THE RELATIONSHIP BETWEEN ENVIRONMENTAL

SETTING AND CURIOSITY IN CHILDREN

by

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Submitted to the Department of City and Regional Planning in partial
fulfillment of the requirement for the degree of Master in City Planning.

Applying psychological theory to an understanding of children's interraction
with their environment, the thesis tests the hypothesis that this interraction
with differing physical environments will produce differing levels of
curiosity and exploration. Three areas were chosen for study which are
similar in social and economic characteristics but which differ both in
visual complexity and in the number and variety of behavior settings available.
Children from each of the areas were interviewed to determine a) the number
and kinds of behavior settings typically engaged in by each group, b) the
pattern of exploration carried out in each environment, c) the level of envir-
onmental complexity required by each group to stimulate curiosity, and
d) the level of curiosity exhibited by the subjects in response to induced
stimulation.

The findings, derived from the results of a questionnaire, maps both drawn
and filled-in by the subjects, and the verbal response to photographs are
summarized as follows:

a) Behavior settings
Of the test neighborhoods, the Lower Roxbury section of Boston is
the most complex, both visually and in the number and variety of
behavior settings entered into by its residents. The area appears
to offer more "unconventional," even more "dangerous" activities
and behavior settings than either of the other two environments,
particularly Columbia Point.

The South End is next in visual complexity and exceeds Columbia
Point in the variety of behavior settings which are typically
engaged in. This is due in part to the presence of unconventional
types of behavior settings, and in part to the greater number of
sub categories of behavior settings which can be found in the area.

Columbia Point is the simplest environment of the three and offers
only a limited number and variety of behavior settings. Most of
these settings are extensions of the home and are in close proxim-
ity to the residential structures. The others are fairly conven-
tional - parks, playgrounds, etc.

b) Exploratory Behavior in the Environment
Environmental differences are reflected in the pattern of explora-
tory activity which is carried out in the three areas. The activ-
ity of Lower Roxbury children is concentrated within an area of
slightly more than a quarter mile. The children do not travel
much beyond this circumscribed area, unless it is to visit some
place of interest in the city.

The pattern of activity of Columbia Point children is an exaggeration of the Lower Roxbury pattern. What would seem to be everyday activity is confined to a very limited area - more limited than either Lower Roxbury or South End. However, there is also a wider and more abundant scattering of occasional activity over the city.

In contrast to the other groups, South End children appear to cover a wider area around their neighborhoods, venturing into areas which are contiguous to their own.

c) Complexity required to stimulate curiosity
The complexity of a visual image required to generate interest varied directly with the complexity of the environment which the children are accustomed to. The children from Columbia Point tended to find the simpler photographs the more "interesting" of a set, whereas Lower Roxbury children tended to select the complex photographs. South End choices tended to fall in between.

d) Level of curiosity exhibited in the interview
Curiosity levels as measured by the response to photographs were directly related to the visual and behavior setting complexity of each area. The residents of Lower Roxbury, the most complex environment, ranked highest in curiosity, with the South End in the middle and Columbia Point rating lowest in complexity and curiosity.

e) Response to the question, "Do you ever go exploring"
Comments from the children indicated that whereas Lower Roxbury and South End children "go Exploring" Columbia Point children denied taking part in this activity and actually seemed to have little concept of what "explore" means. They seemed to believe that to explore, one had to leave Columbia Point.

Thus, it would seem that the hypothesis was confirmed, and that a complex environment facilitates exploration and sustains a higher level of curiosity in its inhabitants than a more simple setting.

Thesis supervisor: Stephen Carr
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INTRODUCTION

In recent years, the attention of social scientists has been drawn to an area of human behavior which went unnoticed for almost a century, explained away in theories which related behavior to physiologically based needs. Exploratory activities which consume a large portion of man's time and effort are now seen to operate independently of physical needs and have a different property in common--the "search for the unexpected" or the "effort after meaning" or information.

While psychologists have become involved in explaining the phenomena of boredom, curiosity and exploratory behavior, designers of the man-made environment have become concerned about providing environments which facilitate exploration. Working largely on the basis of intuition, architects and city planners have begun to talk about affording "choice" and "variety" in the spatial environment and providing "cognitive challenge". But as yet, there is little common ground between psychologists and designers. Psychological theory and observation point to a correlation between curiosity and exploration and stimulus characteristics such as novelty and complexity occurring in the physical environment. There have also been suggestions made that the amount and quality of environmental stimulation may have an effect on curiosity and exploratory behavior as they relate to intellectual development. But there has been relatively little concern on the part of psychologists to investigate the possible effects of the everyday experience of the spatial environment to see whether differing man-made or natural environments actually have differing effects on the level of curiosity of the inhabitants. Caution has undoubtedly been justified in the interest of restricting all possible

variables. However, until theory has been applied to the real world, to the complex physical environment in which we carry out our daily activity, theory can be put to little use. The architect, the city planner, the urban designer, impatient to see how different environments facilitate or impede the fulfillment of human needs and plans, finds himself in a position akin to that of the doctor, anxious to improve the well being of the client, but constrained by the deliberateness of science.

The study presented here makes some small attempt at applying the theory and observations of the psychologists to the interaction of children with environmental form as it exists in several different urban situations. It is the basic hypothesis of the research that in addition to social and hereditary factors, the physical form of the environment influences curiosity and consequent exploratory behavior, and that, given the same social milieus, interaction with different physical environments will produce differing amounts of curiosity and exploration. More specifically, it was hypothesized from psychological theory, that continuing interaction with a more complex environment would produce a higher level of curiosity in young children than interaction with a simple environment.

Because of the implications of curiosity and exploration for child development, it was decided to focus on the comparative effects of several different environments on the exploratory behavior and curiosity of the young residents. Eight to eleven year olds were chosen because children at this age are actively searching for new territory—mental and physical.

The environment of the urban child of this age has expanded beyond his immediate neighborhood, to include the city and beyond, and he is capable of covering much ground. Old enough to show the possible effects of his interaction with the physical environment, he has not yet reached the stage of teen age preoccupation with the social milieu.

With the recent focus of attention on the problem of the disadvantaged child, and efforts to provide programs of enrichment, it was of particular interest to the author to study the possible effects of the spatial setting on the curiosity of children otherwise deprived. Three areas in the City of Boston seemed to satisfy this interest and at the same time fit the necessary criteria of social and economic similarity but differing degrees of spatial complexity. In the South End area around the Harriet Tubman (neighborhood) House, in Lower Roxbury, and in the Columbia Point Housing Project, residents are predominantly low income Negroes, of similar educational attainment and social status. But while the social environment is fairly consistent in each of the three areas, the physical environments appear to differ markedly.

The approach taken was threefold: first, to determine how much novelty and complexity is provided by each environment, not in terms of physical elements alone, but in terms of standing patterns of activity and their physical settings; second, to determine which group of children exhibits the most curiosity and exploratory behavior in their actual use of the environment and in response to stimulus patterns shown in the interview; and third, to determine what type of environment each group of children finds most interesting.

A combination of techniques were used to make the necessary determinations. Some aimed directly at measuring curiosity and exploratory behavior and others took a more indirect route. Principal techniques involved the use of a questionnaire, self-drawn map of the neighborhood, filled-in maps and the use of photographs.

Before considering the methodology of the interview and its results in greater depth, it is helpful to look at the theory upon which the hypotheses are based.

I – CURIOSITY, EXPLORATORY BEHAVIOR & ENVIRONMENTAL STIMULATION

The Development of a Theory of Motivation

With the advent of Darwinism in the nineteenth century, the classical theory
of rational human behavior was shattered. The "soul" had no place in new
scientific theories of motivation. Instead, the behavior of all animals was
thought to originate in "internal biological disturbances" such as hunger,
thirst, and pain which drive animals to restore equilibrium within the
physiological system.

Gradually, behaviorists became aware that there were certain activities which
could not be adequately explained by the "primary drive" theories, activities
which seemed innate but yet not related to biological needs. Some psychologists
became concerned with what seemed to be a need for novelty, others suggested
that there were activities carried on for the efficacy involved in interacting
with the environment.

When, in the 1950's, psychologists began to undertake a specific consideration
of the nature of curiosity and exploratory activity, one of the first contribu-
tions of the new theory was a recognition that the complex activities of
investigation, manipulation, etc. are fundamental characteristics of organisms,
motivated not only by internal conditions but also by external stimuli.
Pointing to investigative activity in which an animal will touch or otherwise
study a new object, some theorists proposed that it is the novel stimuli in the
environment that arouse curiosity and subsequent exploration. Another group
suggested that familiar and unchanging stimuli produce a "boredom drive" which
brings about a search for sensory variety. But in either case, it was seen that

the stimulus characteristics of the environment do influence behavior, and that the influence of a stimulus or set of stimuli changes over time with familiarity.

As investigations continued, it became apparent that animals not only respond to a change in external stimuli, but they will respond in such a way as to bring about a change in stimuli. Although this was in line with the boredom concept, whereby unchanging stimuli lead the organism to explore, it seemed in direct conflict with the theory that novel stimuli can also induce exploration. For how can an instrumental response (exploration) bring about novel stimuli if it is novel stimuli which elicit exploration?[1]

Eventually, the concepts of curiosity and boredom, and the recognition that animals do induce change were brought together in several alternate theories. According to the "drive-incentive" theory developed by Fowler, an animal's exploration is motivated both by a "boredom drive" brought about by his exposure to unchanging stimuli, and the "incentive" of novel stimuli which he anticipates upon performing some instrumental response.[2] The problem with this theory is that if curiosity is "learned anticipation," and arises only as an instrumental response is performed, then curiosity would not be present when an animal first encounters a novel situation. Yet observations of animals experiencing completely novel environments would seem to refute this.

A somewhat more successful integration of the boredom and curiosity concepts was the theory of an optimal level of stimulation or arousal, formulated slightly differently by Fiske and Maddi, and by Berlyne. According to this theory, too much stimulation will evoke fear and anxiety and withdrawal, whereas too little stimulation causes boredom. Thus, either an increase or decrease in stimulation can be rewarding, depending upon the organism's recent experience.[3]

As formulated in the work of Fiske and Maddi,[4] there is for any task an optimal arousal level for effective performance and the individual will behave in such a way as to maintain this level. Where the arousal level differs markedly from the normal or optimal level for a specific task, the animal will experience a negative effect. Berlyne[5] concurs with Fiske and Maddi in conceiving of a normal level of arousal which varies with differences in personality, physiological makeup and experience. But Berlyne suggests that not only stimulation but lack of stimulation generates a rise in arousal - as evident in the restless agitation of bored animals. Therefore, an animal actually seeks to reduce arousal, either by exposing himself to new stimuli when bored, or investigating an unknown environment when anxious.

A final conceptual framework which is not directed towards an explanation of exploratory behavior, but which is highly relevant to it, is information theory. When information is seen as a reduction of uncertainty, it comes to have meaning for the concept of curiosity. For instance, when an animal explores an unfamiliar or changing environment, "it reduces its uncertainty of the sequence of stimulus events or elements that it experiences, and thus gains information, and the more change or variation provided, the more information it gains."[6] Most of the recent theorists have incorporated this concept into their formulations. Berlyne states in 1964 that, "exploration maximizes the inflow of stimulation and thus information from the object in question....Curiosity is then reduced either through habituation or through the advent of additional information that relieves uncertainty and conflict."[7] The concept of psychological conflict comes to be central to Berlyne's thinking, and information theory makes it workable.

Thus, although not all of the behaviorists engaged in a study of exploratory behavior agree on the mechanisms involved in the motivation of exploration, the most advanced concepts do seem to concur on many points. First of all, most contemporary theorists consider the complex activities of investigation, manipulation, etc. to be fundamental characteristics of organisms. Most theorists also see "exploratory" activities as serving some important function or functions, such as feelings of efficacy arising from interaction with the environment, information gathering either in the sense of competence accrual, knowledge as stated above, or the reduction of uncertainty. Contemporary behaviorists also agree in assigning to external stimuli considerable importance in eliciting curiosity and exploration. There are several cogent arguments that there is an optimal level of arousal brought about by these external stimuli that both too little stimulation, or change in stimulation, and too much stimulation produce negative effects.

Having arrived at these common suppositions, we can begin to investigate what characteristics of the organism and of the environment seem to have the most influence on curiosity and exploration.

Influences Inherent in the Individual

First, let us consider briefly what factors inherent in the organism itself are likely to affect its exploratory behavior. Berlyne points out that the "value of exploration in particular circumstances will undoubtedly vary with the pattern of life of a species. Within a species, it is bound to vary with the condition of sense organs, central nervous system and locomotor equipment, all of which, we have good reason to believe, are amenable to some degree of genetic determination."[8]

Personality and cultural differences are also determinants of how easily arousal may be increased or diminished, and at what level arousal tonus is maintained. Berlyne refers to the study of Frenkel Brunswick (1949) in describing a personality type characterized by an intolerance for ambiguity and complexity in the environment.[9] This type of personality seems to be found most often in persons who have been brought up in very disciplined homes and who have rather ambivalent feelings for their parents.[10] It is reflected in tendencies to use stereotypes and norms, to hate indecision, and to prefer "familiarity, symmetry, definiteness and regularity."[11]

From investigations of aesthetic preference and personality, Eysenck (1941)[12] concluded that there is a correlation between extraversion and preference for simple shapes and bright colors, and introversion and preference for complex, irregular forms and subdued color. From the results of similar studies, Barron and Welsh (1952) suggested a relationship between preference for simple, predictable patterns and the personality characteristics of repression of impulses and subservience to authority.[13]

According to Cattell's analyses of human motives, there is an "erg" or drive that he calls exploration which varies in strength from one person to another and is reflected in desires to read, learn about gadgets, see a play, learn what's going on in the neighborhood.[14]

Other factors, such as intelligence and sex, may also play a part in determining individual levels of exploration, but evidence on the subject is scant. It was found in experiments with rats that less intelligent animals "explore more assiduously because of a deficient capacity to retain traces of past experience."[15] However, this finding is less than conclusive. Similarly, the fact that female rats tend to explore more than male rats is not decisive, especially as studies of human children indicate that girls may be relatively less curious than boys.[16]

Environmental Influences - The Collative Properties

Berlyne has evolved the most complete framework for relating exploratory behavior to environmental properties. To recapitulate the author's theory of curiosity, Berlyne conceives of an optimal level of arousal towards which the individual performs. The stimulus properties which are determinants of arousal are of three types, intensive variables, affective variables, and collative variables. The first two groups are familiar to us, intensive variables being such properties as size, color, pitch of sound, and affective variables including pain, fear, and pleasure. These variables which Berlyne calls the "collative properties" refer to such qualities as novelty, uncertainty, complexity, incongruity, surprisingness, degree of change, and suddenness of change - properties which relate to the degree of information offered by the stimulus. According to Berlyne, that which underlies each of these variables and gives them their common motivating effects is conflict caused by simultaneously aroused or rapidly successive alternative responses.[17]

The following definitions of the most important of the collative properties may assist in relating the qualities to each other and to the concepts of conflict and arousal.

Novelty
Novel stimuli are those "which have not yet had a chance to lose effects that all stimuli originally possess."[18] They induce conflict in that they are likely to produce responses based on similar stimuli experienced previously which are not all compatible.[19] Novelty can be measured by a) "how often patterns that are similar enough to be relevant have been experienced before, b) how recently they have been experienced, and c) how similar they have been."[20]

Complexity
refers to the amount of variety or diversity in a stimulus pattern. Complexity increases with the number and dissimilarity of elements, and varies inversely with the degree to which several elements are responded to as a unit. Complexity is associated with uncertainty

and conflict because a complex stimulus can assume a greater range of alternative forms.[21] It is associated with conflict because of the number of competing responses it elicits.

Surprisingness occurs where one stimulus induces an expectation and a subsequent stimulus contradicts the expectation and therefore produces conflict as to response.[22]

Incongruity exists where a stimulus induces an expectation which is contradicted by accompanying stimuli.[23] Because of this contradiction, an incongruous stimulus pattern may be regarded as conflict evoking. Furthermore, an incongruous stimulus pattern will be novel because it has not been seen before.

Uncertainty Situations of uncertainty are those in which a stimulus may belong to any of several alternative classes and alternative responses are aroused, engendering conflict.[24] Novel situations will generally arouse uncertainty, but conditions that arouse uncertainty will not necessarily be novel.[25]

Conflict and consequent arousal are relative to:

1. nearness to equality in strength of competing response tendencies,

2. absolute strength of competing response tendencies,

3. number of competing response tendencies, and

4. the degree of incompatibility between competing response tendencies.[26]

As has been stated, Berlyne's hypothesis is that the collative properties affect a rise in arousal. Let us look at some of the more significant investigations carried out to date to see whether the findings substantiate this hypothesis.

As curiosity motivation is inferred from actions that increase an organism's contact with new or different environmental objects,[27] investigators have assumed an activity to be exploratory if there is:

1. an increase in the level or quantity of an organism's sensory input,

2. an increase in perceptual clarity or the number of objects perceived,

3. an increase in verbal behavior eliciting information, or

4. an avoidance of familiar objects or environmental situations.[28]

As exploratory behavior is manifest in three different kinds of responses: locomotor, orienting (which consists of changes in posture or in the orientation of sense organs), and investigatory (effecting changes in external objects as by manipulation), each of these types of responses suggests a method whereby exploration can be measured. Most experiments involving locomotor responses have measured exploratory activity in terms of the amount of movement taking place in the mazes, alleys, etc.[29] The problem with this is that locomotion serves many functions and it is difficult to isolate the effect of exposure to a particular stimulus. Furthermore, it is uncertain whether an animal which moves rapidly from one stimulus to another is exploring more or less than an animal which spends more time in one place.[30] Orienting responses seem to offer a somewhat more definitive methodology, and have been measured by the incidence and duration of physical responses such as sniffing, turning the head, fixating an image. However, there is still some doubt that these responses are elicited exclusively by curiosity motivation. Strictly biological factors must have some influence here. Methods of determining investigatory responses are also difficult to keep pure of other influences, but they seem to measure a more decisive response. Investigatory responses are generally measured by the number of times a stimulus is approached and how long contact is made. However, another technique which has been used to determine the impact of a stimulus in humans involves verbally expressed preference. There seems to be some problem here in that expressed preference does not always coincide with exploration measured.

The following experiments related to the effects of the collative properties on exploration are organized according to the variable considered, and the type of response sought.

Novelty

(Orienting Responses)
Berlyne "verified that novel stimuli are more likely to attract visual orienting movements than stimuli that have appeared repeatedly in the recent past"[31] in an experiment involving pairs of pictures of animals. The pictures were projected side by side on a screen for ten seconds. One animal reappeared on the same side each time for ten trials, and a different animal appeared each time on the other side. Subjects were found to spend increasing portions of the ten seconds fixating the novel pictures.[32]

(Locomotor Responses)
In an experiment carried out by Dember, two groups of rats were exposed to but were not permitted to enter two alleys, one black and one white. On the second trial, the arms were changed so that both were either black or white. According to the novelty hypothesis, the prediction was made that the rats would enter the changed arm. In group I, ten out of twelve made the predicted choice, and in group II, seven out of eight chose the changed arm.[33]

(Investigatory Responses)
Berlyne (1950) gave rats three identical objects for five minutes (wooden cubes or cardboard cylinders). Ten minutes later, they were again given three objects, this time with one replaced by a new object. During the second trial, the rats spent significantly more time exploring the novel than the familiar objects.[34]

In an experiment with three to five year olds, Mendel (1962) allowed the children to play with eight toys for eight minutes. Then the children were shown five tables with 0, 2, 4, 6, and 8 of each of the total of eight toys on each table identical with those previously played with. The distribution of choices favored the conclusion that the novel toys were the most attractive.[35]

Complexity

(Orienting Responses)
In an experiment by Berlyne, human adults were shown pairs of figures differing in some respect such as irregularity of shape or arrangement, amount of material, heterogeneity of elements. In every pair, the more complex figure was fixated for a significantly higher proportion of total exposure time.[36]

Another experiment by Berlyne involved pairs of patterns, one being "more irregular," one "less irregular." Again, in almost all categories, the more irregular was shown to attract more prolonged exploration.[37]

(Locomotor Responses)
An experiment by Dember, Earl and Paradise (1957) used three mazes shaped like a figure eight. In each maze, the walls of one loop had vertical black and white stripes, the other loop being all black, all white, or having horizontal black and white stripes. In each case, the loop with the vertical stripes presented the greater complexity, having the higher number of distinct units. Rats were placed in the maze for one hour on two or more successive days. On the first day some rats stationed themselves in the more complex loop and some did not. However, on the second and succeeding days, those who had not originally chosen the more complex stimulus showed marked tendency to do so. The findings thus suggest that as a novelty is diminished, a more complex stimulus pattern is preferred.[38]

Berlyne and Slater (1957) found that rats tended to enter a maze arm leading to a more complex stimulation (visual figures attached to the walls and objects laid on the floor on one goal box) as opposed to an empty goal box.[39]

(Investigatory Responses)
In an experiment by Cantor and Ditrichs (1963), sixty children (31 boys and 29 girls) from three years, nine months to five years, six months looked into boxes containing stimulus patterns. In order to have the patterns illuminated, the child pressed his head against the box, a movement which also started a clock. Findings were that subjects spent more time looking at high rather than low or medium complexity stimuli.[40]

Welker (1956) presented monkeys with three sets of blocks, a) one with all pieces alike in size, shape and color, b) one with colors differentiated among the pieces but all having the same size and shape, and c) one differing in shape and color among the pieces but all having the same size. Results showed that novelty increased the length and number of responses, and the greatest increase in responsiveness occurred when subjects were presented with the most complex situations.[41]

Not all experiments have verified the hypothesis. For instance, in an experiment with eighty students, Berlyne showed pairs of patterns which were more or less "irregular." No significant difference in time fixated was observed.[42] In another instance, Berlyne used pairs of pictures differing in complexity but in all cases more complex than used in previous experiments. There was great variability in fixation times among subjects, and the times for the pictures of each pair were not significantly different.[43]

Incongruity

(Orienting Responses)
In an experiment investigating complexity on orienting
responses, described above, Berlyne also included pairs of
pictures differentiated by degree of incongruity. For
instance, a picture of an elephant was juxtaposed with a
picture of an animal having an elephant's head and lion's
hind legs. As with the more complex patterns, the more
incongruous figures were fixated longer.[44]

(Investigatory Responses)
In an experiment by Hebb and Mahut (1955), rats were put
through 150 trials in which they could choose either a
straightway or a maze. The maze was constructed in such a
way that barriers confronted the rat as he tried to find the
exit. Then 50 additional trials were run in which the
barriers were placed in a corner where they were visible but
did not impede locomotion. At the beginning of the series of
trials, there was a sharp but temporary increase in the
proportions of entries into the maze. Furthermore, there
were far more entries into the maze by this group than by a
control group which had experienced a maze in which the
barriers were in the corner throughout the trials.[45]

Using material similar to that in the test of incongruity
on orienting responses (i.e., pictures of normal and
incongruous animals), Berlyne provided for an instrumental
response in the following manner. A subject was seated in a
darkened room facing a tachistoscope. Every time he pressed
a lever, a figure became visible on the tachistoscope for
.14 seconds, and the subject was free to expose himself as
many times as he liked to a particular figure. It was found
that incongruous stimulus patterns evoked significantly more
responses than the normal pictures.[46]

Surprisingness

(Orienting Responses)
Orienting behavior has been elicited in many experiments
where conditioned stimuli repeatedly presented in a certain
order are presented in a different order (Soloveicheh, 1928)
or when one stimulus follows an unbroken series of repetition
of another stimulus (Narbutovich, 1938).[47] In Berlyne's
experiment with the tachistoscope (above), the visual material
included twelve cards on which there were geometrical figures
of colored spots. At two points, the figures deviated abruptly
from the preceding stimulus patterns. These surprising figures
elicited far more investigatory responses than the others.[48]

Thus, most of the evidence seems fairly conclusive that the collative properties of environmental stimuli do tend to affect or bring about arousal and consequent exploration. However, most experiments have only considered response to a stimulus characteristic at a particular time, that is, specific situations of exploration. There have been relatively few attempts at relating exploratory behavior to broader environmental experience.

