is a lively and vibrant area with an atmosphere that is distinctly unlike that in any other part of the city.

Braunstone and New Parks are located in the western part of the urban area and are essentially inter-war and post-war council housing estates respectively. Built according to the urban design (‘garden city’ - type) principles of the time, these estates are comprised of large, sprawling, low density residences surrounded by plenty of open space and set beside large urban parks. Poor initial construction, together with general
fabric decay and lack of regular upkeep has rendered many of the houses uninhabitable, and both areas are recognised now as areas of relative deprivation. Unemployment levels and aspects of social malaise are in greater evidence in these areas than in most others in the city.

Finally, Beaumont Leys is an area of contrasts. It was included here as it has a split identity, first; as another post-war council estate with an ageing physical fabric and a relatively deprived population and second; as a fast developing large modern housing estate on Leicester's northern periphery with a large neighbourhood shopping centre, leisure centre, police station and library.

As part of this exercise, respondents were asked to give a brief description of each of the five residential areas. Their answers contain some clues as to how they perceive different areas and the elements of the residential environment that they find important. It was considered that the types of things that were mentioned in the descriptions would be indicative of the aspects of neighbourhood differentiation that people took notice of, and which had a meaning to them (and possibly, an effect on their spatial behaviour). It will be seen that some people did not differentiate these areas on social criteria at all in their descriptions. This is interesting because it may mean that they have never consciously considered the social geography of the city. It is more likely however, to be due to a methodological problem. These respondents may have tried to give the kind of answer that they expected that the interviewer wanted to hear. Up to this point in the interview, questions had concentrated entirely on the physical aspects of the city, and some may have assumed that they ought to continue in this fashion. Related to this, the sample constituted 'educated' people who may have been conditioned to avoid making supposedly 'racist' or 'classist' statements. Thus the gap between how people think and what they reveal about what they think, may sometimes be unbridgeable, especially when delicate subjects are being addressed. This is merely speculation and further studies of this nature would need to be carried out to provide a firmer conclusion.

It was also intended that the nature of the areas known and not known would be indicative of the aspects of spatial/social differentiation that were noticeable to the newcomer. It must be remembered here that knowledge is acquired both through first hand experience and vicariously through the media and 'hearsay'. Thus the speed of acquisition of knowledge of social differentiation within the city will also reflect cultural and societal preoccupations with these criteria.

Fifteen per cent of the total sample group could not describe any of the residential areas. Between the groups this figure ranged from twenty eight per cent of the three month group, to zero per cent of the three year (plus) group (Figure 7.1.). The area that respondents had least difficulty in describing was Oadby (76% of all
respondents could attempt to describe this residential area, 17% of whom (13% of total group) could not describe any other area) and this is likely to be because Oadby is located in the respondents’ own residential sector and contains some student accommodation, rather than its particular importance in people’s social cognitive maps. Only sixty four per cent of the sample could describe two or more of the residential areas. Table 7.1. shows the differences between the groups with regard to the number of residential areas that they were able to describe. It can be seen that most successful overall at this exercise were the three year (plus) group, but that almost half of the respondents in the twelve month group had a greater level of knowledge than the majority of the three year group. It would appear therefore that there is not much change in knowledge of the residential areas of the city after twelve months of residence. A statistically significant difference was found between the four length of residence groups and their performance on this question (Table 7.4.). Of those who could describe one residential area only, most could describe Oadby. Likely reasons for this were given above.

Table 7.2. gives the proportions of respondents in each group who were unable to describe each residential area. It shows a clear progression of knowledge with increasing length of residence until the twelve month stage. Thereafter, there is no such trend and indeed, more respondents in the twelve month group could describe some areas (e.g. Braunstone, New Parks and Beaumont Leys) than in the three year (plus) group. This may be due to the fact that this group had been asked these questions after six months in the city and this may have increased their awareness of the places so that learning thereafter proceeded at a faster rate than would otherwise have been the case. Another explanation might lie with the process of forgetting. As learning proceeds, the brain organises information and it may be the case that if a particular piece of information is not used or recalled for a long time, that the mind loses the ability to recall it. Thus in this case some respondents in the three year (plus) group may have forgotten information once known, in this way. As length of residence increases, the amount of information loss due to this process is likely to increase. As yet, there have been few studies that have attempted to examine this.

Table 7.2. also shows that Belgrave and Beaumont Leys were reasonably well known by the three year (plus) stage. New Parks was the least well known by all the length of residence groups, probably because it does not feature as frequently in the media as the other four areas. No statistically significant relationship was found between respondents’ self-rated knowledge of residential areas in Leicester and their actual knowledge as indicated by this analysis. This shows that the people who rated themselves highly on knowledge of residential areas in Leicester, were not the same people who achieved high scores in this exercise.

So far in this section, the quantitative aspects of residential area knowledge have been
FIGURE 7.1.
MEAN SCORES FOR KNOWLEDGE OF THE SOCIAL GEOGRAPHY
OF LEICESTER - BY LENGTH OF RESIDENCE.

Rating

<table>
<thead>
<tr>
<th>V. Poor</th>
<th>Average</th>
<th>V. Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Description of residential areas

Asians

Afro-Caribbeans

Unemployment

KEY:

Length of Residence
- - - - 3 Months
- - - - 6 Months
- - - - 3 Years plus
considered, but no attention has been paid to the qualitative aspects; most essentially, the social 'meanings' that these areas have for the sample groups. These can be considered by paying attention to the nature of the descriptions given for each residential area and these have been classified according to this nature. The categories used in the classification were as follows; social (i.e. description involving the naming of a social group), physical (i.e. describing the type of housing), evaluative (i.e. using words such as 'well kept' or 'attractive'), functional (i.e. describing the area in terms of something that could be done there e.g. shopping), economic (i.e. using words such as 'wealthy' or 'expensive') emotive (i.e. using a term such as 'grotty' or 'poor'), or a combination of these. It is held that the types of descriptions given will be indicative of the way that the residential area is perceived by respondents. (Special care needs to be taken in view of the possible problem of respondents trying to give the 'right' answers). It will be interesting to see whether different areas receive different description types or whether respondents always give the same type of description irrespective of area, and whether there are any changes in description type used with length of residence.

In all cases, there was little difference between the four length of residence groups and their use of description types. Most respondents described the residential areas with reference to their physical or social characteristics. Thirty two per cent of all descriptions concentrated on the social elements of the areas (e.g. "very high Indian/Pakistani community"). Close behind this were physical descriptions which accounted for twenty nine per cent of all descriptions (e.g. Spacious detached properties”). Twenty five per cent of descriptions were a combination of different types; usually this combination was a mixture of social and physical elements (e.g. "Upper middle class, large houses in wide leafy roads"). Eight per cent of descriptions were functional (e.g. "Good shopping area"). This type of description was mostly given for Beaumont Leys and New Parks and they normally made reference to the swimming pools in these areas. The economic description was only really used for Oadby, and only five per cent of respondents used it in this context (e.g. "An area of expensive houses"). Evaluative and emotive descriptions were very rare (accounting for only 4% and 1% of descriptions respectively).

Descriptions of Oadby and Belgrave tended to include a combination of social and physical elements (e.g. of Oadby, "Small town, mainly detached houses or semis, few ethnic minorities"). The physical element was most important for Belgrave, which is a surprising result as it was expected that the area would have been described predominantly as being one of high proportions of Asian people. Instead respondents were more likely to say that it was an area concentrated around the Melton Road and comprised mostly terraced housing. As has been already seen, this could be due to respondents answering in a way that they believed was required. Oadby was often described in terms of class (i.e. 'upper/middle class'), but many also commented on
the "large houses" and spaciousness of the surrounds (e.g. "Upper middle class, good amenities, expensive housing"). Braunstone received predominantly social descriptions (i.e. usually described as a "large council estate"). People also often mentioned its reputation as a deprived area (e.g. "Run-down council estate - poor area"). Beaumont Leys received predominantly physical descriptions (described often as a "new housing area"), and less often as a "part-council/part-new housing estate"). But had a good proportion of social-type descriptions, and also above average proportions of both evaluative and functional descriptions (e.g. "Very modern, like Milton Keynes. It has a good leisure centre"). The latter has been mentioned above. The evaluative comments usually featured some expression of dislike for the new housing estate situated there (e.g. "Nasty modern housing estate"). Finally New Parks, as the least known area was described in predominantly social terms as a 'council estate' (e.g. "I think that it is another council housing estate").

A number of tentative conclusions can be drawn from the above: First, that the residential areas of the city are most often thought of and distinguished from each other, on the basis of their social and physical characteristics rather than according to their economic, functional or locational features. This is perhaps an obvious conclusion but one which has a great significance for the nature of cognitive maps of the urban area. It suggests that people's cognitive maps constitute a rich collage of snippets of qualitative information which are concerned mostly with the nature of the buildings and the nature of their inhabitants. Second, people have been seen to have a predominant ‘way’ of viewing, or giving meaning to the urban area. On the whole, people tended to give the same type of description for every area. Thus some people tended to be very ‘socially aware’ and describe all areas in terms of the nature of their inhabitants; and others were much more biased towards the nature of the urban fabric, although the proportion of people found to do this was probably over-represented in these results. Similarly, small numbers of people were found to be biased towards the cost of housing and described all areas in these terms and some were more ‘functionally’ orientated. Third, that these qualitative orientations might be related to a number of personal factors, but length of residence in the city was not one of them. Section 7.2. will now go on to investigate respondents’ knowledge of the distribution of significant ethnic groups in Leicester.

7.2. Ethnic Groupings in the City.

A significant proportion of Leicester’s population are of ethnic origin or descent (see Chapter One). This proportion is mostly comprised of two groups, by far the largest of which being the Asian community (twenty four per cent of the population, 1985), who are mostly concentrated in Belgrave, Highfields and Spinney Hill. The second group comprises the Afro-Caribbean community who make up four per cent of the population and who tend to be concentrated in the St. Peters area of Highfields. The
analysis reported in the above section attempted to determine whether or not ethnicity (amongst other things), was an important variable in respondents' cognitive maps of Leicester, without asking them directly about this aspect of the city's make up. This section reports the findings of questions asked which aimed to determine the nature of respondents' knowledge of this aspect of the city's social geography.

Respondents were asked to name the residential areas where the main concentrations of both Asian and Afro-Caribbean people were to be found. These two groups were chosen on the grounds that they constitute the most significant minority populations.

7.2.1. The Distribution of the Asian Population.

Only two per cent of the total sample group could not attempt to answer the question on the distribution of the Asian population, and a further two per cent answered it, but got the answer wrong. Many respondents cited the Highfields/Spinney Hill area as the only major residential area for this population (25% of all respondents). Fewer mentioned Belgrave only (9%). Twenty seven per cent of respondents mentioned Highfields and Belgrave together, and seventeen per cent mentioned all three areas correctly. The proportions of the different answers given by each of the three length of residence groups included in this question (three month, six month and three year+ groups) were almost identical. No differences therefore, seemed to exist between the three groups with regard to their knowledge of this factor.

Generally, knowledge was found to be comprehensive and accurate, with very few respondents being unable to answer the question, and answers usually being correct. Those areas that were nearest to respondents were mentioned most often. For example, Highfields which is situated in the southeast sector of Leicester and is an area where some of the respondents lived, was mentioned by seventy five per cent of respondents, whereas Belgrave, situated in the north, was mentioned by only fifty nine per cent. It would be reasonable to expect that this 'home area' - centred distortion would be most evident amongst the shorter length of residence groups, but this was not the case.

Respondents were given a score according to their performance on the Asian population question and the mean scores for each length of residence group are shown in Figure 7.1. It can be seen that scores were very similar between the three length of residence groups.

7.2.2. The Distribution of the Afro-Caribbean Population.

There was greater ignorance about the location of the Afro-Caribbean population in Leicester amongst respondents than there was about the Asian population. This is
perhaps not surprising as they form a much smaller percentage of the total city population, and are as such, not so obviously concentrated anywhere. In this case also, there was found to be a significant difference between the knowledge levels of the three length of residence groups. Forty three per cent of the total sample group could not attempt to answer this question. Between the groups, this proportion ranged from fifty four per cent of the three month group, to fourteen per cent of the three year (plus) group. The majority of respondents who could answer this question correctly, identified this sub-population as living in the Highfields area (sixty nine per cent of the attempted answers mentioned Highfields only). Five per cent of respondents mentioned the Narborough Road area and five per cent mentioned a Highfields/Belgrave combination. Once the respondents who could not answer were removed from the analysis, there was not a significant difference between the answers of the three length of residence groups. The answers given by most of the respondents who attempted this question were therefore accurate, and although there were differences in levels of knowledge between the three groups, there were no differences in levels of accuracy.

Scores were awarded for performance in this question, but because there was a 'right' answer which was 'Highfields', respondents could only be 'right' or 'wrong' and thus could not be graded on a five-point scale. In order that some comparison might be possible with the scores for other attributes of knowledge, respondents were here awarded the top score for the correct answer and the bottom for an incorrect (or no) answer. Figure 7.1. shows the differences between the three length of residence groups on these scores. It can be seen that there were differences between the three length of residence groups, with knowledge increasing with lengthening residence. This relationship was not found to be statistically significant however, and this indicates that the differences between the groups were not great enough to be statistically significant.

7.2.3. Overall Knowledge of Ethnic Groupings in the City.

Respondents were asked to rate their awareness of the distribution of ethnic groups in Leicester on a five point scale which ranged from 'very aware' to 'very unaware'. (This question was administered before the ethnic-group questions.) Figure 7.2. shows the mean ratings of each length of residence group and allows a comparison between these self-ratings and respondents' actual knowledge as revealed by the ethnic-minority questions. There was a statistically significant difference between the self-ratings of the three length of residence groups, with confidence increasing in line with increasing length of residence. Differences between the groups on their actual knowledge were not significant (although this result has to be treated with caution in the case of the Afro-Caribbean question as the rating scale used here was a little 'contrived').

Figure 7.2. shows that only in the case of the three year (plus) group were group mean ratings received for actual knowledge of both ethnic groups very similar to the
FIGURE 7.2.
MEAN SCORES AND SELF RATINGS OF KNOWLEDGE OF THE
DISTRIBUTION OF ETHNIC GROUPS - BY LENGTH OF RESIDENCE.

Rating

V. Poor          Average          V. Good

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
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<tbody>
<tr>
<td>3 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Years plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KEY:
--- Self-rating
----- Asian test
---------- Afro-Caribbean test
self-estimated knowledge mean ratings. For the other two length of residence groups, mean group performance on the Asian question was better than mean self-estimates, and on the Afro-Caribbean question, it was worse. Self-estimates therefore, provided a reasonable average which suggests that people were well aware of their weaknesses and strengths in this particular aspect of urban area knowledge. In support of this, a Chi Square test found a highly significant difference between the performances of those respondents who rated their knowledge of ethnic group distribution highly and those that didn’t on the Afro-Caribbean question. Those that gave themselves high self-ratings generally received high scores. No such relationship however was found between self-ratings and performance in the Asian population question. This is because, as Figure 7.2. shows, people generally performed better on this question than their self-ratings would have predicted.

Figure 7.2. also shows that with increasing length of residence, the gap between knowledge of the Asian and Afro-Caribbean population distributions narrows, until there is very little difference between the two after three years or more in the city. This suggests a differential learning pattern of these two elements of city composition. It shows that after coming to the city, an awareness of the most obvious aspects of a city's social geography will quickly be gained, which will thereafter change very little and very slowly. Less obvious aspects will be learned over much longer time periods, but will eventually reach a similar level in terms of the comprehensiveness of the knowledge. In terms of the city of Leicester, the most obvious aspects of its social geography are the Asian population and their high degree of spatial concentration. It takes a lot longer for people to gain an idea of the distribution of other, less obvious minority groups, but this knowledge does eventually form.

In an attempt to discover whether or not the knowledge formation discussed above occurs consciously or unconsciously, after answering the ethnic-group questions respondents were asked whether they had ever consciously considered the question of social group distribution before. Forty three per cent of the sample group said that they hadn’t, but fifty seven per cent replied that they had and of these, fourteen per cent had thought about the subject in relation to ethnic groups only. There was not found to be a statistically significant difference between the three length of residence groups, although slightly fewer respondents in the three month group had thought in these terms. Neither was there a relationship between previous thought about the distribution of social groups in the city and performance on either the Asian, or the Afro-Caribbean questions. A relationship was found to exist however, between self-ratings on ethnic group knowledge and previous conscious thought about social distributions. People who had thought in these terms before were more likely to rate themselves as above average on this knowledge than those who hadn’t. Thus, it would seem that conscious thought is not necessary for the environmental learning process, and that information can be stored in a non-spatial framework, but retrieved and
ordered into a spatial framework which has never consciously been realised before. Furthermore there would seem to be no differences in the success rates at such an exercise between those who had previously consciously ordered their knowledge into a spatial framework and those who hadn't. It would seem reasonable to conclude from this that such information about the environment does not need to exist in the form of cognitive 'maps' in the mind, and that indeed for probably the majority of people it is in fact, stored in a different form but one which can be converted into a map if and when necessary. Thus those researchers who propose that people have a map-like representation of the social environment in their heads as suggested by Smith and Patterson (1980) in a study of the perception of urban crime may well be taking the map analogy too far.

The final aspect of knowledge of the social environment to be considered in this Chapter, is that of the distribution of different levels of economic well-being in the city.

7.3. Economic Well-Being in the City.

The distribution of economic well-being is another important aspect of the social geography of the city. It is here suggested that people will have a reasonable idea of its distribution in the city, although again, they probably will never have consciously thought about it before. Well-being can be measured in a number of ways, and it was here decided that unemployment should be used as the determining factor. Thus respondents were asked to name areas where they thought the unemployed might be concentrated. Figure 1.7. shows the distribution of the unemployed in Leicester. The areas with the highest concentrations of unemployment are Braunstone (26%), Saffron Lane (17%), Highfields and Spinney Hill (27%), Northfields (17%), Belgrave (16%) and Beaumont Leys (14%). (The figures in the brackets give the percentages of the economically active population who were unemployed at the time of the 1981 census - ward-level data.) Thirty per cent of the overall sample could not attempt an answer to this question. Between the groups, this figure ranged from forty per cent (three month group) to twenty five per cent (six month group) and fourteen per cent (three year (plus) group), thus suggesting increasing knowledge with increasing length of residence. Forty per cent of respondents listed a combination of correct areas. Most often mentioned were Highfields, Braunstone, Beaumont Leys and the Narborough Road, indicating large gaps in their knowledge of the other areas where unemployment is high. The areas mentioned were those that respondents knew from first hand experience (e.g. Highfields and Narborough Road), or that often featured in the media (e.g. Braunstone and Beaumont Leys). Other unemployment 'blackspots' feature less often in local media, and thus were less well known. Respondents were awarded a score according to their performance in this question. Figure 7.1. shows the differences between the three length of residence groups, and it can be seen that they
are not very great. Indeed, the differences were not found to be statistically significant, indicating that the level of learning that takes place about unemployment in the city between the three month and the three year stages is only slight. Indeed differences between people on their levels of knowledge of this factor are likely to be due more to personal factors rather than their length of residence in the city.

A statistically significant relationship (0.002 level) was found between those people who had consciously considered the city in terms of the distribution of social groups and those who hadn’t (Table 7.4.). Respondents who had received on the whole, higher scores than those who hadn’t. Respondents appeared to find it more difficult to convert their ‘patchy’ knowledge of economic disadvantage in the city into a mental map in order to answer the question, than they had earlier done with their knowledge of the location of ethnic groups. This is probably because the latter are more obvious features of the city’s social geography than the former. It is interesting that once again evidence seems to suggest that information about social differentiation in the city (and this is especially so in the case of the unemployment variable), is not stored as a ‘mental map’, but rather as a series of subconscious associations between place and these social criteria.

7.4. Differential Learning of the Social Elements of the City.

As in section 6.4, aggregate knowledge levels for each length of residence group for each of the elements discussed, will here be compared against the knowledge of the three year (plus) group. Again, the mean scores received by the groups for each class of element, have been divided by the mean scores of the three year (plus) group, so that a measure has been arrived at that signifies the amount of knowledge that each group has, as a proportion of that which it could be expected to have after three years in the city. Table 7.3. displays the results of this comparison.

Again it should be stated that the index values reported within the table are not measures of the amount of knowledge that groups have of a particular attribute relative to the other attributes; but rather they are measures of the amount of knowledge that groups have, relative to a level that they could be expected to have achieved after three years in the city. It can be seen from the table that differential learning rates for these social attributes clearly exist. The differences between the knowledge proportions at each length of residence stage on each attribute show that for some attributes, respondents quickly acquired a level of knowledge approaching that of the three year (plus) group (e.g. the location of the Asian population), and for others, knowledge acquisition was much slower (e.g. the location of the Afro-Caribbean population). Most change was found between the three month and the six month stages on knowledge of the characteristics of selected residential areas (a rise from forty seven per cent of the three year (plus) group aggregate scores after three months, to
seventy four per cent after six months in the city). To summarize these patterns of knowledge acquisition, the length of residence groups can be taken in turn:

After three months in the city, respondents were found to have a poorly developed knowledge of the characteristics of selected residential areas relative, both to their knowledge of other social elements, and the knowledge of the longer length of residence groups. Their knowledge of the spatial distribution of ethnic groups in the city depended on the ethnic group in question. Knowledge of the distribution of the Asian population was very advanced, and almost equivalent to that of the three year (plus) group (they were 90% as competent at this question as the three year (plus) group), thus showing that this element of the city's social morphology is quickly learnt by newcomers to Leicester. Knowledge of the location of the Afro-Caribbean population was far less advanced, with respondents only forty seven per cent as competent as their three year (plus) counterparts. The differences in the rates of acquisition of what is essentially the same 'type' of knowledge has already been accounted for by reference to the fact that the Asian population in Leicester constitute twenty four per cent of the city's population, thereby making them a more 'obvious' group than the Afro-Caribbeans who constitute just four per cent of the overall population. Thus it would seem that the more subtle the attribute of the city's morphology (whether it be social, economic or physical), the longer it takes for individuals to become aware of it. Finally, knowledge of the distribution of unemployment was by the three month stage, sixty four per cent as comprehensive as it was in the three year plus group, indicating that this was something that once again, people relatively soon after arrival in a new city acquire an idea about. Here again, care has to be taken when these results are interpreted as indicative of absolute knowledge levels as they are in fact, only relative measures. However, it has already been seen that the knowledge levels of the three year plus group are fairly comprehensive for all these attributes, and thus a group mean approaching the three year plus group mean, can be accepted as one that indicates a reasonable degree of knowledge about the attribute in question.