To be sure, there have been investigations into the effect of novelty over time. Experiments by Berlyne and others have shown that exploration diminishes with exposure to novel stimulus--that as the stimulus is investigated and information is attained, the stimulus loses its arousal potential, and arousal diminishes. Furthermore, we know that lack of stimulus or stimulus change increases receptivity to novelty. But will the length of deprivation lower the degree of novelty, complexity, etc. which an animal finds stimulating or, on the other hand, will long-term exposure to a high degree of complexity raise the level at which novel stimulus is experienced? Doe environmental experience by stimulating curiosity have any influence on the degree to which an individual participates in the more "elevated" types of intellectual activities? In short, what is the effect of previous experience on a particular instance of exploratory behavior. And, more important, what effect does environmental experience in a broader sense have on general exploratory behavior and mental development? These are questions which are of vital concern to the designer of environments as much as to the behaviorist or developmental psychologist.

Suggestions have been made to the effect that there may be a strong correlation between environmental experience and exploration. Berlyne has stated that "we

know that an individual animal's previous experience will affect exploration, at least to the extent of determining how novel particular stimulus patterns are. But apart from this, the broad characteristics of the environment will surely leave an affect on the strength of exploratory behavior in general, or of the exploratory behavior attracted by specific types of situation."[49] Bruner has suggested the influence of the environment even more strongly in saying that, "It is plain that a stunted organism is produced by depriving an infant of the rich diet of impressions on which his curiosity normally feeds with such extravagance." "Animals raised in homogenized environments show crippling deficits in their later ability to learn and to transfer what they have learned."[50]

In order to make more general applications, it is relevant to see if previous experience affects particular instances of exploratory behavior. However, investigations into this question have been meager and the resulting evidence mixed. For example, in the findings of Charlesworth and Thompson (1957) and Montgomery (1953), locomotor exploration of rats did not seem to have been intensified by stimulus deprivation or physical confinement prior to exploration.[51] However, these findings conflict with results of an experiment by Thompson and Haron (1954) in which dogs having experienced severe restriction (physical and visual) were more active in an empty room and in a maze than dogs which had been moderately restricted, and the latter were more active than dog raised normally.[52] Because of the fact that locomotor response is measured primarily in terms of physical activity, it would seem to be unwise to give too much weight to results involving physical restriction. In a study of investigatory response where the influence of any physical constraint was mitigated, Butler found that monkey's deprived of visual stimulation

responded more frequently to induce visual stimuli the longer the period of

deprivation experienced.[53] This would tend to corroborate the second set of

results above.

A new dimension was added in an experiment by Zimbardo and Montgomery, where

there were no significant differences in behavior in a Y maze among "normal",

"behaviorally deprived" and "sensorily and behaviorally deprived" rats.

However, rats raised in "free environment" cages containing many varied

objects explored the maze significantly less than normal or deprived rats.[54]

From this, the authors propose that animals will explore vigorously only those

environments which are more novel or complex than the environment with which

they are most familiar.[55] There may indeed be an important connection between

stimulus deprivation and subsequent exploration not simply in the length of

time of deprivation but the relative complexity, etc. of each environment.

It would not be surprising if an animal conditioned to a highly complex

environment did not experience much novelty in a less complex situation

(unless, of course, the stimuli were quite different). On the other hand,

an animal conditioned to a very simple environment may tend, when exposed to

an environment in which there are many novel stimuli, to make only incidental

forays until the overall novelty has diminished with exposure. Another

mechanism may also come into play in the case of long term deprivation and

that is the impairment of sensory, cognitive and motor functions.

The experiments noted above have dealt primarily with the quantity of

exploratory responses elicited by stimulus deprivation. There is also some

evidence to the effect that stimulus deprivation can have a detrimental effect

on the quality of subsequent exploratory responses and perceptual activity.

For instance, puppies were isolated in fairly roomy, lighted, but windowless

and featureless boxes for various periods of time. Those released after
six months were "perceptibly more stupid than normal dogs."[56] Those
released after eighteen months were "far more stupid."[57] Years later,
they were found to still have puppy behavior, "learning poorly, frisking
in again and again to the same shock or unpleasant experience. The lack
of normal variety at the prior stages in their early environment has
stunted their minds...."[58] When human subjects have undergone severe sensory
deprivation for only a few days, they have been unable to answer simple
questions on termination of the experiment, and even days later have
experienced difficulty in perception and problem solving.[59]

Drawing upon the observations of those concerned with learning and child
development, we can begin to draw some analogies. Piaget has suggested
that there is an intrinsic need for cognitive organs, once functioning,
to perpetuate themselves by more functioning.[60] The individual has a built-
in tendency to nourish cognitive activity by assimilating everything he
can from the environment. In a rephrasing of the optimal arousal concept,
Earl points to an expanding process rather than random assimilation. He
suggests that the individual has at any moment a "level of complexity"
relating to the stimulus characteristics he has been experiencing. "Given
the choice," the individual will "expose himself to external stimuli
offering a degree of complexity just exceeding his momentary level."[61]
In the context of conceptual learning, "the child who masters simple
words enjoys them intensely but doesn't stay there. In the proper atmos-
phere, he spontaneously shows eagerness to go to more and more new words,
longer words, more complex sentences, etc. If he is forced to stay at
the simple level he gets bored and restless with what formerly delighted

him. He wants to go on, to move, to grow. Only if frustration, failure, ridicule come at the next steps does he fixate or regress." Eventually, this frustration may lead to a loss of impulse or capacity to move on to new sources of information and more difficult problems. [62]

From these observations, it is possible to recognize several ways in which the environment can facilitate or inhibit mental development. First, it is in the child's everyday experience with his environment, in the objects and events that he observes in his daily travels, that many of the child's "spontaneous concepts" of the world arise. These "spontaneous concepts" prepare the way for the "scientific concepts" in which the child is instructed. Although the relationship between the two different kinds of concepts is not perfectly understood, Vygotsky suggests that "the development of a spontaneous concept must have reached a certain level for the child to absorb a related scientific concept." [63] Thus, in order for the child to understand the basic principles of economics, he must have carried on some financial transactions of his own. The spontaneous concept gives body and relatedness to the scientific one. Thus, the environment which limits the experience of the child, limits the development of his conceptualization of the world.

When a child meets a novel situation, explores it until he has decided that it can fit into his mental schema, or has refined his schema appropriately, he has not only refined his image of the world, but he has solved a problem. Intelligence has often been measured in terms of the ability to adjust to novel situations, and to solve numerous and difficult tasks. The environment which does not offer surprise and ambiguity fails to challenge this problem solving capacity.

Third, and perhaps most important, the environment provides the nourishment required for cognitive functioning. Thompson and Schaeffer stress the importance of early stimulation on subsequent behavior and point to the experimentation with animals, whereby rats, dogs and monkeys restricted in early environmental stimulation have shown "drastic and enduring effects on such traits as emotionality, learning ability, activity level, social behavior and perception."[64] Dubos relates these findings to human subjects, suggesting that the lack of sufficient early stimulation may prevent the development of essential mechanisms and patterns of response which are necessary for adaptability throughout life. In his opinion, "complete psychological development depends on a multiplicity of environmental stimuli. In their absence or if they are inadequate, intelligence does not develop normally and the personality becomes grossly atypical."[65]

It is not difficult to imagine extreme environmental situations which can produce mental stultification. Adults isolated in arctic explorations, or in solitary confinement in prison have been seen to suffer deterioration in their ability to think. But it may be that environments less extreme than these have an effect on curiosity and cognitive functioning. From the drop in I-Q level of children relocated from urban slums to a very bland exurban housing project,[66] it might be suggested that more subtle environmental differences can influence mental development. Perhaps the monotony of urban housing projects and suburban tract developments are violating more than esthetics. Perhaps these, or any environments which are homogenous and unchanging, which reveal only one way of life and limited

activities--in short, which have a low level of complexity--frustrate the child's desire for new stimulus and eventually lead to a decline in his natural curiosity and a slowing down of his mental growth.

II — THE INTERVIEW SURVEY: AREAS, HYPOTHESES, & METHODS

The Three Study Environments

Of the three environments chosen to represent different levels of complexity, Columbia Point Housing Project is the simplest. It is, first of all, an entity. A residential enclave set upon a point of land extending into Boston Harbor, the housing project is isolated from the mainstream of urban development of Dorchester and South Boston by several strong physical barriers - the Southeast Expressway and Morrissey Boulevard to the west and south, Columbus Park and the bay to the north. The closest development is in the form of several light industrial and business establishments which are turned away from the project and separated from it by undeveloped land. One small industrial plant is fairly close to the project, although separated from it by fences. The residential function of the project is interrupted only minimally by the presence of other uses ancillary to the predominant residential use. There are, for instance, a church, a school, a community center building, a couple of stores, post office, and heating plant - all on the fringes of the residential core. One alien element which is also to be found on the point but removed from the project itself is a fortress-like structure which is in reality a pumping station.

Columbia Point's strong functional unity is reinforced by the homogeneity of its visual form. As seen from the Southeast Expressway, the project is a giant monolith unrelieved by any natural vegetation and broken only by blind windows. At closer view, the image is somewhat less austere and more human in scale, but simplicity and homogeneity are the key descriptive words for Columbia Point. Homogeneous in building type, age, material and even minutest architectural detail, the housing itself is of a simple, unadorned style, the

prototype of the typical housing project design. There is some variety in the size and degree of enclosure of the spaces defined by the buildings but the treatment of these spaces is limited to four types: fenced and paved areas for hanging laundry, fenced areas of grass and small trees, open paved areas for pedestrians, and parking lots.

There is little possibility for individual expression at Columbia Point. Some differentiation is found in the curtains at the windows, and the environment shows the influence of its human inhabitants in chalked messages and sagging fences. But there seems to be no private territory outside the apartment.

The most ambiguous element of the environment is the street layout, which curves about in an unexplained manner - perhaps to provide some variety.

At the opposite extreme from Columbia Point is the area known as Lower Roxbury. Not so much an entity as Columbia Point, Lower Roxbury extends vaguely from Massachusetts Avenue to Centre Avenue north and south, and from Columbus Avenue to Harrison Avenue east and west. In contrast to Columbia Point, it is an area of great functional and visual variety and complexity. Within a few blocks of the Cooper Community Center - the source of the respondents - there is a relatively fine grain mix of residential uses of high and fairly low density, small neighborhood shops and larger stores serving the wider community, bars, numerous schools, churches and other institutions, garages, industry and even an open air market.

An area developed intermittently, but no more recently than about the turn of the century, Lower Roxbury is a chaotic point of juncture between the flat, regularly laid out South End with its Victorian row houses, and hilly,

irregularly laid out Roxbury with its single and two family dwellings. As a result, the street pattern is haphazard. "Parallel" streets come together; "perpendicular" streets are not at right angles to each other. Streets which seem to cross the area east to west do not always quite line up. In addition to the lack of clarity in the path system, there is, in contrast to Columbia Point, a great deal of heterogeneity in building type, age and site character-istics. Besides the detached and row houses of the areas contiguous to Lower Roxbury, the latter contains also apartment buildings and housing projects - all of various vintage and style and built of wood, masonry or brick. Spaces vary from narrow alleys to open expanses and range in character from fenced-in yards and gardens to individual open lots piled with sand, debris-filled vacant lots, and an almost abandoned park with tall grass and broken glass.

Change is the byword of Lower Roxbury. Whereas at Columbia Point the housing project itself seems very stable and the change taking place around the project is positive--that is, a building up of the area, new buildings, etc.--in Lower Roxbury the change is negative. Vacant buildings are continually succumbing to the wrecker's ball. In two years, nearly ten vacant buildings owned by the city as a result of tax-foreclosure were demolished within a single block. Fire is a constant threat, and two schools have been demolished recently as a result of fire damage. Now the whole area is under the threat of demolition due to highway construction and urban renewal.

In between the extremes of homogeneity and heterogeneity as found at Columbia Point and Lower Roxbury is the kind of physical environment found in the South End. The area around the Harriet Tubman House where the respondents live contains less diverse functions than Lower Roxbury, but is somewhat more varied than Columbia Point in this respect. Although primarily a residential

area, commercial uses have a more prominent place in the South End area than
at Columbia Point. Columbus Avenue, with its markets, bars, second-hand
stores and brothels, is the main axis of the area. A few light industries
impinge upon the residential neighborhoods. Although Columbus Avenue itself
has a fine grain mix of commercial and residential uses, the residential
streets coming off of Columbus Avenue are relatively free of any other uses.
Diagrams of the land use character of each of the three areas might look
something like this: (∴ residential, △ other)
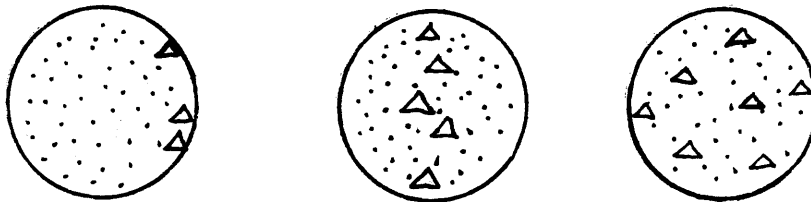
The organization of the South End by a fairly regular street system tends to
reduce its relative topographical complexity. The area is also intermediate
between the other two areas in degree of architectural simplicity and homoge-
neity. Nineteenth century row houses are the dominant building type of the
area, and consist of many more parts than the monolithic buildings of Columbia
Point, but fewer parts than the segmented rows, detached and apartment dwell-
ings found in Lower Roxbury. Most, but not all, of the buildings are of brick
in the South End--again, more limited than Lower Roxbury, more varied than
Columbia Point. The style of South End structures is far more ornamented
than Columbia Point and even where all the houses on a street have the same
bay, front steps, and mansard roof, there is likely to be great diversity in
the kinds of front doors, fences and rails which are used, or the presence or
absence of color, trees and bushes or shutters.

The South End is also somewhat more spatially diverse than Columbia Point
but less than Lower Roxbury, having narrow pedestrian alleys, wider alleys
opening into back yards, open areas for parks and playgrounds, and residential
street channels. However, the area of the South End which is under considera-
tion doesn't have any wide open areas like those of Columbia Point and Lower
Roxbury. The open space is treated in a greater variety of ways in the
South End than at Columbia Point. For instance, back yards of houses serve
any number of functions from parking of cars to gardens and barbecues. Some
are paved, some landscaped, some left as bare earth, some full of trash.
Front yards too are gardened or not. Some of the streets are tree lined, and
one or two have a park in the center of the street. Individual expression
and manipulation of the environment is much more evident here than at Columbia
Point or even in Lower Roxbury--particularly in the yards and maintenance of
the houses. This is probably due in part to the fact that more of the houses
are owner-occupied here than in the other two areas.

Hypotheses and Methods

On the basis of the optimal arousal theory of Berlyne, and Fiske and Maddi,
and the observations of those concerned with child development, the working
hypothesis of the research project was that a simple, homogeneous and static
spatial environment will tend to produce a lower level of curiosity and con-
sequent exploratory behavior than an environment which is richer, more complex,
and changing. On the other hand, an environment which is extremely complex,
uncertain and changing will produce avoidance behavior—the individuals
experiencing the environment will tend to avoid novel or complex elements and
consequently will explore very little. Somewhere in between is a range of
complexity, novelty, etc. within which falls the optimum level of arousal for
most individuals.

A secondary hypothesis of the study was that the degree of complexity normally
experienced by an individual will condition the level at which curiosity is
stimulated. An individual accustomed to a complex environment will require
more novelty or complexity to stimulate his curiosity than an individual who
normally experiences a simpler environment.

From initial investigations of the three areas, it was expected that the
simplest environment, Columbia Point, would produce the lowest level of
exploratory behavior both in actual interaction with the environment and in a
test situation. The South End was expected to produce a higher level of
curiosity and Lower Roxbury the highest, unless that environment proved to be
so complex as to be overwhelming.

In order to evaluate the environments and measure the curiosity and exploration
of their inhabitants, several methods of investigation were chosen. First of

all, the environments could not be evaluated simply in terms of the degree

of visual complexity found in each area (although visual complexity and

identity was to be measured incidentally). A method had to be found to

measure the complexity of the environments in terms of the various kinds of

interaction which is typically maintained with each of them. A useful concept

derived from the repertoire of the psychologist is that of "behavior setting."

Originated by Barker in his study of children's behavior in a midwestern town,

and used subsequently in Gump's consideration of one boy's behavior at home and

at summer camp, the term "behavior setting" was rather abstrusely defined as

"a standing pattern of behavior and a part of the milieu which are synomorphic

and in which the milieu is circumjacent to the behavior."[67] What Barker seems

to be pointing to is a pattern of behavior which is congruent with the

environment, being either surrounded by physical or temporal boundaries, or

distributed among spatially separate physical elements. Expressed in another

way, and more concisely, a behavior setting is an "enduring configuration of

activity and its setting."[68] Examples of behavior settings suggested by Barker

and Gump are: ball game, playground, paper route, woods, park, swimming,

classroom. The importance of this concept for this study is suggested by

Gump's proposal that the number of behavior setting varieties entered into by

an individual is a measure of the variety of experience he encounters and the

opportunities offered by his environment.[69]

For this study, several adaptations were made in the use of the behavior

setting concept. First, emphasis was placed on physical as opposed to temporal

setting. Second, differentiation was made between activity which is closely

related to (or even dependent on) relatively stable elements of the physical

environment (buildings, trees, even fences) and objects which are impermanent

or transportable (rocks, balls, bicycles). Third, the method of determining behavior settings was altered. Whereas behavior settings were identified in the Barker and Gump works by extremely lengthy observation of children's actual behavior, in this study, a list of potential behavior settings was presented to the children in the form of a questionnaire. The children were asked to note which of a list of activities they actually participated in, and in which places they play. Besides those items which could be considered behavior settings, additional activities were included in the list in order to supplement the picture of each environment as facilitating or impeding a wide range of experience. Some of the particular "places" and "activities" named were selected with the study areas in mind, others were not. There was not much concern for the more formal kinds of behavior settings such as ball games of various sorts, or for activities which are expensive to participate in. Emphasis was placed on activities and behavior settings involving individuals rather than groups.

Exploratory activity as it actually occurs in each of the environments was determined in several ways. First, the children were asked to draw a map of their neighborhoods showing where they go and what they see. It was hoped that these would give some reflection of the area covered by the child's everyday excursions and indicate his favorite or usual places to play or visit. This would also assist in ascertaining the number and variety of behavior settings in each area. In addition to the more straightforward interpretations, it was also suggested, on the basis of Mendelowitz's observations,[70] that the level of detail, clarity, etc. of a child's drawings would indicate his familiarity with, and exploration of the environment. However, this interpretation was found to be somewhat questionable, as we shall see.