At the six month stage, knowledge levels concerning the characteristics of the selected residential areas of the city had risen considerably to seventy four per cent of the three year (plus) level. Scores for knowledge about the distribution of the unemployed had reached an equivalent level (76%), but there had been less change on this attribute during the previous three months. Knowledge of the distribution of Asians in the city had increased almost imperceptibly (by 3%) to ninety three per cent, which, allowing for a reasonable margin for inaccuracy in these relatively crude measures, could be accepted as almost the equivalent to the three year (plus) groups knowledge. Knowledge of the Afro-Caribbean population had increased by a much larger margin, but was the least advanced of all the attributes, at seventy six per cent of the three year (plus) level.
Finally, on the one attribute that the twelve month group were measured on, they were found to have achieved ninety per cent of the three year (plus) level of knowledge of the characteristics of the residential areas by this stage. This suggests that very little extra learning occurs on this attribute between the twelve month and the three year stage. Differential learning patterns of all city attributes together (e.g. physical, economic and social), will be compared in Chapter Nine.

7.5. Conclusion: Knowledge of Social Differentiation in the City.

The aims of this Chapter have been to investigate the level of knowledge and understanding that respondents have of the spatial distribution of selected social attributes of the city, in an attempt to determine whether or not there were differences between the length of residence groups, and between the attributes themselves. The attributes that have been considered in this Chapter are; the characteristics of residential areas, the distribution of ethnic groups and the distribution of the unemployed. Both the quantity of information that respondents have about these attributes, and the nature of this information have been considered. The analysis has also attempted to determine both the degree and nature, of differential learning sequences through time.

Respondents have been found more commonly to distinguish the residential areas of the city in terms of their social and physical characteristics than with accordance to their economic, functional or locational features. Evaluative or emotive descriptions of residential areas were found to be given rarely. Knowledge of the distribution of the Asian population amongst the study population has been found to be comprehensive and accurate, and more developed in the early stages in the learning process than knowledge of the distribution of Afro-Caribbeans. It has been suggested that this is a function of the relative sizes of these two subgroups and their consequent visibility in the social urban vista. Over half of all respondents reported to have addressed this question consciously before. Knowledge of the distribution of the unemployed was found to be poorer, with those who had reported to have addressed the problem before scoring higher on this question.

It has been seen that on the whole, knowledge quantity and quality have been found to increase with lengthening residence and in some cases these differences have been found to be statistically significant (Table 7.4.). The magnitude of these increases varied between the attributes. A consideration of differential learning rates of these attributes of the city's social geography has indeed shown that knowledge of some attributes is gained very quickly after entry to the city (e.g. knowledge of the distribution of ethnic groupings who make up a considerable percentage of the total population), whilst others develop much more slowly (e.g. appreciation of the characteristics of residential neighbourhoods in the city). When a comparison is made between the learning rates for these social attributes (Table 7.3.) and those for the economic elements of the city
(considered in Chapter Six - Table 6.2.), it can be seen that on the whole, respondents had advanced further in their knowledge of social attributes by the three month stage (average attribute 'mean score' of 62% of the three year (plus) level) than they had on economic elements (average element 'mean score' of 42% of the three year (plus) level). By the six month stage, knowledge of social elements was still more advanced than that of economic elements, but the margin of difference was greatly reduced (average mean score of 77% of the three year level for social attributes, and 61% for economic elements). These 'average attribute mean scores' are extremely crude, but they do provide a measure for comparison purposes that is likely to be reliably indicative of the differences between these two types of knowledge at these length of residence stages. The fact that differences between the length of residence groups on knowledge of social variables were less often statistically significant than those of the economic variables, is also supportive of the conclusion that learning about the social characteristics of an urban area proceeds at a greater rate than learning about the economic characteristics after a person enters a new city.

The factors that account for 'within' length of residence group variation in knowledge levels and speed of acquisition, will now be turned to in Chapter Eight.
Table 7.1. THE NUMBERS OF RESIDENTIAL AREAS DESCRIBED BY THE FOUR LENGTH OF RESIDENCE GROUPS. (%)

<table>
<thead>
<tr>
<th>Length of Residence</th>
<th>None</th>
<th>One Only</th>
<th>Two/Three</th>
<th>Four/Five</th>
</tr>
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<tr>
<td>3 Months</td>
<td>27.9</td>
<td>30.1</td>
<td>37.3</td>
<td>4.7</td>
</tr>
<tr>
<td>6 Months</td>
<td>12.5</td>
<td>20.9</td>
<td>45.8</td>
<td>20.8</td>
</tr>
<tr>
<td>12 Months</td>
<td>9.8</td>
<td>14.6</td>
<td>29.3</td>
<td>46.3</td>
</tr>
<tr>
<td>3 Years +</td>
<td>-</td>
<td>7.2</td>
<td>57.1</td>
<td>35.7</td>
</tr>
</tbody>
</table>

Table 7.2. THE PROPORTION OF RESPONDENTS UNABLE TO DESCRIBE EACH RESIDENTIAL AREA.

<table>
<thead>
<tr>
<th>Length of Residence</th>
<th>Oadby</th>
<th>Belgrave</th>
<th>Braunstone</th>
<th>New Parks</th>
<th>Beaumont Leys</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Months</td>
<td>44.2</td>
<td>65.1</td>
<td>83.7</td>
<td>97.7</td>
<td>76.6</td>
</tr>
<tr>
<td>6 Months</td>
<td>18.8</td>
<td>47.9</td>
<td>62.5</td>
<td>85.4</td>
<td>54.2</td>
</tr>
<tr>
<td>12 Months</td>
<td>17.1</td>
<td>48.8</td>
<td>41.5</td>
<td>68.3</td>
<td>24.4</td>
</tr>
<tr>
<td>3 Years +</td>
<td>-</td>
<td>35.7</td>
<td>50.0</td>
<td>85.7</td>
<td>28.6</td>
</tr>
</tbody>
</table>
Table 7.3. **KNOWLEDGE OF THE SOCIAL ATTRIBUTES OF THE CITY AS A PROPORTION OF THE KNOWLEDGE ATTAINED BY THE THREE YEAR (PLUS) GROUP.**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>3 Years +</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character of residential areas</td>
<td>100</td>
<td>47</td>
<td>74</td>
<td>90</td>
</tr>
<tr>
<td>Distribution of Asian population</td>
<td>100</td>
<td>90</td>
<td>93</td>
<td>-</td>
</tr>
<tr>
<td>Distribution of Afro-Caribbeans</td>
<td>100</td>
<td>47</td>
<td>66</td>
<td>-</td>
</tr>
<tr>
<td>Distribution of the unemployed</td>
<td>100</td>
<td>64</td>
<td>76</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 7.4. SIGNIFICANT RELATIONSHIPS OF CHI SQUARE AND ANOVA

<table>
<thead>
<tr>
<th>Variables</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ability to describe residential areas.</td>
<td>0.0000</td>
</tr>
<tr>
<td>2. Knowledge of the distribution of the Afro-Caribbean population x length of residence.</td>
<td>0.0444</td>
</tr>
<tr>
<td>3. Self ratings of knowledge of the distribution of ethnic minority populations x length of residence.</td>
<td>0.0207</td>
</tr>
<tr>
<td>4. Self ratings of knowledge of the distribution of ethnic minority populations x knowledge of Afro-Caribbean distribution.</td>
<td>0.0009</td>
</tr>
<tr>
<td>5. Knowledge of the distribution of the unemployed x previous thought about social distributions in the City.</td>
<td>0.0139</td>
</tr>
</tbody>
</table>
CHAPTER EIGHT.

PERSONAL FACTORS AND THEIR INFLUENCE ON ENVIRONMENTAL LEARNING.

This Chapter aims to explore the influence of personal factors on the process of environmental learning. The preceding Chapters have examined the nature of environmental learning with reference only to the subjects' length of residence in the city. In a number of cases, it has been postulated that other factors may account for the observed differences between respondents. Zannaras (1976) has suggested that "personal characteristics which represent an individual's active commerce with the environment (e.g. navigational experience, shopping habits) are more important than those which could conceivably represent a passive existence within a given environment (e.g. length of residence, rural-urban background)" (Zannaras 1976, 348). Many other researchers have been in agreement with this position. In particular therefore, this Chapter addresses the question as to whether or not personal variables in certain instances account for more of the differences between individuals than does length of residence. If this is found to be the case, then it will be clear that models of the environmental learning process will need to incorporate these factors. This investigation will therefore attempt to throw light upon the nature of the influence of personal characteristics so that it becomes clearer how these factors should be built in to a broad conceptualization of the environmental learning process. It has been seen in the previous three Chapters that environmental knowledge increased significantly across the study period, but what factors account for the differences between individuals within each of the four length of residence groups?

The personal characteristics that have been examined here, are classified under six headings which constitute the major sections of this Chapter. Figure 8.1. represents these and their various sub-divisions (as they are considered in this Chapter) diagrammatically. The analysis reported in this Chapter considers differences in ability by concentrating on the group aggregate scores that respondents were awarded for each of the different types of question and task. The classification of the personal variables into the six categories, was not clear-cut and so it has sometimes been necessary to consider one variable under more than one category. The diverse nature of the subject matter considered in this Chapter necessarily results in a patchy and in places, disaggregated discussion. The different personal variables considered here are not all treated in the same way nor in the same depth. Greater emphasis is placed on those variables that have been the subject of speculation in previous research and on those which were found to be the most significant in this research. The various conclusions drawn within each subsection are drawn together and considered within a more holistic frame in the conclusion to the Chapter (section 8.7.). Tables 8.1. to 8.9. present
FIGURE 8.1.
PERSONAL FACTORS TO BE CONSIDERED IN THIS CHAPTER AS POSSIBLE DETERMINANTS OF ENVIRONMENTAL LEARNING.

Sense of direction

PERSONALITY
Environmental disposition

GENDER

Residential location

RESIDENTIAL VARIABLES
Search for accommodation

ENVIRONMENTAL LEARNING

Secondary information

LIFE-STYLE
Environmental commitment

Expected length of stay

Travel mode

Frequency of going away

GEOGRAPHICAL ACTIVITY PATTERNS

Workplace

Grocery shopping

Recreational activity

Within Leicester

PREVIOUS RESIDENTIAL EXPERIENCE

Other environments

Workplace

Other environments

Workplace

Other environments

Workplace
some of the aggregate mean scores received by respondent groups delimited by some of the key variables. It is intended that these should support the following discussion.


8.1.1. Theoretical Considerations.

Few studies of environmental cognition have concerned themselves solely with the role of gender as a determinant of differences between individuals. However, many efforts in the field of psychology have been directed at the discovery of differences in cognitive processing between males and females (e.g. Ounsted and Taylor, 1972; Maccoby and Jacklin, 1974; Fairweather, 1976; Sherman, 1978). In particular, some have looked at gender differences in human spatial abilities (e.g. McGee 1979). There is disagreement amongst psychologists about the factors which comprise human spatial ability, although they are generally agreed on the fact that it comprises several distinct but interrelated factors. There is consensus however, over the existence of two elements; spatial visualization and spatial orientation (McGee 1979, 890).

Spatial visualization can be defined as an individual’s capacity to manipulate visual stimuli mentally (e.g. such tasks as mentally rotating spatial images, visualizing two- or three-dimensional structures etc.). There is general evidence from the results of empirical studies in psychology, that males are better at spatial visualization than females. This is an important conclusion for work in environmental cognition, because it is believed that the ability to generate and use cognitive maps is related to spatial visualization (Gilmartin and Patton, 1984). In support of this contention, in one of the few studies of the differences between the cognitive maps of males and females, Brown and Broadway (1981) found that the maps of female adolescents were less accurate than those of males.

Spatial relations and orientations is another facet of spatial ability in which it is generally believed that females have an inferior ability to that of men (Bryant 1982). This refers to the ability to comprehend the arrangement of visual elements in a pattern, to retain them in different orientations, and to determine spatial relations with respect to the orientation of oneself. ‘Sense of direction’ is an ability that would fall into this category. A recent research project which aimed to examine the nature of these skills, came to the conclusion that males and females may employ different problem-solving styles in this area (McGlone 1981). This was because females were found to use more movement aids (e.g. hand movements, head tilting etc.) than males when attempting to solve the tasks that they were asked to perform. In contrast to the numerous studies that have found females to be inferior in their ability at orientation to males, studies carried out by Baker (1980, 1981) and Walmshley and Epps (1988) which aimed to examine the possibility that sense of direction is innate.
(and tuned to magnetic compass points in much the same way as other animals and birds) found that indeed, this idea could be empirically supported, and that females fared better than males in direction-finding. Thus if this is indeed true, something in the socialization and development of males and females must attribute to the greater skills of males, rather than differences in innate ability. This contention is further supported by the fact that most research on sex differences in spatial cognition has found few differences until adolescence, with a slight male advantage emerging from then on (Maccoby and Jacklin, 1974).

As Gilmartin and Patton (1984) have pointed out, these two skills do not include all the elements of spatial ability, but they are often used as the basis for generalization of male/female differences in spatial ability. In other types of perceptual tasks (such as discrimination, order, containment and memory for spatial information), females have often been found to be equal or even superior to men. As Fairweather (1976, 250) has noted, "the male advantage appears to be confined to tasks involving transformations of visual stimuli...". It would seem in fact, that there is considerable overlap between the abilities of males and females, and it would be dangerous to try to predict abilities simply on the basis of gender.

In spatial cognition research some trends have been found that suggest male superiority in spatial cognition for small-scale stimuli (Maccoby and Jacklin, 1974). The preponderance of evidence from real-scale spatial tasks however, indicates few sex differences in environmental cognition. Where gender differences have been noted they are likely to be the result of many interrelated factors rather than pure gender differences. It has been found in research that environmental/spatial ability is likely to be related to a myriad of factors including spatial behaviour, predominant travel mode, whether the subject is a car driver or not, extent of spatial experience, and residential history. To the extent that these factors are often related to gender/established sex roles in many societies, it is difficult to separate the role of gender. With these considerations in mind, this section will now consider the role of gender in the differentiation of subjects in their environmental knowledge of, and abilities in Leicester. It will be interesting to see if there are any differences in knowledge as a function of sex, and if there are, to pose the question as to whether this is a function of differential spatial ability, or different ways of using the environment as a function of sex-role conditioning. Table 8.1. presents the results of this analysis.

### 8.1.2. The Free-recall Sketch Maps.

Most cognitive mapping research has found no sex differences in environmental knowledge based on sketch maps (Francescato and Mebane 1973; Maurer and Baxter 1972; Orleans and Schmidt 1972). The results of the present study are consistent with this. No differences were found between the sexes in the style and complexity
of their free-recall sketch maps of the city centre, either overall, or at any period of residence. Changes between the length of residence periods were found to be similar for both sexes, indicating that learning and ability proceed at the same rate for both males and females. No differences were found between tendency to have spatially or sequentially dominant maps.

8.1.3. Knowledge of Neighbourhood Shopping Areas.

No statistically significant difference was found between men and women in their knowledge of, and familiarity with the neighbourhood shopping areas of the city. However, when the results are considered by length of residence, slight differences in the learning processes are detectable. In the exercise (where respondents were asked to indicate from a list, those shopping areas that they had heard of), women appeared to be slightly more knowledgeable up until six months of residence, by which point they had attained a level of knowledge that did not seem to improve thereafter. However, after six months, the knowledge of men continued improving until it had superseded female knowledge at twelve months of residence and thereafter. There was a statistically significant difference between mean scores of the sexes only at the twelve month stage (anova - 0.03 level of significance). There was even less of a difference between the sexes on their familiarity with these shopping areas (judged by their ability to name five shops in the shopping area). The aggregate scores received by respondents in both groups were almost identical at each time period with the exception of the three year (plus) stage (Table 8.1.). No statistically significant differences were found either overall, or at any length of residence period.

8.1.4. The Spatial Ability Tasks.

The above discussion on the claimed differences between men and women in their cognitive spatial ability would lead one to expect that differences would be found between the two groups in their ability to perform the plotting and connectivity exercises. This is because the undertaking of these exercises required the implementation of both visualization and orientation skills. If differences could be found between the sexes in their ability to perform these exercises, evidence would exist for the support of this thesis. Indeed differences between males and females were evident here. In the city centre-scale plotting exercises no differences between the sexes were found until the three year (plus) stage, when men were found to produce more accurate plots than women (0.04 level of significance). Overall, the difference between males and females in this test was not significant. In the connectivity exercise (where respondents were required to connect the plotted landmarks by drawing in the roads around them), there was a statistically significant difference found between males and females (0.04 level of significance) with males proving to have greater ability. When the differences were considered by length of residence stage, the opposite trend was
found. There was a significant difference between the sexes at the three month stage (0.008 level), but thereafter the gap between the sexes was seen to become narrower and not significant (although males remained slightly more successful). Figure 8.2. shows the mean group ratings for males and females on the city centre scale plotting and connectivity exercises by length of residence. It can be seen that at all stages, men on average, performed better than women at the connectivity task and that they were more proficient at this than the plotting task. However, women performed better at the plotting task than the connectivity task at the three month stage of residence, and it is not until the three year (plus) stage that they are found to be better at the connectivity than the plotting task. Thus we see here evidence of differential development of environmental ability between the sexes. Before attempting to offer an explanation of this finding, attention should be given to the citywide plotting and connectivity tasks.

Here, as a comparison between Figure 8.2. and Figure 8.3. will show, the differences between the sexes was greater than those which were found at the city centre scale. Overall, males performed better than females on both the plotting (0.02 level of significance) and the connectivity (0.001 level of significance) exercises. At the three month stage of residence, differences between the sexes were found to be slight (and not significant), although as Figure 8.3. shows, males were more successful than females. In the plotting exercises however, males after this time developed so that by twelve months in the city they were much more successful, but females changed very little. The gap between males and females in their ability to perform these tasks thus became wider with increasing length of residence, and for both the plotting and the connectivity exercises, males were found to be more successful than females (statistical significance of 0.03 and 0.005 respectively) by the three year (plus) stage.

What conclusions can be drawn from this about the differential nature of spatial ability and environmental learning between males and females? The overall differences between the sexes are indicative of differential spatial ability. In three out of the four cases, males were found to achieve on average, higher scores than females in the plotting and connectivity exercises. City centre plotting was the only exercise which showed no overall differences between the sexes, but this is likely to be due to the fact that females possibly spend more time in the city centre and thus initially, their greater familiarity with the environment offsets their lesser ability at the spatial task. By the three year stage however, males demonstrated greater ability at this task as well. Overall differentials were found to be greatest for the connectivity tasks, suggesting that the male relative advantage is greater in route-based rather than point-based spatial relations. Given the general tendency for males to own and drive motor vehicles, it might be reasonable to expect that this could be the explanation for these observed differences. However as the analysis in Chapter Four revealed, there was not a marked difference between the sexes on ownership of motor vehicles in the sample.
FIGURE 8.2.
MEAN GROUP RATINGS ON THE CITY CENTRE PLOTTING
AND CONNECTIVITY EXERCISES - BY GENDER.

V. Poor

Poor

Average

Good

V. Good

KEY:
- Male plotting score
- Female plotting score
- Male connectivity score
- Female connectivity score

3 Months 12 Months 3 Years plus
Length of Residence
FIGURE 8.3.
MEAN GROUP RATINGS ON THE CITYWIDE PLOTTING AND CONNECTIVITY EXERCISES - BY GENDER.

V. Poor

Poor

Average

Good

V. Good

KEY:

- Male plotting score
- Female plotting score
- Male connectivity score
- Female connectivity score

3 Months 12 Months 3 Years plus

Length of Residence

175b
population, so this factor is unlikely to explain the differences. Instead, this is likely to be due to differences in spatial ability between the sexes.

As far as environmental learning is concerned, the spatial ability tests have demonstrated that males show the greatest improvement in their scores on these tests with increasing length of residence. Differences between the sexes in ability generally have been seen to increase with lengthening residence. Males have been found to have greater ability at these tests, so it must be concluded that their lack of knowledge is the reason for their lack of advantage at the three month stage, rather than any equivalence in spatial ability at this time.

8.1.5. Photograph Recognition.

No statistically significant differences were found between males and females in their iconic photograph recognition (Table 8.1.), although men received on average, slightly higher scores than women at all length of residence stages. Similarly in the aerial photographs, no statistically significant differences were found at any length of residence stage. This latter result is surprising, as it has been suggested that aerial photograph interpretation is an orientation-related spatial skill of the type that males are supposed to be better than females (Gilmartin and Patton, 1984).


With regard to the economic and social elements of the urban area, no statistically significant differences were found between men and women on their performance in any of the questions. They demonstrated similar levels of knowledge about these elements, and similar learning patterns (Table 8.1.).

8.1.7. Conclusion.

Differences have been found to exist between individuals on the bases of gender, although these were only evident in the results of questions that dealt with spatial ability. No statistically significant differences were found between males and females with regard to their general city knowledge, their ability to construct maps of the city centre or their ability to recognise city landmarks from iconic and aerial photographs. Males were found to be more successful than females at the tests that involved abstract spatial relations, and this relative advantage was found to grow with increasing length of residence. Thus there is evidence here to suggest that males do in fact have greater macro-spatial ability.

8.2. Location in the City and Household Tenure as Determinants of Environmental Knowledge and Ability.
8.2.1. Theoretical Considerations.

Many studies have found evidence to suggest that sectoral bias exists in people's urban mental maps (e.g. Adams 1969; Donaldson 1973; Smith and Ford 1985). Such findings are indeed, not at all surprising and reasons for this effect have been suggested by Adams (1969) when he proposed that urban residents have sectorally biased mental maps of the city which are coincident with their 'kinetic fields' (activity spaces). These mental maps he claimed, focus on the 'home sector' which includes; (1) that part of the city in which the resident lives; (2) the most direct route between the resident's home address and the city centre; (3) the most direct route between the place of residence and the urban fringe. The mental maps, Adams proposed, were the bases from which people searched for new residences within the urban area once they had made the decision to migrate.

In this research, the concern has been for the influence that residential location has upon the environmental learning patterns of newcomers (most importantly what they learn and when). As has already been shown, most respondents in the study group lived in the southeast sector of the city. Within this sector however, there was variation in residential location which (as Adams' proposals would have us believe) may lead to differences in the content of the cognitive maps of the respondents. Thus a brief examination of the possible effect of residential location within the sector will follow. The possible complication here with regard to previous residential locations within the city was discounted, as those respondents who had moved within the city (forty eight per cent) had rarely changed residential sector (two per cent), and moves within the same sector normally involved short distances. Concern in this section is also for the influence that the search procedures of new residents to the urban area for a place to live, have on the nature of mental maps. These variables therefore, will be briefly explored in case they account for any of the variation between individuals in environmental learning.

8.2.2. Residential Location.

Overall, residential location within the southeast sector of the city was found to impose no effect on the developing cognitive maps of respondents. Local differences could be detected (i.e. knowledge of a place nearby that other respondents may not acquire until later in their stay in the city) but these averaged out and did not give overall advantage. A problem in this analysis was that residential location was found to be highly related to length of residence (chi square - significance 0.01), but individual analysis by length of residence group was not possible because only small numbers of people fell into each category. It is indeed more likely that the length of time a respondent had spent looking for accommodation (and related to this, household tenure) would exert a more significant influence over the nature and growth of urban area
knowledge.