A technique which had been used by Hanz and Martha Muchow in earlier research

to determine the "living space" and "roaming space" of the city child was

also adopted. This method called for printed maps to be presented to each

child with the directions to mark in one color the places where he goes often

and in another color the places where he goes occasionally. Distance

ordinarily and occasionally travelled from home and intensity of places cited

were taken as measures of the extent and nature of exploratory activity,

related to one of two possible theories--that a pattern of intense local

activity which is limited in scope reflects an environment which satisfies the

need for novel stimulation, or that such a pattern indicates a low level of

curiosity and exploration on the part of the children. As adapted for use in

this survey, the Muchow technique involved two maps, one of the local area at

1/100 and one of the City of Boston at 1/800. The area shown in the local

maps was determined by the investigator's knowledge of the general locales in

which the children travel. For instance, in the South End, the natural

barrier of the railroad tracks to the northwest and the location of schools

to the east causes most child activity to take place east of the railroad

tracks. In Lower Roxbury, Washington Street and commercial-industrial uses

to the east of Washington Street have a similar effect in determining the

territory covered by children in that area. Columbia Point did not present

so much of a problem, as most of the point could be included in the local

maps.

In order to determine the level of environmental complexity to which each

group of children responds, a technique used in research by Berlyne and

others was adapted. Berlyne had shown his subjects visual material contrasted

for degree of complexity, incongruity, etc. and asked them which pattern they

found more interesting. Using the same general criteria for weighing relative complexity—number of parts, homogeneity of parts, and degree of unity and organization—visual material in the form of photographs was selected for a similar test. Instead of using simple abstract patterns or figures, photographs of actual man-made environments were used in the hopes of getting some more direct relation to environmental form. Therefore, complexity involved the number and homogeneity of parts as visible objects and activities, and as elements of an abstract visual pattern. The attempt was made to choose images which would be equally familiar or alien to all groups. Where this was not possible, an image more familiar to one group was compared with visual material more familiar to the others (in the pictures of residential areas, for example). Effort was also made to compare photographs of similar subject matter and composition. Where human figures were present in one photograph, it was considered to be essential to have figures of equal number and interest level in the other. The subject matter of the photographs included:

- 2 aerial views of different urban (primarily residential) areas - one old, complex, even quaint; one new and simple.

- 2 ground level views of residential areas with children playing.

- 2 possible play areas: a conventional playground and a junk filled lot.

- 2 industrial areas.

- 3 parks.

- 3 commercial streets.

Perhaps the most difficult task involved was to arrive at some way of measuring an individual's level of curiosity in a test situation. Psychologists have, as has been noted, attributed various kinds of observable behavior to exploratory activity, from sniffing and turning the head (orienting response)

to locomotor activity, to investigation and manipulation of environmental objects. Berlyne has suggested that, with human subjects particularly, measuring the time spent observing an object or image is an efficient method for giving a fairly good indication of the degree of curiosity aroused.[72] For the purposes of this study, it was decided that it would be helpful to measure not just the time spent fixating an image, but the degree to which observation takes place. This could be determined by asking a subject to tell what he sees in a complex visual pattern, and allowing him to stop at will. The number of responses would indicate the degree to which the image had been explored visually.

For this purpose, it was necessary to select visual material which would be of sufficient interest to the children to maintain their participation in the project and at the same time allow for varying depths of observation. For instance, there might be several prominent objects or activities visible, along with a host of lesser details. Photographs of urban situations were again selected such that none was exactly similar to any of the areas studied, yet none was so strange as to be unfamiliar to a subject. The purpose in choosing photographs, as opposed to abstract visual material, was to relate more directly to the physical environment, to see if the pictures differing in complexity would give some indication of the degree of environmental complexity to which children of each area respond. The subject matter of these photographs included:

- A man and woman standing on the steps of an old house.
- Children buying food or candy from an outdoor stand in front of a church.
- A man sitting outside his second-hand store.
- Some men eating outdoors in the yard of a restaurant.

Because of the nature of the methods to be used, not all techniques could be

used in group interviews. The maps to be filled in required individual

explanation and assistance, and responses to the photographs had to be made

independent of the influence of peers. Yet time did not permit a large sample

of individual interviews. Therefore, the survey was carried out in two stages--

a group interview of fifteen children from each area, and individual interviews

with five children from each area in subsequent sessions. For the first inter-

view, fifteen children aged 8 to 11 who are participants in the programs regu-

larly provided by the local community centers were asked by the social workers

at the centers to be present for a special program. An even number of boys

and girls was requested and the resulting ratios of male to female were six to

nine for Columbia Point and Lower Roxbury, seven to eight in the South End.

III – THE INTERVIEW SURVEY: FINDINGS

Evaluation of Behavior Settings

1) Results of the Questionnaire

Included in the lists of places and activities which the children were asked
to consider were a total of 42 types of behavior settings which the investi-
gator thought might be present in any or all of the study environments.
From the questionnaires turned in, it would seem that all of these behavior
settings were participated in by at least a few of the children in each area,
as the minimum response to any potential behavior setting was 13.3% or 2 out
of 15 of the respondents. This may reflect participation in behavior settings
outside of local environments, or it may be a product of the children's
eagerness to check as many categories as possible. In order to compare the
number of behavior settings which actually have meaning for a particular
environment, only the total numbers of behavior settings which were checked
by fifty percent or more of the subjects were contrasted initially. The
results of this gross comparison show that out of the 42 potential settings,
Columbia Point and the South End each have 28 meaningful behavior settings,
and Lower Roxbury 35. Of the 42 settings, 25 could be considered meaningful
in all three of the areas. Eight are common to two environments, and nine are
"meaningful" to only one area - in most cases, Lower Roxbury. From these
results, there would seem to be a significant difference in the number of
behavior settings between Lower Roxbury and the other two areas, but little
difference between the South End and Columbia Point.

If the actual variations in percent response to the different behavior settings
are examined, some interesting differences in the variety of behavior settings
come to light. Although the absolute percentages are not too meaningful due

to responses based on wish rather than fact, the relative numbers of responses are revealing. When these are graphed, strong individual differences in the environments can be seen. The graph compiled from the Lower Roxbury material shows a fairly even distribution in the response pattern. Although a few behavior settings are noted by a high percentage of the respondents, the other settings follow closely in times cited. This would seem to indicate a wide range of choice of behavior settings available. Furthermore, the fact that the responses for the behavior settings are all quite high suggests that many of the respondents participate in many of the behavior settings. (fig.1)

In sharp contrast to the Lower Roxbury findings, Columbia Point responses tend to fall more into extremes. Several behavior settings were noted by a very large proportion of the children, and others were noted only infrequently. This would seem to indicate a fairly limited choice of behavior settings at Columbia Point - a conclusion which is in keeping with preliminary evaluations of the environment.

Also in keeping with initial assumptions is the fact that South End responses seem neither to be as evenly distributed as those from Lower Roxbury nor as polarized as Columbia Point. Lower than the Roxbury area in certain categories, the South End responses are also slightly higher for other categories. The same holds true for the South End when compared to Columbia Point.

Where do the similarities lie, and where the differences? In general, the overall pattern of highs and lows is similar for the three areas, but with exaggeration increasing with the South End and Columbia Point. In the first category of behavior settings - the "places" which are listed, all three areas are remarkably similar in the places most often noted, and the number of

respondents who noted them. Sidewalks, front steps, beach, school and other

playgrounds were cited as places to play by at least 13 out of 15 in each

area. Back yards[*] and parks followed closely, with at least 12 of each group

recognizing those behavior settings. This grouping of behavior settings most

frequently entered into is generally to be expected. Most are either exten-

sions of the home or are conventional types of areas for child play - play-

grounds and parks. The high response to "beach" is somewhat of a surprise,

but this is probably attributable to the strong emotional impact, and con-

sequently the remembering of this behavior setting.

For Columbia Point, the only other places approaching the top group are fields

(100% response), inside and outside stores (80%) and parking lots (93.3%).

After that, there is a large gap.

In Lower Roxbury, on the other hand, the top seven behavior settings are

followed closely by another six - building halls (73.3%), fields (86.6%),

inside and outside stores (each 73.3%), woods (73.3%), and gardens (73.3%), a

fairly generous variety of behavior settings.

South End responses are more spread out in the middle range. Thus, although

only fields, outside stores and parking lots follow behind the most prominent

behavior settings, and are second to Columbia Point in two of these categories,

other settings such as streets and near railroad tracks are noted more often

at Columbia Point.

Areas in which the widest discrepancies occur between the three environments

are generally those which are less conventional, less readily available types

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* "Back yards" at Columbia Point are the paved areas around the buildings,
  not really the same behavior setting denoted by the term in other areas.

of behavior settings. For instance, Lower Roxbury reports rooftops as being a place to play twice as often as either South End or Columbia Point. Inhabitants of Lower Roxbury also note woods, gardens and abandoned cars far more times than their contemporaries. Both Columbia Point and Lower Roxbury residents seem to participate in the behavior setting "inside stores" more than South End children. Although there are many stores in the South End area studied, they may tend to be less neighborhood stores and therefore less friendly to children. On Columbia Point, a coffee shop seems to be a favorite hangout of the kids.

Thus, from the first category - the "places to play" - it would appear that Lower Roxbury provides the widest variety of behavior settings as well as the largest number. Columbia Point activity seems to be concentrated within a few behavior settings--mostly those which are an extension of the home (parking lots can be included here, due to their proximity to the dwelling unit), as well as fields and stores.

The South End is less clearly understood. There seems to be less agreement among the respondents, as evident in the somewhat lower average of responses per type of behavior setting. While exceeding Columbia Point in some of the less prominent settings, it actually falls behind that area in several cases, suggesting perhaps the South End does not differ significantly from Columbia Point in number of behavior settings. It is necessary to see if other information clarifies this situation.

Differences in the second category of behavior settings, included in the list of activities in the questionnaire, are only slight in most instances. Almost equal numbers of children from the three areas participate in "walking on

walls," "crawling through tunnels," "watching buildings being torn down,"
and "going downtown." However, more people in both Lower Roxbury and
Columbia Point seem to climb fences than in South End, and Lower Roxbury
children cited climbing trees more often than the others. Again, Lower
Roxbury exceeded the South End and (by almost double) Columbia Point in
"exploring vacant buildings." More Columbia Point children noted "watching
buildings being put up" and "watching traffic" than either of the other
groups. (fig. 2)

The third group of potential behavior settings - another set of "places" -
again repeats the pattern of even distribution for Lower Roxbury and extreme
contrast for Columbia Point, with the South End in between. Here, all three
have a similar degree of incidence for School, Church, Library, Supermarket,
Hospital, and Community Center. However, Lower Roxbury again exceeds the
other areas in several instances--for example, significantly more children in
Lower Roxbury checked Fire Station and Police Station than at Columbia Point
and South End (the latter exceeding the former), and both Lower Roxbury and
the South End noted Gas Station and Laundry more than did Columbia Point
children. The only place which more Columbia Point children visit than the
other groups is the Post Office. One strange phenomenon found here is that
in the South End, where Columbus Avenue is teeming with second-hand stores,
fewer children acknowledged having been to one than in either of the other
areas. This may be because of the social connotations of such stores which
would be more evident in the South End than in the others. (fig. 3)

In addition to those items in the questionnaire which satisfy the definition of "behavior setting," there were also many activities listed which have certain requirements for the form of the environment, even if these do not include the more permanent elements involved in a behavior setting. For instance, piling rocks or bricks, or playing with sand implies that certain materials or objects are available. In order for other activities to take place, the environment must be supportive in certain ways. For example, hopscotch and bicycle riding both require a fairly smooth hard surface. Because of the area of concern here, it was of particular interest to see which of the three areas seemed most conducive to a wide range of activities, particularly investigative and manipulative ones. (fig. 4)

It is interesting to note that the tendencies evident in the behavior setting categories persist here also. That is, there seems to be quite an even distribution among possible activities in Lower Roxbury, whereas more concentration occurs in the pattern of Columbia Point - South End again falling in between. Of the seventeen types of activities which remain when those "activities" which qualify as behavior settings are subtracted from the original list, we find all seventeen noted by 50% or more of the respondents in Lower Roxbury, 12 in the South End, and 11 at Columbia Point. Here, as above, number must be qualified by variety in distribution. There seems to be less agreement here on which activities are most engaged in than there was on behavior settings. The activities which are highly ranked in each area are primarily "throwing balls" and "riding bicycles," a fact which is not too surprising. "Playing with sand" also seems to rate fairly high in the three areas. This could be attributed both to beach activity and to the sand which is dumped following demolition. (This might account for the particularly high

incidence of notation found in Lower Roxbury, where playing with sand is second only to throwing balls in that area.) General agreement is also found for catching insects and for hopscotch, an activity noted by almost all the girls questioned and almost none of the boys.

After the activities in which there seems to be agreement, differences between the areas become more evident. Columbia Point has a high concentration in "walking in tall grass" (93.3%), higher than either of the other areas. Then there is a drop down to "writing on walls" and "climbing jungle gyms" (66.6%). "Piling rocks" and "hopscotch" follow (60.0% each). In the South End, the top activities (ball throwing and bicycling) are not responded to as frequently as at Columbia Point and Lower Roxbury. There seem to be more activities clustered in the medium range of response. Equal to "playing with sand" in times cited are several activities including "hiding in boxes and crates," "hopscotch," "walking in tall grass," and "piling rocks and bricks." All of these were noted by nine or ten of the fifteen children. A large number of children also "climb jungle gyms" (80.0%, or more than either Lower Roxbury or Columbia Point). South End respondents also seem to participate more than Columbia Point children in several activities - "digging holes in the ground," (53.3% as opposed to 33.3%), "throwing cans and bottles," (40.0% to 26.6%) "hiding in boxes and crates," (66.6% to 46.6%), but is lower than the housing project group in "writing on walls," (66.6% to 26.6%), "climbing laundry poles," (33.3% to 13.3%), and "looking for treasure," (55.3% to 33.3%).

Lower Roxbury responded more frequently than the other groups to 14 out of the 17 activities. Several categories showed quite a large gap between Lower

Roxbury responses and other responses. These included "throwing cans, etc.,"
"jumping on tires," "climbing on laundry poles," and "climbing on old cars" -
not very conventional activities.

If the activities are classified according to their primary function, children
in Lower Roxbury appear to engage in manipulative activities--hitting rocks,
throwing cans, digging holes, piling rocks and bricks, etc. slightly more than
children in the South End, and considerably more than children at Columbia
Point. The only exception is that more Columbia Point children write on walls
than other children, particularly South End children. (This may be because
Columbia Point children have fewer opportunities to manipulate their environ-
ment and therefore write on walls as an expression of this need.) Lower Roxbury
children also carry on the most motor activities involving varied types of
equipment such as tires, derelict cars and laundry poles, with South End and
Columbia Point being nearly equal in these categories. Both South End and
Lower Roxbury top Columbia Point in "hiding in boxes and crates."

If a list of activities which are primarily orienting and investigative is
assembled and behavior settings such as "exploring vacant buildings" included,
some interesting, although not very clear-cut differences, can be seen. Lower
Roxbury tends as usual to the upper ranges of response, but is surpassed in
several instances by Columbia Point. For instance, Columbia Point ranks
slightly higher than the others in orienting responses--"watching traffic,"
in particular, and then "watching building construction." "Watching building
demolition" also ranks slightly higher at Columbia Point than at the others, an
unexplained phenomenon. With investigative activities, both Lower Roxbury and
South End have a higher frequency of response where specific environmental
requirements are present: "exploring vacant buildings" and "hiding in boxes."
But Columbia Point is a close second to Lower Roxbury in the abstract "looking

for treasure." Perhaps this tendency for Columbia Point to rate high on activities in which curiosity is less dependent on stimulation from the environment than from an inner motivated search for novelty is reflective of an unsatisfied need.

From the results of the questionnaire, it can be seen that in both number and variety of activities and behavior settings participated in, the children of Lower Roxbury responded consistently and considerably more than children from either of the other areas. In number of activities and behavior settings, the South End and Columbia Point do not seem to differ too greatly. However, the South End tends to be more varied than Columbia Point; less confined to a few classes of highly meaningful activities and behavior settings, less restricted to behavior settings which are extensions of the home and activities which make few demands of the environment. Both Lower Roxbury and the South End show evidence of activities and behavior settings being participated in which are possible only in relatively "free" territory where there are few constraints from public and private ownership. Lower Roxbury also seems to offer more activities and behavior settings which might be considered dangerous or unsavory by adults: climbing on derelict cars, playing on rooftops, exploring vacant buildings, throwing cans.

2) Behavior Settings in the Self-Drawn Neighborhood Maps

The maps that the children drew of their neighborhoods helped to clarify the differences between the South End and Columbia Point. The children had been asked to draw their map indicating the places they go. From maps of Columbia Point, a list compiled of behavior settings mentioned once or more times came to a total of nine, including the shuttle bus and two different kinds of stores.

A similar list for the South End revealed about 15 behavior settings. The South End list included all of the Columbia Point settings except two, and added about six general categories. It was felt that there were probably more than two different behavior settings evident in the many different types of stores mentioned, but caution was exercised lest the number of stores in the South End have undue weight. One important difference which appeared in the maps was that within certain broad categories there can be a considerable variety of behavior settings, and it is in these sub-categories that the South End exceeds Columbia Point. For instance, in the South End there are about five different kinds of parks and playgrounds which can be seen as distinct behavior settings. One of these is a formal, grassed park visited mostly by what the police might call "vagrants." Another is a fairly clean, modern play area with good equipment; still another, a narrow strip of macadam euphemistically referred to as a playground.

Because of the fact that there were fewer maps or other clear representations of the area submitted by Lower Roxbury children, it is difficult to compare the Roxbury findings with the other groups. Nevertheless, the area held its own with about twelve behavior settings indicated.

3) Behavior Settings in the Filled-In Maps

From the places the children marked on the maps presented to them, we find that at Columbia Point nine different kinds of behavior settings are noted by at least two of the respondents. In the South End, the number rises only to ten and remains at ten for Lower Roxbury. Although this finding tends to undermine other evaluations of the relative number of behavior settings in each area, several factors should be kept in mind in considering this information. First,

only those behavior settings occurring within fairly tight geographical
boundaries and involving specific environmental elements such as school,
playground, community center, library, etc. could be determined with ease.
Two children might mark the map in almost the same location, but there needed
to be some reasonable basis for assuming that both indicated the same behavior
setting. For instance, one might place an X at a friend's house, and another
might mark an area close by which has a stand of trees. The investigator's
knowledge of the environments and the children's activity patterns was too
limited to make assumptions. The fact that children might put an X on the
map where a street is labelled rather than coloring in the parts of the street
they frequent also confused matters, making it difficult to determine what
kind of a behavior setting was indicated. Finally, the children from Lower
Roxbury tended to agree less on the places they frequent.* Several identifiable
behavior settings such as Eliot Square and an indoor swimming pool were noted
by only one individual. Therefore, in spite of these equalizing findings, the
results of the questionnaire and the self-drawn maps make it possible to main-
tain that the most complex environment in terms of behavior settings is Lower
Roxbury, followed by the South End, and finally Columbia Point. Having arrived
at this determination, which coincides with the author's field analysis, the
results of the other areas of research will give us an idea of how these
differences are reflected in the behavior of children from these environments.

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* This may be partly due to the fact that they do not live as close
together as the other children.

Exploratory Behavior as It Occurs in the Environment

1) Results of the Neighborhood Maps - the ability to represent the
   environment

As noted above, the theory of Mendelowitz would lead us to believe that the

level of observation in a child's drawing is indicative of his familiarity

with the subject matter. One of the original assumptions of this study was

that Mendelowitz's theory, taken a step further, offered a means of determin-

ing the child's familiarity with, and exploration of, his environment. It

was anticipated that, if asked to draw a map or picture of their neighborhood,

the children who were most familiar with their environment would produce the

clearest, most detailed representations. However, after longer deliberation

and the actual test, the author finds this assumption to be in error. Maps

are abstractions of the structure of the environment. Thus, the ability to

represent the environment is not only a function of an individual's experience

with it but is perhaps even more a reflection of the clarity of the environment

itself.

The results of the children's attempts to draw maps correspond to the relative

clarity of the areas as observed by the author. In Lower Roxbury, where the

path system and general form of the environment is disordered and confusing,

only two of the fifteen children were able to produce actual maps, and one of

these covered only a four block area. In contrast, in the South End, where

the street pattern is a close approximation of a grid system and the building

forms clearly define the street channels, eight children submitted abstract

maps showing the spatial distribution of particular elements and streets. It

is interesting that the children living near the point of juncture with the

only disrupting element in the structure - several streets crossing the grid

diagonally - were markedly less able to draw clear maps than children living on streets perpendicular to the main axis.

In spite of its visual homogeneity, Columbia Point was not easily represented in map form by the subjects. Columbia Point children submitted fewer maps than South End, and about the same number as Lower Roxbury residents. Unlike the maps submitted by the other groups, the Columbia Point drawings tend to give general indications of the form of the environment without attempting to represent the actual spatial distribution of elements. In three maps and perspectives, the children have suggested the curving path system but have not tried to represent the exact street alighments or even to label the streets.* This may be due in part to the fact that they do not use the streets much, but it is more likely to be a reflection of the fact that the paths and building form do not fit as they do in the South End, and streets are not laid out in a readily comprehensible pattern. On the basis of these maps, the South End would appear to be the most clearly structured of the three areas, with Columbia Point exceeding Lower Roxbury only slightly in clarity.