8.2.3. The Search For Accommodation.

There was no clear relationship between length of residence and time spent searching for accommodation or household tenure. There was however, a very strong relationship (0.0000 level of significance) between the length of time that a respondent had spent searching for accommodation and household tenure (Table 8.1). This is because a proportion of respondents (thirty eight per cent) lived in University accommodation which requires no search behaviour in the city for its acquisition. Privately rented accommodation requires rather more search effort, but not as much as the process of looking for a house to buy. Thus by virtue of this strong relationship, the length of time that a person had spent searching for his or her accommodation will be treated here as synonymous with residence tenure as a factor which could account for some of the variation between individuals in their environmental learning.

The length of time that a person had spent searching for accommodation in Leicester was broken down into five categories; ‘none’, ‘less than three days’, ‘three to seven days’, ‘one to two weeks’, and ‘a fortnight plus’. No great differences were found between the performances of respondents who fell into any of the first four categories. However, respondents who had spent more than a fortnight searching for accommodation in the city (generally those who had bought their own home) were more successful at some of the questions than the other respondents (Table 8.2). They displayed a much greater awareness of the suburban shopping centres than the other respondents, in terms of both their knowledge of them (0.0009 level of significance) and their familiarity with them (0.001 level of significance - Table 8.11.). Similarly, the ability to describe the five residential areas that respondents were asked to describe, was found to be related to the length of time that a person had spent searching for accommodation in the city (0.03 level of significance). These results are not at all surprising considering the extra exposure to the suburban districts of the urban area, both in terms of direct experience and secondary information gathering that those who had spent a lot of time searching for accommodation would have had. Slightly more surprising is the finding that those respondents who had spent more time searching for accommodation were also more proficient at the city centre plotting and connectivity exercises (0.03 and 0.005 levels of significance respectively). It would seem perhaps that the engagement in the activity of searching for a residence has spillover effects in that it encourages the individual to take a greater interest in the environment and, as a corollary of this, to learn more about the city. Longer search respondents also were more successful at the citywide plotting exercise, but strangely did not perform significantly better at the citywide connectivity exercise (Table 8.2). Performance in the other tests was not found to be related to length of search for a place of residence. Thus, the variables that tended to be related to the length of time that a respondent had spent searching
for accommodation were those that pertained to the physical fabric and content of the urban area. In no case however, was the variation in scores greater between people who had spent differing lengths of time searching for accommodation in Leicester than the variation between the length of residence groups.

8.2.4. Residential Variables: Conclusion.

Residential location in the city has been found to have local effects on knowledge and form the basis of sectoral and concentric information bias. Length of time spent searching for accommodation was found to effect knowledge of the physical composition of the urban area, with the longer length of search respondents demonstrating greater knowledge levels on many of these variables.

8.3. Life-style.

This section will consider those variables that contribute to the life-style differences between individuals that are likely to influence environmental learning. One important element of life-style which will influence both a person's degree of exposure to the environment and the nature of his or her interaction with it, is whether or not the person has access to a car. Predominant mode of travel through an environment determines the way that the environment is experienced and perceived, as well as what the individual needs to learn about his or her surroundings. The degree of exposure that the individual has to secondary information about the environment will also influence what is learnt (either consciously or unconsciously). Obviously, this is a difficult variable to measure, but in this research, respondents were asked whether they read the local papers or listened to local radio. The frequency with which respondents visited the city centre might be a variable that could be expected to influence their knowledge of the city centre; at least certainly in the early stages of residence in the city. This variable therefore will also be explored here. Finally, it was considered that a person's level of commitment to the city would have an effect on their developing cognitive maps. Some respondents had moved to Leicester with the knowledge that they would be there for nine months only, and thus could possibly regard it as a short stay which would not necessitate active environmental learning. Most important amongst these people were those who would go away from Leicester every weekend, and thus effectively treat it as a temporary and part-time place of residence. A person's requirements from an environment will affect what they learn about it (see for example, studies on specific user-environments such as Pearce (1977) on tourist areas), and thus it was considered necessary to examine this variable in the research in case it was important in differentiating individuals on their level of environmental knowledge. Each of these considerations will here be taken in turn.
8.3.1. Travel.

As has been mentioned above, the predominant travel mode of an individual in an environment is believed to be a factor which will influence environmental cognition. This is because it is generally believed that the nature of the interaction with the environment, and most importantly, whether the interaction is 'active' (e.g. activity which involves navigational decisions, e.g. car driving, cycling) or 'passive' (e.g. activity which involves being a passenger in a car or mode of public transport). Moore (1979) suggested that we might expect "that walking or bicycling would be most important to the formation of environmental representations, followed by active car driving, and finally by being a passive passenger in a car or on public transportation" (Moore 1979, 53). Indeed, Appleyard (1970) found in his study that car drivers were able to draw much more coherent maps of their city than people who travelled by public transport.

8.3.1a. Motor Vehicle Driving.

Respondents in this study, were asked whether or not they had driven a motor vehicle on a regular basis in Leicester. This question was considered likely to elicit more accurately, the division of people into car and non-car drivers than the simple question as to whether or not they had access to a car. This is because some respondents may have formerly had a car in Leicester but since sold it, or may have had driving lessons in the city, but not have a car, and these circumstances could have effected their knowledge of the city. In fact, the proportion of respondents falling into these two categories was so small (six percent) that they have been treated as non-car drivers for the purposes of this analysis. Car drivers constituted thirty four per cent of respondents and non-car drivers (plus intermittent drivers) sixty six per cent. There was not a statistically significant difference between the four length of residence groups and the proportions of their populations who were car drivers, although a slight trend was apparent with slightly larger numbers of drivers in the longer length of residence groups. This was not considered to be a problem for the analysis of this variable as the differences were only slight. However, two tests were performed to test for the influence of length of residence on this variable, whereby the length of residence factor was controlled (by weighting), and the relationship between the car/non-car driving variable and the performance measures actually strengthened rather than weakened.

In virtually all of the questions and tests, car drivers were found to perform better than non-car drivers (Table 8.3.) and the extent to which these performances differed was often highly statistically significant (Table 8.11.). No pattern emerged between the different length of residence groups which would suggest that the influence of motor vehicle driving on environmental cognition is not any greater or less at any particular time period. There was a statistically significant difference between car drivers and non-car drivers and their knowledge and familiarity with shopping areas (0.00 level of
At the three month stage, differences between the groups were not great. However thereafter, car drivers developed faster than non-car drivers. The differences between these two groups on their ability to describe the five residential areas was also statistically significant (0.00 level). Here, the differences between the groups at each length of residence stage were similar. There were no statistically significant differences between the groups on their city centre plotting and connectivity exercises or the free-recall mapping exercise. This is perhaps to be expected because it is unlikely that much experience of the central area of a city is gained through driving a vehicle. This does demonstrate however that the generally greater knowledge of the car-driver is gained through direct experience rather than as a function of a required heightened awareness of the environment in general. Car drivers did perform significantly better at the citywide plotting and connectivity exercises (0.00 and 0.04 levels of significance respectively). Similarly, they were more aware of the distribution of the Asian population (0.01 level of significance), but there was no difference between the awareness of the two groups on the distribution of the Affro-Carribean population or unemployed people in the city. Recreation facilities were also better known by car-drivers. The levels of statistical significance in all cases (except in the case of parks where there was not found to be a statistically significant difference) exceeded ninety nine per cent confidence (0.00).

It can be seen therefore, that being a car driver can make a significant difference to environmental learning and subsequent environmental ability at the citywide scale. This discussion will now turn to predominant travel mode as a variable which may account for differences between individuals in their environmental knowledge. This is obviously strongly related to the previous variable considered, but it contains more information and may thus provide deeper insight into the influence of travel mode on environmental cognition.

8.3.1b. Predominant Travel Mode.

Predominant travel mode can be defined as the usual way that a person moves from one point in the city to another, whether it be by bus, train, car, bicycle or foot. In the absence of a rapid transit system in Leicester, respondents in this survey did not travel by train. Where a combination of modes were used, people were classified into two groups according to whether or not this combination involved a car. Only one respondent fell into the 'combination with car' category, and thus this category has been subsumed within the 'car' category. Figure 8.4. shows the frequencies of occurrence of each of the travel mode categories in the total sample group. It can be seen that walking accounted for forty three per cent of respondents, and only seventeen per cent predominantly travelled by car even though (as we have already seen) thirty four per cent had access to a car. Many respondents travelled by bicycle (twenty three per cent). Statistics based on this variable have to be treated with caution.
FIGURE 8.4.

THE PREDOMINANT TRAVEL MODE OF RESPONDENTS.
because the small numbers in each category are not as statistically valid as they might be. However, tests of significance are indicative of the magnitude of the differences that are found between the groups of respondents, and they will be used here as such.

There was not a statistically significant relationship between length of residence and predominant travel mode. This means that any differences found between the different travel mode groups are likely to be a function of this variable rather than of length of residence. Predominant travel mode was not found to be as significant in explaining the differences between individuals as the car-driving dimension (Table 8.4.). Only three of the knowledge measures were found to contain statistically significant differences between the different travel mode groups. These were knowledge of suburban shopping areas (0.0003), familiarity with suburban shopping areas (0.0002) and description of residential areas (0.0003). On most of the knowledge variables, cyclists and car drivers showed very similar levels of competence and were seen to possess the most comprehensive knowledge after all periods of residence. Similarly, walkers and bus travellers were also very similar to each other in their levels of competence, and were generally poorer. Changes between the different length of residence stages were not consistent between the various knowledge measures, neither was there an obvious improvement within some travel mode groups of knowledge and ability with increasing length of residence. However, the numbers of respondents in some of the groups were so small that it is impossible to infer anything from this.

8.3.1c. Conclusion: The Role of Travel Mode in Environmental Learning.

It would seem from this consideration of the role of travel mode in environmental learning that for some aspects of this learning, this variable is very important. These aspects are all those which relate to general knowledge of the whole urban area. It has been seen that car drivers develop a much more comprehensive knowledge of the urban area through their greater, and more extensive interaction with it. Similarly, bicycle riders develop on average a more comprehensive knowledge than people who primarily move through the environment by bus or on foot. These differences are likely to be a function of both differential exposure to more parts of the urban area, and of the differential necessity of learning about the spatial relations in an environment where the individual is required to be a decision maker (in terms of wayfinding, route-choosing etc.). Predominant travel mode is thus a very important factor in the environmental learning process.

8.3.2. Exposure To Secondary Information.

Direct or primary experience is not the only medium through which newcomers to an environment learn about its structure and content. Secondary sources of information
(e.g. the media, books etc.) are also a powerful medium of environmental information portrayal. In a study such as this therefore, it is important to consider the possible role that such sources may have on the environmental learning of individuals, with a view to determining whether or not differential exposure can lead to differential rates of learning. The type of secondary information that is important in an environmental learning context is dependent on the scale of environment which is under consideration.

At the national or international scale, the national media (television, radio, newspapers, magazines) and books are the major sources of secondary information. At the city scale, the sources considered to be important for the purposes of this research were local newspapers, local radio and books or other publications about Leicester. In this research therefore, respondents were asked whether they ever read the local newspapers (primarily the daily evening paper the 'Leicester Mercury'), listened to local radio ('Radio Leicester' or 'Leicester Sound') or whether they had ever read any books or other publications about the city. Other sources of secondary learning might be estate agent material, neighbourhood circulars, cinema or other advertisements, etc. These were considered difficult to measure and, with the exception of estate agent material (and the respondents to whom this may have been important can be identified through the 'household tenure' variable discussed earlier) all people were considered to be fairly equally susceptible to their influences (because they represent passive exposure). It is believed here that exposure to this secondary information will not have an identifiable effect on the environmental learning process of newcomers to an urban area, but that if it is found to do so, then it will be the general citywide knowledge variables that will reveal some relationship rather than the physical structure variables.

8.3.2a. Readership of Local Newspapers.

Twenty five per cent of the total sample group were found to read the Leicester Mercury 'often' (Figure 4.4.). This proportion varied between the length of residence groups from twenty one per cent of the three month and six month groups, to fifty seven per cent of the three year (plus) group. Fifty three per cent of the total sample group read the paper 'sometimes but infrequently', and twenty two per cent 'never' read it. Forty two per cent of the three month respondents fell into this category. Analysis of variance on the mean scores received by respondents for each type of knowledge test, revealed very high levels of correspondence between 'above average' performance on almost every knowledge test and readership of the 'Leicester Mercury' (Table 8.11.). However, a Chi Square test between length of residence and readership of the Leicester Mercury showed that these two variables were highly related (significant at the 0.0008 level of significance) with the longer length of residence respondents being more likely to regularly read the paper. It would seem therefore that newcomers to an area take a while to become interested in local affairs and thus buy a local paper. This medium as a source of early environmental information may not therefore, be particularly important. This must be left to conjecture because it is
intuitively plausible to suspect that this sample of people behaved differently to the ‘normal’ migrant in the early stages of their stay in the city because the University provides the early support (by way of local information etc.) that they may otherwise have had to go out and seek.

It is likely to be the case in this research therefore, that the relationship between readership of the local newspaper and performance on the knowledge tests, is very much attributable to the influence of length of residence. To steer around this problem, analysis of variance was performed on each of the length of residence groups separately, to see if the relationships still existed once the influence of length of residence had been removed. This revealed quite a different pattern and will be presented below. Scores for exercises were found to be intermittently (between the different length of residence groups) related to the frequency with which respondents read the Leicester Mercury (as will be seen below). The statistical significance levels can be used here (because of small frequencies in some of the categories), not as proof of the validity of the relationship, but as indicants of the likelihood that the relationship is possible. Where a significant relationship is reported, it was not always the ‘frequent’ readers of the Leicester Mercury that performed the best, often the ‘infrequent’ readers performed marginally better (Table 8.5.). Never however, were those respondents who ‘never’ read the local newspaper better at any of the tasks than those who sometimes did.

At the three month stage, readership of the Leicester Mercury appeared to be related to knowledge of suburban shopping centres (0.05 level of significance), the distribution of the Asian population (0.02 level), the location of industry (0.002 level) and the city wide plotting and connectivity exercises (0.0001 and 0.0003 levels of significance respectively). The knowledge necessary for success at these exercises is exactly of the nature that one would expect a local newspaper to impart. Articles on different local people would provide an idea of the distribution of social groups and advertisements would suggest the presence and location of shopping areas and industries. Similarly, the exposure of the reader to different place names would lead them to recognise more in their early travels around the city, and thus improve their ability to attempt an exercise of plotting places in abstract space. It must not be overlooked here that this observed influence of local newspaper readership at the three month stage may be more attributable to other interacting factors than the newspaper readership itself. Other personal variables that could conceivably be related to readership of the local newspaper are the search for a residence to buy or rent (which has already been shown to have an influence on environmental learning), and also the ‘environmental disposition’ of the individual and his or her ‘commitment’ to the city as a new habitat. Chi square tests revealed that there were no statistically significant relationships between measures of these personal variables and the tendency to read the Leicester Mercury. However, slight trends were apparent, for example nobody in the ‘home owner’ group ‘never’
read the paper; and people whose 'environmental disposition' was assessed as 'passive' were found to be more likely not to read the newspaper. These variables could not be assumed to account for the observed variation between knowledge and readership of the local newspaper on their own, but it is safe to assume that these variables together would account for more of the variation than the readership variable alone.

At the six month stage, the knowledge variables that appeared to be related to readership of the local newspaper were the distribution of the unemployed (0.07 level of confidence), knowledge of urban parks (0.06 level) and performance on the aerial photograph tests (0.005 level). With the exception of the aerial photographs, again, the variables that this personal factor appears to be related to seem quite plausible. It would seem strange however, that readership of the local newspaper would improve a person's ability to recognise built features of the central area of the city from aerial photographs. Possible explanations could be forwarded (perhaps, for example, those who read the paper are more used to recognising city features from photographs - and this group did not perform the iconic photograph task which is why no relationship has been found with this), but none seem particularly convincing and thus this will be left as a finding which cannot be adequately explained by the action of this variable alone.

The twelve month respondents performed fewer of the tasks than the other groups as they were being re-interviewed and thus had performed many of them previously. Of the nine tasks that they did perform, three of them were found to suggest some sort of relationship with the readership of the local newspaper. These were the city centre plotting and connectivity exercises (0.06 and 0.002 levels of significance respectively) and the iconic photograph recognition (0.03 level). The later result seems to suggest that exposure to photographs of the urban area perhaps does impose some sort of influence on place visualization ability, so that they are better able to recognise places from photographs shown to them in the context of a research interview. Again, this interpretation should be treated with caution. It would also seem strange that those people who read the Leicester Mercury performed better at the city centre plotting and connectivity exercises than those who did not, especially as this influence has been found at the twelve month stage and not before when it would seem more intuitively plausible. Similarly, it would seem strange that it is the city centre exercises and not the city wide exercises that demonstrate this effect. Further analysis of the readership variable and its relationship with other personal variables has shown that it is not related to the frequency of visiting the city centre or the frequency of going away from Leicester (two variables which might be expected to account for this finding), either within the sample group as a whole, or within the twelve month group in particular. These findings are likely therefore to be the result of a quirk in the data rather than anything significant.

Finally, at the three year (plus) stage, no relationships were found between readership
of the local paper and environmental knowledge and ability. It might be expected that this should be the length of residence group for which readership of the paper would have the least influence, because after a certain period of residence, the influence of secondary information could be expected to have been 'swamped' by firsthand experience. On the other hand however, the reverse could be true, and in fact more could be learned from secondary information the more developed the contextual framework (in this case knowledge of the city) against which the presented information can be assimilated. In other words, longer term residents may learn more from a local newspaper because the people and places that they read about 'mean' more to them. Whichever position is correct, as the nature of this learned material will change over the length of residence span, it is very difficult to make comparisons between the different length of residence groups. A study such as this would be unlikely to reveal any such effects, as discovery is limited by the nature of the knowledge that is examined. Indeed, it would seem from the findings of this study, that the first position is correct (i.e. secondary information sources becoming less important to knowledge acquisition with increasing length of residence).

8.3.2b. Local Radio Listening.

Exposure to one particular medium of secondary environmental information (local newspaper readership) has been seen here to have had an effect on environmental learning, although it has been cautioned that this effect is neither straightforward nor (possibly) direct. Further research in this area would need to be conducted under laboratory conditions so that this effect could be isolated in a meaningful way, although this of course would detach the context of the research from the 'real' world and thus suffer from a different set of limitations. A second type of medium of secondary environmental information which has been considered here is that of local radio. The effect of this variable will be even more difficult to quantify because fewer respondents actually listened to the two local stations. Sixteen per cent of the total sample group reported to 'regularly' listen to local radio (Figure 4.4.). This proportion varied between the different length of residence groups from seven per cent of the three month and three year (plus) groups, to twenty three and twenty two per cent of the six and twelve month groups respectively. There was more variation between the groups on the 'never' listen to local radio category. Seventy six per cent of the three month group never listened to local radio, in contrast to only forty four per cent of the six and twelve month groups that never did so. The difference between length of residence and whether or not the respondent listened to local radio was found to be significant at the 0.03 level of significance (Chi Square). However, there was no simple relationship between these two variables as the three month and the three year (plus) groups were found to be similar in their radio-listening habits.

A crosstabulation of the local radio variable with other personal variables has shown
that there was a very high correspondence between household tenure and the length of
time spent searching for accommodation and local radio listening. Respondents living in
University or privately rented accommodation (and thus had spent the least time
searching for accommodation in total) were the least likely to have ever listened to
local radio. This is not to suggest a causal relationship, but it is important that this
 correspondence be noted, since much of the variation between the different groups on
the local radio variable could possibly be due to these other variables. It has indeed
been seen in section 8.2. that these variables were found to be related to
environmental learning.

In most cases, the respondents who 'never' listened to local radio were found to
perform the worst on the knowledge tests. Where a significant difference was found
between the different groups, it was often the 'infrequent' rather than the 'regular'
listeners who performed best. At the three month stage, no knowledge variable was
found to demonstrate any relation to the frequency of listening to local radio. Very
few respondents at this stage of residence had ever actually listened to the local stations
(22%). At the six month stage, the differences between the different radio-listening
groups were statistically significant for the following variables; knowledge of residential
areas (0.05 level of significance), the distribution of the Affro-Carribean population (0.05
level) and knowledge of swimming pools (0.02 level - see Table 8.11.). These are
all knowledge variables which might well be forwarded by the sort of material that is
heard on local radio. No statistical relationships were found at the twelve month
stage, but at the three year (plus) stage, knowledge of sports facilities and overall
recreation knowledge were found to be more advanced amongst the 'regular' listeners of
local radio than amongst the non-listeners (0.04 and 0.01 levels of significance
respectively). It is difficult in this case, to come to any conclusion as to whether or
not listening to local radio has advanced knowledge of the urban area, as
 multicollinearity amongst the possible explanatory factors cannot be reduced in any valid
statistical test. However, it would seem intuitively reasonable that the radio will impart
information that the listener would not otherwise come across, and it has been seen
that, if this is the case, it is knowledge of the economic and social aspects of the city
that are advanced through this medium. It would appear however, that this is not
such a powerful medium of environmental knowledge advancement as the local press.

Respondents were also asked whether they had read any books or other publications
about Leicester. So few respondents replied in the affirmative that this variable was
discounted.

8.3.2c. Conclusion: The Role of Secondary Information.

In conclusion to this section on the role of secondary information as a conveyer of
environmental knowledge, it would seem reasonable to assert that it is likely that
exposure to such information will promote environmental learning. The sort of information that the learner will amass from this source will be mostly concerned with the economic and social aspects of the urban area, rather than information regarding its physical make up. However, exposure to place names and facilities hitherto unknown will add to the physical aspects of cognitive maps also. It is also possible that exposure to visual material (e.g. photographs) concerning the urban area will aid the process of place recognition. Overall therefore, it is here proposed that secondary information will contribute to the development of a coordinated and comprehensive mental system of reference about urban habitats, and that the more exposed a person is to these sources, the more likely (s)he is to have a better developed knowledge of the urban area at all length of residence stages.

8.3.3. Environmental Commitment.

This section will consider a facet of a person's life-style in the city which has not before been considered in research in the field as a factor which could influence environmental learning. This facet is the person's predisposition to the environment in terms of his or her level of personal commitment to it as a new place in which to make a life. It is purported here that this predisposition is very important in the context of environmental learning; but will be especially so in the context of a study such as this where the great majority of respondents have come to the city for a fixed-term (and sometimes short-term) stay. The attitudes of newcomers to their new environment could perhaps be divided into three possible groups. First there are the 'settlers' who have come to the city with the intention to make it their new home, and who will thus be concerned to learn enough about the city in order that acclimatization is as rapid as possible. It is proposed that the longer a person is to stay in the new environment, the more likely (s)he is to react to a new residential situation in this way. The study population that is the subject of this research were atypical as a group of in-migrants as they generally knew how long they were going to live in the city on arrival. It will later be seen whether this is likely to have had an effect on the environmental learning patterns of these subjects.