If the "pictures" as well as the maps of the three areas are compared, a distinction begins to appear between visual complexity and clarity in the environment. Whereas Lower Roxbury and Columbia Point children did not differ too greatly in the number of actual maps submitted, the Columbia Point children produced more pictures having some obvious connection with the environment by way of general character, landmarks or smaller elements such as fences and front stoops. On initial comparisons, it appeared that seven of the fifteen

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*This is not true in the elevations drawn, where the address written on each building seems very important.

"maps" from Lower Roxbury have no obvious connection with the neighborhood, as opposed to four such drawings from the South End and only one from Columbia Point. It may be that some of the Lower Roxbury drawings were attempts to represent actual places in the area, but were not recognized as such by the investigator. In general, however, the Lower Roxbury drawings seem to be less specific than the other representations, often using symbols for houses. The South End drawings show much more subtle detail than the Roxbury work differentiating between row houses and different types of stores. Almost all of the Columbia Point images can be seen as recognizable places—whether parking lots, the community center, or the elevation of one portion of the housing. Once again, this is probably a function of the environment itself. But whereas the maps pointed out the comparative clarity of the areas, the other drawings seem to be related more to visual complexity. Columbia Point's visual simplicity, due to homogeneity and repetition of parts, makes it easy for the children to draw something representative of "the neighborhood." Lower Roxbury's complexity makes the representation of even a small part of the environment difficult. (Exhibit B)

Thus, rather than indicating the familiarity of the children with their environments, the self-drawn maps reinforce the initial evaluation of the visual complexity of the three areas and sharpen the distinction between complexity values and clarity values.

2) Results of the Neighborhood Maps - area covered

Because of the fact that not all three groups yielded the same number of maps, and the maps submitted at Columbia Point are not strict representations of street patterns, it is difficult to make a comparison of the living and

roaming space of the children of the three areas on the basis of this material. However, a few generalizations can be made which are of some value in themselves and which can be used to confirm the results of the filled-in maps.

First, for both Lower Roxbury and the South End, the area which seems to be well known extends over about three or four blocks. But in addition in the South End, knowledge of an area covering perhaps twenty blocks was indicated in half of the maps drawn. This is undoubtedly a reflection in part of the relatively simple layout of streets, a fact which is evident in the relative accuracy of the South End maps, as opposed to the great inaccuracy found in the one Lower Roxbury map covering a sizeable distance (1000 feet in diameter). Because of the tendency of Columbia Point children not to represent exact street alignments, it is little more than a guess to say that the area covered by their maps is about one half of the residential area on Columbia Point. Other drawings are confined to a particular building or buildings or a parking lot. There is no attempt to represent the wider limits of Columbia Point - the water's edge, fields or even the dump across the street from the housing project. On the basis of this limited evidence, one would be tempted to say that both Lower Roxbury and Columbia Point children tend to stay fairly close to home while the South End children roam somewhat further. We shall see how this interpretation compares with the results of the filled-in maps.

3) Results of the Filled-In Maps (living and roaming space)

The area covered by the travels of the children in each of the areas was measured in two ways. First, the maximum distances travelled within the geographical limits of the map were compared between the groups. Second, the areas were compared within which most activity seems to occur.

It was found that maximum distance does not vary much between the three groups of children. In each case, the average maximum distance travelled lies between 2300 and 2500 feet or slightly less than a half mile. In most cases, the distance is influenced by the location of the school or some other place of interest such as a park, playground or movie theater in relation to the child's home. (Exhibit A)

The average distances within which most destination points are located differ slightly more than the average maximum distances. Lower Roxbury shows the widest area covered averaging about 1960 feet in diameter. South End is next with 1640 feet and Columbia Point averages slightly less with 1580 feet. If this is compared with the findings of the city maps, an interesting pattern can be seen. On these maps, the percentage of total notations lying within a quarter of a mile, half mile, mile, and over one mile are as follows:

	1/4 mile	1/2 mile	one mile	over a mile
Lower Roxbury	20.6%	26.9%	50.7%	49.3%
South End	16.6%	42.1%	78.9%	21.7%
Columbia Point	6.5%	11.1%	23.3%	76.7%

What first appears to be slightly contradictory - that Lower Roxbury children cover a wider distance in their ordinary travels (local map), but South End and Columbia Point children appear to venture greater distances in the city - can be seen to be quite reasonable. First of all, if it is taken into consideration that most of the children have been taken to certain places of interest such as the Boston Common, Prudential Center, Museum, Fenway Park, etc., these places are closest to the South End and furthest away from Columbia Point. For the South End, it is difficult to distinguish which

places are ones which have been visited once with an adult, and which are places frequented more regularly by the children. From comments made during the interview, it appears that some places, like the Prudential Center, Copley Square and the Common, are places travelled to by the children independent of an adult.

On the other hand, the remoteness of Columbia Point from the rest of Boston makes access to almost any place equally difficult and dependent upon public transportation, and once on the train, it is easy to go many places. As a result, the distribution of places visited by Columbia Point children is more scattered than the South End or Lower Roxbury patterns.

The two sets of filled-in maps as well as the neighborhood drawings would suggest that in Lower Roxbury, an area of slightly more than one quarter mile, is covered fairly intensively by the young residents, but they do not travel very far beyond this circumscribed area unless it is to go to the major places of interest noted above. Columbia Point children carry out a similar but heavily exaggerated pattern. They explore a more limited area (the area immediately surrounding their homes) and depend on trips to far-reaching parts of the city for novelty. This interpretation is reinforced by the children's appeal to the interviewer to come back and "take them somewhere."

In contrast, the children of the South End seem to travel more into contiguous areas at a distance of a half mile to a mile. If this is related to the question of the complexity of the environment, it might be suggested that the most complex environment satisfies the need for novelty and complexity and therefore does not force its inhabitants outward in search of new territory. What happens in the other two environments is that in the South End, where the immediate environment is not as conducive to exploration as Lower Roxbury,

but is closer and better connected to places of interest, the children travel in a widening circle in search of novel territory. At Columbia Point, the limited complexity of the housing project and the lack of a stimulating environment contiguous to the project forces the children out and away from the point for diversion. The limitations of the project area itself are compounded by its isolation.

4) Response to the Question - "Do You Ever Go Exploring?"

An additional source of information on the exploratory activity which children of the three areas actually engage in is their own comment on the question, "Do you ever go exploring?" In the South End and Lower Roxbury the response was consistently affirmative, the children mentioning a number of places which they "explore," including alleys, fields, railroad tunnels, and "near the library" (meaning Copley Square). In contrast, the children at Columbia Point almost unanimously denied ever going exploring. When asked where would they explore if they could, they suggested "Grandfather's house in Malden," the Boston Globe Building, and Florida. One girl commented that she couldn't go exploring because she needed someone to take her. The implication would seem to be that the children had little concept of exploration and believed that in order to explore, one had to leave Columbia Point.

Level of Complexity Required to Stimulate Curiosity

On the basis of the hypothesis that individuals tend to find those stimuli, or complexes of stimuli-environments, more interesting which equal or exceed the level of complexity to which the individual is accustomed, it was anticipated that the children of Columbia Point would tend to prefer the simpler photographs and Lower Roxbury the more complex, with South End somewhere in the middle.

For purposes of easy comparison, the more simple photograph in each set was ranked as 1, the more complex 2. Where a third picture was included, it was ranked three. Thus, in terms of the expectation, more 1's should have appeared in the results of the Columbia Point test, more twos and threes in the Lower Roxbury results. This was in fact, the case. A comparison of the findings is as follows:

	total 1's	total 2's	total 3's
Columbia Point	21	6	3
South End	18	9	3
Lower Roxbury	11	12	7

Thus, there was a tendency for the inhabitants of more visually complex environments to choose the more visually complex material. (Table 1)

However, there are certain limitations which must be recognized before interpreting these findings. First, common sense tells us that people tend to prefer what they know, what they are familiar with. Thus, in the first two sets of pictures, where fairly modern buildings of simple form and layout are contrasted with older buildings which are more detailed and irregular, it could be expected that housing project children would choose the simpler

setting. This could explain Columbia Point's response, but South End children used to an older, more complex environment also chose the simpler photographs in these sets, and even Lower Roxbury's choices tended toward the less complex in the close-up view of two residential areas. A better criticism would be that there is some inherent or learned value in that which is new, big and bold. In fact, the words "new," "better" or "big" (houses) were used frequently in answering why one picture was chosen.

Another value judgment may be seen to operate in the choice between play areas: playground versus junk filled lot. With this set of pictures, there was very little difference in the responses: 13 of the 15 children chose the playground, and at least 7 indicated that this was because it was "cleaner" or "safer."

Another possibility is that particular objects or conditions in the environments chosen may have been the determining factors. For instance, one boy chose the more complex aerial view ostensibly because of a fountain which was just visible in the picture. The presence or absence of snow in the industrial scenes was mentioned by two individuals as the reason for their choice. Two others mentioned the degree of traffic visible. On the other hand, people can rarely tell you why they prefer what they do, and the children may simply have been selecting something to use as an answer.

Nevertheless, the differences in response stand, and the differences are greatest where social values and familiarity have less influence, that is in the photographs of the parks, commercial streets and industrial settings. More clearly a question of more or less to look at or do, these photographs seem to have a more direct relationship to the environmental experience of the respondents. The results for these three sets alone are as follows:

	total 1's	total 2's	total 3's
Columbia Point	8	4	3
South End	5	7	3
Lower Roxbury	2	6	7

Although it is difficult to place too much weight on such a small sample, the results certainly are consistent even to the point of showing the peak response for the South End in the middle range of complexity. The picture is further reinforced by the fact that children from the most complex environment tended to choose on the basis of which environment depicted offered the most to do, the most to see, the most excitement.*

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*Ten responses were made on the basis of these criteria, all of which were from Lower Roxbury.

Exploratory Behavior in a Test Situation

The final and perhaps most important measure of exploratory behavior-- the level of curiosity exhibited by each group of children in a test situation--produced a set of results which further confirm the original hypothesis. It had been expected that Lower Roxbury, being the most complex environment, would produce the highest level of curiosity and consequently the highest number of responses to the photographs, with the South End following, and Columbia Point last.

In order to quantify the number of responses made by each child, a fairly simple technique was arrived at involving "observation units." The value of one unit was ascribed to each noun, verb, adjective or adverbial clause used to describe the visual material, such the "Fat man sitting in a chair" would be credited with four units.*

On the basis of this evaluation, it was found that the number of responses ranged from a minimum of three to a maximum of 81--interestingly enough, for the same picture! Individual totals for each child ranged from a low 19.5 to a high 197.5. These totals did seem to fall into three natural groups, although not a mathematical curve.

*Credit was only given the first time an item was mentioned unless it was later used as part of an adverbial clause. Even in that case, however, it was the clause rather than the noun within it which was credited with a unit. Where an adjective and noun, two nouns, or some other combination were united in such a way as to constitute a complete thought and new identity, only one credit was given (for example, pool table, dixie cups, boy scout, olden days). Only half credit was given to such indefinite nouns as something, somebody, or "stuff."

Totals for each child		Groupings by Area			

Totals for each child				Low	Med.	High
18.0 (S.E.)	6 Low					
19.5 (L.R.)						
21.0 (S.E.)		Columbia Point		3	2	
23.5 (C.P.)						
24.0 (C.P.)		South End		2	3	
29.0 (C.P.)						
		Lower Roxbury		1	2	2
53.5 (C.P.)	7 Medium					
64.0 (C.P.)						
68.0 (S.E.)						
70.5 (L.R.)						
83.5 (L.R.)						
86.5 (S.E.)						
89.5 (S.E.)						
116.5 (L.R.)	2 High					
197.5 (L.R.)						

Although differences in the general groupings are not remarkable, due once again to the limited sample, the total responses for the groups reveal considerable differences as follows:

Total Responses for Each Group

Columbia Point	194.0	
South End	283.0	(increase of 45% over Col. Pt.)
Lower Roxbury	487.5	(increase of 35% over South End)

For each picture, there is a consistent and considerable rise in number of responses from Columbia Point through South End to Lower Roxbury. This is exactly in keeping with expectations that children from more complex environments will tend to exhibit a higher level of curiosity than those from simpler, more homogeneous environments.

It was of interest to see whether the children of the three areas differed in the kinds as well as number of responses they made. Bruner and Tajfel suggest that there may be a correlation between a

high degree of curiosity and a tendency to use narrow categories in
labelling s timuli.⁷³ Thus, it might have been expected that the child-
ren of Lower Roxbury would have used narrower, more specific terms in
describing what they saw. The description of certain elements in the
photographs seemed to offer clues as to the breadth of categories
used by the children. For instance, the man in the first picture
might be simply and broadly a "man" or he might be a "priest," deliv-
ery man" or "tax collector." Similarly, the setting in photograph
number three might be a "store" or it might be a "general store" or
"second hand store." The people in picture four might be "eating"
or having a "picnic." The problem was that many of the children
included both what could be considered broad and narrow categories in
their descriptions, so the determination w as not always clear cut.
Also, where responses were scant there was little to base judgment
on. Rather than falling into neat pigeonholes of "broad" and "narrow,"
the response pattern tended to be a continuum as follows:

	L.R.
	L.R.
	C.P.
Narrow categorizers	C.P.
	C.P......
	L.R.
	C.P.
	S.E.
	S.E.
	L.R......
	S.E.
	C.P.
B road categorizers	L.R.
	S.E.
	S.E.

If a fairly aribitrary break is made, the picture for each group is
as follows:

	Narrow	Interm.	Broad
Columbia Point			
respond. A.	-	X	-
" B.	X	-	-
" C.	-	-	X
" D.	X	-	-
" E.	X	-	-
South End			
respond. F.	-	X	-
" G.	-	X	-
" H.	-	X	-
" I.	-	-	X
" J.	-	-	X
Lower Roxbury			
respond. K.	-	-	X
" L.	-	X	-
" M.	X	-	-
" N.	X	-	-
" O.	-	-	X

However, with the exception of about three at the "narrow" and four
at the "broad" ends of the continuum, the other eight are really
quite similar in breadth of categorization. The fact that these
findings do not seem to concurr with the pattern of responses in
terms of number is because in several instances, observations limited
in number were very precise. An extreme example of this is the girl
who stated simply "it looks like they're having a meeting in an
outside restaurant." Other children might mention that there were
people eating outside or in a backyard, but they would perhaps not

risk suggesting (or didn't think of), a restaurant.

Although the results of this endeavor were not conclusive, it would be interesting to see what the results of a larger sample and different techniques would be.

IV - CONCLUSIONS

CONCLUSIONS

On the basis of the results of the interview survey, there does appear
to be a positive correlation, as originally hypothesized, between
the complexity of an environment and the curiosity and exploratory behavior
of the children who inhabit it. The findings seem to point to three
tentative conclusions.

First, there appears to be a relationship between the visual complexity
of the environment which the child is accustomed to and the level of
complexity required to stimulate his curiosity. In a fairly consistent
pattern, children from the more complex environments tended to select as
"more interesting," those images which offered the highest degree of
novelty, heterogeneity, etc.

Second, there appears to be a correlation between the level of complexity
experienced in the daily life of a child and the level of curiosity he
exhibits in a novel situation. In the response patterns found in the
interview, curiosity levels tended to rise with an increase in environ-
mental complexity.

Third, differences can be seen in the degree to which actual environments
facilitate exploration. When the total picture is seen, the numerous
behavior settings engaged in, the high level of curiosity, etc., the
heavy concentration of activity reported within a somewhat limited area
in Lower Roxbury seems to indicate that the most complex environment
satisfies the need for novel stimulation and facilitates exploration more

either of the other two areas studied.

On the other hand, children from the least complex area, Columbia Point, give many indications of being bored with their environment. Eager to be taken off the point into Boston, they are either not interested in, or are prohibited from exploring their own environment. The pattern of activity which shows a concentration close to the housing and then a wide and heavy scattering over the city reflects the inadequacy of the immediate environment of Columbia Point to satisfy the need for novel and increasingly complex stimuli. The isolation of the housing project compounds its inadequacy and makes the children dependent on journeys into other parts of the city for "excitement."

In the South End, the pattern of activity spreading out from the neighborhood would seem to indicate that the less complex local environment is not as satisfying as Lower Roxbury, but the connectedness of the South End to other areas of interest facilitates exploration in outward directions.

Although it is difficult to say which pattern of reported activity is "best," some speculation can be made as to their relative value. Since the Lower Roxbury pattern of concentration in the local area corresponds with a high level of curiosity in the test, it is tempting to say that this pattern must be the closest to optimum. However, if we are concerned that the child has experience not only with many and complex stimuli, but with stimuli having a broad range of meaning, then perhaps the very

tight pattern is not best. In the interest of his long range development, the child should probably not be so satisfied with his own area that he does not venture into other social and spatial environments. In this context, the South End pattern of activity spreading out into contiguous areas seems to have more value. For the young child, the immediate neighborhood of the South End provides quite a high degree of visual and behavior setting complexity, and as the child develops, the surrounding environment yields new challenge and stimulation. As the child's environment gradually expands through his own exploration, he not only picks up information about what the world is, but develops a sense of individual adventure and self-reliance. This is probably not the case at Columbia Point, where children seem to feel dependent on adult leadership in going beyond the limits of the point.

There are, however, several limitations on the results of the survey. In a research project such as this which attempts to use actual rather than simulated environments, there is difficulty in controlling and identifying the exact dimensions responsible for producing effects. Although there was an attempt to choose socially similar neighborhoods and to control age and sex variables, the three areas were not completely equivalent in each of these factors, and length of residence was not controlled. Furthermore, it is recognized that although there are gross similarities in the social environments of the three study neighborhoods, individual differences in stimulation received in the home could not be accounted for. It is these family influences which play the prominent role in the development of the young child, and there is evidence that the curiosity

of a child may be conditioned substantially by his very early experience.

The results of the study are also handicapped by the small number of subjects interviewed. Although the environments were evaluated for behavior settings on the basis of information from forty-five respondents, the measurements of curiosity and exploration depended upon the responses of only fifteen children - five in each area. It is possible that had another set of children been interviewed, the results might have been different. Nevertheless, it should be stated in support of the findings that psychologists have developed and tested theories with samples similarly limited in scope.

The fact that the results of this survey were in accord with the hypotheses and are internally consistent gives them some value in themselves and point to the need for further research. If with larger samples and refined methods, the evidence still indicates a relationship between the complexity of the environment and curiosity in children, the implications must be fully condidered. Until this research has been carried out, it is possible only to speculate that there are man-made environments which stifle curiosity and inhibit mental growth.

Fortunately, there are few Columbia Points, and the trend is away from the Levittowns and the massive, monotonous redevelopment projects of Manhattan's East Side. But these extremes of regimented homogeneity are still with us, enveloping the lives of their young residents. Even today, in urban renewal, we are sacrificing challenging, exciting

places for bland, stereotypic settings. And many of the suburban sub-
divisions currently being laid out are only slight improvements over the
past.

It is not too early, before all the facts are known, to pay closer attention
to visual and behavior setting complexity in designing and re-designing
environments; to become concerned with finding ways of structuring the
environment so as to provide the multiplicity, the open endedness, the
depth of reality which children need to sustain their curiosity and cog-
nitive development.

APPENDICES

APPENDIX I

Procedure

At the Harriet Tubman House in the South End, the group interview was held in two sessions - one each for boys and girls at the regularly scheduled times for those independent programs. At the Cooper Community Center in Lower Roxbury and at the Columbia Point Center, the "program" was held at the regular time for the members of one sex with the others in special attendance. Thus, the sessions at Columbia Point and Lower Roxbury involved larger groups who were unaccustomed to having members of the opposite sex present at their programs.

It was explained that the interviewer was a designer of neighborhoods and that she felt that neighborhoods were too often planned with only adult needs and preferences in mind. Therefore, she would like to find out what children do in their neighborhood, where they go, and what places they like in their neighborhood. It was stressed that this was not a test, that there was no right or wrong answer, and that no information would be reported or used against them.

At this point, a questionnaire was handed out with the directions to put an X beside each of the activities that the child participates in and the places he goes, a double X before each of the things he does or places he goes "a lot." It was stressed that the child should only put an X by those things he actually does or places he actually goes--not things or places he might enjoy doing or seeing.

As the children completed the questionnaire, they were given pieces of drawing paper on which they were asked to draw a map of their neighborhood, showing the places they go and the things they see. If there seemed to be real difficulty in knowing how to begin, it was suggested that the child start with his own house or some familiar place and draw the streets on which the place was located, expanding from there. If a child was totally unwilling or unable to draw a map, it was suggested that he draw a picture of his neighborhood. Many pictures were submitted as maps even without this direction.

In the individual interviews, the child was asked to perform several tasks. First, he was given the map of his area at 1/100 and asked to mark in red the places he goes "a lot" and in blue the places where he goes "once in a while." Then he was given the map of the City of Boston and asked to mark that map in a similar manner. In each case, several places were located verbally so as to familiarize the child with the basic layout and locate his own position on the map. It was explained that the interviewer was particularly interested in the places where the child goes by himself or with friends. The suggestion was made that the child think about the places he goes and then find them or ask for assistance.

The child was then shown the six sets of contrasted photographs, a set at a time, and asked which of each set of photographs he found more interesting and why. Occasionally, the question was also asked, "Which place would you prefer to go to?" This was directed at seeing if there was any difference between the pictures the children found most "interesting" and the places they would prefer to visit. With the pictures of residential areas, the question was also put, "Which do you think looks more like your neighborhood?"

Finally, the child was shown the photographs intended to test his level of curiosity. Each photograph was presented singly, and the directions given for the child to describe what he saw.

During the course of the interview, questions were asked as to how long the child had lived in his present neighborhood, what was the farthest he had ever been from home, and if he ever goes exploring and, if so, where.

APPENDIX II

General Problems Involved in the Approach

In retrospect, one of the major problems involved in testing the chosen

hypotheses was in the selection of the environments to be studied.

Initial judgements were based primarily on the observation of the visual

complexity of the areas and on the general knowledge which the author

had of the neighborhoods, as well as limited observation of the actual

activities being carried on. The more thorough evaluation of behavior

settings came about after the initial selection of the three areas had

been made. Had there proven to be major discrepancies between the

investigator's expectations and the findings of the behavior setting

evaluation, changes would have been made in the study areas. Although

major discrepancies did not occur, the fact that the South End was not

always a clear third choice - barely differing from Columbia Point in

one instance and Lower Roxbury in another - complicated matters. In

general, however, the choice was fortuitous, and one can only say that

if these areas produced the results they did, how much more conclusive

should the results of more contrasted areas be. Nevertheless, it is

recommended that in the future, final selections of areas to be studied

should be made on the basis of behavior setting evaluations of more

 areas than needed for the actual study.

Many of the problems which arose in the interview survey originated in

the difficulty of interviewing children. First, there is the necessity

of keeping them interested and cooperative. (Generally, it would seem

that if the first can be accomplished, the second will follow.) Second, there is the difficulty of expressing questions, etc., in a manner which can be understood by all the children participating. With these children in particular, there were some whose reading level was quite low. When detected, this problem can be mitigated by assistance by the interviewer, but if undetected can produce inaccurate results. In attempting to maintain a carefully structured interview, carried out in exactly the same way in each of the areas, there is the danger of missing valuable information which can come from less structured approach. Similarly, in avoiding influencing the children through questions and comments, the interviewer sacrificed observations which might have appeared in conversation.

The investigator had anticipated that there would be difficulty in getting children to think about where they explore or have explored their environment - that there would be little conscious connection between an excursion or act of "play" and "exploration." On the assumption that many instances of exploration are recalled simply as places to which the individual goes or has gone, it seemed that the lesser acts of exploration had to be forfeited and concentration placed on determining the areas and places with which the children were familiar. However, in using an indirect approach, extraneous influences were found to interfere with the principal aim. For instance, a well known area may be too unclear in structure to represent, while a clearly structured area may be represented simply because it is easy to represent.

APPENDIX III

Evaluation of Methods Used

The Questionnaire

Generally, the questionnaire listing play activities and places to play was a good technique for determining the behavior settings in which children of the study areas participate. However, certain refinements should be made. First, there should be some determination of where an activity is carried on or a behavior setting participated in. For instance, it became evident that children checked behavior settings found at "grandmother's house," or "in the country," as well as in their own neighborhood. This could be taken into account by having several general categories of places follow each item, to be checked as appropriate, such as:

☐   Climb trees   (in the neighborhood ___ , in other parts of the city ___ , in the country ___ .)

It might also be advantageous to determine more specifically where an activity is carried on. "Playing with sand" is quite different in a playground, vacant lot, or beach. The child could write where he does something on a line following the item, or again have possibilities to check.

Another refinement which could be made to the questionnaire would be to employ a better means of determining frequency of participation in a behavior setting. Asking the children to put a double X if they did something or went somewhere "a lot" was too difficult a direction to be

grasped by everyone. It would be better to have several possibilities to check , such as:

Never ____, Once ____, A few times ____, Often ____.

The questionnaire could also be lengthened to include more activities and places, especially if this were the only task performed in a single session. The researcher was surprised to see how well the subjects performed in this portion of the interview. In a pretest in another area, the children couldn't or wouldn't make up their own list of where they play and what. But this form of questionning which is a test form to which they are accustomed, does not depend on writing skill, and which offers some clues is a much more successful technique.

Self-drawn Maps

As has already been noted, this technique is wanting as a method of determining familiarity with, and degree of exploration of an environ ment. Map drawing itself may be a learned art, and the ability to represent the environment depends as much or more on the clarity of the environment as the individual's familiarity with it. However, the self-drawn map can be a useful tool in determining the behavior settings participated in by the subjects.

Filled-In Maps

The maps seem to have potential as a means of determining what patterns of exploration occur in different environments, but in order to be very successful, they should be clarified so that the children can read them easily. Color might help, as well as the notation of more

landmarks, as children probably are less familiar with street names
than place names outside their own area.

It would also be helpful to get the children to label what places they
have marked so as to eliminate some confusion. And it is also important
to know whether a child has gone somewhere by himself, with other
children, or has been taken by an adult.

In producing the maps for the children to mark, it was recognized that
the researcher's choice of the area to be represented on the map limits
the direction and scope of the child's reported travels. The child
who lives on the edge of the area shown on the map may only be able to
represent half of the area he actually frequents. In order to counteract
this influence of the investigator and obtain a more complete view of
the area the child covers while neither reducing the scale nor overwhelm-
ing the subject by a monstrous map, the following technique might be
used: the child would be confronted with a panel in the center of which
would be a map at about 1/100 showing the area immediately around his
own home. On the direction of the child, the areas adjacent to his
immediate neighborhood could be uncovered for him to mark.

Choice of the " More Interesting " Photograph

The principal problem in asking subjects to choose which of two images
is more interesting lies in the fact that their choice does not necess-
arily reflect their actual behavior. The answer which is given may
instead reflect what the child thinks the right answer is - especially
if there is any social value involved. Also, with some children, there

may be a tendency to answer according to which image they like better -
which may not be the same as the image which is more interesting, or
which stimulates curiosity.

If research is aimed simply at seeing how subjects from different areas
respond to differences in complexity, then abstract visual material is
probably adequate and simpler to use than photographs, having fewer
variables to contend with. If, on the other hand, there is concern to
find what levels of complexity found in environmental situations stim-
ulate the interest of the various subjects, then concrete representations
of actual environments is preferable. These should probable be graded
more systematically for complexity than was done in this study.

Descriptive Response to Photographs

This technique does seem to have some validity as a measure of curiosity,
and is fairly easy to employ, requiring only that the photographs or
other visual material used have different levels of observable detail.
Perhaps the biggest flaw is that some individuals may be curious in
exploring the material visually, but their description may be couched
in general terms, lowering their response rate. Such individuals might
use narrow categories - such as "priest" rather than "man" - but in
describing would sort out the irrelevant details. In this study, there
were only a few subjects who seemed to fall into this category. Most
children tended to itemize what they saw, and differed principally in
the amount of detail which they observed. A few generalized in such a
broad and disinterested manner that curiosity seemed low.

APPENDIX IV

Recommendations for Further Research

The following are several types of research which the author would
like to see carried out in the future:

First of all, using the same or similar types of urban environments,
a research project might be undertaken using refined methods and a
significantly larger sample. Measurement of curiosity should be bol-
stered, if possible with school records and intelligence tests -
although these are not adequate indicators of curiosity in themselves,
due to the methods now generally used to determine intelligence.

Suburban environments should also be compared with urban settings -
if possible, using lower class, as well as middle class children as
subjects.

Children relocated from one type of environment to another should be
studied in each location to see if curiosity is altered. This should
be done over a period of time to allow for the effect of the change
itself. Relocatees from urban renewal areas might be a possible study
group, but is would also be helpful to study children whose relocation
was somewhat more voluntary.

Given the resources, children's curiosity and exploratory behavior in
designed, prototype environments could be investigated over time,
keeping some groups stable and moving others. In this way, many of
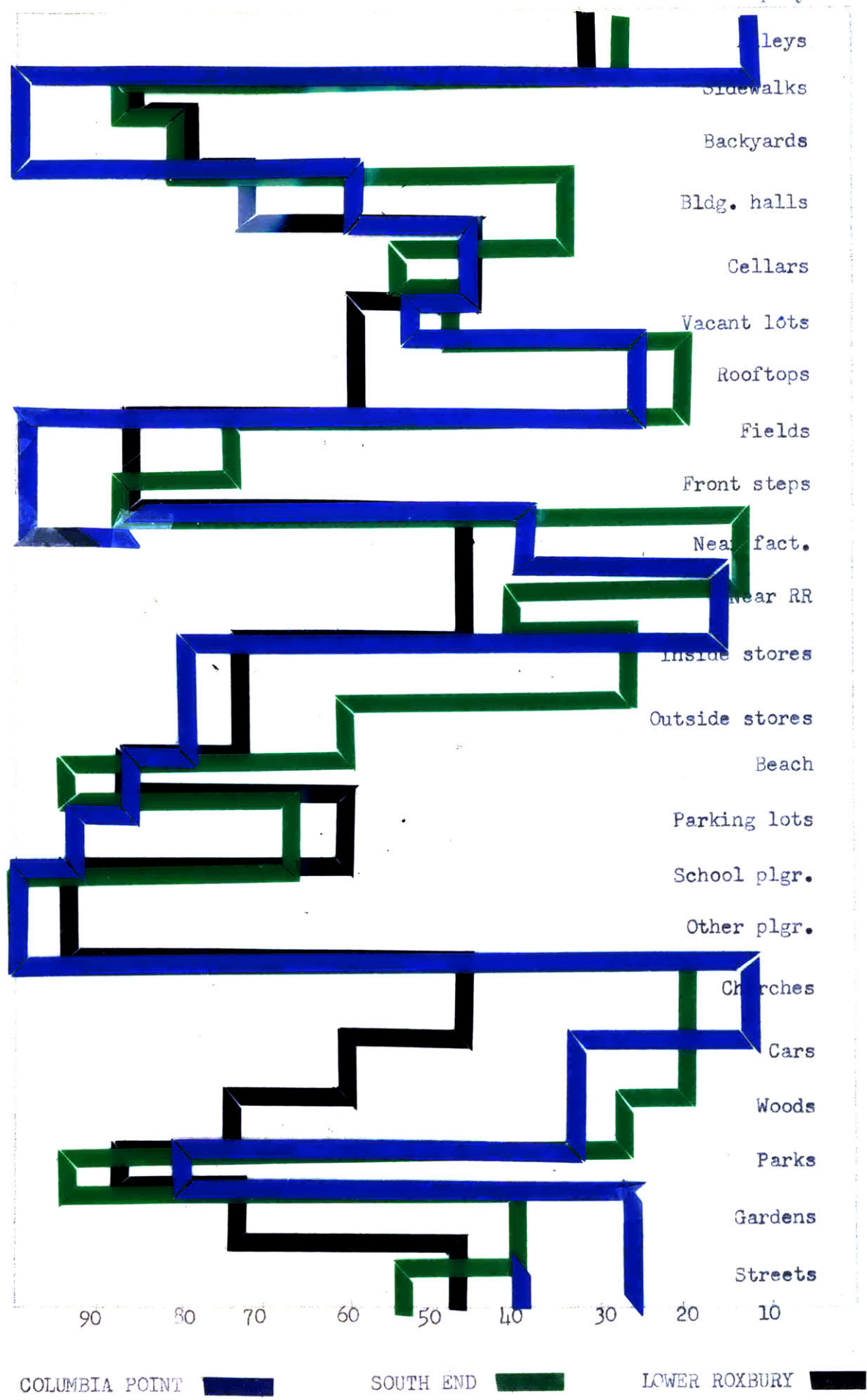the variables now uncontrollable, could be isolated.

The effects of particular environments should also be explored by studying children of various ages who have lived in an area all their lives. Or, children of the same age but differing in length of residence could be compared for curiosity. This would be helpful in extreme environmental situations, particularly in simple homogeneous settings where short and long term stimulus deprivation could be investigated.

FIGURES 1, 2, 3, 4

The following graphs indicate the responses of each group to potential behavior settings and activities listed in the questionnaire. Percentages indicate the percent of the total number of respondents in each group who checked a particular item. Thus, if ten out of the fifteen children in an area noted that they climb trees, the top of the bar will be at 66.6%.

FIGURE 1 . . . . BEHAVIOR SETTINGS, CATEGORY I
Places to play

Alleys
Sidewalks
Backyards
Bldg. halls
Cellars
Vacant lots
Rooftops
Fields
Front steps
Near fact.
Near RR
Inside stores
Outside stores
Beach
Parking lots
School plgr.
Other plgr.
Churches
Cars
Woods
Parks
Gardens
Streets

90   80   70   60   50   40   30   20   10

COLUMBIA POINT � ▬   SOUTH END ▬   LOWER ROXBURY ▬

FIGURE 2

BEHAVIOR SETTINGS, CATEGORY II
Activities

Climb fences

Walk on walls

Crawl tunnels

Climb trees

Watch bldgs, down

Watch bldgs, up

Watch traffic

Explore vac. bldg.

Go downtown
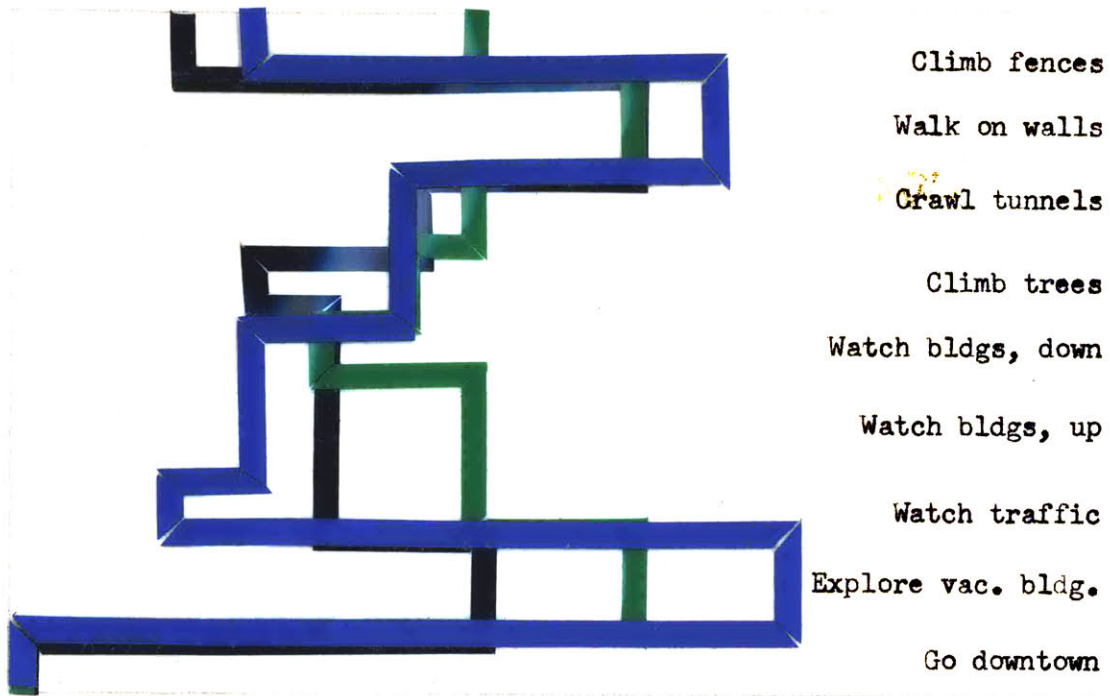
FIGURE 3

BEHAVIOR SETTINGS, CATEGORY III
Places to visit

Post office

School

Churches

Library

Fire sta.

permarket

Laundry

2nd h nd st.

Hospital

Gas sta.

Police sta.

Comm'ty ctr.

90   80   70   60   50   40   30   20   10
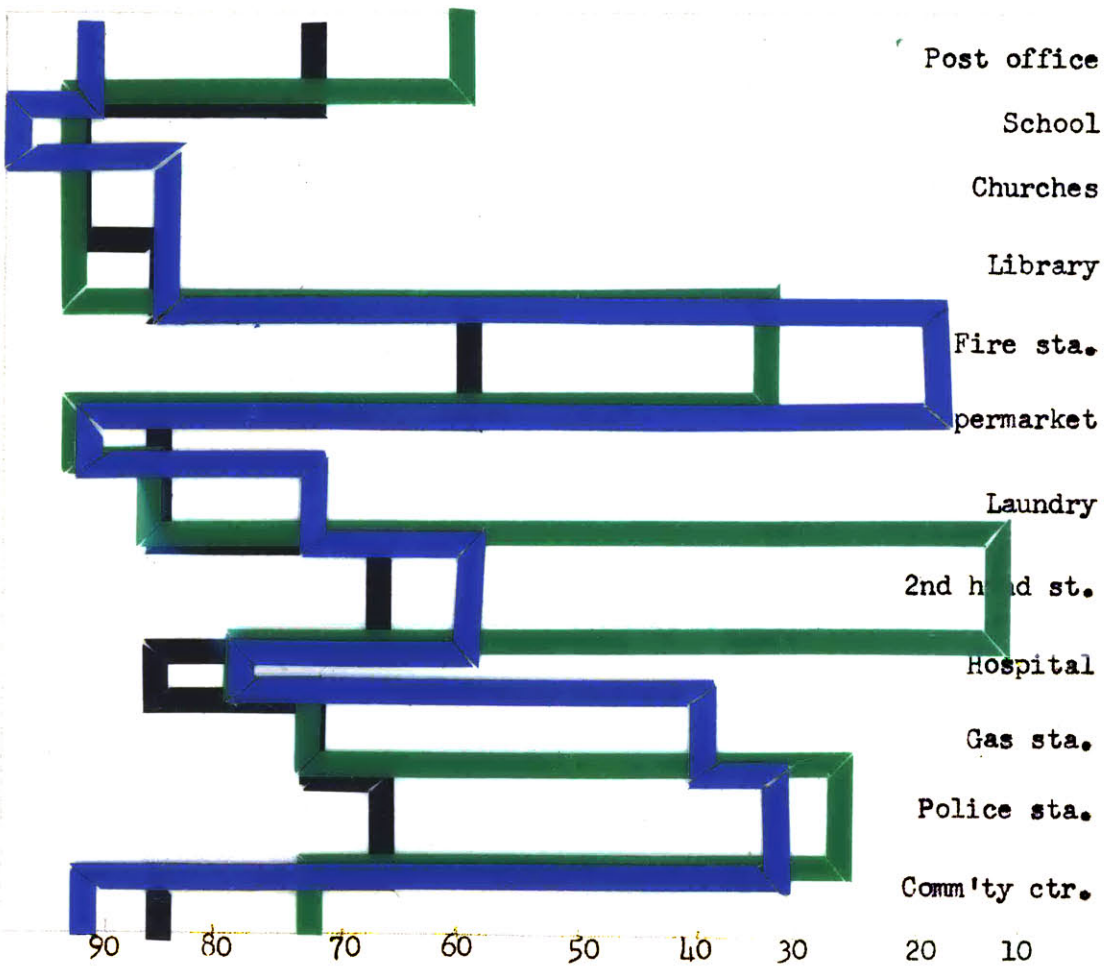
COLUMBIA POINT   SOUTH END   LOWER ROXBURY

FIGURE 4   ADDITIONAL ACTIVITIES

Throw cans, bottles
Hit rocks c sticks
Dig holes
Play c sand
Write on walls
Climb jungle gyms
Jump on tires
laundry oles
Catch insects
Climb on old cars
Walk in tall grass
Pile rocks, bricks
Hide in boxes
Look for treasure
Throw balls
Play hopscotch
Bicycle

90   80   70   60   50   40   30   20   10
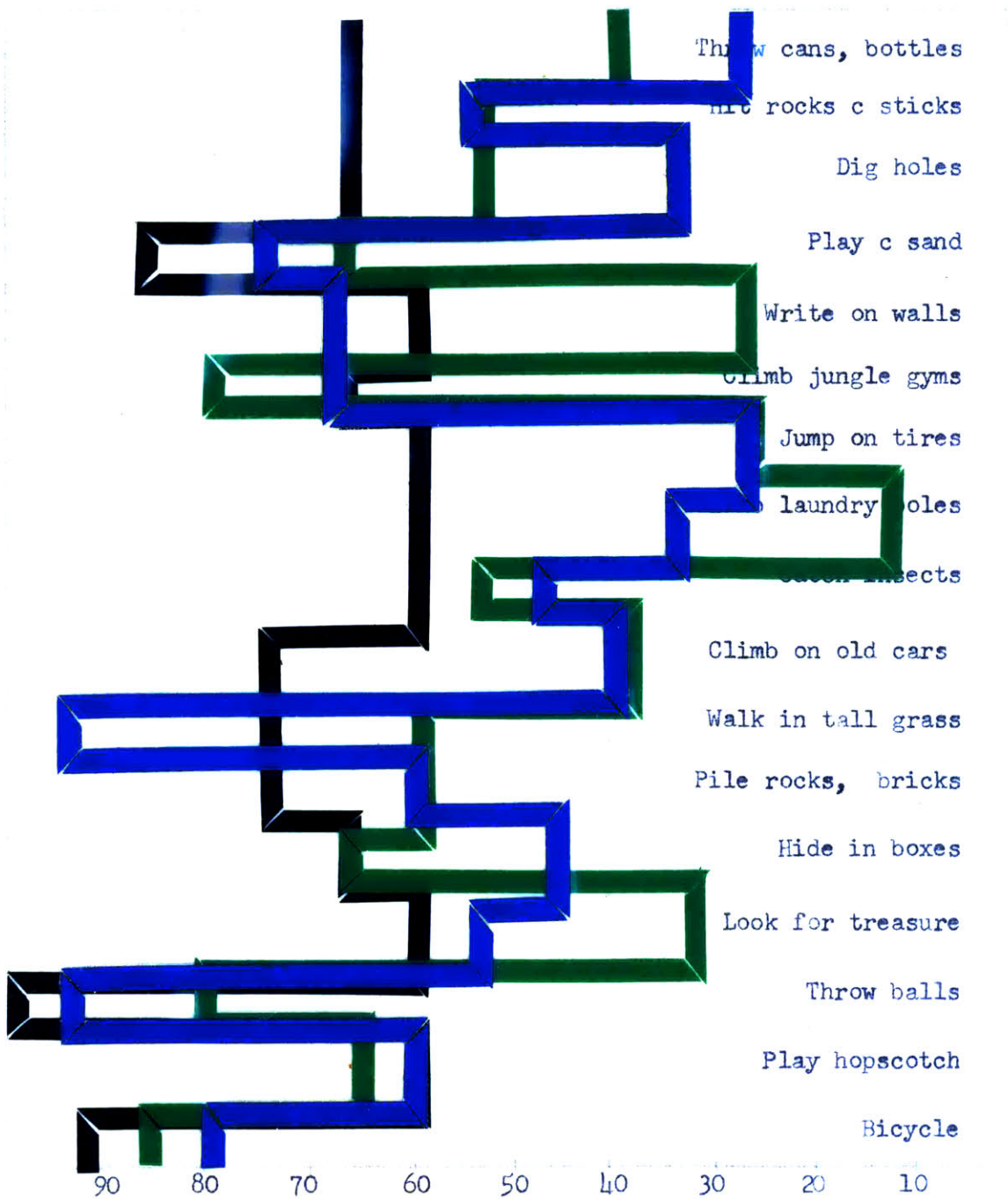
COLUMBIA POINT   SOUTH END   LOWER ROXBURY

EXHIBIT A.