The second proposed attitude-group are the 'abiders', who have the attitude that they are in the city for a fixed period of time and therefore it will never function as a 'home', but that whilst they are in the city they will enjoy themselves as much as is possible. Lastly, there are the 'endurers', for whom living in the city is indeed a feat of endurance and who will go away from the city as much as they can (often every weekend) and thus retain ties with a previous or certainly, different place of residence. These people will have lesser requirements of the new environment as they will normally fulfill their needs elsewhere. They are unlikely to be interested in the new city, and thus, may learn less about it than those in the other two groups. In the context of this study, people falling into this group were most likely to be those
who were going to be in Leicester for one year or less. However, such attitudes to the city were present amongst some of the longer-term migrants too. Commitment to a new environment therefore, might well be a contributory factor in the environmental learning process. It is however, a difficult variable to measure. In the present research, two variables will be explored in this context; the respondents expected length of stay in the city, and his or her frequency of going away from Leicester for overnight stays.

8.3.3a. Expected Length of Stay in the City.

Expected length of stay in the city has been divided into four groups; seven to twelve months, thirteen to twenty four months, two to three years and three years or more. These four time periods were chosen as they were thought to encompass the periods which might make a difference to people's environmental learning strategies. The three year (plus) respondents were not asked this question as it was considered that it was a meaningless variable in their case. A complication in the data was that expected length of stay was found to be closely related to length of residence (Chi Square statistic - significant at the 0.005 level of significance). This was because the number of respondents in the three month group who were enrolled on one year courses was disproportionately large (forty per cent as opposed to twelve per cent of the six/twelve month respondents). In the analysis of this variable therefore, the influence of length of residence was controlled.

At the three month length of residence stage, no differences were found between respondents with regard to their environmental knowledge according to their expected length of residence. This is perhaps to be expected, as the learning that occurs in the first three months of residence in the city will be that which is necessary for adequate functioning in the new environment. Thus, a person's attitude to the new place should have little effect at this stage, as little of the learning is a function of deliberate interest or learning for learning's sake. One would expect that the influence of length of stay as a variable which will part-determine environmental commitment would be greater at the six and twelve month stages of residence. Indeed at the six month stage, those respondents who were going to live in the city for three years or more often displayed greater knowledge than their shorter-stay counterparts. Similarly, those who were only going to be in the city for one year or less often received lower scores. This however, was not consistent across all the different knowledge variables. On two of the knowledge variables there was found to be a statistically significant difference between the different length of stay groups. These were knowledge of residential areas (0.02 level of significance), and the distribution of the unemployed (0.01 level). On both of these variables, the 'three years or more' group performed best. The 'thirteen to twenty four months' group also performed well on these variables, but this can be explained by the fact that the majority of this group
were engaged on the Social Work course, and thus had reason to be aware of this spatial social differentiation. At the twelve month stage, only the relationship with the residential areas variable remained (0.03 level of significance - Anova), and again, the longer length of stay respondents performed the best. It would seem therefore, that on the grounds of the examination of 'expected length of stay' as a determinant of environmental commitment, some evidence can be found for the support of the hypothesis that this will determine the rate and comprehensiveness of environmental learning. However, the relationship neither appears to be particularly strong nor universal. The nature of the knowledge that appears to be effected, is that which is concerned with social differentiation in the city. Perhaps the stronger is a person's commitment to a city, the more likely (s)he is to conceive of the environment in social terms. This is purely conjectural. Discussion will now turn to the consideration of the second variable that is to be used here as an indicator of levels of environmental commitment, the frequency of overnight stays away from Leicester.

8.3.3b. Frequency of Overnight Stays Away From Leicester.

The frequency with which respondents went away from Leicester for an overnight stay was classified into one of four groups. These were 'less than once per month', 'once per month', 'every fortnight' and 'every weekend'. The three length of residence groups who answered this question (the exception was the three year (plus) group), gave similar replies. Total group frequencies for this question are displayed in Figure 8.5. In general, examination of the mean scores of respondents in each of the four groups shows that the group who went away from Leicester 'every weekend' were the most likely to receive the lowest group mean score on the knowledge variables. This was, however, not always the case, and in fact in several incidences, this group actually received the highest scores. Sometimes these differences were even found to be statistically significant (for example, the differences between the four groups were found to be statistically significant on the 'knowledge of industry' variable (0.01 level), and here, the 'every weekend' group received the highest mean score). This is therefore not a very reliable variable as a predictor of differences in environmental knowledge between individuals.

8.3.3c. Conclusion: Environmental Commitment.

This consideration of two variables that were thought to be possible determinants of environmental commitment, has not produced strong evidence in support of the contention that 'environmental commitment' will influence the rate of environmental learning. Instead there has been an overall predominance of slightly below average knowledge performance amongst the groups defined as having low levels of commitment, but several results have also been found to the contrary. Thus conclusion in this discussion will need to await further research on this factor as a determinant of
FIGURE 8.5.
THE FREQUENCY OF AN OVERNIGHT STAY AWAY FROM LEICESTER
- ALL RESPONDENTS.

Frequency of Overnight Stays
environmental cognition.

8.3.4. Central Area Visits: Influence on Knowledge of the City Centre.

This section will consider whether the frequency of visit to the city centre affects the rate of learning about its various aspects. Respondents were asked how frequently they visited the city centre and their responses were classified into one of four groups; 'more than once per week', 'once per week', 'once per fortnight' and 'less than once per fortnight'. The modal group was the 'once per week' category which comprised forty eight per cent of all respondents. Twenty seven per cent of respondents visited the city centre more frequently than once per week, fourteen per cent visited once per fortnight, and eleven per cent visited the city centre less frequently than this. There was found to be a statistically significant difference between the four length of residence groups on their frequency of visit to the city centre (Table 8.11.). These differences were not however a function of differences in length of residence as the three month and three year (plus) groups were the most similar.

Frequency of visit to the city centre was found to have a slight effect on knowledge of the city centre. These differences were most often not found to be statistically significant, but generally the less frequent visitors were found to be less successful at the free-recall mapping exercise, the city centre plotting and connectivity tasks and photograph recognition. Examination of these relationships by length of residence showed that the groups differed little in this. Again however, variation on performance in the city centre exercises was much greater between the different length of residence groups than between the different 'frequency of visit' groups.

8.3.5. Conclusion: Life-style as a Determinant of Environmental Learning.

It has been seen in this section on the role of life-style variables in the environmental learning process that life-style variables should not be overlooked when considering the process of the acquisition of environmental information. Predominant travel mode through an environment has been seen to influence general city knowledge and orientational ability in a city, especially at the citywide scale. Secondary information sources have also been found to be important, especially local newspaper which appears to impart knowledge about the social and economic attributes of the environment. Finally this analysis has also suggested that environmental commitment could be a contributory factor in urban knowledge differences between people as overall, slightly below average performance was found by those respondents defined as having low levels of commitment.

8.4. Geographical Activity Patterns.
From empirical observations of urban spatial activity arose the concepts of 'action space' (which refers to that part of the environment which has a place utility to the individual and with which the individual is therefore familiar) and 'activity space' (which is that part of the action space with which the individual interacts on a daily basis) (Adams, 1969; Horton and Reynolds, 1969, 1971). The basic premise of such concepts is that movement through an environment (and especially regular movement) will effect what is learnt and therefore known by the individual about that environment. This section will consider the role of such geographical activity patterns in the development of environmental knowing. Personal variables such as the location of the workplace, places visited on a regular basis (for recreation purposes for example), and usual place of grocery shopping will have an effect on those parts of the environment that a respondent becomes exposed to and thus, what is learnt. This section will therefore provide a brief examination of these as contributory variables to the environmental learning process.

8.4.1. Workplace Location.

The effect of this variable on environmental knowing is likely to be similar to that of residential location within the city (Gold, 1982). In this respect therefore, there will be an enhanced local knowledge around the workplace and along the regular route travelled between home and work. Also, the route between workplace and the city centre may be well known. In the context of this research, this variable will not be important in differentiating respondents’ levels of knowledge, as the primary workplace of the total sample was the University, which is spatially concentrated around a campus to the southeast of the city centre, and few respondents had a permanent secondary location of work (three per cent). Those respondents who were engaged on the Social Work course were taking part in a three-month placement by the twelve-month interview stage. All of these placements were located in the city centre or in residential areas to the north of the city. As these respondents constituted such a small proportion of the overall sample group (six per cent), it was considered that the effect that their increased experience would have on the aggregate results would be minimal.

8.4.2. Recreation Activity.

It was considered that recreation activity within an individual’s own residential sector (previously defined - Chapter Three) would not enhance city knowledge. Respondents were asked how many ‘regular’ (defined as at least once per fortnight) recreation activities they partook in, and these were recorded if they involved travel into a different residential area than the respondent’s own. The number of regular recreation activities undertaken in a different city sector was also recorded. Only twenty three per cent of respondents took part in a ‘regular’ recreation activity outside their own residential area. Differences were not statistically significant between the four length of
residence groups. The proportion of respondents taking part in recreational activities outside their own city sector was only six per cent (and thus too small to conduct any statistical enquiry).

On many of the knowledge variables, those respondents who regularly partook in recreational activity outside their own residential sector were seen to have greater knowledge than those who didn't (Table 8.6.). It might be supposed that this could be partially explained by the fact that those partaking in this recreation activity might also be those who had access to a car. However, crosstabulation of car-drivers against recreation activity showed that there was no relationship between the two. Neither was there found to be any relationship between recreation activity and environmental disposition, sense of direction or exploratory behaviour. Thus it would seem that this superior knowledge is associated with the recreation variable in some way. The knowledge variables upon which statistically significant differences between the groups were found, were, the description of residential areas (0.004 level of significance), the citywide plotting exercise (0.004 level), knowledge of the location of industry (0.03 level), knowledge of sports facilities (0.07 level), overall recreation knowledge (0.02 level) and iconic photograph recognition (0.04 level - Table 8.11.). Variations were found to exist between the various length of residence groups when analysis was conducted by this variable. It would seem however, that those respondents who regularly travelled to a destination outside their own residential area had for some reason, greater knowledge of the urban area than those who didn't.

8.4.3. Usual Place of Grocery Shopping.

As another regular activity, the usual place of grocery shopping might affect the respondent's knowledge of the city. Respondents were asked to name the place where they carried out 'most' of their grocery shopping. The answers were then classified into one of three categories; the city centre, a location in the respondent's own residential area, or a location outside the respondent's residential area but within his or her city sector. No answer fell outside this classification. Thirty percent of all respondents carried out the majority of their grocery shopping in the city centre and with the exception of the three year (plus) group, most length of residence groups had similar proportions falling into this category (fifty seven per cent of the three year (plus) group shopped in the city centre). Thirty four per cent of the sample group carried out their grocery shopping in their own residential sector (none of the three year (plus) group did this), and thirty six per cent shopped elsewhere in their own residential sector. On the whole very few people travelled far to shop. Few travelled to one of the city-periphery superstores, respondents were much more likely to shop locally in small supermarkets or corner shops.

The results of the analysis suggest that the usual place of grocery shopping of an
individual does affect environmental knowledge. Differences between the mean group scores for the three shopping groups have been found in the analysis. For example, knowledge of suburban shopping areas and familiarity with these was found to be greatest amongst those respondents who shopped somewhere in their residential sector, and least developed in those who shopped in the city centre (the difference between the groups was found to be significant at the 0.05 level of significance on both the knowledge and the familiarity variables). The city centre shoppers performed least well on most of the knowledge measures, and statistically significant were, knowledge of the distribution of Asian people (0.05 level), and the location of industry (0.02 level). This group however (city centre shoppers) performed significantly better than the other two groups at the aerial photographs (0.04 level). This is possibly due to the fact that the second photograph featured a part of the city centre where the J. Sainsbury store is located. Being the most popular city centre food store, this is probably the supermarket where a lot of the town centre shopping was carried out, and thus the city centre shoppers would recognise the area when others may not. At the three month length of residence stage, those respondents who carried out their grocery shopping in their own residential sector were significantly better at describing the different residential areas (0.02 level). This suggests that enhanced learning about other residential areas within the home sector can be a function of grocery shopping activity.

8.4.4. Conclusion: The role of Geographical Activity Patterns in Environmental Learning.

The discussion in this section has shown that, as we would expect, environmental learning is influenced by the geographical activity patterns of the individual. Unfortunately it is impossible to quantify or even describe this effect as peoples’ activity patterns were as various as the people themselves. Suffice it here therefore to have made the rather obvious observation that these variables cannot be discounted from the environmental learning model.

8.5. Previous Residential Experience.

In this section, the role of previous residential experience in the environmental learning sequences of individuals will be examined. It could be contended that all previous environmental experience could have an effect on the capacity that an individual has for environmental learning (Devlin, 1976). Most of this is however, impossible to measure. More obviously, previous environmental experience within the study environment (such as previous places of residence - if different from the present) might be expected to have had an effect on the knowledge of the individual. This discussion will focus on this latter consideration first as it is the easiest to deal with.

8.5.1. Previous Residential Experience within the Study Environment.
There was a perfect relationship between length of residence and the number of different residential areas that a respondent had lived in Leicester. Only five per cent of the three month group had lived in a different residential area to their place of residence current at the time of interview. This figure was twenty per cent for the six month group, fifty-six per cent for the twelve month group, and ninety-three per cent for the three year (plus) group. It would thus be very difficult to separate the effects of previous residential experience from length of residence for the purposes of analysis. It is likely that this experience would have only local effects on knowledge unless the previous residential area was located in another city sector. This was only the case for seven per cent of the respondents in the overall sample, and thus not a large enough proportion for analysis to be undertaken.

8.5.2. Environmental Experience Previous to Moving to the Study Environment.

Environmental experience previous to moving to Leicester was another variable that was thought to be a possible determinant of environmental learning. This is because it may be the case that people can 'learn how to learn'; thus the more often an individual has had to learn a new environment, the more successful he or she will be at it. Similarly, generic knowledge about cities is likely to be a contributory factor in environmental learning, as this knowledge may act as a mental template upon which expectations about the environment and the location of its functions therein may be based, which will aid environmental learning. It could be expected that the more experience an individual has had of different environments, the more likely (s)he is to have a well developed generic template of the sort above described (Jackson, 1970; Devlin, 1976). To examine this theory, respondents were asked how many separate places they had lived in (defined as a period of at least three months) in total, between the ages of five and eighteen, and between the ages of eighteen and the present time. The total places lived in were divided into these age-bands as it was considered that environmental experiences before the age of eighteen would not be as significant as those after this age, since heavy reliance on parents before the age of eighteen would abate the need for wayfinding.

On the whole, respondents had been fairly residentially mobile in their former years. Only seven per cent of the total sample had only lived in two separate towns/cities/villages or less. The modal number of separate residential locations was 'three or four' (thirty eight per cent of respondents), but twenty eight per cent had lived in 'five or six' separate places, and twenty seven per cent had lived in 'seven or more'. There was little difference between the four length of residence groups. Not surprisingly, for most respondents most of these moves had taken place after the age of eighteen. Only a quarter of respondents had moved more than twice between the ages of five and eighteen and a half had not moved at all before this age. After the age of eighteen however, over half of all respondents had changed residential
environment more than five times. It is clear from this that if this were found to be an important variable in environmental learning ability, then this particular sample with its high degrees of previous mobility, would be extremely unrepresentative of the general population.

There were found to be no relationships between previous environmental experience (as elicited by the questions asked in this research) and environmental learning, as upon examination, no patterns emerged which suggested any differences in knowledge between the different experience groups. It would seem therefore that the role of previous environmental experience in environmental learning, although intuitively credible, is very difficult to measure. Here, the findings suggest that this role is insignificant, but this may be because the wrong measures have been regarded. Thus, conclusion on this matter will have to await further research.

8.6. Personality and its Role in Environmental Learning.

It has been found that accurate mental representations of the environment are not obtained spontaneously, but rather they are the result of a sustained effort and repeated trials in the environment (Kozlowski and Bryant, 1977; Garling, 1980; Evans, Marrero and Butler, 1981). For this reason dispositional differences between individuals are here considered to be an important determinant of the attainment and effective use of mental maps of the environment. Such dispositional differences are likely to be a function of personality (Piaget, 1960). Personality as a determinant of spatial ability and environmental learning has been briefly considered in Chapter Five (section 5.3.). It is not unusual to claim that some aspects of personality bear a causal relationship with environmental ability and therefore learning, as learning theory has long suggested the importance of personality. Most importantly, an organism needs to be interested in something if it is to learn effectively. Whether this interest arises through necessity or from a desire to be knowledgeable, it nevertheless needs to be present. It is here postulated that individuals are interested in their environments to different degrees, and that this interest, a function of their personality or 'environmental disposition' as it is termed here, will in-part determine their success at becoming familiar with new environments.

Bryant (1982) is one of the few researchers in the field who has concerned himself with personality in this way. As justification for his interest he mentions various implied relationships between personality and environmental ability that have arisen from previous studies, such as the claim that emotional upset can lead to environmental disorientation (Binet, 1894). In his study Bryant has related various traditional personality measures (from the California Psychological Inventory (CPI)) to geographical orientational ability. His initial contention was that "plans of action and attitudes toward the environment engage individuals differentially in building accurate real world
representations" (Bryant 1982, 1318). His research findings lent support to these initial claims. Similarly, studies by McKechnie (1974, 1978) and Borden and Francis (1978) have found that people differ in their degrees of 'environmental concern' with the traditional personality correlates of high concern being Dominance, Capacity for Status, and Sociability. Thus it would seem that evidence exists in support of the intuitive claim that systematic styles of interaction with the environment exist and that they bear relation to the accuracy and extent of an individual's cognitive representation of the environment.

In the present research, a strong relationship has been found to exist between environmental disposition and sense of direction (section 5.3.). This suggests that these two aspects of an individual may be functionally related, with one determining the other. The direction of this causal relationship is more difficult to determine and it is in fact, most likely to be a form of circular causation (e.g. environmental nature determining sense of direction, which in turn influences environmental nature). Spatial orientation has also been found here to be a deliberate and semiconscious process, thus ensuring that it is subject to the 'filters' of personality. Therefore, both environmental nature and sense of direction need to be examined here against the aggregate performance variables so that the degree of their influence on environmental knowledge might be determined. The strong causal relationship between these two facets of personality means that it is somewhat false to separate them. However, this is done in the following subsections for the sake of clarity rather than out of a belief that they should be treated as such.

8.6.1. Environmental Disposition.

Respondents were asked three questions that were designed to elicit their attitudes to the environment. These questions were given and discussed in Chapter Three (section 3.2.5c.). On the basis of the resulting answers to these questions, subjects were classified into one of three groups according to how exploratory they were in new environmental situations. The three groups were 'very exploratory', 'semi-exploratory' and 'passive'. There was little difference between the length of residence groups on their environmental nature. Overall, thirty four per cent were classified as being 'very exploratory', sixty per cent were 'semi-exploratory' and six per cent were 'passive' in environmental contexts. The three year (plus) group were slightly over-represented in the 'very exploratory' group which possibly is a result of the small sample size employed here. The high correlation found between the resulting classification and respondents' self-assessed sense of direction can be regarded as an indicator of the success of this variable in dividing people by environmental disposition.

Environmental disposition was found to be highly related to performance on many of the knowledge variables included in the study (Table 8.7.). Where the relationship
was not strong enough to be statistically significant (anova 0.05 level of significance) there was nevertheless an obvious trend in the data towards superior performance amongst the 'very exploratory' group, with the 'passive' group performing very much worse. The spatial ability tests (city centre and citywide plotting and connectivity tests) were found to be most related to this variable. Statistically significant relationships were found between environmental nature and the city-centre connectivity, the citywide plotting and the citywide connectivity exercises (0.03, 0.007 and 0.03 levels of significance (anova) respectively). Table 8.8. shows the differences between mean scores gained in these tests. It can be seen that those respondents who were classified as 'exploratory' by nature performed better at these tests than other respondents. Thus attitude or disposition towards the environment does appear to make some difference in spatial ability. Likewise, learning appeared to proceed faster amongst the 'very exploratory' group on many of the other variables and eventual knowledge levels appeared to be greater. Statistically significant amongst these were, knowledge of the distribution of the Asian population (0.01 level of significance), and knowledge of recreation facilities (0.01 level).

Thus, there appears to be some facet of personality which results in differential interest in the environment and a consequent differential development of environmental knowledge and ability. Furthermore, environmental ability is something that a person is aware of, especially if (s)he perceives her/himself to be particularly high-achieving in this context. High levels of interest in the environment is seemingly related to macro-spatial ability (or 'sense of direction') probably because such conscious interest manifests itself in the form of conscious effort which (as research findings have suggested - Kozlowski and Bryant, 1977) is necessary for effective orientation in new environmental situations. This discussion will be continued in the following section.

8.6.2. Sense of Direction.

It has already been noted above that this factor was found to be highly related to 'environmental disposition'. This finding is consistent with those of other attempts to relate sense of direction to personality (e.g. Bryant, 1982). Sense of direction could possibly be viewed as the ability-element of environmental character. It is as yet unknown what causes differences between individuals in this ability. Some would suggest that it is an innate skill (Baker, 1980; Walmsley and Epps, 1988) and others would favour a developmental explanation (Kozlowski and Bryant, 1977). Bryant (1982) contested that differential sense of direction is gender-related (amongst other factors), as results of his study suggested that sense of direction played a greater role in self-esteem for males than for females. The differential development of this skill between individuals could in fact be attributable to a number of factors, both personal and environmental (e.g. ‘environmental disposition’, intelligence, experience, conditioning, socialization, education, role-adoption). Indeed, it is probably a combination of many
or all of these factors.

Respondents' self-ratings of their sense of direction have been used in the present research as an indicator of this ability. Previous research has demonstrated that people are normally well aware of their sense of direction ability (Kozlowski and Bryant, 1977) and that their self-ratings offer a reasonably reliable reflection of these. This has been discussed in greater detail in Chapter Three. The analysis undertaken here has used a threefold classification of individuals based on their self-ratings; 'above-average', 'average' and 'below-average'. Results are also considered by the original seven-point classification which ranged from 'excellent' to 'very poor' (Chapter Three). When the mean scores for each of the knowledge variables were calculated for each of the groups, in many instances, statistically significant results were obtained (analysis of variance - see Table 8.11.), which demonstrated a very clear difference between the groups in their environmental learning. Thus, good sense of direction people were often found to have superior knowledge of the urban area as well as superior ability in the spatial orientation tests (Table 8.9.). This is an interesting finding as it suggests that orientational/spatial ability or sense of direction is a determinant of environmental knowledge in general; and thus as such, is also a determinant of geographical activity patterns and spatial decision-making (and thus the very core of human-geographical behaviour). The claim here therefore, is that sense of direction (or macro-spatial ability) is one of the most important determinants of the nature of an individual's cognitive representation of the environment (mental map, cognitive image etc.), which in-turn, determines his or her spatial behaviour. This conclusion rests on the findings which are presented and discussed below.