(Filled - In Maps)

The maps included here are composites made from the maps filled - in

by the children. The base maps are the same as those actually used,

only reproduced somewhat smaller here. Dots have been used wherever

the child marked a particular place, and strips wherever the child

used lines to mark places where he goes. On the city maps, where the

children tended not to differentiate between places visited occasionally

and places visited often, there has been no attempt to differentiate

in the composite. However, the local maps do distinguish between

places to which the children go frequently and infrequently. The key

is as follows:

● ▬▬▬ Places to which children report going often

⊘ ◤◥ Places to which children report going occasionally
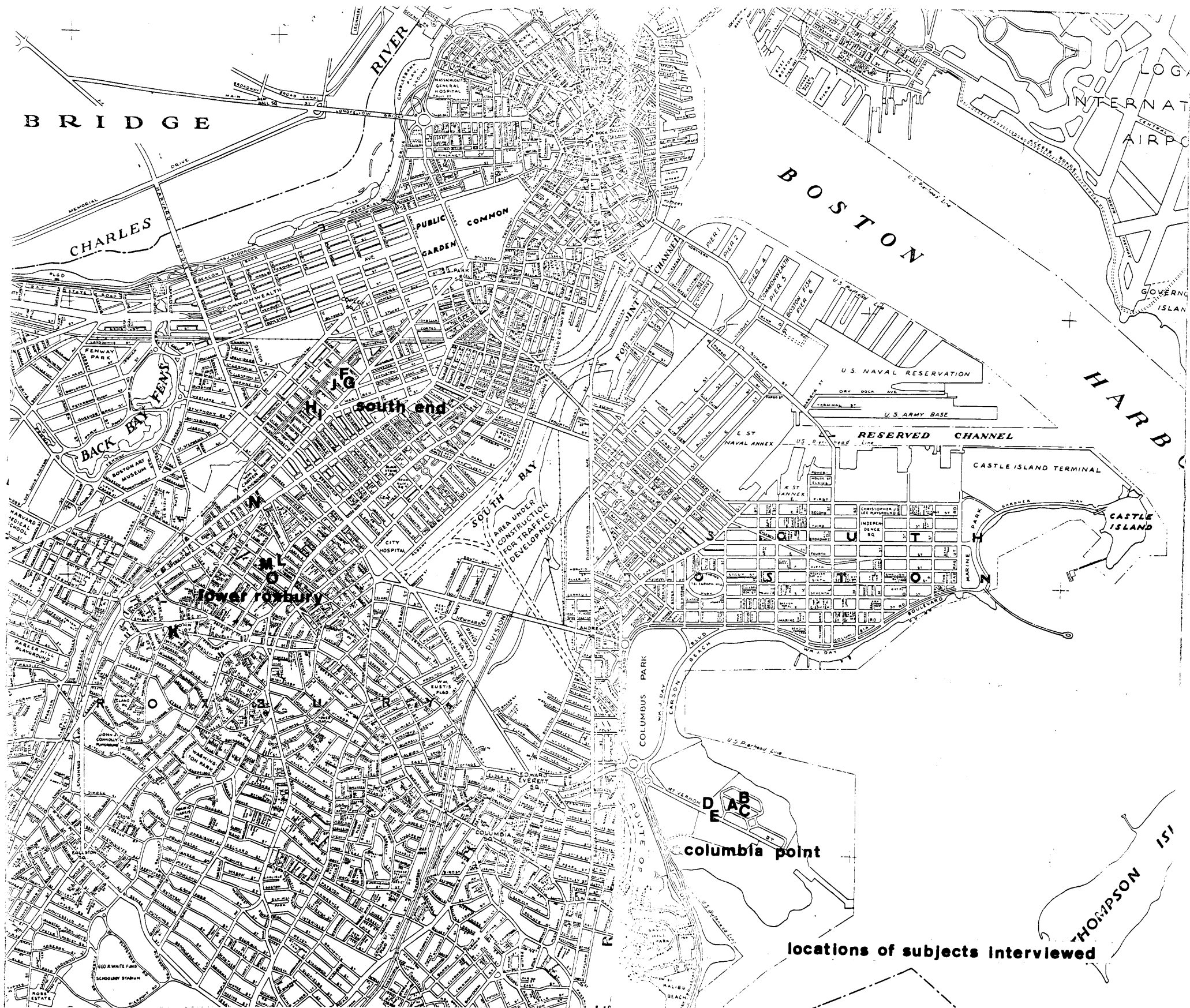
BRIDGE

CHARLES RIVER

BOSTON HARBOR

PUBLIC GARDEN COMMON

south end

BACK BAY FENS

SOUTH BAY

lower roxbury
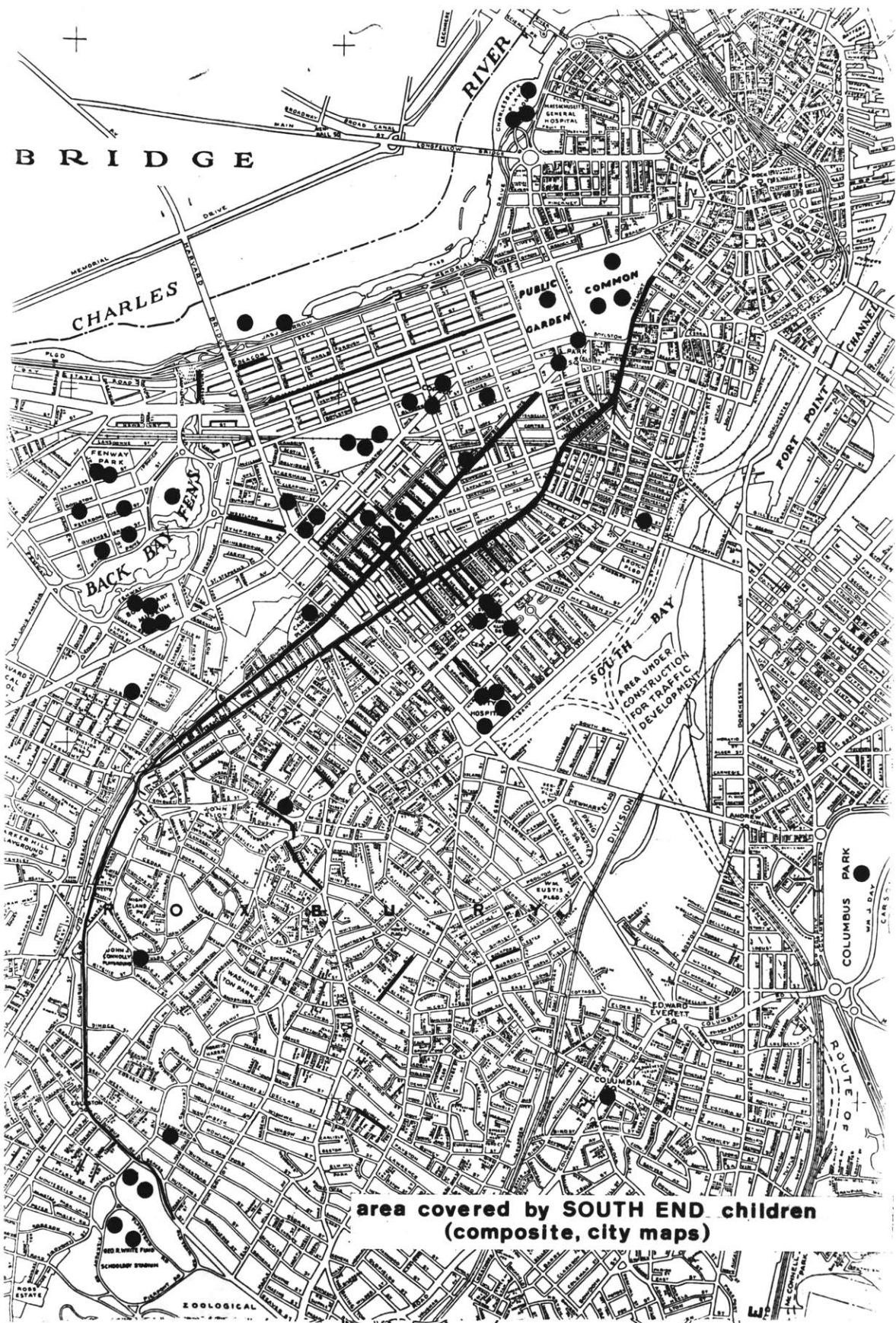
columbia point

locations of subjects interviewed
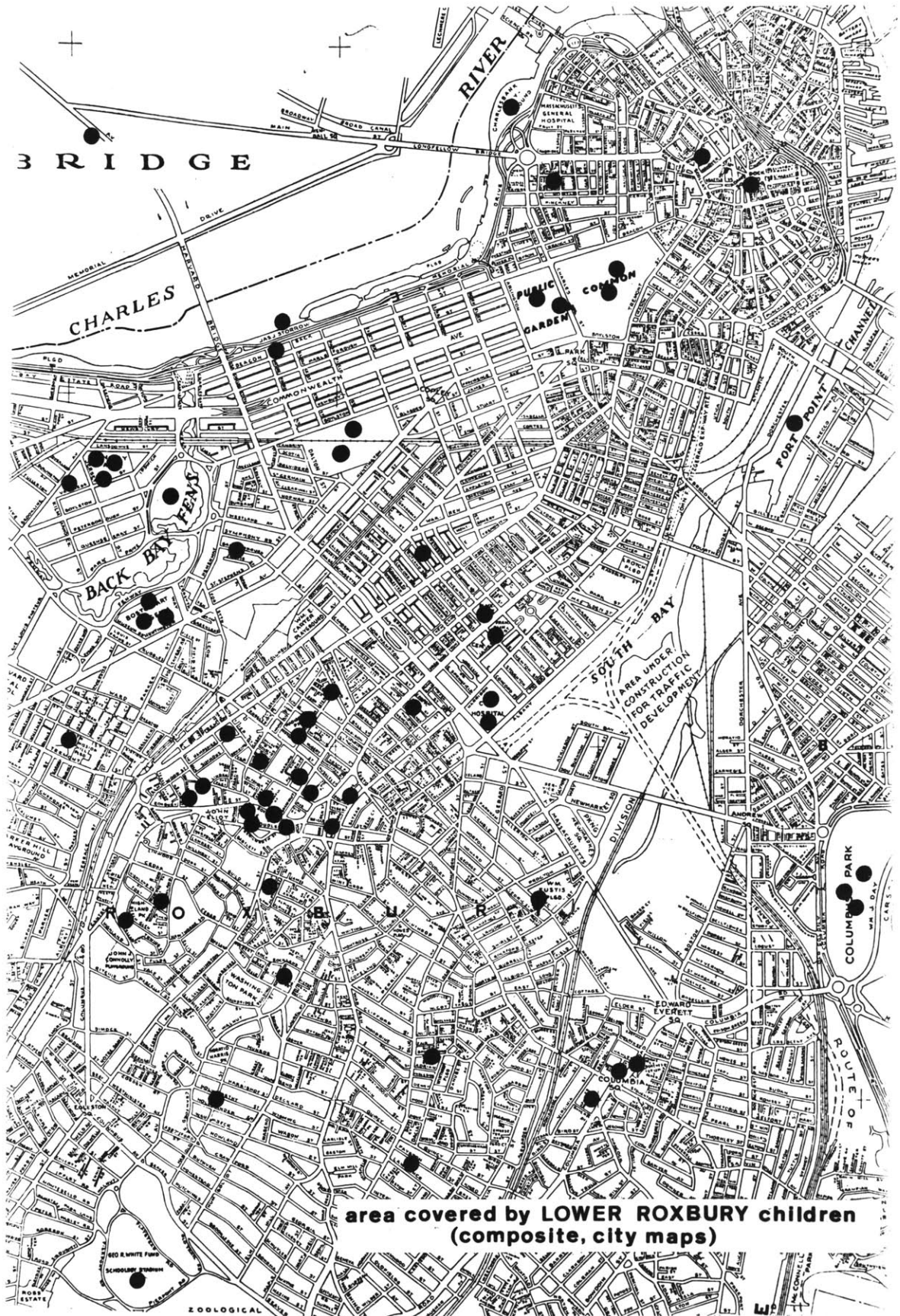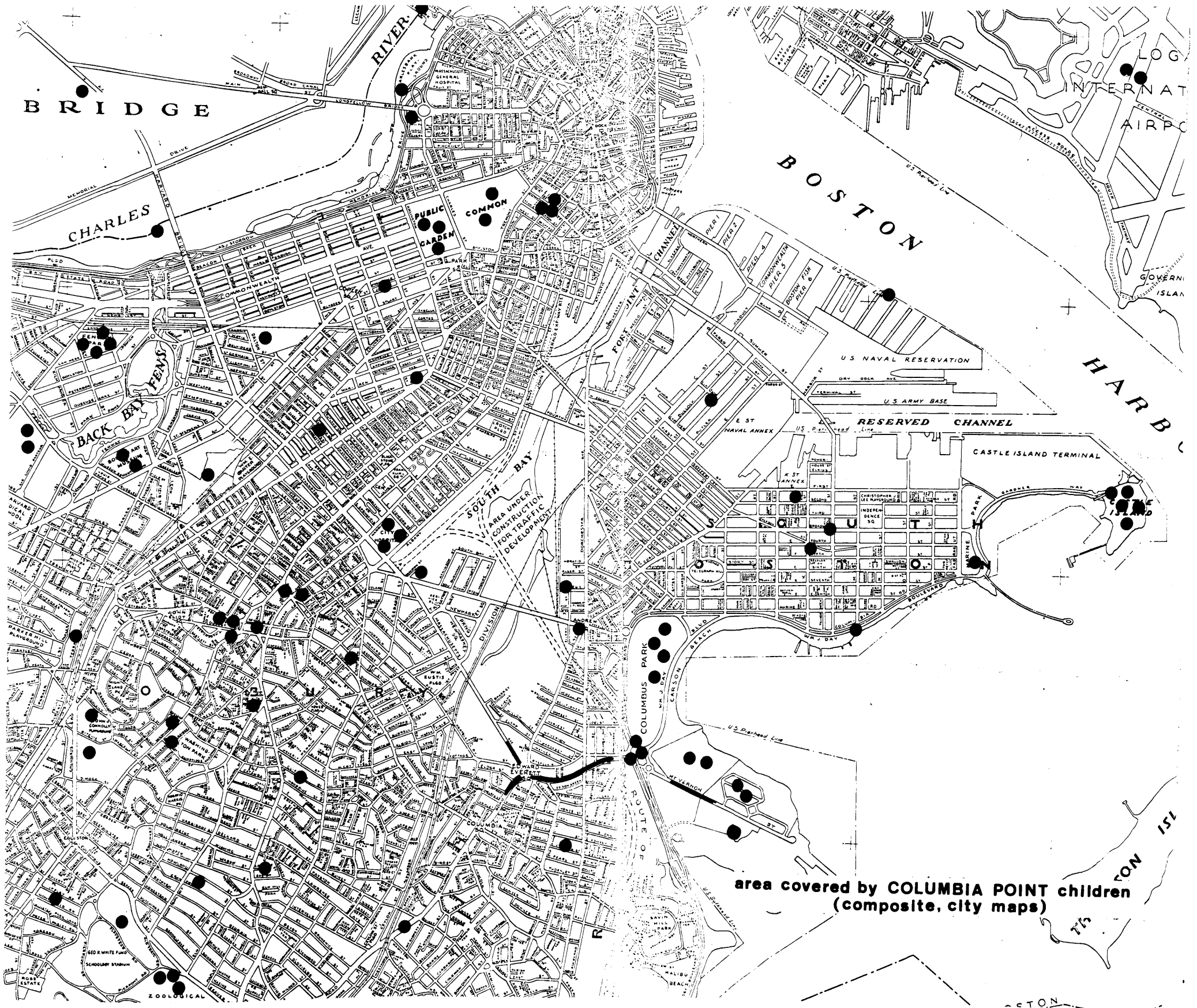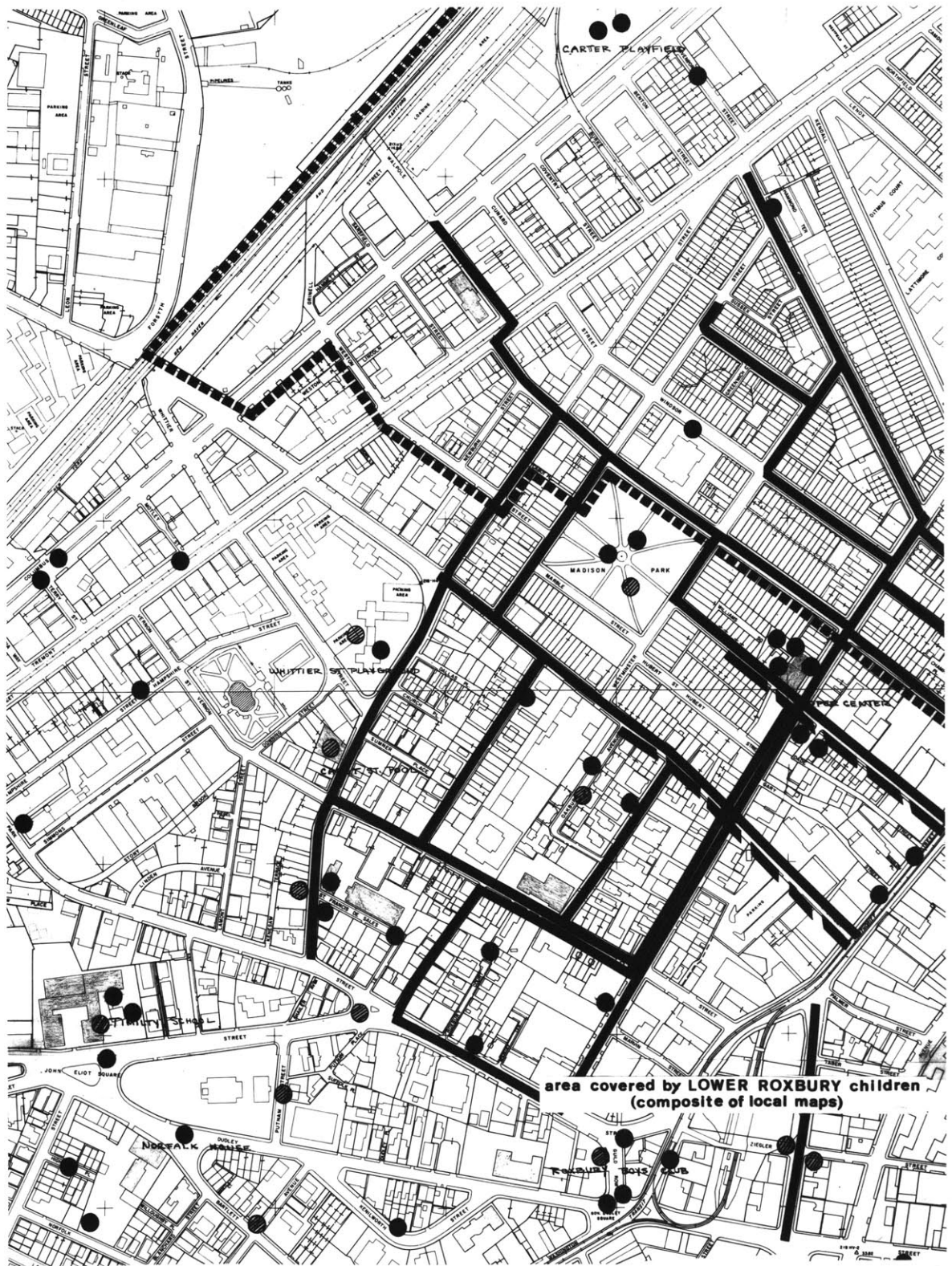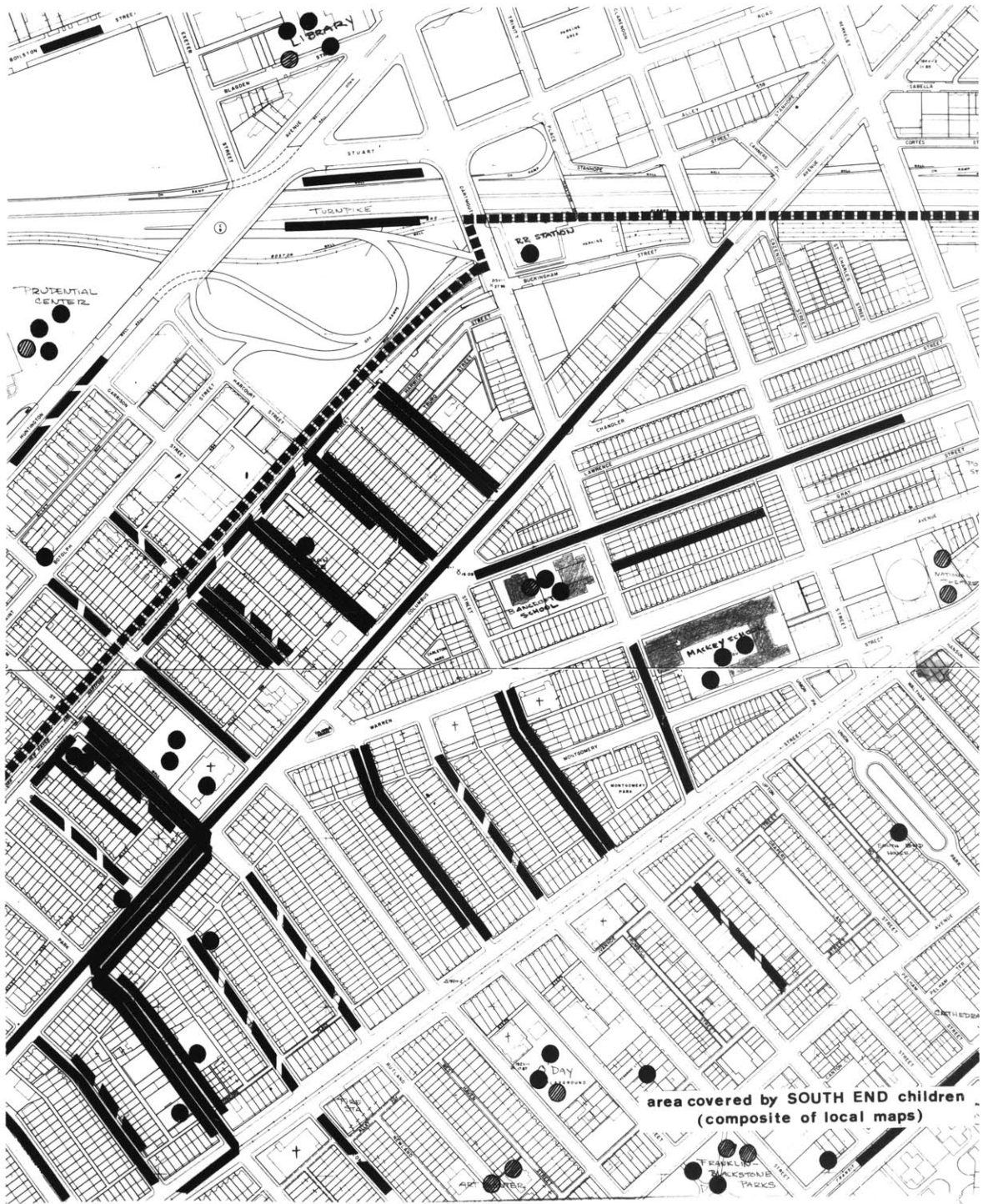
area covered by LOWER ROXBURY children
(composite, city maps)

area covered by SOUTH END children
(composite, city maps)

area covered by COLUMBIA POINT children
(composite, city maps)

area covered by LOWER ROXBURY children
(composite of local maps)

area covered by SOUTH END children
(composite of local maps)
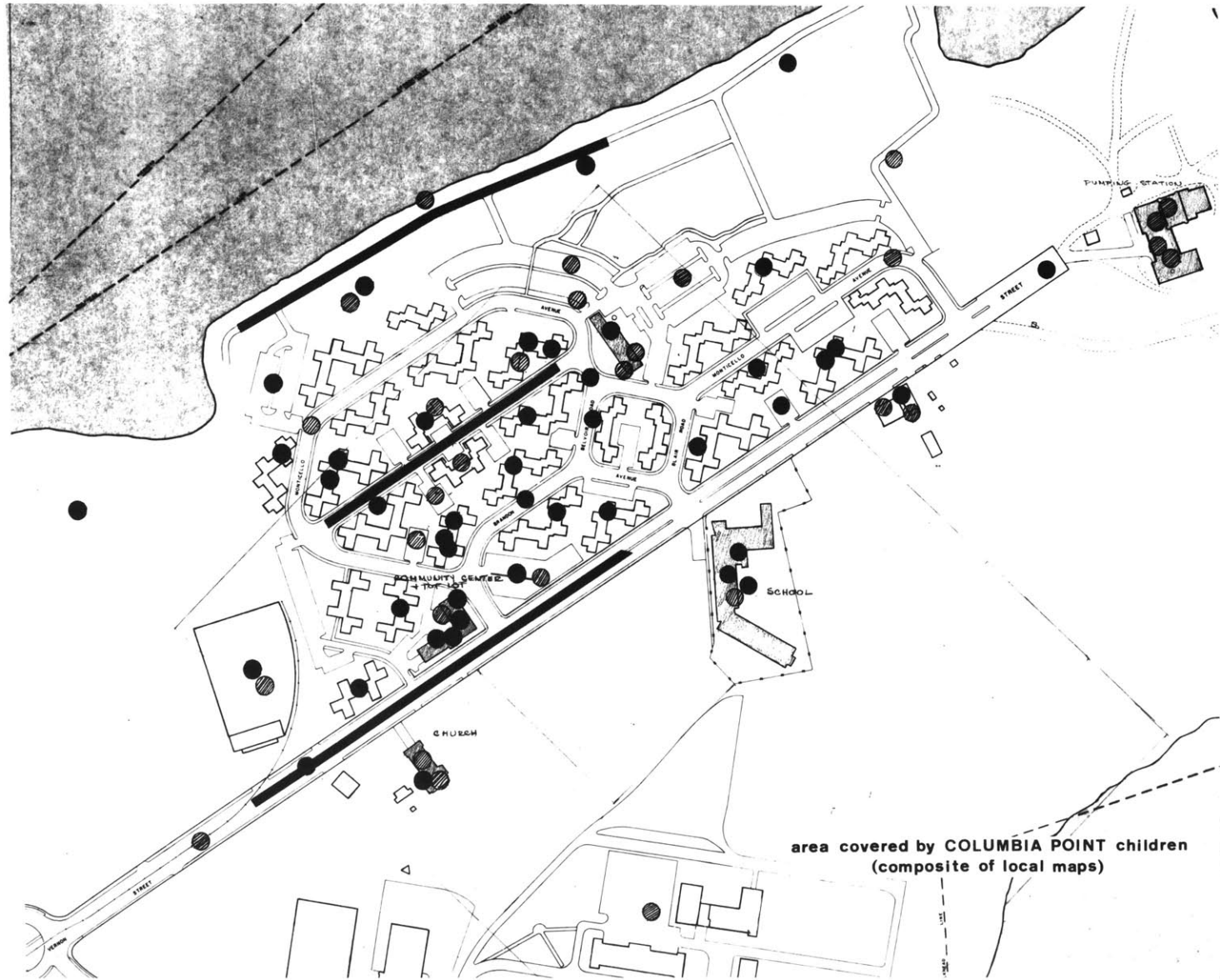
area covered by COLUMBIA POINT children
(composite of local maps)

EXHIBIT B.

(Self-Drawn Map Samples)

The following drawings were submitted in response to the direction to draw a map of the neighborhood. Although it is difficult to say these are actually "typical" of the drawings from each area, they show characteristic ways of representing the environment in the group to which they belong. Not the most interesting or skilled drawings, they tend to be slightly better than average among work submitted.

Since so many elevations were substituted for maps, an elevation as well as a map is included from each group.

Michael Bowden

School Sho

Rogers

WILLAMS St.