Again there was found to be little difference between the length of residence groups in their self-assessed sense of direction (with the exception of the three year (plus) group which had ninety three per cent of respondents rating themselves as 'above average'). The overall distribution comprised sixty five per cent of respondents rating themselves as 'above average', sixteen per cent as 'average', and eighteen per cent who considered themselves to have a sense of direction ability that was 'below average'. These ratings were made on a seven-point scale which ranged from 'very good' to 'very poor'. The distribution of responses is given in more detail in Figure 4.6.


Figure 8.6. presents the mean scores received by respondents for their city-centre free-recall mapping exercise. Respondents are divided into the seven sense of direction groups that they assigned themselves to. It can be seen that, with the exception of the 'good' group, there was a clear improvement in mean scores with an improvement in self-assessed sense of direction. This suggests two things: First, that respondents' self ratings are a fairly accurate representation of actual ability differences between
FIGURE 8.6.
MEAN RATINGS RECEIVED FOR SKETCH MAP COMPLEXITY
- BY SENSE OF DIRECTION.
them; and second, that sense of direction is a determinant of free-recall mapping ability (and presumably of knowledge acquisition and mental mapping, as processes that underlie this ability). Differences between the groups were statistically significant at the 0.03 level of significance (anova).

8.6.2b. Knowledge of Suburban Shopping Areas.

On the knowledge of shopping areas variable, the 'above average' sense of direction respondents generally received higher scores than the 'below average' respondents. The relationship was not quite so clear as the relationship found for the free-recall mapping exercise. The 'average' group were found to receive the lowest scores in both the shopping centre questions (knowledge and familiarity). This was found to be the case with many of the other variables as well and may be indicative of a certain trait amongst people who would rate themselves as 'average' (which is often the 'easy' way out). No relationship was found between knowledge of residential areas and sense of direction.

8.6.2c. The Spatial Ability Exercises.

Performance in the city centre and citywide plotting and connectivity exercises was found to be very much related to self-assessed sense of direction (Table 8.9.). Figure 8.7. gives the mean scores achieved for each exercise by each of the seven groups. It can be seen that for every exercise, there was a very clear improvement in performance with increasing sense of direction ability. All relationships were found to be statistically significant at the 0.02 level of significance or higher (Table 8.11.). These exercises were a test of orientational ability and knowledge. Their completion required knowledge of the urban area and the ability to deal with spatial relations (both point-based and topological) in an abstract manner. The results presented here show that these skills are related to sense of direction, and that the better a person's sense of direction, the better they are likely to be at such tasks.

8.6.2d. Other Knowledge Variables.

It is not too surprising that the spatial ability tests have been found to be related to sense of direction. It is more surprising however, that some of the other knowledge measures demonstrate similar relationships to this variable. When respondents' knowledge of the social characteristics of the city were analysed by sense of direction ability it was found that although not statistically significant, the above average group seemed on the whole more aware of the geographical distribution of different minority groups, than the other respondents. This was similarly the case for knowledge of the nature and location of industry and knowledge of recreation facilities in the city (Table 8.9.). A statistically significant difference was found between the different sense of
FIGURE 8.7.
MEAN RATINGS RECEIVED FOR THE CITY CENTRE AND CITYWIDE PLOTTING AND CONNECTIVITY EXERCISES - BY SENSE OF DIRECTION.

KEY:
- City centre plotting
- City centre connectivity
- Citywide plotting
- Citywide connectivity
direction groups on their iconic photograph recognition (0.004 level of significance), which suggests that 'above average' sense of direction people are either wider-travelled or that they are more observant whilst travelling. This later suggestion is probably the most plausible and it is consistent with Kozlowski and Bryant's (1977) contention that good sense of direction people have to be consciously trying to orientate themselves in order to be better than 'poor' sense of direction people. Thus it is suggested here that 'good' sense of direction people will have a level of interest (also a function of environmental nature) in the environment which will be higher than 'poor' sense of direction people which will lead ultimately to greater knowledge (and therefore ability). It might also be the case that 'above average' sense of direction people have a better developed cognitive framework within which to incorporate spatial information. This can only be conjecture at this stage. At recognising features of the city centre from aerial photographs also, 'good' sense of direction people performed better than those with a 'poor' self-assessed sense of direction (statistically significant at the 0.02 level of significance).

8.6.2e. Length of Residence.

Sense of direction was found to be a determinant of environmental knowledge and ability at all stages of residence. Although differences did occur between the different length of residence groups in the relationship between the sense of direction variable and performance in the knowledge tests, none of these were consistent over time and thus did not suggest any changes in the influence of this variable on knowledge and ability with increasing length of residence.

8.6.3. Conclusion: Personality and its Influence on Environmental Learning.

Evidence has been found and presented in the above section in support of the claim that environmental learning and spatial ability are subject to the influences of personality. 'Environmental nature' has been found to be a reliable predictor of performance in several spatial ability tests as well as a determinant of knowledge of some aspects of the urban area. It has also been found to be highly related to 'sense of direction' (macro-spatial ability) and it is likely that it is causally linked to this variable. 'Sense of direction' has proved to be an even more powerful predictor of environmental knowledge and ability, again, especially with regard to knowledge of the physical content of the urban area and those tasks involving the utilization of spatial orientation ability. These findings therefore would support the claim that systematic styles of interaction with the environment exist and that these styles do indeed bear relation to the formation, accuracy and extent of an individual's cognitive representation of the environment.
8.7. Conclusion: The Role of Personal Characteristics in Environmental Learning.

This Chapter has given regard to a wide range of characteristics and circumstances peculiar to the individual which could influence the nature and the rate of environmental learning (Figure 8.1.). This has resulted in a necessarily fragmented discussion so these factors will now be considered together.

Figure 8.1. represents diagrammatically the proposed influence of certain personal characteristics on environmental learning. Previous discussion in this Chapter has shown that all of these variables exert some influence on this learning process. This influence however, is neither standardized (in terms of the nature of the effect it imposes) nor of a constant magnitude. It has been seen that each variable is likely to influence only certain aspects of environmental learning (and therefore knowledge).

Knowledge of the environment has been considered for the purposes of this research to be characterized by the following elements; knowledge of the physical structure and content of the urban area, knowledge of the social composition of the city, knowledge of its economic and commercial functions and knowledge of leisure opportunities within the built-up area. As in all geographical studies, the concern for this knowledge has not simply been the 'what' but also the 'where'. Thus, knowledge of the distribution of the different city elements (their location(s)) has been given equal emphasis to knowledge of their existence. An appreciation of the above-mentioned differential effect of personal characteristics/circumstances on these different types of knowledge can lead to a better understanding of the process of learning about the environment. This differential effect is summarized in Table 8.10. and will be considered here below:

8.7.1. The Effects of Personal Variables on Knowledge of the Physical Structure and Content of the City.

The questions which were designed to test this particular aspect of urban area knowledge were the free-recall sketch maps, the plotting and connectivity exercises and the iconic and aerial photographs. Some of these measured spatial ability more than knowledge (i.e. the plotting and connectivity exercises) and the successful completion of the other tests depended on both. Thus in most cases it is impossible to separate the effects of spatial ability from those of knowledge levels. However, this aspect of urban area knowledge (i.e. the physical structure and content of the city) has been found to be highly related to spatial ability (section 8.6.2.), and thus arguably, the two are impossible to separate anyway.

Many of the personal variables considered in this Chapter have been found to exert an influence on the physical structure knowledge variables (Table 8.10.). Gender was found to influence performance on the plotting and connectivity exercises (spatial ability).
Males were found to be better than females on tasks that involved the dealing with abstract spatial relations, a skill which is likely to facilitate the environmental learning process. Overall, evidence suggested that males do have on the whole, superior macro-spatial ability. Gender differences were not found to be significant for any other knowledge variable.

Residential location was found to exert little influence on this aspect of urban area knowledge apart from very local effects. More important with respect to residence was the search procedure that the respondent conducted in order to find his or her residence. It was found that the length of time that a person had spent searching for accommodation affected knowledge of the physical structure of the urban area, to the extent that longer lengths of search had usually resulted in greater knowledge of this aspect of the city. No other aspect of urban area knowledge was affected by this variable.

Predominant travel mode was also found to exert an influence on knowledge of the physical structure of the urban area. Its influence was found to spread a little further than that of gender, incorporating not only the plotting and connectivity exercises (only at the citywide scale), but also the other physical knowledge variables (and indeed other variables pertaining to general knowledge of the city as a whole). It has been seen that car drivers and those who travelled by bicycle were likely to have a greater knowledge of the physical structure of the urban area than other respondents. It was concluded in section 8.3.1. that these differences are likely to be a function of both differential exposure to more parts of the urban area and of differential necessity of learning about spatial relations in the environment (depending on whether the individual is required to be a decision maker or not).

The personality of the individual was also found to affect knowledge of the physical structure of the urban area. Under this title, this Chapter has considered both ‘environmental disposition’ and ‘sense of direction’ (treated here as analogous to spatial ability). Environmental disposition was seen to be related most strongly to the physical structure knowledge variables, especially the spatial ability tests. It was concluded that there appears to be some facet of personality which results in differential interest in the environment and which results in the differential development of environmental knowledge and ability. It was also concluded that this disposition is something that an individual is aware of, and that if it is one of high levels of interest in the environment, it will result in conscious effort which leads to superior learning. Sense of direction, which was found to be highly related to environmental disposition, was found to be an even more powerful predictor of environmental knowledge levels, again, especially with regard to the physical composition of the city. Thus there appear to exist systematic styles of interaction with the environment, determining or determined by spatial ability, which result in differential learning, especially with respect to those aspects of
knowledge that incorporate the physical structure and content of the urban area.

8.7.2. The Effects of Personal Variables on Knowledge of the Social, Economic and Recreational Components of the City.

Fewer of the variables examined in this chapter were found to effect these aspects of urban area knowledge than those aspects pertaining to the morphology of the city (Table 8.10.). However, several were found to be significant. Predominant travel mode was found to be related to virtually all knowledge variables which suggests that this is a very important determinant of the development of environmental knowledge. Again here, car drivers and cyclists were found to have the most knowledge about these aspects of the city. Secondary information sources, particularly local press has also been found to be important. Those respondents who regularly read the local evening newspaper the 'Leicester Mercury' were found to have a greater knowledge of the social and economic aspects of the city than those who did not. It was concluded that this was a powerful medium of local information portrayal.

More specifically, expected length of stay in the city was found to influence knowledge of the social aspects of the urban area. Those people who were expecting to live in Leicester for a relatively long period were found to have a greater knowledge of the distribution of different social groups within the city than the other respondents. This variable was related only to this aspect of urban area knowledge. Many of the personal variables examined here were found to display trends which suggested that, although not statistically significant, they did impose some influence on the acquisition and retainment of knowledge of the social, economic and recreational aspects of the urban area.

8.7.3. Personal Characteristics Vs Length of Residence.

The introduction to this Chapter specified that one of the aims of the Chapter was to determine whether in certain instances, personal variables could be seen to account for more of the knowledge differences between individuals than length of residence; and, if found to be the case, to determine how such variables could be incorporated into an overall conceptualization of the environmental learning process.

It has been seen that certain personal variables are very important determinants of the rate and nature of environmental learning, but that rather than having a general influence on environmental knowledge, they are more likely to exert an influence on specific aspects of that knowledge. Indeed the only variables that were found to have even the remotest 'general' influence were 'predominant travel mode' and 'sense of direction'. Similarly, the relationships between knowledge levels and the personal variables were often not constant between the different length of residence stages. In
other words, personal variables were often found to exert a differential influence on environmental learning from one length of residence period to another. Problems of small samples have rendered it impossible here to refine this observation further, and the determining of its exact nature will need to await further research. This does however, mean that the incorporation of these personal variables into an overall conceptualization of the environmental learning process although necessary, is not a straightforward nor an obvious task.

It cannot be concluded here therefore that personal characteristics are more important as predictors of the differences between individuals in their levels of environmental knowledge than length of residence in the first three years of residence in a city. In certain instances they might be, but in these instances, the nature of their influence might too be explained by length of residence. This Chapter has attempted to clarify the role of personal factors in the environmental learning process so that they might be incorporated into an overall model of the environmental learning process. Chapter Nine will now attempt to develop this model.
<table>
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<tr>
<th>Physical Variables</th>
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<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sketch Mapping Complexity.</td>
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<td>1.4</td>
</tr>
<tr>
<td>2. Knowledge of Shopping Areas.</td>
<td>1.4</td>
<td>1.4</td>
</tr>
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<td>0.7</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>2.1</td>
<td>1.4</td>
</tr>
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<td></td>
</tr>
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</tr>
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</tr>
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<td>7. Aerial Photograph Recognition.</td>
<td>2.2</td>
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<tr>
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<th>Female</th>
</tr>
</thead>
<tbody>
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<td>8. Knowledge of Industry.</td>
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<td>1.7</td>
</tr>
<tr>
<td>9. Location of Industry.</td>
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<td>10. General Recreation Knowledge.</td>
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<tr>
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<th>Female</th>
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<td>2.4</td>
</tr>
<tr>
<td>12. Afro-Caribbean Population Distribution.</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>13. Unemployed Population Distribution.</td>
<td>1.2</td>
<td>1.7</td>
</tr>
<tr>
<td>14. Description of Residential Areas.</td>
<td>2.2</td>
<td>2.4</td>
</tr>
</tbody>
</table>
Table 8.2. MEAN GROUP SCORES FOR SELECTED KNOWLEDGE VARIABLES BY TIME SPENT SEARCHING FOR ACCOMMODATION

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<th>Fortnight +</th>
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<td>3. Familiarity with Shopping Areas</td>
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<td>4. City Centre:</td>
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<td></td>
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<tr>
<td>- Plotting</td>
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</tr>
<tr>
<td>- Connectivity</td>
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<td>2.5</td>
</tr>
<tr>
<td>5. City-wide:</td>
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<td>- Connectivity</td>
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<td>6. Iconic Photograph Recognition.</td>
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</tr>
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<td>7. Aerial Photograph Recognition.</td>
<td>1.8</td>
<td>1.5</td>
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</table>

| Economic Variables                |                     |              |
| 8. Knowledge of Industry.         | 1.6                 | 1.8          |
| 9. Location of Industry.          | 1.0                 | 1.7          |
| 10. General Recreation Knowledge. | 1.1                 | 1.0          |

| Social Variables                  |                     |              |
| 11. Asian Population Distribution.| 2.4                 | 2.8          |
| 12. Afro-Caribbean Population Distribution.| 1.5 | 1.3          |
| 13. Unemployed Population Distribu- | 1.3                 | 1.8          |
|   tion.                           |                      |              |
| 14. Description of Residential    | 2.1                 | 3.0          |
|   Areas.                          |                      |              |
Table 8.3. MEAN GROUP SCORES FOR SELECTED KNOWLEDGE VARIABLES BY ACCESS TO A MOTOR VEHICLE.

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<td>0.5</td>
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<td></td>
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<td>1.4</td>
</tr>
<tr>
<td>- Connectivity</td>
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<td>1.2</td>
</tr>
<tr>
<td>5. City-wide:</td>
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<tr>
<td>7. Aerial Photograph Recognition.</td>
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<td>1.8</td>
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<td>10. General Recreation Knowledge.</td>
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Table 8.4. MEAN GROUP SCORES ON SELECTED KNOWLEDGE VARIABLES BY PREDOMINANT TRAVEL MODE.

<table>
<thead>
<tr>
<th>Physical Variables</th>
<th>Car</th>
<th>Bus</th>
<th>Cycle</th>
<th>Walk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sketch Mapping Complexity.</td>
<td>1.7</td>
<td>1.5</td>
<td>1.9</td>
<td>1.1</td>
</tr>
<tr>
<td>2. Knowledge of Shopping Areas.</td>
<td>2.0</td>
<td>1.3</td>
<td>1.6</td>
<td>0.5</td>
</tr>
<tr>
<td>3. Familiarity with Shopping Areas.</td>
<td>1.3</td>
<td>0.7</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>4. City Centre:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.4</td>
<td>1.6</td>
<td>1.8</td>
<td>1.4</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>1.9</td>
<td>1.7</td>
<td>2.1</td>
<td>1.5</td>
</tr>
<tr>
<td>5. City-wide:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.9</td>
<td>1.5</td>
<td>1.9</td>
<td>1.5</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>1.5</td>
<td>0.9</td>
<td>1.4</td>
<td>1.1</td>
</tr>
<tr>
<td>6. Iconic Photograph Recognition.</td>
<td>2.0</td>
<td>1.5</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td>7. Aerial Photograph Recognition</td>
<td>2.1</td>
<td>1.3</td>
<td>2.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Economic Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Knowledge of Industry.</td>
<td>1.8</td>
<td>1.4</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>9. Location of Industry.</td>
<td>1.1</td>
<td>1.3</td>
<td>1.5</td>
<td>1.1</td>
</tr>
<tr>
<td>10. General Recreation Knowledge</td>
<td>1.3</td>
<td>0.7</td>
<td>1.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Social Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Asian Population distribution.</td>
<td>3.0</td>
<td>2.1</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>12. Afro-Caribbean Population distribution.</td>
<td>2.1</td>
<td>1.1</td>
<td>1.1</td>
<td>1.6</td>
</tr>
<tr>
<td>13. Unemployed Population Distribution.</td>
<td>1.7</td>
<td>1.3</td>
<td>1.9</td>
<td>1.3</td>
</tr>
<tr>
<td>14. Description of Residential areas.</td>
<td>2.8</td>
<td>2.6</td>
<td>2.7</td>
<td>1.7</td>
</tr>
</tbody>
</table>

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Table 8.5. MEAN GROUP SCORES ON SELECTED KNOWLEDGE VARIABLES BY LOCAL NEWSPAPER READERSHIP.

<table>
<thead>
<tr>
<th>Physical Variables</th>
<th>Never</th>
<th>Often</th>
<th>Infrequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sketch Mapping Complexity</td>
<td>0.9</td>
<td>1.9</td>
<td>1.5</td>
</tr>
<tr>
<td>2. Knowledge of Shopping Areas</td>
<td>0.9</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>3. Familiarity with Shopping Areas</td>
<td>0.3</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>4. City Centre:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.2</td>
<td>1.9</td>
<td>1.5</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>0.9</td>
<td>2.3</td>
<td>2.0</td>
</tr>
<tr>
<td>5. City-wide:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>0.9</td>
<td>2.2</td>
<td>1.8</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>0.6</td>
<td>1.8</td>
<td>1.2</td>
</tr>
<tr>
<td>6. Iconic Photograph Recognition</td>
<td>1.1</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>7. Aerial Photograph Recognition</td>
<td>1.1</td>
<td>2.4</td>
<td>2.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic Variables</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Knowledge of Industry</td>
<td>1.5</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>9. Location of Industry</td>
<td>0.8</td>
<td>2.0</td>
<td>1.1</td>
</tr>
<tr>
<td>10. General Recreation Knowledge</td>
<td>0.8</td>
<td>1.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social Variable</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Asian Population distribution</td>
<td>2.0</td>
<td>2.7</td>
<td>2.5</td>
</tr>
<tr>
<td>12. Afro-Caribbean population distribution</td>
<td>0.9</td>
<td>2.1</td>
<td>1.7</td>
</tr>
<tr>
<td>13. Unemployed Population Distribution</td>
<td>1.4</td>
<td>1.1</td>
<td>1.6</td>
</tr>
<tr>
<td>14. Description of residential areas</td>
<td>1.7</td>
<td>2.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Table 8.6. Mean Group Scores on Selected Knowledge Variables by Recreation Activities Outside an Individual's Own Residential Sector.

<table>
<thead>
<tr>
<th>Physical Variables</th>
<th>None</th>
<th>One or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sketch Mapping Complexity.</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>2. Knowledge of Shopping Areas.</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>3. Familiarity with Shopping Areas.</td>
<td>0.7</td>
<td>1.1</td>
</tr>
<tr>
<td>4. City Centre:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>- Connectivity</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>5. City-wide:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>- Connectivity</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>6. Iconic Photograph Recognition.</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>7. Aerial Photograph Recognition.</td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

| Economic Variables                             |      |             |
| 8. Knowledge of Industry.                       | 1.7  |             |
| 9. Location of Industry.                        | 1.2  |             |
| 10. General Recreation Knowledge.               | 1.1  |             |

| Social Variables                               |      |             |
| 11. Asian Population distribution.             | 2.4  | 3.0         |
| 12. Afro-Caribbean population distribution.    | 1.9  | 2.3         |
| 13. Unemployed population distribution.        | 1.4  | 2.5         |
| 14. Description of residential areas.          | 2.2  | 3.2         |
### Table 8.7. MEAN GROUP SCORES ON SELECTED KNOWLEDGE VARIABLES BY ENVIRONMENTAL DISPOSITION.

<table>
<thead>
<tr>
<th>Physical Variables</th>
<th>Very Exploratory</th>
<th>Semi-Exploratory</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sketch Mapping Complexity</td>
<td>1.9</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>2. Knowledge of Shopping Areas.</td>
<td>1.5</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>3. Familiarity with Shopping Areas.</td>
<td>1.0</td>
<td>0.8</td>
<td>0.5</td>
</tr>
<tr>
<td>4. City Centre: - Plotting</td>
<td>1.7</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>5. City-wide: - Plotting</td>
<td>1.7</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td>6. Iconic Photograph Recognition.</td>
<td>2.2</td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td>7. Aerial Photograph Recognition.</td>
<td>2.0</td>
<td>1.7</td>
<td>1.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic Variables</th>
<th>Very Exploratory</th>
<th>Semi-Exploratory</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Knowledge of Industry.</td>
<td>1.6</td>
<td>1.9</td>
<td>1.0</td>
</tr>
<tr>
<td>9. Location of Industry.</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
</tr>
<tr>
<td>10. General Recreation Knowledge.</td>
<td>1.3</td>
<td>1.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social Variables</th>
<th>Very Exploratory</th>
<th>Semi-Exploratory</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Asian Population distribution.</td>
<td>2.4</td>
<td>2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>12. Afro-Caribbean population distribution.</td>
<td>1.9</td>
<td>1.8</td>
<td>1.0</td>
</tr>
<tr>
<td>13. Unemployed population distribution.</td>
<td>1.3</td>
<td>1.6</td>
<td>0.0</td>
</tr>
<tr>
<td>14. Description of residential areas.</td>
<td>2.2</td>
<td>2.3</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Table 8.8. **MEAN SCORES GAINED FOR THE CITY CENTRE AND CITY-WIDE PLOTTING EXERCISES BY THE DIFFERENT ENVIRONMENTAL DISPOSITION GROUPS.**

<table>
<thead>
<tr>
<th></th>
<th>Very</th>
<th>Semi-</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exploratory</td>
<td>Exploratory</td>
<td>Exploratory</td>
</tr>
<tr>
<td><strong>City Centre</strong></td>
<td>1.7</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Plotting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>City Centre</strong></td>
<td>1.7</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>City-wide</strong></td>
<td>2.2</td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Plotting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>City-wide</strong></td>
<td>1.7</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 8.9. MEAN GROUP SCORES ON SELECTED KNOWLEDGE VARIABLES BY SELF-ASSESSED SENSE OF DIRECTION.

<table>
<thead>
<tr>
<th></th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Sketch Mapping</td>
<td>1.8</td>
<td>1.4</td>
<td>0.9</td>
</tr>
<tr>
<td>Complexity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Knowledge of</td>
<td>1.5</td>
<td>0.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Shopping Areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Familiarity with</td>
<td>1.0</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Shopping Areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. City Centre:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.8</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>2.2</td>
<td>1.3</td>
<td>1.0</td>
</tr>
<tr>
<td>5. City-wide:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plotting</td>
<td>1.9</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>- Connectivity</td>
<td>1.6</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>6. Iconic Photograph</td>
<td>2.0</td>
<td>1.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Recognition.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Aerial Photograph</td>
<td>2.3</td>
<td>1.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Recognition.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Economic Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Knowledge of Industry.</td>
<td>1.8</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>9. Location of Industry.</td>
<td>1.7</td>
<td>0.9</td>
<td>1.1</td>
</tr>
<tr>
<td>10. General Recreation</td>
<td>1.3</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Knowledge.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Asian Population</td>
<td>2.5</td>
<td>2.4</td>
<td>2.1</td>
</tr>
<tr>
<td>distribution.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Afro-Caribbean</td>
<td>2.0</td>
<td>0.5</td>
<td>1.9</td>
</tr>
<tr>
<td>population distribution.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Unemployed population</td>
<td>1.6</td>
<td>0.9</td>
<td>1.4</td>
</tr>
<tr>
<td>distribution.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Description of</td>
<td>2.4</td>
<td>1.8</td>
<td>2.4</td>
</tr>
<tr>
<td>residential areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 8.10. **THE EFFECTS OF PERSONAL CHARACTERISTICS ON ENVIRONMENTAL LEARNING:**

<table>
<thead>
<tr>
<th>Personal Characteristic / Circumstance</th>
<th>Knowledge Type Affected</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Spatial Ability Tasks</td>
<td>Males superior to females</td>
</tr>
<tr>
<td>Residential location</td>
<td>Only specific local knowledge</td>
<td></td>
</tr>
<tr>
<td>Time spent searching for accommodation</td>
<td>Morphology (physical aspects)</td>
<td>Longer search-greater knowledge</td>
</tr>
<tr>
<td>Travel Mode</td>
<td>All knowledge generally (City-wide only)</td>
<td>Car drivers and cyclists superior</td>
</tr>
<tr>
<td>Secondary information sources</td>
<td>Economic and Social Aspects</td>
<td>Frequent readers of local newspapers superior</td>
</tr>
<tr>
<td>Expected length of stay</td>
<td>Social aspects</td>
<td>Longer-term stayers superior</td>
</tr>
<tr>
<td>Environmental nature</td>
<td>Spatial ability tasks</td>
<td>Exploratory groups superior</td>
</tr>
<tr>
<td>Sense of direction</td>
<td>Morphology (physical aspects) and general city knowledge</td>
<td>Sense of direction positively related to knowledge</td>
</tr>
</tbody>
</table>
N.B. Due to small sample sizes (particularly in the three year plus group) the tests reported here are to be used as indicators of probable relationships between the variables rather than as statistically verified findings.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Statistic</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gender x knowledge of Shopping Areas at 12 month stage of residence</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>2. Gender x City Centre Plotting Scores</td>
<td>Anova</td>
<td>0.04</td>
</tr>
<tr>
<td>3. Gender x City Centre Connectivity Scores</td>
<td>Anova</td>
<td>0.04</td>
</tr>
<tr>
<td>4. Gender x City Centre Connectivity Scores at 3 months of residence</td>
<td>Anova</td>
<td>0.08</td>
</tr>
<tr>
<td>5. Gender x City-wide Plotting scores at 3 years of residence</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>6. Gender x City-wide Connectivity scores at 3 years of residence</td>
<td>Anova</td>
<td>0.001</td>
</tr>
<tr>
<td>7. Place of residence x Length of residence</td>
<td>Chi Square</td>
<td>0.01</td>
</tr>
<tr>
<td>8. Length of time spent searching for accommodation x tenure</td>
<td>Chi Square</td>
<td>0.0009</td>
</tr>
<tr>
<td>9. Length of time spent searching for accommodation x knowledge of shopping areas</td>
<td>Anova</td>
<td>0.0009</td>
</tr>
<tr>
<td>10. Length of time spent searching for accommodation x familiarity with shopping areas</td>
<td>Anova</td>
<td>0.001</td>
</tr>
<tr>
<td>11. Length of time spent searching for accommodation x description of residential areas</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>Variables</td>
<td>Statistic</td>
<td>Level of Significance</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>12. Length of time spent searching for accommodation x City Centre plotting scores</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>13. Length of time spent searching for accommodation x City Centre connectivity scores</td>
<td>Anova</td>
<td>0.005</td>
</tr>
<tr>
<td>14. Motor vehicle driving x knowledge of shopping areas</td>
<td>Anova</td>
<td>0.001</td>
</tr>
<tr>
<td>15. Motor vehicle driving x familiarity with shopping areas</td>
<td>Anova</td>
<td>0.001</td>
</tr>
<tr>
<td>16. Motor vehicle driving x descriptions of residential areas</td>
<td>Anova</td>
<td>0.002</td>
</tr>
<tr>
<td>17. Motor vehicle driving x City-wide plotting</td>
<td>Anova</td>
<td>0.0001</td>
</tr>
<tr>
<td>18. Motor vehicle driving x City-wide connectivity</td>
<td>Anova</td>
<td>0.04</td>
</tr>
<tr>
<td>19. Motor vehicle driving x distribution of the Asian population</td>
<td>Anova</td>
<td>0.01</td>
</tr>
<tr>
<td>20. Motor vehicle driving x knowledge of swimming pools</td>
<td>Anova</td>
<td>0.01</td>
</tr>
<tr>
<td>21. Motor vehicle driving x knowledge of general recreation facilities</td>
<td>Anova</td>
<td>0.009</td>
</tr>
<tr>
<td>22. Travel mode x knowledge of shopping areas</td>
<td>Anova</td>
<td>0.0003</td>
</tr>
<tr>
<td>23. Travel mode x familiarity with shopping areas</td>
<td>Anova</td>
<td>0.0002</td>
</tr>
<tr>
<td>Variables</td>
<td>Statistic</td>
<td>Level of Significance</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>24. Travel Mode x description of residential areas.</td>
<td>Anova</td>
<td>0.0003</td>
</tr>
<tr>
<td>25. Readership of 'The Leicester Mercury' x length of residence.</td>
<td>Chi Square</td>
<td>0.0008</td>
</tr>
<tr>
<td>26. Readership of 'The Leicester Mercury' x shopping centre knowledge.</td>
<td>Anova</td>
<td>0.05</td>
</tr>
<tr>
<td>27. Readership of 'The Leicester Mercury' x knowledge of the location of industry.</td>
<td>Anova</td>
<td>0.002</td>
</tr>
<tr>
<td>28. Readership of 'The Leicester Mercury' x City-wide plotting scores.</td>
<td>Anova</td>
<td>0.0001</td>
</tr>
<tr>
<td>29. Readership of 'The Leicester Mercury' x City-wide connectivity scores.</td>
<td>Anova</td>
<td>0.0003</td>
</tr>
<tr>
<td>30. Readership of 'The Leicester Mercury' x City Centre plotting scores at 12 months of residence.</td>
<td>Anova</td>
<td>0.06</td>
</tr>
<tr>
<td>31. Readership of 'The Leicester Mercury' x City Centre connectivity scores at 12 months of residence.</td>
<td>Anova</td>
<td>0.002</td>
</tr>
<tr>
<td>32. Readership of 'The Leicester Mercury' x iconic photograph recognition at 12 months of residence.</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>Variables</td>
<td>Statistic</td>
<td>Level of Significance</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>33. Listening to local radio x length of residence.</td>
<td>Chi Square 0.03</td>
<td></td>
</tr>
<tr>
<td>34. Listening to local radio x descriptions of residential areas at 6 months of residence.</td>
<td>Anova 0.05</td>
<td></td>
</tr>
<tr>
<td>35. Listening to local radio x knowledge of the distribution of the Afro-Caribbean population at 6 months of residence.</td>
<td>Anova 0.05</td>
<td></td>
</tr>
<tr>
<td>36. Listening to local radio x knowledge of swimming pools at 6 months of residence.</td>
<td>Anova 0.02</td>
<td></td>
</tr>
<tr>
<td>37. Listening to local radio x knowledge of sports facilities at 3 years of residence.</td>
<td>Anova 0.04</td>
<td></td>
</tr>
<tr>
<td>38. Listening to local radio x knowledge of overall recreation facilities at 3 years of residence.</td>
<td>Anova 0.01</td>
<td></td>
</tr>
<tr>
<td>39. Expected length of stay x length of residence.</td>
<td>Chi Square 0.005</td>
<td></td>
</tr>
<tr>
<td>40. Expected length of stay x knowledge of residential areas.</td>
<td>Anova 0.02</td>
<td></td>
</tr>
<tr>
<td>41. Expected length of stay x knowledge of the distribution of the unemployed.</td>
<td>Anova 0.01</td>
<td></td>
</tr>
<tr>
<td>Variables</td>
<td>Statistic</td>
<td>Level of Significance</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>42. Expected length of stay × residential area descriptions at 12 months of residence.</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>43. Recreation outside own sector × description of residential areas.</td>
<td>Anova</td>
<td>0.004</td>
</tr>
<tr>
<td>44. Recreation outside own sector × City-wide plotting scores.</td>
<td>Anova</td>
<td>0.004</td>
</tr>
<tr>
<td>45. Recreation outside own sector × knowledge of the location of industry.</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>46. Recreation outside own sector × knowledge of general sports facilities.</td>
<td>Anova</td>
<td>0.07</td>
</tr>
<tr>
<td>47. Recreation outside own sector × overall recreation knowledge.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>48. Recreation outside own sector × iconic photograph recognition.</td>
<td>Anova</td>
<td>0.04</td>
</tr>
<tr>
<td>49. Place of grocery shopping × shopping centre knowledge.</td>
<td>Anova</td>
<td>0.05</td>
</tr>
<tr>
<td>50. Place of grocery shopping × shopping centre familiarity.</td>
<td>Anova</td>
<td>0.05</td>
</tr>
<tr>
<td>51. Place of grocery shopping × knowledge of the distribution of Asian people.</td>
<td>Anova</td>
<td>0.05</td>
</tr>
<tr>
<td>52. Place of grocery shopping × knowledge of the location of industry.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>Variables</td>
<td>Statistic</td>
<td>Level of Significance</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>53. Place of grocery shopping x aerial photograph recognition.</td>
<td>Anova</td>
<td>0.04</td>
</tr>
<tr>
<td>54. Place of grocery shopping x residential area description at 3 months of residence.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>55. Environmental disposition x City Centre connectivity scores.</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>56. Environmental disposition x City-wide plotting scores.</td>
<td>Anova</td>
<td>0.007</td>
</tr>
<tr>
<td>57. Environmental disposition x City-wide connectivity scores.</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>58. Environmental disposition x knowledge of the distribution of the Asian population.</td>
<td>Anova</td>
<td>0.01</td>
</tr>
<tr>
<td>59. Environmental disposition x general recreation knowledge.</td>
<td>Anova</td>
<td>0.01</td>
</tr>
<tr>
<td>60. Sense of direction x sketch mapping score.</td>
<td>Anova</td>
<td>0.03</td>
</tr>
<tr>
<td>61. Sense of direction x City Centre plotting score.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>62. Sense of direction x City Centre connectivity score.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>63. Sense of direction x City-wide plotting score.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>64. Sense of direction x City-wide connectivity score.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
<tr>
<td>65. Sense of direction x iconic photograph recognition.</td>
<td>Anova</td>
<td>0.004</td>
</tr>
<tr>
<td>66. Sense of direction x aerial photograph recognition.</td>
<td>Anova</td>
<td>0.02</td>
</tr>
</tbody>
</table>
CHAPTER NINE.

ENVIRONMENTAL LEARNING: AN OVERVIEW.

This Chapter aims to draw the various strands of the previous analysis together into an overall conceptualization of the environmental learning process. The study has, until now, separated knowledge of the city into three city elements; the physical, the economic and the social; and it has separated the determinants of this knowledge into two components; length of residence and personal characteristics. It was claimed at the beginning of this study that analysis was to be carried out within a holistic frame and yet, so far, discussion has been fragmented. Thus it is the purpose of this Chapter to bring the fragmented strands together.

These objectives present considerable problems. The study has obtained information about respondents' knowledge of the urban environment through measures which were various and therefore strictly, incomparable. Furthermore, it has been seen in Chapters Three and Five, that some of these measures (especially those pertaining to knowledge of spatial relations between the physical features of the city) are not well understood in terms of the nature of the demands that they place upon respondents (Carroll, 1978). These problems render the comparison between the various measures difficult.

Consideration will be give in this Chapter to the rating scores achieved by respondents for the various knowledge components. These rating scores, although subjectively awarded, do provide a yardstick against which comparisons can be made between respondents performance in the different knowledge tests. This is because, the rating scales were standardized and comprised of five categories; 'very good', 'good', 'average', 'poor' and 'very poor'. In some cases, answers to the knowledge questions were finite (for example where a respondent was asked to name the swimming pools in the city, it was possible that (s)he could name all of them and so achieve maximum points), and in such cases, the definition of a scoring system was easy. In others however, the scoring system needed to be imposed after the range of respondent responses were considered because there was no absolute answer (e.g. the free recall sketch maps). Although the scoring of respondent knowledge and performance thus proved difficult, the result in this research has been encouraging. It is believed that ratings are representative of the differences between individuals, groups and the different knowledge criteria. It is on the grounds of this confidence that discussion will now proceed into a consideration of knowledge differentials, although it should be stated that all observations made in this Chapter are of a relative nature, and are only intended as a broad conceptualization of the process of environmental learning.
Figures 9.1., 9.2., and 9.3. give the mean scores received by each length of residence group for each knowledge variable. The overall height of each bar shows the mean score achieved by the three year (plus) group and it can be seen that these are various which indicates that knowledge levels are also various. Each bar is then divided into shaded blocks the ceilings of which each represent the scores achieved by the younger length of residence groups. Thus the speed of acquisition of knowledge can be observed by comparing the proportion of the overall bar height which is comprised of the younger residence group blocks. These will be considered below.

The ratings received by the three year (plus) group were considered to be representative of those which would be attained by any group of people who had lived in a city for a few years and had thus reached a 'plateau' or stable stage in their environmental learning. The levels of knowledge that these ratings reflect are therefore those which all respondents would be expected to have achieved (at the group level) after three years of residence. It is here argued therefore, that rates of learning can be determined by comparing the mean group scores achieved by each length of residence group with those achieved by the three year (plus) group.

Because the values of the mean ratings received by the three year (plus) group vary between the different knowledge variables, it was considered that comparison between the various knowledge variables would be better achieved if the three year (plus) knowledge levels were standardized. Thus, the mean scores achieved by the three year (plus) group were converted into index scores of 100 and the mean rating score of each length of residence group on each variable, was similarly converted so that it might be expressed as a proportion of the score achieved by the three year (plus) group. (Such a procedure had already been carried out in Chapters Six and Seven in the sections on differential learning rates). In this way, the scores for each variable were made comparable.

In addition, it would be desirable here to calculate an overall rating score for each of the three city elements (physical, social and economic). However, this could only be done by calculating the mean of the above-mentioned, mean ratings. Because these mean ratings varied so greatly within each element class (Table 9.1.), it was considered that this would be erroneous and that a 'meaningless' measure would result from such calculations. Thus a comparison between the three city elements will have to be achieved through consideration of their various component measures.

Figures 9.4., 9.5., and 9.6. present theoretical learning curves for each of the knowledge elements represented in Table 9.1. These curves are not identified, and Table 9.1. must be consulted for this. The learning curves have been calculated using the mean scores achieved by each length of residence group on each knowledge variable and expressing them as a proportion of the scores achieved by the three year...
FIGURE 9.1.
THE AGGREGATE SCORES RECEIVED FOR THE PHYSICAL KNOWLEDGE ELEMENTS - BY LENGTH OF RESIDENCE.

N.B. Turn to page 223 for an explanation of this figure.
FIGURE 9.2.

THE AGGREGATE SCORES RECEIVED FOR THE ECONOMIC AND RECREATIONAL ELEMENTS - BY LENGTH OF RESIDENCE.

N.B. Turn to page 223 for an explanation of this figure.
FIGURE 9.3.
THE AGGREGATE SCORES RECEIVED FOR THE SOCIAL ELEMENTS
- BY LENGTH OF RESIDENCE.

N.B. Turn to page 223 for an explanation of this figure.
The curves represented in Figure 9.4. portray respondents' knowledge levels of the physical components of the urban area. A comparison of these curves with those represented in Figures 9.5. (economic elements) and 9.6. (social elements), shows that knowledge of these physical components was found to proceed in a much more uniform fashion (with respect to three year (plus) knowledge levels) than that of the economic and social elements. The standard deviations of values from the means of each of the three element classes at each length of residence stage, are given in the figures. It can be seen that these standard deviations are generally lowest for the physical element knowledge measures. The following discussion will consider the implications of this finding by considering each length of residence stage separately.

9.1. Knowledge of the City After Three Months of Residence.

Figure 9.1. shows that the mean scores awarded to the three month length of residence group for each of the physical knowledge tests were fairly similar, and that they averaged around 1.0. Figure 9.4. gives respondents' performance in the physical element knowledge tests relative to that of the three year (plus) group, and it can be seen that this relative performance ranged from twenty seven per cent of the three year (plus) group's attainment in the sequential photograph tests, to fifty two per cent in the citywide plotting exercises. Relative performance on the other physical element tests was fairly standard at the three month length of residence stage, and clustered between these two extremes. In all but one exercise, the three month group were found to be less than fifty per cent as successful at the physical tasks than the three year (plus) group.

In the economic exercises, the knowledge levels achieved by the three month group compared to those of the three year (plus) group can be seen to be more various (Figure 9.5.). This probably reflects the various nature of the knowledge elements
FIGURE 9.4.
A THEORETICAL LEARNING CURVE FOR KNOWLEDGE OF THE PHYSICAL ELEMENTS OF THE CITY.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>40.4</td>
<td>57.6</td>
<td>65.5</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>8.2</td>
<td>10.6</td>
<td>9.6</td>
</tr>
</tbody>
</table>

N.B. Turn to pages 223 and 224 for an explanation of this figure.
FIGURE 9.5.
A THEORETICAL LEARNING CURVE FOR KNOWLEDGE OF THE ECONOMIC
AND RECREATIONAL ELEMENTS OF THE CITY.

<table>
<thead>
<tr>
<th>Length of Residence</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>42.0</td>
<td>61.4</td>
<td>74.2</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>12.4</td>
<td>16.7</td>
<td>10.3</td>
</tr>
</tbody>
</table>

N.B. Turn to pages 223 and 224 for an explanation of this figure.
A THEORETICAL LEARNING CURVE FOR KNOWLEDGE OF THE SOCIAL ELEMENTS OF THE CITY.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>61.9</td>
<td>77.1</td>
<td>90.1</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>20.2</td>
<td>11.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

N.B. Turn to pages 223 and 224 for an explanation of this figure.
being tested, and the consequent variation in the knowledge of the three year (plus) group between these elements. This variation can be seen in Figure 9.2. The index scores for this category of city knowledge were found to range from 22.3% for familiarity with suburban shopping areas, to 64.8% for knowledge of the nature of industry. The majority of the index values however, ranged between thirty five and fifty per cent of the three year (plus) groups’ knowledge levels and were thus similar to those for the physical city elements. It can be seen that absolute knowledge values varied between the different knowledge types at every length of residence stage (Figure 9.2.) showing that respondents met with different degrees of success at the different tests. Variation in these scores at the three month stage was greater than that for the physical attribute questions, and this is likely to be due to the more diverse nature of these economic elements.

Figure 9.3. shows that the mean scores of the three month group were highest for the social variables (generally averaging around 1.5). At the same time, the scores achieved by the three year (plus) group were not significantly higher on these variables than those that they received for the physical and economic variables. Thus, the gap between the performances of the three month and three year (plus) groups was smallest for these social variables, and this can be observed in Figure 9.6. Index scores ranged from a minimum of forty seven for knowledge of the distribution of the Afro-Carribean population, to a maximum of ninety for knowledge of the distribution of the Asian population, and it can be seen in Figure 9.3., that in the case of the latter, the three month group were almost as knowledgeable about this attribute as the longer length of stay respondents.

It can be concluded from this therefore, that after three months of residence in the city, respondents will have achieved on average almost half the competence of a group of people who have lived in the city for three years or more (and thus the level of knowledge that people could be expected to attain) at tests of knowledge about the urban environment. This proportion will vary between the different knowledge elements, and is likely to be highest for the social element.

9.2. Knowledge of the City After Six Months of Residence.

It is difficult to draw any conclusions about the knowledge levels of the six month group on the physical elements because, as Figures 9.1. and 9.4. show, only two measures of this group were taken at this stage. These two measures were free-recall map complexity for which the six month group were found to score only fifty per cent of the three year (plus) group’s aggregate score, and the aerial photographs for which the index score achieved was sixty five (Table 9.1.) was achieved. The interpolated scores for the other knowledge aspects are not reliable as indicators of relative knowledge levels, as there is no reason to suppose that learning between the
three month and twelve month residence stages would assume a linear progression.

Index scores were again most various for the economic elements of the city (ranging from twenty nine to seventy seven per cent of the three year (plus) knowledge levels). The steepness of the curve gradient between the three and the six month stages (Figure 9.5.) shows the relative learning rates between these two periods. It can be seen that these gradients vary widely also. For knowledge of the nature and location of industry, and for familiarity with suburban shopping centres, changes in levels of knowledge between the two periods were slight, and for the latter, the actual mean ratings achieved by this length of residence group were very low (Figure 9.2.). On the other hand, great changes can be seen to occur in relative knowledge levels on the 'location of shopping areas', the 'knowledge of sports facilities' and the 'general recreation knowledge' variables. These changes are much steeper than any changes observable on either the physical (Figure 9.4.) or the social variable (Figure 9.5.) graphs. Figure 9.2. suggests that these knowledge types develop more in quantitative terms than the other knowledge types between the three and the six month stages, so it would seem that this period is important for the development of recreation and shopping facility knowledge.

Changes in knowledge levels of the social variables tested in this research between the three month and six month stages were found to be less dramatic (Figure 9.6.). Most change is observable on the 'character of residential areas' variable. Relative knowledge levels were seen to vary from between sixty six per cent to ninety two per cent of the three year (plus) group's aggregate knowledge scores.

This consideration of the relative knowledge levels of the six month length of residence group, has shown that there was a clear (but not uniform) progression of knowledge between the three and the six month stages. By this stage of residence, it could be summarized that respondents met with roughly sixty-seven per cent of the success in tests of environmental knowledge that they could ever be expected to achieve, but that this figure varied widely between the different knowledge elements.

9.3. Knowledge of the City After Twelve Months of Residence.

At the twelve month stage, several of the knowledge measures were not taken and therefore in certain cases, interpolation has to serve somewhat unreliably, as an indication of twelve month knowledge levels. On the physical knowledge elements, Figure 9.4. shows that respondents had attained relative index scores of between forty six and seventy six per cent of the three year (plus) knowledge levels. With the exception of the citywide plotting exercise scores, relative attainment can be seen to be more standardized between the different physical knowledge measures at this stage than they were at the three month stage. This is not so for the absolute values, which
show widely differing success rates in the physical variable tests. Little can be said about economic and social element knowledge at this stage, as few measures were taken.

A brief glance at the three theoretical knowledge curves (Figures 9.4., 9.5., and 9.6.) shows that by the twelve month length of residence stage, city knowledge generally could be expected to have progressed to a level which represents between seventy and eighty per cent of the asymptotic level of knowledge (represented in this analysis by the three year (plus) group's knowledge levels) that they could be expected to eventually attain. This is of course an oversimplification, the limitations of which, will be discussed below.

9.4. Knowledge of the City After Three Years (or more) of Residence.

The widely differing heights of the bars in Figures 9.1., 9.2., and 9.3. show the variations in overall mean scores achieved by the three year (plus) group on the different knowledge tests. Comparison of the three Figures shows that on average, this group received the lowest scores on the economic variables. It is difficult to draw more detailed conclusions from these graphs as the individual tests are not strictly comparable due to the unquantifiable variation in the levels of difficulty of each test.


The attempt in this Chapter to produce a broad conceptualization of the process of environmental learning has produced a comparative framework which is less useful than the findings which constitute its component parts. It is a gross-oversimplification, based on aggregate mean levels, and is only intended as a rough indicator of environmental knowledge progression. The problems of the incomparability of different types of environmental knowledge render it impossible to achieve a model of environmental learning which is any more precise than that which is presented here. These problems aside however, the discussion presented in this Chapter is useful as a yardstick against which to conceptualize learning.

It has been seen that the acquisition of knowledge proceeds at varying rates according to the nature of that knowledge, and that the eventual level reached is likely to be dependent on knowledge type. The discussion in this Chapter has offered a hint as to the nature of these differentials in learning rates. It has been seen that after three months of residence, respondents had achieved almost half the competence of respondents who had lived in the city for three years or more at tests of knowledge about the urban environment. This proportion varied widely between the different knowledge variables. A clear (but not uniform) progression of knowledge was seen to occur between the three and the six month stages of residence, and by six months,
respondents were found to possess between sixty and seventy per cent of the knowledge levels of the asymptotic group. By twelve months of residence, this figure had risen to between seventy and eighty per cent and thus knowledge acquisition can be assumed to progress slowly between this and the three year stage.
Table 9.1. KNOWLEDGE OF THE CITY AS A PROPORTION OF THE THREE YEAR (PLUS) GROUP KNOWLEDGE LEVELS.

<table>
<thead>
<tr>
<th>Physical Elements</th>
<th>3 Years (Plus)</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map Complexity</td>
<td>100</td>
<td>40</td>
<td>50</td>
<td>72</td>
</tr>
<tr>
<td>City Centre Plotting</td>
<td>100</td>
<td>49</td>
<td>-</td>
<td>76</td>
</tr>
<tr>
<td>City Centre Connectivity</td>
<td>100</td>
<td>38</td>
<td>-</td>
<td>64</td>
</tr>
<tr>
<td>City-wide Plotting</td>
<td>100</td>
<td>52</td>
<td>-</td>
<td>75</td>
</tr>
<tr>
<td>City-wide Connectivity</td>
<td>100</td>
<td>33</td>
<td>-</td>
<td>46</td>
</tr>
<tr>
<td>Direction Tasks</td>
<td>100</td>
<td>36</td>
<td>-</td>
<td>69</td>
</tr>
<tr>
<td>Sequential Photographs</td>
<td>100</td>
<td>27</td>
<td>-</td>
<td>61</td>
</tr>
<tr>
<td>Iconic Photograph recognition</td>
<td>100</td>
<td>41</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>Aerial Photographs</td>
<td>100</td>
<td>49</td>
<td>65</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic Elements</th>
<th>3 Years (Plus)</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of Industry</td>
<td>100</td>
<td>65</td>
<td>71</td>
<td>-</td>
</tr>
<tr>
<td>Location of Industry</td>
<td>100</td>
<td>41</td>
<td>42</td>
<td>-</td>
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<tr>
<td>Location of Shopping Areas</td>
<td>100</td>
<td>39</td>
<td>77</td>
<td>82</td>
</tr>
<tr>
<td>Familiarity with Shopping Areas</td>
<td>100</td>
<td>22</td>
<td>29</td>
<td>67</td>
</tr>
<tr>
<td>Knowledge of Swimming Pools</td>
<td>100</td>
<td>44</td>
<td>66</td>
<td>-</td>
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CHAPTER TEN.

SUMMARY AND CONCLUSIONS.

The research presented in this thesis has investigated the environmental learning and subsequent knowledge of four groups of individuals selected from a population comprised of postgraduate students and academic staff of Leicester University. The major aims of the study have been to gain a greater understanding of the process of environmental learning at the urban scale and to examine the products of this learning in order to understand more fully the nature and contents of cognitive representations of the environment. An appreciation of the differences between individuals in their environmental learning and the reasons for them has also been sought.

The city of Leicester has provided the environmental context for the study, although it has been argued that the results of the study could be transferable (in broad terms) to any urban context. As a study population, the respondents selected for the survey have been ideal in terms of their high degrees of similarity on demographic, life-style and geographical variables. Indeed, it would have been difficult to achieve such an internally homogenous group from another section of society. As a group which is representative of the population at large, this study population is not so robust. Indeed, the respondents constituting the study population are so unrepresentative of the 'general population' that the results of this investigation need to be considered carefully within the context of the study group and extrapolated to the general population with considerable care. This is not to say that such an extrapolation cannot be done. It is believed that many of the findings reported in this thesis would also have been found with a different group of people as subjects. Indeed the fact that many of the results achieved here are in agreement with the findings of previous studies bears this point out.

The study has been experimental in design, and has utilized a number of methods to extract information from individuals which have not been used before. As such it has been an exploration of methodological possibilities as well as an exploration of knowledge and learning. The discussion below will summarize the findings of this exploration.

The analysis presented in this thesis has concentrated on the roles of both time and personal characteristics in the acquisition of environmental knowledge and the formation of internal representations. Chapters Five, Six, Seven and Nine have presented the results of the former, and Chapter Eight has presented those of the latter. In the summary to follow, both time and personal characteristics will be considered as
interacting variables in an overall conceptualization of the determinants of environmental knowledge.

In an experimental study such as this, certain avenues of enquiry are likely to produce less significant and useful findings than others, and what were originally sidelines to the main concern can turn out to produce the most interesting findings. Similarly, the comprehensive treatment of the subject of environmental knowledge attempted here has resulted in a proliferation of findings which are interesting yet separate, and not easily summarized within an overall framework. For these reasons, it was considered that the conclusions to the study should take the following form: First, the most important findings of the study will be summarized (10.1.). Discussion will then follow which will set these findings in the context of the main concerns of the thesis (i.e. the nature of environmental knowledge and spatial representation - 10.2., the determinants of this knowledge - 10.3., and environmental learning - 10.4.). Any implications that the results of the study hold for methodology in environmental cognition research will be summarized in section 10.5., and future research avenues will be considered in section 10.6. The implications of the findings of the study for the field of education will be discussed in section 10.7. and a final comment (10.8.) will draw the thesis to a close.

10.1. The Major Findings of the Study.

These can be divided into three classes;

1. Macro-Spatial Ability and its effect on environmental learning and the resultant image.
2. The differential determining effects of personal characteristics.
3. Distortions in cognitive representations.


Macro-spatial ability might well be heralded on the basis of the findings of this study, to be the most important determinant of environmental learning and subsequent knowledge. It has been considered under the title of 'personality' in this research, even though strictly speaking this is an inaccuracy, and for the purposes of convenience, it has been regarded as synonymous with the concept of 'sense of direction'.

A strong relationship has been found to exist between macro-spatial ability (sense of direction) and environmental disposition. The latter has been identified as an important
determinant of environmental learning as it constitutes an individual's level of active interest in the environment and as such, influences the 'exploratoriness' of the individual in environmental contexts. It is believed that the relationship between these two variables (sense of direction and environmental disposition) is one characterized by circular causation, and thus both are important in the context of macro-spatial ability.

It has been found that accurate representations of the environment are not obtained spontaneously, but rather they are the result of a sustained effort and repeated trials in the environment (Kozlowski and Bryant, 1982). For this reason therefore, environmental disposition is a very important determinant of the development of these accurate representations. Sense of direction/orientational ability has also been found to be a deliberate and semiconscious process (Chapter Eight) and something which individuals are generally very well aware of (Chapters Five and Eight). Previous research has suggested that it may be an ability which is important to the self esteem of some individuals (Bryant, 1982), and the research findings here support this idea (Chapter Eight). Many respondents were seen to take a pride in their levels of environmental knowledge and their ability to perform the tests set before them. These were generally those people who rated themselves as 'above average' on the 'sense of direction' rating scale, and those who were classified as 'very exploratory' on the 'environmental disposition' measure. These findings have provided support for the thesis that spatial orientation/ability is a deliberate and semiconscious process, and that it is related to the personality of the individual.

Differences between individuals in their macro-spatial ability and environmental disposition might be due to differences in innate skills, developmental influences or a mixture of the two. No formal attempt has been made in the present research to clarify this uncertainty, but the strong links found between this ability and environmental disposition would seem to suggest that it is most likely to be most fully attributable to ontogenetic developmental influences. It would seem reasonable to expect that societal, social and sex-role conditioning might play their part in the differential development of these skills. If this is the case (and the results of this study would suggest that it is), then this has important implications for education, in as much as it will be possible to encourage the development of these skills through the education medium (see section 10.5.).

The present research has found that males have greater macro-spatial ability than females (Chapter Eight). This is another finding that strongly favours the 'nurture' argument in the context of spatial ability. Bryant (1982) found that 'sense of direction' played a greater role in the self esteem of males than of females. This might be one factor which accounts for the observed ability differences, and it again gives support to the idea that spatial orientation is a deliberately and consciously developed ability.
The above discussion has therefore established that macro-spatial ability is variable, deliberately and consciously developed, related to personality and most specifically to environmental disposition, is an aspect of self esteem for those who have above average degrees of competence in it and is probably a function of microgenetic developmental influences and is as such, a skill which people can be trained to develop. It is as well, subject to an understanding of the concepts of euclidean space, and thus, might be subject to certain innate capacities within the individual. More important than all of this however, is the support afforded by the findings of this study that this macro-spatial ability is a powerful determinant of environmental learning and subsequent knowledge. For example, 'above average' sense of direction respondents were found to have superior knowledge of the urban area on most of the knowledge variables examined in this study, as well as superior ability at the spatial ability tests (Chapters Five and Eight). It is suggested here that one of the reasons for this superior learning amongst this group is that the greater the spatial ability of the individual, the better developed will be his or her cognitive framework within which to incorporate spatial knowledge. This is because a cognitive framework for spatial information will need to possess the properties of space in some form, and the better understood these properties of space are by the individual, the better will be the spatial framework. The superior knowledge amongst 'above average' sense of direction individuals could also be partly explained by the fact that these people have been found to be those who are most interested to acquire this spatial knowledge (see above). The corollary of all this is that spatial ability as a determinant of environmental knowledge and the cognitive representations within which it is contained, will in turn effect the spatial behaviour of the individual, and hence everything that is of interest to the human geographer.

10.1.2. The Differential Effects of Other Personal Characteristics on Environmental Learning and Resultant Knowledge.

Macro-spatial ability is not the only variable which has been found to affect environmental learning. Figure 10.1. presents a flow diagram which attempts to show the relationships between environmental knowledge and the factors which have been found in this study to be its determinants. It can be seen that five major factors are thought to be accountable for variations between individuals in levels of environmental knowledge, and that these are the 'macro-spatial ability', 'characteristics of the environment', 'generic knowledge', 'interaction with the environment' and 'secondary information'. The nature of each of these is in turn, a function of a number of other factors which are also shown in Figure 10.1.

Macro-spatial ability has been considered above, and the characteristics of the environment will be mentioned in section 10.3. Table 8.9. (Chapter Eight) gave a summary of the effects of those personal characteristics found to be the most important determinants of environmental learning. It was seen in Chapter Eight that only two of
FIGURE 10.1.
A CONCEPTUALIZATION OF ENVIRONMENTAL KNOWLEDGE:
- THE FACTORS WHICH AFFECT ITS ACQUISITION.
these variables, 'travel mode' and 'spatial ability', were found to have any general effect on knowledge as a whole. The other variables exerted influence over only selected aspects of urban area knowledge.

Interaction with the environment is perhaps the most obvious of the factors represented in Figure 10.1., as a determinant of levels of environmental knowledge. The Figure shows that this factor is thought to be comprised of eight further factors which describe the individual's cultural and class background, demographic characteristics (e.g. gender, age, life cycle stage), length of residence, place of residence, the search for a residence, workplace, and travel and leisure habits. Some of these factors were controlled in this study (e.g. age, lifecycle stage, workplace), and thus haven't been examined as determining variables. Length of residence has been examined in this research more fully than any other variable. Differences in levels of knowledge between the four length of residence groups have been found with few exceptions to be greater than the differences between individuals within these groups, and this has provided a justification for the emphasis placed on the role of time in this study. More will be said about this factor in section 10.4. Amongst the other variables which are represented under the heading of interaction with the environment, only gender, travel mode, expected length of stay, residential location and the search for a residence have been found in this study to influence any aspect of environmental knowledge. Their effects will be summarized below:

Gender is a variable which might be expected to influence environmental knowledge. Studies in the past have suggested that males generally have a greater spatial spread of knowledge and this has been related to their different roles in society and the process of socialization. The respondent groups that have been the subjects of this research are atypical of the 'general population' in that greater degrees of equality between the sexes characterize them. Thus differential interaction with the environment between the sexes as a function of sex-role conditioning and enactment is unlikely to be a factor of importance here. Indeed, the knowledge of males and females were found to be equitable on all of the knowledge criteria. The only difference found between the sexes was differential performance in the spatial ability tasks (Chapter Eight, Table 8.9.) with males being found to perform better than females. It could be expected therefore, that within the general population, this superior spatial ability amongst males, combined with differences in environmental interaction will result in males having more comprehensive cognitive representations of the environment. Changing female roles within society are expected to diminish this advantage however.

Mode of travel within the city has been found in this study to affect most aspects of environmental knowledge, as well as performance on the spatial ability tests at the citywide scale (and therefore, understanding of citywide spatial relations). Generally those members of the study population who were car drivers or cyclists were found to
have greater knowledge about the city than those who travelled about the environment by bus or on foot. It was concluded that these differences are likely to be a function of both differential exposure to parts of the urban area, and of the differential necessity of learning about the spatial relations of an environment between those individuals who are required to be decision makers (in terms of wayfinding etc.), and those who are not (Chapter Eight).

Expected length of stay in the new environment was a factor which was examined as a determinant of commitment to an environment and thus interaction with it (Chapter Eight). This factor was found to influence respondents' learning of the social aspects of the city. Respondents who expected to live in the city for a period of more than one year were found in general to perform better in those questions that were concerned with the distribution of social groups within the city (Table 8.9.) than those who were going to stay for a year only. It was concluded that this finding should be treated with caution, although it does suggest that this variable can have some effect on environmental learning.

Residential location within the city was a variable which was not fully considered within this study because the locations of respondents were confined to a small area in the southeast sector. However, the slight variation which did exist between respondents' places of residence was found, not surprisingly, to lead to very local knowledge differences.

The amount of time that a respondent had spent searching for a residence was a factor which has been found to affect knowledge of the physical components of the urban area (Chapter Eight). Generally, those individuals who had been engaged in some sort of search activity in the Leicester environment had a greater knowledge of its contents than those who had not. In this respect, the study population are likely to differ from other migrants in as much as their search activities were rarely prolonged and often did not involve active interaction with the environment at all.

Generic Knowledge is the knowledge about environments in general that people have which is transferable to new environmental situations and helps them to come to terms with the spatial arrangements of functions and places within it. This is probably a very important variable in environmental learning, because adult migrants have a great deal of knowledge about previous environments from which it is possible to make inferences about the probable locations of certain urban functions. For example the migrant to a British city might expect to find the 'High Street' shops, banks, cinemas and theatres in the central area of the city. Indeed, it is not unreasonable to expect that people carry with them 'models' of urban environments not dissimilar to the classic models of urban morphology (e.g. Burgess, 1923, Hoyt, 1939). These models are likely to exist in the subconscious memory and are likely to differ in their levels
of complexity between individuals according to their previous environmental experience
(both residential and travel), their intellect and perception, their education and
upbringing, and their exposure to secondary sources of information (Figure 10.1.).

It has been concluded in the present research that this 'generic knowledge' is very
difficult to measure and quantify. In future research a useful exercise might be to
run group discussions or engage respondents in informal discussions which would
introduce the subject of a hypothetical city 'similar to those' with which the respondent
is familiar. The respondent could be encouraged to talk about such a city and the
contents therein, which might give the researcher an insight into the properties of that
person's 'generic model'. In the present research, this variable has been poorly
measured with respect to the number of different 'towns, cities or villages' the
respondent had lived in, and no relationship was found between this and environmental
learning (Chapter Eight).

Finally, the role of secondary information in environmental learning has been considered
(Chapter Eight). These have been identified in the context of the Leicester
environment as local newspapers, local radio and other publications concerning the urban
area. It was concluded that it is likely that exposure to secondary information sources
will promote environmental learning, and that the sort of information that the learner is
likely to amass from these sources will be mostly concerned with the economic and
social aspects of the urban area rather than information regarding its physical make up.
It was also concluded that it is possible that exposure to visual material from these
sources (e.g. photographs) concerning the urban area will aid the process of place
recognition. Overall therefore, it was proposed that secondary information will
contribute to the development of a coordinated and comprehensive mental system of
reference about urban habitats, and that the more exposed a person is to these
sources, the more likely (s)he is to have a well developed knowledge of the urban
area.

10.1.3. Distortions in Urban Cognitive Representations.

The findings of this study have suggested that the mental organisation of the city
becomes subverted to a particular orientation as length of residence increases (Chapter
Five). This orientation tends in the direction of the city centre along the primary
route between the city centre and place of residence. It exists at any scale in the
urban environment (this subversion was observed in exercises carried out at both the
city centre and citywide scales of environment) and is constant in character between the
various scales. In addition, it has been found that people are likely to rationalize the
spatial relations between places in this subverted representation by converting the actual
configuration of the path network into a simpler 'geometric' arrangement of streets
which follow north-south and east-west orientations and meet at right angles. This was again observed at both the city centre and citywide scales of environment which would suggest that the finding is not peculiar to a particular Leicester environment. Thus the respondents who were the subject of this study were found to rationalize the alignment of the London Road (A6), which in most cases was the route about which their orientation of the city had become subverted, to a north-south aligned road, rather than recognise its true northwest-southeast alignment. This tended to lead to a predominant clockwise rotation of their image of the city. Again, this rationalization was found to become increasingly common amongst respondents as length of residence increased, which would suggest that a common perception exists amongst the population of particular areas of the city which develops over a period of time. Such a rationalization of spatial relations in the cognitive representation is probably common, although it has not been expressed as such in the findings of similar research. Previous research has however established the tendency for respondents to ‘good-figure’ their sketch maps of urban areas (e.g. Pocock, 1976), and it is argued here that this is essentially an observation of the same process.

Respondents were also found to foreshorten north-south distances and exaggerate east-west distances (Chapter Eight). It is not known whether this is a function of the particular orientation system imposed on the city by the individual (which is dependent on place of residence - see above), and thus peculiar to this group of respondents only.

A number of different methodological techniques have been employed in this study to examine the nature of cognitive representations, and they have all indicated the tendency for people to subvert their orientations and rationalize spatial relations. Such a convergence in the results of these various methods is taken here to be an indicant of the strong likelihood that these observations are true reflections of the properties of peoples’ cognitive representations.

It has been seen above that orientational systems and rationalizations of spatial relations are independent of environmental scale. However, distance cognition was found to differ with environmental scale, and it was concluded that this process may be subject to different forces at different scales of environment (section 5.4).

Finally, evidence has been found for high degrees of inflexibility in spatial representations and this inflexibility was found to manifest itself in a number of different ways. First it was clear that conceptions of spatial relations between places or landmarks in the urban area were often not metrical conceptions, but instead were topological conceptions. As a result, respondents would often describe the location of a place in terms of the route that would be taken to get there, and this route would often not be the most direct. Similarly, when presented with a representation of the
environment in from a plan perspective (e.g. an aerial photograph), these topological relations could not be translated into a perspective which would enable the respondent to make inferences about the locations of objects, and hence enable the recognition of a known object. Second, it became clear that images of the environment can be inflexible to the extent that a view of a place or building from a new perspective in the context of the interview, would often render the respondent incapable of recognizing the subject. It was concluded that images possess some of the qualities of photographic stills (Chapter Five). It was also found in Chapter Five that these 'cognitive maps' could not always be relied upon to solve a novel problem even if the information required to solve the problem was contained within them. It is likely that macro-spatial ability has a role to play in differences between individuals in the degrees of flexibility which pertain to their cognitive representations.

10.2. The Nature of Cognitive Representations of the Environment and the Knowledge Which They Contain.

Because environmental knowledge is dependent upon the existence of an understanding of the spatial relations between the elements of that environment, researchers in the field of environmental cognition have assumed that this knowledge possesses a spatial structure. It would indeed be hard to imagine how spatial knowledge could be stored and organized in the absence of some sort of spatial structure. The body of environmental knowledge contained within the brain with its accompanying spatial structure has come to be denoted by the term 'cognitive representation' and conceived as possessing some of the properties of euclidean space. This may not be a realistic conception, but it would be hard to imagine an alternative form that this knowledge might take. Consequently, a study of environmental knowledge is a study of cognitive representations, and as such, also a study of levels of understanding which individuals have pertaining to the spatial relations between the various components of the environment.

Besides an understanding of the spatial relations pertaining to an environment, knowledge of the urban area is comprised of numerous and various items of information which relate to every aspect of the city's constitution. For the sake of convenience in this study, these 'items' have been grouped into three classes which represent the 'physical' (which incorporates knowledge of spatial relations), the 'economic and recreational' and the 'social' aspects of the city.

Environmental knowledge has been found to vary in character and extent between individuals and with length of residence. In all cases, a clear progression of knowledge over time has been seen to occur. It has been seen that cognitive representations are egocentric distortions of reality, but that these distortions hold several similarities amongst people from the same area of the city.
Knowledge of spatial relations within the city has been found to be dependent on environmental scale. It would seem that environments become easier to conceptualize spatially the smaller they are (which is perhaps not surprising), but this is important in the context of environmental learning and ability because it will lead to differentials in the speed of acquiring an understanding of spatial relations at different scales, and thus consequential differences in the ability to learn about the contents of such environments.

Respondents were also found to be selective in their gathering and retention of environmental information. In common with other studies, evidence was found here for high degrees of restriction in the spatial extent of knowledge, both sectorally (i.e. respondents having limited knowledge of all areas of the city except their own residential sector), and concentrically (ignorance extending also into those areas of the respondent's own residential sector located further away from the city centre than his or her own place of residence). Personal mobility by way of the travel mode that the respondent has at his or her disposal was found to affect the spatial extent of knowledge (Chapter Eight), with those respondents who had access to a bicycle or car generally demonstrating a greater spatial spread of information. Residential location in the city, along with exposure to secondary sources of information (e.g. the local press) and expected length of residence in the city, were all factors which were also found to influence the spatial spread of information (Figure 10.1).

Respondents were found to possess a predominant way of viewing the social aspects of the city (Chapter Seven). Analysis found that knowledge of social distributions in the urban area is comprised of a rich collage of snippets of qualitative information which are concerned mostly with the nature of the physical fabric and the nature of its inhabitants. People were on the whole, well aware of the distribution of ethnic minority populations and many were able to name unemployment blackspots in the city. Much of this knowledge was found to be acquired quickly after moving to the city.

10.3. The Determinants of Environmental Learning and the Resultant Cognitive Representations of the Environment.

It has been seen that the speed, nature and effectiveness of environmental learning are dependent on a number of factors which pertain to the individual, both in terms of his or her personal qualities, and his or her life-style and interaction with the environment. It has also been seen that these factors operate differentially on different aspects of environmental knowledge, and the nature of these 'operations' have been identified. On the basis of this insight therefore, it may be possible to predict the different levels of knowledge that an individual is likely to have about the various aspects of the environment from a knowledge of these factors as they pertain to that individual.
Of the five major determining factors shown in Figure 10.1., the 'characteristics of the environment' is the only one which has not received special attention in this study. Spatial relations within environments are likely to vary with regard to the levels of difficulty that they present to the newcomer who is seeking to understand these relations. It is here believed that the 'legibility' of spatial relations within an environment will be primarily a function of the spatial configuration of the path network, and it would seem reasonable to expect that the simpler this configuration (e.g. perhaps a grid-pattern), the easier will the task of grasping these metrical relations. Little research has been carried out in this area. It would be interesting to see what configurations people find most simple to comprehend, and whether this is variable between individuals and perhaps dependent on past experience and generic knowledge. This study was undertaken in one environment only, and hence this influence on environmental learning could not be investigated.

It has been seen that a particularly important determinant of environmental knowledge is macro-spatial ability. Other important influences can be summarized under the headings of 'interaction with the environment', 'generic knowledge' and 'secondary information sources' (Figure 10.1), and these have been discussed in section 10.1.2. above. Evidence has also been found to suggest that these personal factors exert differing degrees of influence over learning at the different stages of the learning process (Chapter Eight). Small sample numbers in this study prevented further investigation in this area.

10.4. Environmental Learning.

Knowledge about the urban environment has been found to progress over the course of the first three years of residence in a city in such a way as it is possible to monitor changes between different periods and always find an improvement over the last period. This might seem like an obvious statement, but when this study was conceived, it was not known whether such clear relationships as have been found between knowledge and length of residence would be present or could be elicited. For many of the knowledge variables, the bulk of learning was found to take place in the first year of residence, commonly fifty per cent of this occurring in the first three months (Chapter Nine). Learning rates were found to vary however according to the nature of the knowledge variable being investigated (Chapters Six, Seven and Nine).

Learning rates were also found to be affected by several of the personal variables which have been examined in this study, and these personal variables were found to exert differential effects on the different knowledge aspects (Chapter Eight). The personal variables were also found to exert different influences at different times in the learning process. Very important is the effect of macro-spatial ability in environmental learning, and it has been suggested that this ability will determine the
comprehensiveness of the individual's understanding of spatial relations, and thus the form of his or her cognitive framework within which amassed information is placed. It is suggested therefore that macro-spatial ability is the most important of the factors investigated here (and as has already been seen, this study has not investigated all the factors which might influence environmental learning), as a determinant of the speed and effectiveness of environmental learning.

10.5. Methodological Review.

This study has met with several successes and several difficulties and many of these have been of a methodological nature. As an experimental study, some of the techniques used and enquiries embarked upon were of an experimental nature, incorporated in the research in order that their possibilities might be assessed as much as their results might provide some answers. The methodological successes of the study will therefore be reviewed first, and then a discussion of the difficulties that have been encountered will follow.

First, the framework of analysis adopted in this study could be regarded as a success. The four length of residence groups were found to differ from each other in their knowledge levels in a way which was consistent with the learning hypothesis. Similarly, between group differences were found to be greater in most cases than within group differences. The part-longitudinal, part-cross-sectional framework adopted presented little problems, although it could be criticized for its inconsistency. In retrospect it would have been preferable to have adopted a cross-sectional framework throughout as this would have allowed greater uniformity in the questions and tests that the four groups responded to.

The free-recall sketch maps were successful at eliciting differing degrees of comprehensiveness of respondents' cognitive representations of the city centre, and it is believed that they did this accurately. They were however, less useful than the abstract spatial tasks (plotting and connectivity exercises) at eliciting information about the properties of these cognitive maps. The success of these latter tests proved that people can successfully perform abstract spatial tasks, even at stages which are early on in the learning process. They also proved that people are prepared to perform such tasks if they are given good instructions and the right encouragement. Performance of the tasks was found however to be more difficult at the larger environmental scale, and this might be a trend that would continue further as scale increases. These tests were extremely useful in enabling the researcher to assess the accuracy of the cognitive image (in a broad sense), and actual measurements were made from them. It is believed that they suffer little from interference brought about through differences in graphic ability (a criticism often given to sketch mapping).
The self-assessment technique used to determine respondents' sense of direction was successful in realistically representing differences between individuals. This conclusion arises from the results of several tests which found that those respondents who rated themselves as 'above average' were also those who were most successful at tests requiring the operation of spatial ability. It can be concluded therefore that self-assessment is a reliable technique in this context as people are generally well aware of their orientational ability.

Discussion will now turn to the difficulties encountered in the study. First, attempts to establish learning curves and a general model of environmental learning based on the differences between the learning curves of the different knowledge variables met with limited success due to the incomparability of the different types of knowledge. The reliance on aggregate group means for the construction of these learning curves is undesirable, but necessary for such analysis. The resulting conceptualization is useful only in the broadest sense as a yardstick, and it can be concluded that, due to the difficulties outlined above, it is impossible to produce a model of environmental learning that is any more precise than that which is presented in this thesis.

The major methodological problem which has faced this study is one which is inherent in the field of environmental cognition research. This was discussed in Chapter Five and will be reiterated here. The problem is twofold: First, there is the difficulty of trying to discover modes of cognitive organisation by examining their outcome (i.e. spatial behaviour, performance in tests etc.). There is obviously no other way to try to gain an understanding of these cognitive structures; but the interpretation of these outcomes is subject to error both in its translation from the brain to some manifest form, and in the interpretation then given of this manifest form by the researcher. It was seen in section 5.8. that empirical findings resulting from inquiry into cognitive processes are very much dependent on the methodology employed to discover them, and that many of the apparent contradictions in the results of research in the field may be attributable to differences in methodology employed. Second, a set of tests are required that measure exactly what they are supposed to measure, and that can be generally accepted and agreed upon by all workers in the field. Before this is possible, the nature of the spatial skills that are required to carry out various spatial tasks, both in the field and in the test situation need to be established. At present, the techniques which are used are only 'thought' to be testing what they are supposed to be testing. From the basis of such uncertainty, no conclusions yielded by the methods employed in the field can be heralded to be indisputable 'truths'. Indeed in the present research, several lines of enquiry proved inconclusive as a result of these methodological difficulties (e.g. spatial versus sequential element dominance in cognitive maps, and the developmental stages of environmental learning). Once greater understanding is achieved, researchers need to go on to develop a set of tests which will measure spatial ability. Until such a set of 'tools' exist for this type of enquiry, the field
will continue to be characterized by conflicting evidence and inconclusive results.

10.6. Further Research.

This thesis has connoted four major research thrusts which are needed in the field of environmental cognition research. These will be discussed here in turn.

First, research needs to be carried out which will refine the set of methodological tools which are at the disposal of practitioners in the field. In particular, an insight is needed into the exact nature of the cognitive demands of the different tests which researchers are asking respondents to perform, in order that practitioners can be sure that they are measuring what they think they are measuring. It has been seen in the above discussion that the lack of clarity in this area has resulted in conflicting research findings in the field. This is therefore an important challenge for cognitive psychologists. Once there is a greater level of understanding about the exact nature of the cognitive tasks that researchers are asking their subjects to perform, environmental cognition research will be at last free from the shackles of its present methodological indecision. It will become clear which methods to use in which circumstances, and the establishment of an accepted methodology will be within reach.

This thesis has highlighted the importance of macro-spatial ability in environmental learning and spatial cognition. Little really is known about this ability at this stage. Further research should investigate more fully the role of spatial ability in environmental cognition and seek an understanding of its determinants. Within the latter, it is important to establish the relative importance of 'nature' and 'nurture' in order that the practicalities of training people to develop their spatial ability might be appreciated (Section 10.7.).

Moving away from the areas of competence of the psychologist and into a more general arena, investigation also needs to proceed into the area of generic knowledge about the environment, in order that its nature and determinants might be better understood. It was suggested in section 10.1.2. that people might possess knowledge about environments in general which provides them with a 'model' (perhaps similar to the traditional models of urban morphology) from which they are able to infer the locations of different city functions in a city which is novel to them. This perhaps an obvious suggestion, but one which needs further investigation.

Finally, the role of the environment in environmental learning needs to be investigated more fully. This is a variable which is often overlooked in environmental cognition research, but it is one which is important, especially in the context of comparisons between the findings of research conducted in different environments. Contradictory findings between different research projects are explained in terms of differences in
research methodology, when it might be the case that it is the environments themselves which have introduced the variability. A greater understanding of their role therefore should result in improved understanding in the field in general.

10.7. Implications For Education.

The importance of macro-spatial ability and 'environmental disposition' in the development of cognitive representations of the environment have been established in this thesis. It has also been established that accurate cognitive representations aid the individual in his or her daily life, thereby affecting spatial behaviour. It therefore follows that optimization (however defined) in spatial behaviour will be dependent on the comprehensiveness and quality of the 'mental map'. Conversely, a poorly developed cognitive representation will result in less than optimum spatial behaviour, and perhaps even, poorer life-chances. An extreme example of this might be the person who easily gets lost, and who will avoid getting into a situation where he or she is alone in a novel environment. This will restrict his or her spatial behaviour possibly to a detrimental degree.

Speculation as to the role of macro-spatial ability in the quality of life might continue, but if it is accepted that the role is probably a realistic one, it will also be accepted that it would be useful to help individuals to develop this ability if it is possible to do this. Certainly it might be possible to train people to take more of an interest in the environment (environmental disposition), a factor which has been identified as an important aspect of ability (Chapters Five and Eight). Additionally, if macro-spatial ability is determined by developmental factors even only partly, then it will follow that once these factors are established, it will be possible to incorporate the right combination into the school curriculum, and thus aid the development of the skill.

As a corollary of this, macro-spatial ability might also be important to geography education. Certainly the understanding of the subject is dependent on the understanding of certain spatial concepts such as 'distribution', 'location', and the conception of two-dimensional space. Thus, measures might be introduced into the geography syllabus which would aim to improve macro-spatial ability.


This thesis has examined the patterns of environmental learning amongst a group of postgraduate students and staff who were new to the University in the Octobers of 1975 and 1976. It has done so by examining the levels of knowledge held by four sample groups who had been in the city for differing lengths of time, these being, three months, six months, twelve months and three years (or more). A wide range of techniques have been employed in order to elicit information about the nature and
quality of the information which is contained in the resulting cognitive representations of the environment. The merits and disadvantages of these have been reviewed.

This investigation has resulted in the attainment of information regarding the nature of cognitive representations of the environment, the determinants of the quality of these representations and the nature and determinants of environmental learning. In particular, cognitive representations were found to possess distortions of reality, and the nature of these distortions has been realised. Macro-spatial ability and travel mode have been identified as the most universally important determinants of the quality of environmental knowledge and the speed of learning. It has been stated however that this research has not investigated all the possible determinants. Several future avenues for research have been identified and the educational implications of the research findings have been reviewed.
APPENDIX 'A' - AN EXAMPLE OF AN INTERVIEW SCHEDULE

UNIVERSITY OF LEICESTER
THREE MONTH INTERVIEWS:
INTERVIEW SET THREE
INTERVIEW NO. ______
DATE: ________________
SEX: ________________

1. When did you first come to Leicester to live?
   MONTH ______________ YEAR ______________

2. Whereabouts do you live? ____________________________

3. Is your accommodation:
   YOUR OWN  PRIVATELY RENTED  UNIVERSITY  OTHER

4. Have you always lived where you are now? YES  NO
   If no, where did you live before and for how long?
   PLACE ___________________________ LENGTH OF STAY ____________________________
   1. ___________________________ ____________________________
   2. ___________________________ ____________________________
   3. ___________________________ ____________________________
   4. ___________________________ ____________________________
   5. ___________________________ ____________________________
   6. ___________________________ ____________________________

5. How much longer do you expect to live in Leicester? ____________________________

6. Whereabouts do you work?
   LOCATION PROPORTION OF TIME
   PRIMARY ___________________________ SPENT THERE ____________________________
   SECONDARY ___________________________ ____________________________
   3. ___________________________ ____________________________
   4. ___________________________ ____________________________
   (to be used for more than 1 location)

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7. Where do you go to within this City on a regular basis? (e.g., places where you drink, play sport, etc.)

<table>
<thead>
<tr>
<th>PLACE</th>
<th>FREQUENCY</th>
<th>TRAVEL MODE</th>
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</table>

8. Do you have/drive a motor vehicle in Leicester?
   YES   NO

9. How do you usually travel to work?
   CAR   BUS   TRAIN   CYCLE   WALK
   COMBINATION OF MODES: Which? ______________________

10. Which parts of the surrounding countryside have you most frequented?  NONE
     ____________________________________________
     ____________________________________________

11. Which area(s) of the city do you consider you know best?
     ____________________________________________
     ____________________________________________
     ____________________________________________

12. Where do you usually do your grocery shopping?
     ____________________________________________
     ____________________________________________

13. Do you ever read the 'Leicester Mercury'?
    OFTEN   INFREQUENTLY   NEVER   NOT ANY MORE

14. Do you ever listen to local radio?
    OFTEN   INFREQUENTLY   NEVER   NOT ANY MORE

15. How many Towns/Cities/Villages have you lived in (3 months duration or over)?
   a. From age of 5 to age of 18 ______________________
   b. From age of 18 to present ______________________
      (include town spanning 18 twice)
16. On a scale of 1 to 5, how would you rate how well you know Leicester if 1 is VERY WELL, 5 is NOT WELL AT ALL and 3 is the average figure? 

1  2  3  4  5 

17. How aware are you of the following characteristics of Leicester on a scale similar to the last? Where: 1 is VERY AWARE, 5 is NOT AT ALL AWARE and 3 is average.

a. The Shopping Areas ____________________________  
b. The Housing Stock ____________________________  
c. The distribution of ethnic groups ________________  
d. The leisure facilities ____________________________  
e. The location and nature of industry ________________  

18. On this blank piece of paper, could you please draw a map for me of Leicester city centre. You may ask me any questions that you wish. Please put on your map features such as roads, major landmarks like shops etc. and any other relevant information. 

19. Which shopping centres/areas from the following list would you:

<table>
<thead>
<tr>
<th></th>
<th>a. Be able to find quickly on a street map</th>
<th>b. Be able to name 5 shops in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Centre</td>
<td></td>
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<tr>
<td>Evington Rd</td>
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<tr>
<td>Stoneygate/Alandale Rd</td>
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<td>Queens Rd</td>
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<td>Oadby</td>
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<td>Wigston</td>
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<tr>
<td>Narborough Rd</td>
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<td>Belgrave Rd</td>
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<tr>
<td>Beaumont Leys</td>
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<td>Thurmaston</td>
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<td>Humberstone</td>
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<td>South Wigston</td>
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<tr>
<td>Glenfield</td>
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</tbody>
</table>
20. Here is a piece of paper with a grid and two symbols on it. At the bottom of the sheet there is a key showing what the symbols on the grid represent, and some symbols for other landmarks/places in the central area of Leicester. Could you please complete the map by placing the other symbols on the grid in relation to their relationship with each other in real space?

ADDED ALL SYMBOLS JUST SOME SYMBOLS NO ATTEMPT

21. Here is a map with the previous landmarks correctly located in geographical space. Could you draw in the roads around them that link them together in real space?

LINKED ALL SYMBOLS JUST SOME SYMBOLS NO ATTEMPT

22. Can you describe the following residential areas?

a. OADBY

b. BELGRAVE

c. BRAUNSTONE

d. BEAUMONT LEYS

e. NEW PARKS
23. Here is another piece of paper with a grid and two symbols. This time we are representing Leicester as a whole. Could you repeat the exercise as before by plotting the symbols in the key in relation to where the places are in real space?

ADDED ALL SYMBOLS   JUST SOME SYMBOLS   NO ATTEMPT

24. Like before, here is a map with the places correctly located in geographical space. Could you draw the roads in around them that link them to each other.

ADDED ALL SYMBOLS   JUST SOME SYMBOLS   NO ATTEMPT

25. Referring to the outline map of residential districts in Leicester, where do you suggest you would find the highest concentration of the following ethnic groups:
   a. ASIAN PEOPLE
   b. AFRO-CARIBBEAN PEOPLE

26. Also referring to the outline map, where would you expect to find the highest concentration of unemployed people?

27. Have you ever thought of the city in these terms before?

YES   NO

28. Have you ever read any books or any other publications about Leicester?

YES   NO
If yes, what?

29. What are Leicester's main industries?

30. Where are these main industries located? (If Known)

DON'T KNOW
31. Could you give me the names of:
   a. Any swimming pools in the city ________________
   b. Any parks _________________________________
   c. Any sports centres __________________________
   d. Any other public sports facilities ____________

32. You are in a new city for an afternoon on your own and you have just arrived by train at the station where you must make your connection later. You have time to kill. Do you:
   a. Make your way to the central shopping area following signposts or asking people, making sure you memorize the route back.
   b. Decide to explore the city and start walking in a direction that takes your fancy knowing that you will easily find your way back because you always can.
   c. Make your way to the nearest coffee shop or place to eat or place to sit and pick up a newspaper or book to read for a couple of hours.

33. If you are taken to a place that you have never been to before and, a week later, you unexpectedly have to go there again, how do you find it?
   a. Ask the person who took you last week how to get there as you have no idea.
   b. Have a slight idea but consult a map or somebody to be sure.
   c. Start out on the journey knowing you will probably remember the route as you are going along.
34. When on holiday in a new place, do you:
   a. Feel it absolutely necessary to go everywhere and see everything, exploring every nook and cranny and often straying from the normal path of tourist traffic.
   b. Like to see the major sites but also like to relax by the pool/sea, etc.
   c. Stick to the area around the hotel/camp site etc. as everything you need for a good holiday is usually there.

35. How would you rate your sense of direction abilities on this 7 point scale ranging from good at +3 to bad at -3?

   GOOD  BAD
   +3  +2  +1  0  -1  -2  -3

36. I have four sets of photos depicting four journeys from one place in Leicester to another. Could you tell me where we are at the journey's outset and at its finish and tell me if you recognize the places in the intervening shots.

   JOURNEY ONE
   OUTSET LOCATION: __________________________________________
   INTERVENING SHOTS:
   1. _______________________________________________________
   2. _______________________________________________________
   3. _______________________________________________________
   4. _______________________________________________________
   5. _______________________________________________________
   6. _______________________________________________________
   7. _______________________________________________________
   END LOCATION: ___________________________________________
JOURNEY TWO
OUTSET LOCATION: ____________________________
INTERVENING SHOTS:
1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________
6. ____________________________
7. ____________________________
END LOCATION: ____________________________

JOURNEY THREE
OUTSET LOCATION: ____________________________
INTERVENING SHOTS:
1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________
6. ____________________________
END LOCATION: ____________________________

JOURNEY FOUR
OUTSET LOCATION: ____________________________
INTERVENING SHOTS:
1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________
END LOCATION: ____________________________
Here are some photographs of places in Leicester. The first set are places in the central area and the second are places in greater Leicester. Could you identify the subject of the photograph, tell me where the place is and say if you would know how to get there or not.

**SET ONE: CITY CENTRE**

<table>
<thead>
<tr>
<th>Photo</th>
<th>Subject</th>
<th>Location</th>
<th>Get There</th>
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**SET TWO: GREATER AREA**

<table>
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<th>Photo</th>
<th>Subject</th>
<th>Location</th>
<th>Get There</th>
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38. We are standing in Town Hall Square facing the Town Hall and somebody approaches and asks for directions to the following places. Could you please direct them to:
   a. The Clocktower
   b. St. Margarets Bus Station

39. We are now standing outside the railway station and somebody wants directions to:
   a. St. Martins Centre
   b. Town Hall Square

40. Could you please point out to me any features on these two aerial photographs that you can recognise and identify.
   (TAPE)
   PHOTO 1
   PHOTO 2
KEY

+ City Centre (Clocktower)  [ ] AbbeyPark

○ University  ● Highfields:Evington rd/East Pk rd junction

△ Oadby  ▲ Royal Infirmary

□ Wigston
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