StePLEN st

Shawmut AV

Wash. Store

S cor

Drog

FIRE house

96
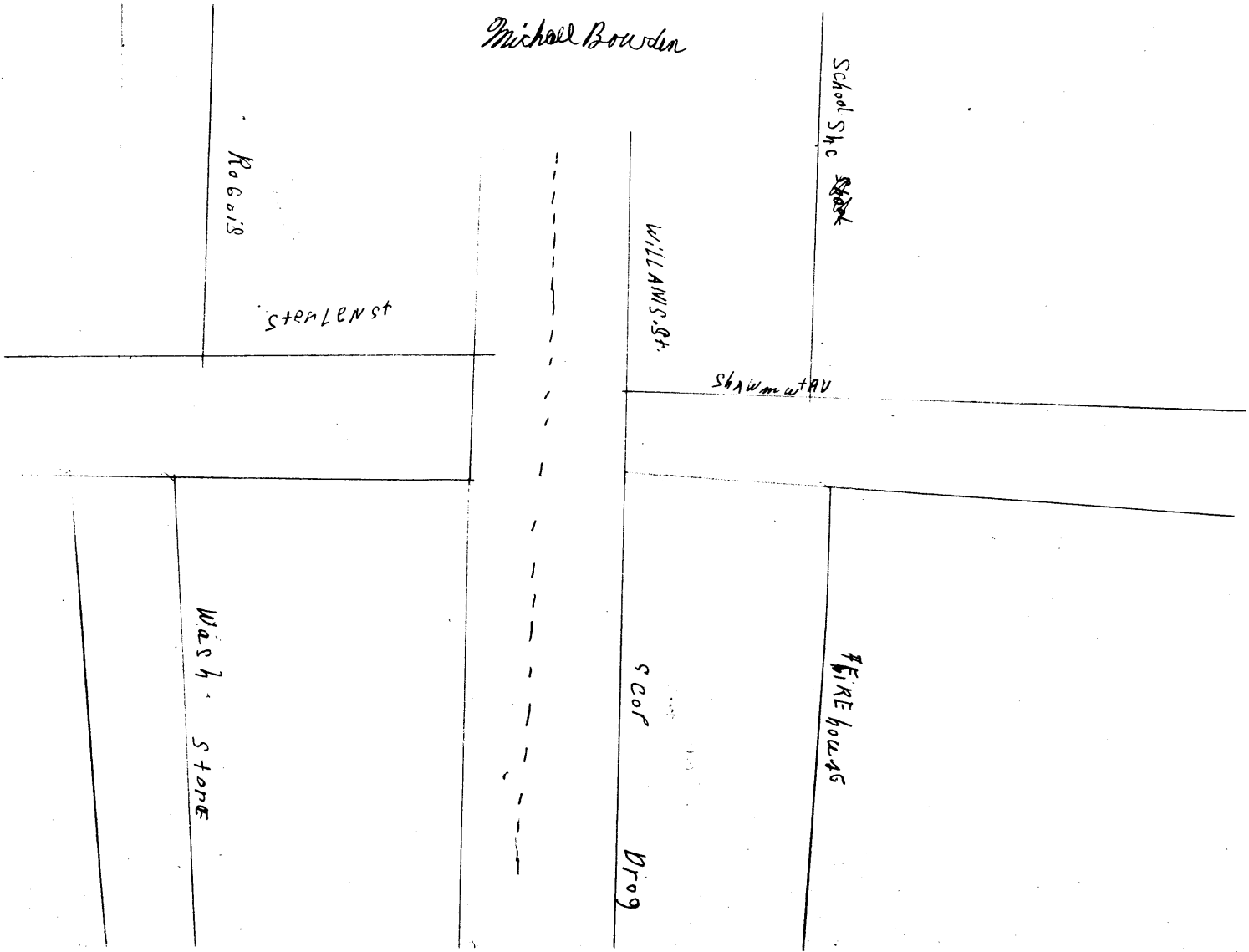
LOWER ROXBURY

Marion Fields
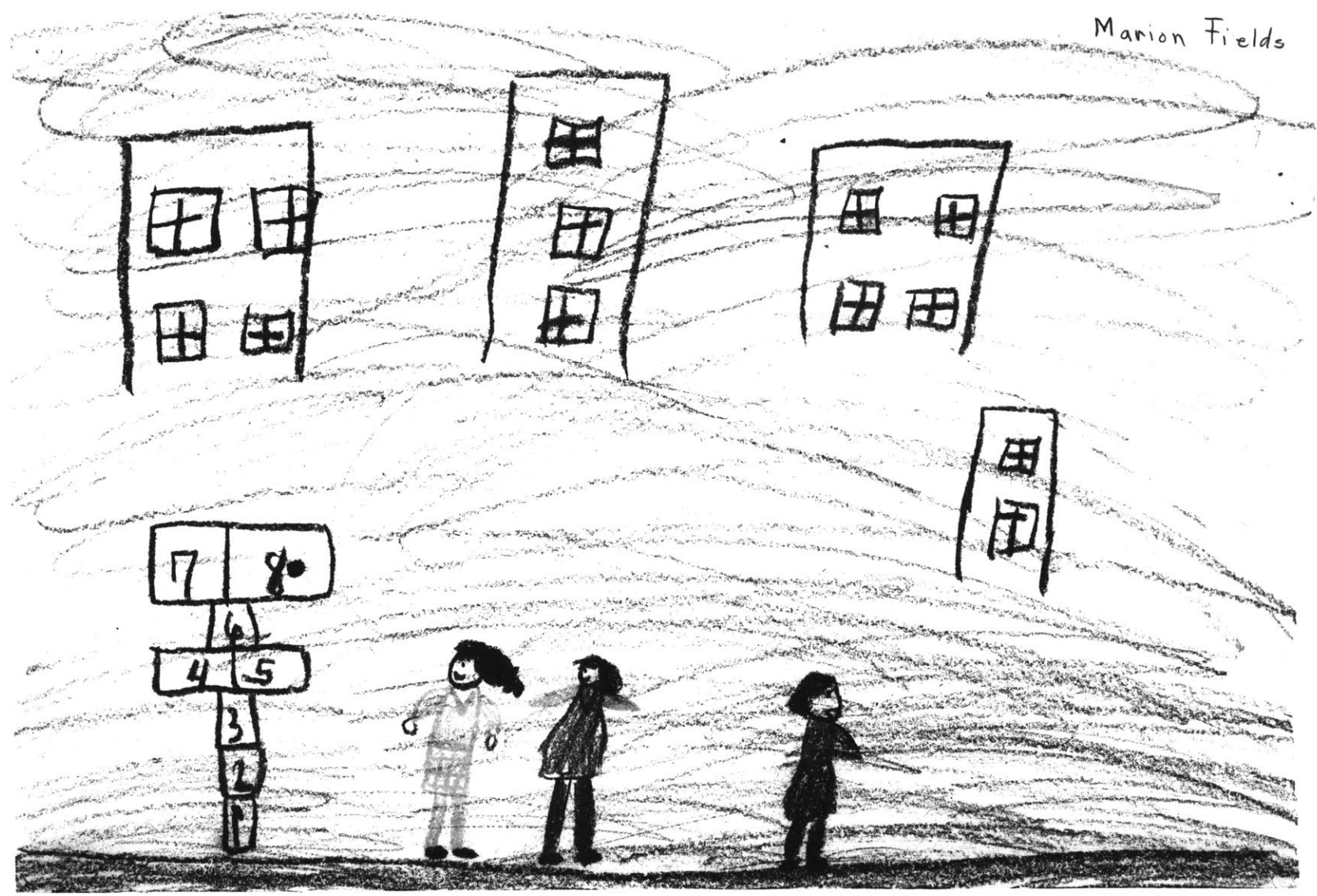
LOWER ROXBURY

Vanessa
301 Ave
8

Appileton

Store

Church

Bar

Milk Store

School

West Canton

Store

Col Ave

X

Bar

Store

Store

SOUTH END

Farris

PRUDENTIAL

DRUG STORE   TV. REPAIR   JOKE SHOP

FOR SALE
Call~630-0000
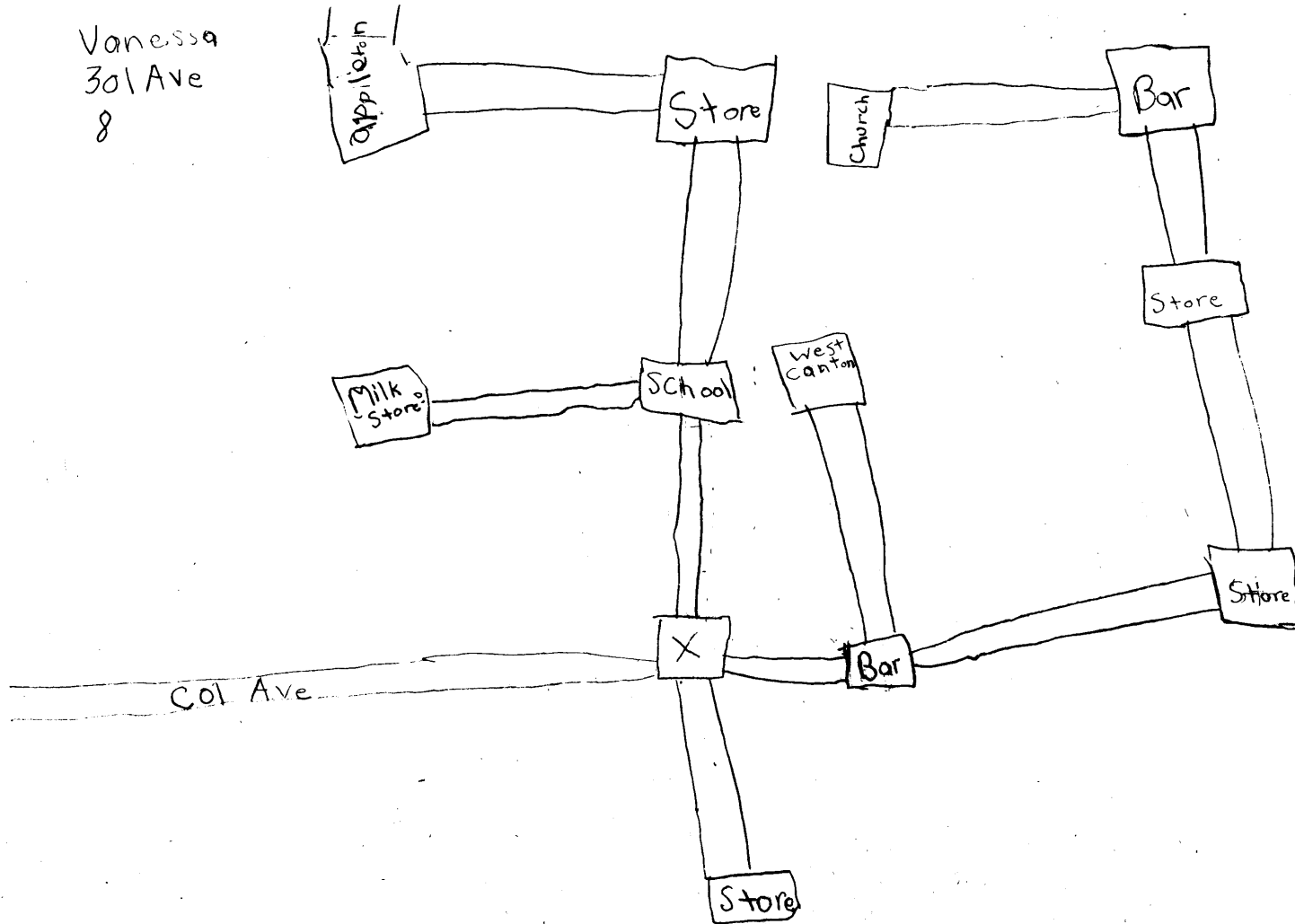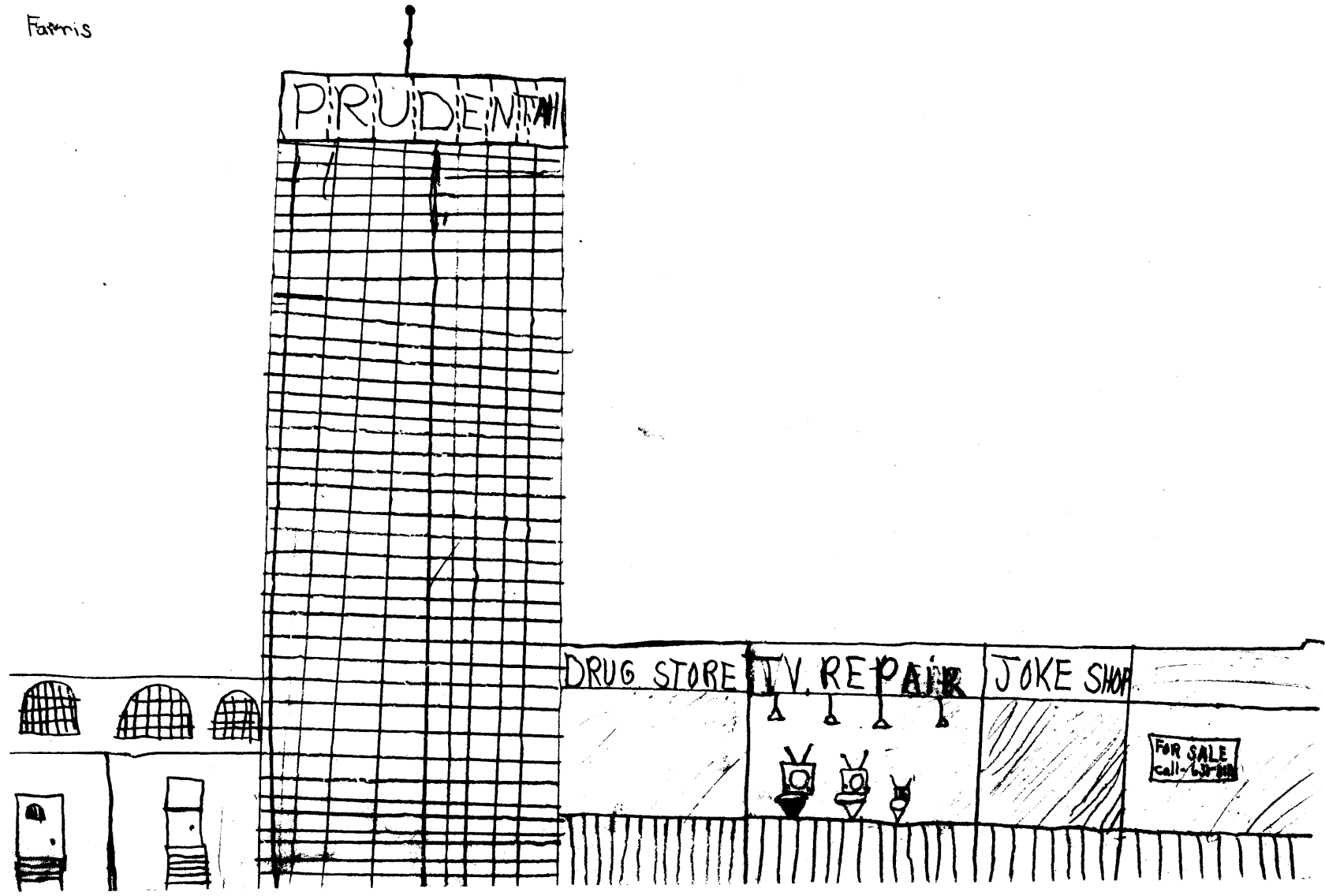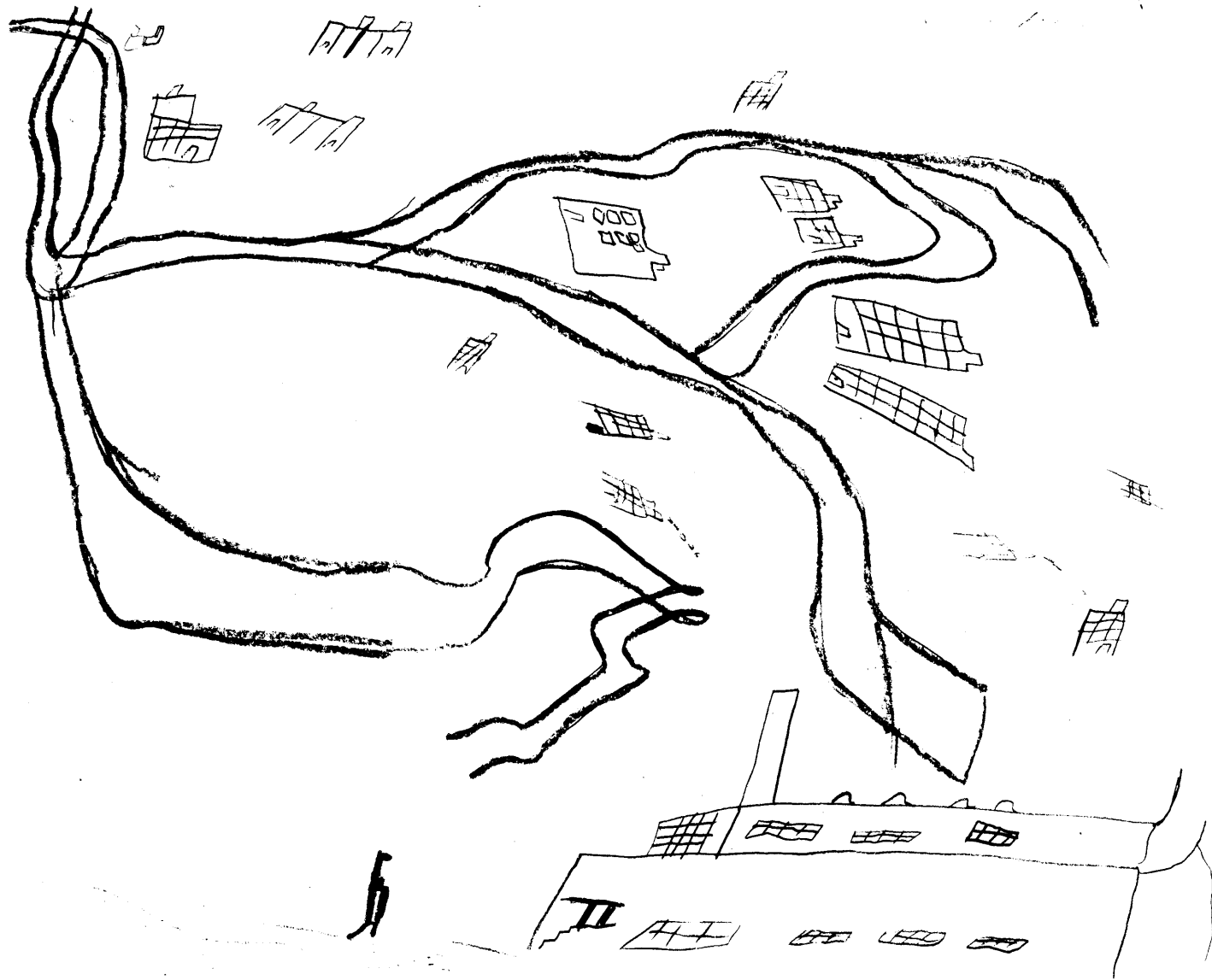
COLUMBIA POINT

Mt Deihshist
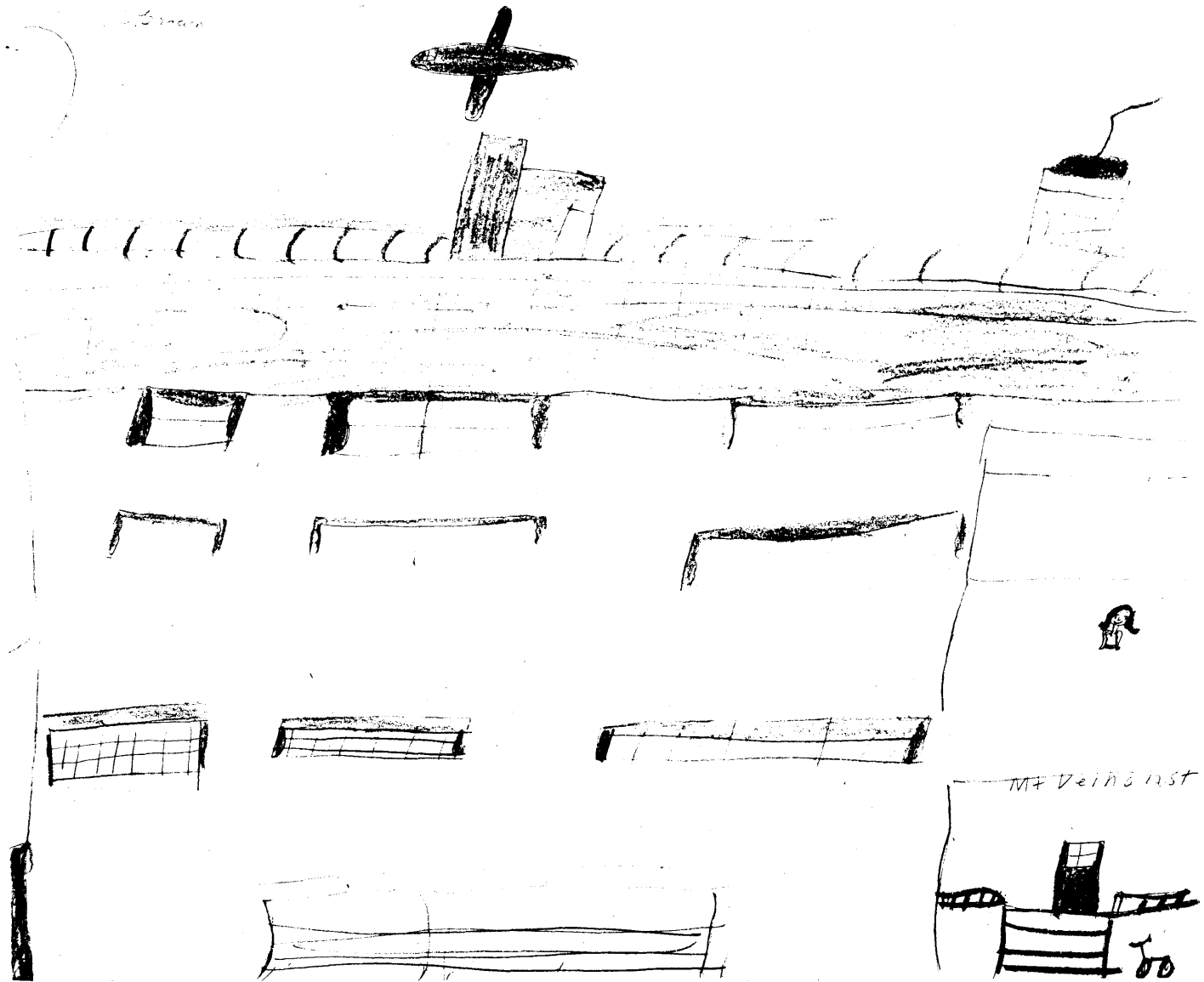
COLUMBIA POINT

TABLE 1

(Choices as to "Interesting" Photographs)

The following table indicates the response pattern for each child to

the photographs in Group I - intended to test the complexity required

to stimulate curiosity.   The numbers indicate the grade of the picture

chosen,in terms of its visual complexity. Thus, 1 indicates the simpler

of two photographs, and 2 the more complex. Number 3 notes the most

complex of three photographs (three photographs were used in two sets).

TABLE 1

CHOICES AS TO "INTERESTING" PHOTOGRAPHS

	I (Aerial View)	II (Res. Area)	III (Play Areas)	IV (Parks)	V (Commercial)	VI (Industrial)
Columbia Point						
A. Alicia	1	1	1	2	1	1
B. Shirley	1	2	1	2	2	2
C. Barry	1	1	1	3	1	1
D. Jonathan	1	1	1	3	1	1
E. Michael S.	1	2	1	3	1	1

<div align="right">

total 1's - 21
" 2's - 6
" 3's - 3

</div>

	I (Aerial View)	II (Res. Area)	III (Play Areas)	IV (Parks)	V (Commercial)	VI (Industrial)
South End						
F. Vanessa	2	1	1	3	2	1
G. Linda	1	1	1	2	1	2
H. Charles	1	1	1	2	3	1
I. Jackie	1	1	2	1	2	1
J. Farris	1	1	1	2	3	2

<div align="right">

total 1's - 18
" 2's - 9
" 3's - 3

</div>

	I (Aerial View)	II (Res. Area)	III (Play Areas)	IV (Parks)	V (Commercial)	VI (Industrial)
Lower Roxbury						
K. Denise	1	2	2	3	2	2
L. Yolanda	2	2	1	3	3	2
M. Michael B.	2	1	1	2	3	1
N. Calvin	1	1	1	3	3	2
O. Dennis	2	1	1	2	3	1

<div align="right">

total 1's - 11
" 2's - 12
" 3's - 7

</div>

TABLE 2

(Descriptive Responses to Photographs)

The following table gives the response pattern to Group II photographs –
used to measure curiosity. The numbers indicate the number of observation
units credited to each child. (see text for explanation)

TABLE 2

DESCRIPTIVE RESPONSES TO PHOTOGRAPHS

		I (2 people)	II (children)	III (fat man)	IV (backyard)	Total
Columbia Point						
A.	Alicia	7	5½	6	5	23.5
B.	Shirley	12	10½	14	17	53.5
C.	Barry	4	4	10	6	24.0
D.	Jonathan	14	17	11	22	64.0
E.	Michael S.	5	9	9	6	29.0
	Total	42	46	50	56	194.0
	Average	8.4	9.2	10.0	11.2	38.8 (9.7)
South End						
F.	Vanessa	13	27½	19	27	86.5
G.	Linda	21	19	13	15	68.0
H.	Charles	19½	23½	24½	22	89.5
I.	Jackie	5½	3½	9	3	21.0
J.	Farris	5½	4½	4	4	18.0
	Total	64.5	78	69	71	283.0
	Average	12.9	15.6	13.6	14.2	56.6 (14.15)
Lower Roxbury						
K.	Denise	25	13½	19	26	83.5
L.	Yolanda	3½	4½	8½	3	19.5
M.	Calvin	13	15	48	40½	116.5
N.	Michael B.	23	43	50½	81	197.5
O.	Dennis	11	20	24	15½	70.5
	Total	75.5	96	150	166	487.5
	Average	15.1	19.2	30.0	33.2	97.5 (24.37)

EXHIBIT C.

(Copy of the Questionnaire Used)

DO YOU PLAY IN ANY OF THESE PLACES?

☐	alleys
☐	sidewalks
☐	backyards
☐	building halls
☐	cellars
☐	vacant lots
☐	rooftops
☐	fields
☐	front steps of houses
☐	near factories
☐	near railroad tracks
☐	inside stores
☐	outside stores
☐	beach
☐	parking lots
☐	school playgrounds
☐	other playgrounds
☐	churches
☐	cars
☐	woods
☐	parks
☐	gardens
☐	streets

WHEN YOU PLAY, DO YOU DO ANY OF THESE THINGS?

☐	climb on fences
☐	walk on top of walls
☐	throw cans, bottles
☐	hit rocks with sticks
☐	dig holes in the ground
☐	play with sand
☐	crawl through tunnels
☐	write on walls, the ground
☐	climb on jungle gyms
☐	climb trees
☐	jump in or on tires
☐	climb on laundry poles (clothes lines)
☐	catch insects
☐	watch buildings being torn down
☐	watch buildings being put up
☐	watch traffic
☐	climb in and on old cars
☐	walk through tall grass
☐	explore vacant buildings
☐	pile rocks, bricks
☐	hide in boxes, crates
☐	look for treasure
☐	throw balls
☐	play hopscotch
☐	ride bicycles
☐	go downtown

DO YOU GO TO ANY OF THESE PLACES?

|	
	post office
	school
	churches
	library
	fire station
	supermarket
	laundry
	second-hand store
	hospital
	gas station
	police station
	community center

EXHIBIT D.

(Photographs)

The photographs included here are examples of those used in the last
two sections of the interview. Group I was used to test the level of
complexity required to stimulate curiosity. Group II was used to test
curiosity.

As actually used in the interview, the photographs were of higher
quality and larger (8" x 10"). Some were derived from books, and the
rest were pictures of parts of Boston. No. 1 of Set IV, No. 2 of Set V,
both 1 and 2 of Set VI, and the single photograph of the backyard scene
in the second group were taken by Professors Lynch and Kepes under the
auspices of the Rockefeller Institute.

Two photographs are not reproduced here - No. 1 of Set IV, and No. 2 of
Set VI.

SET I

SET IV

SET VI
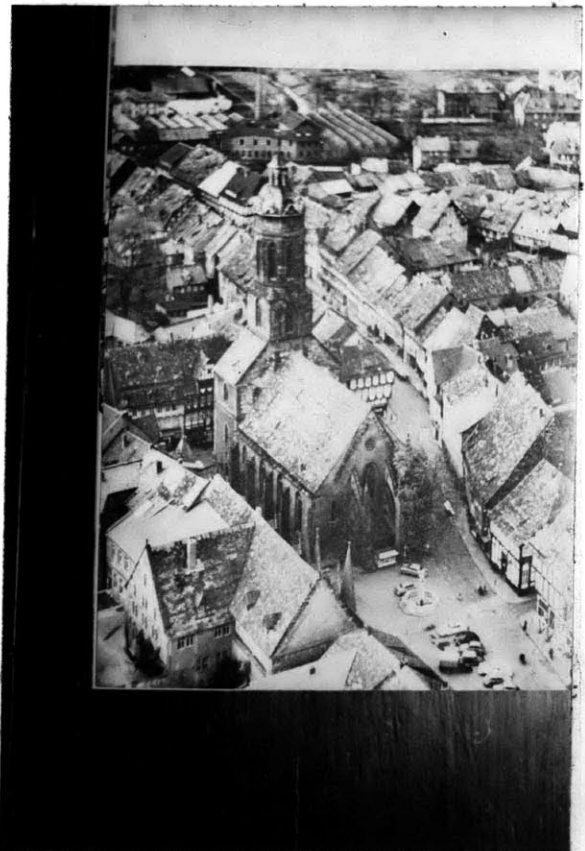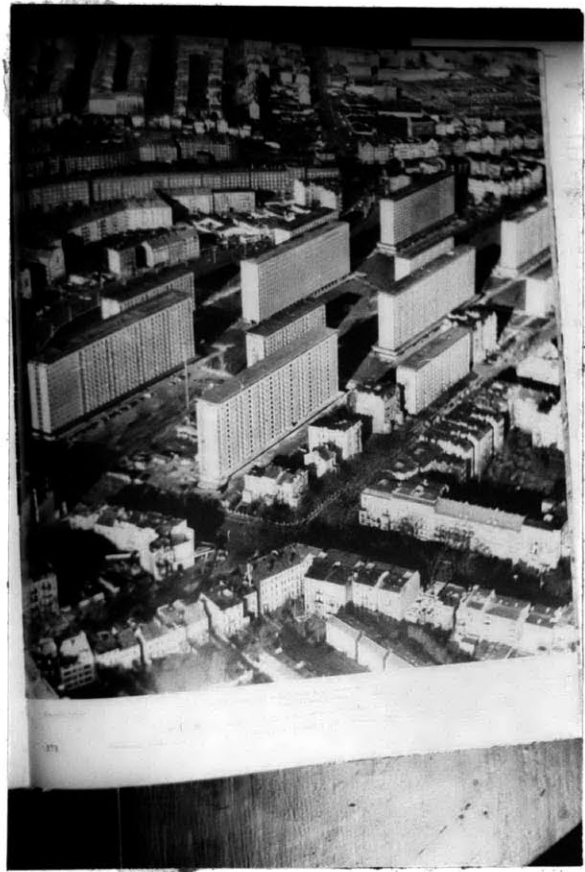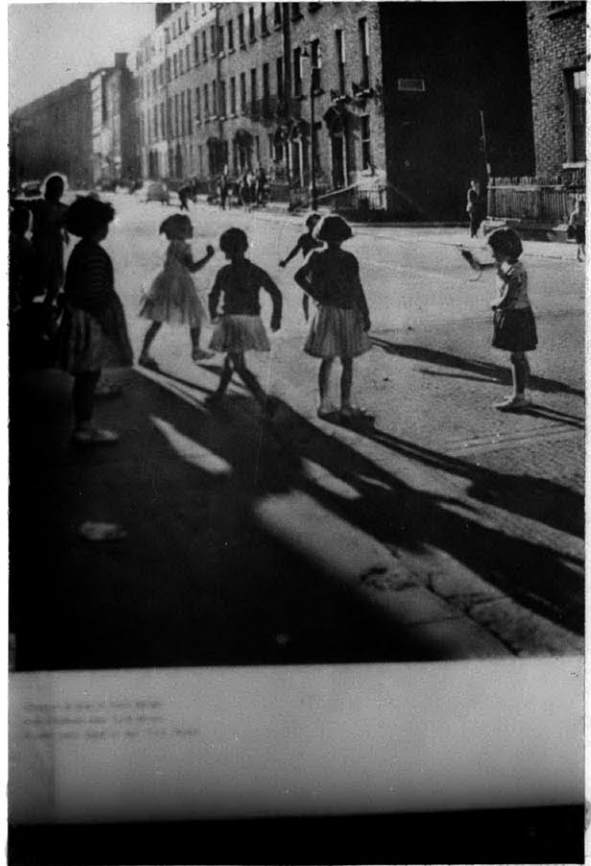
St. George's Church, Hardwick Crescent, one of the most elegant churches in the city
L'église St. Georges, Hardwick Crescent, l'une des plus élégantes églises de la ville
St. George's Church, Hardwick Crescent, eine der elegantesten Kirchen der Stadt

The Presbyterian Church, Russell Square, with its lofty spire
L'église presbytérienne de Russell Square, et son fier clocher
Die presbyterische Kirche am Russell Square mit ihrem emporstrebenden Turm

FOOTNOTES

1. Fowler, Harry, _Curiosity and Exploratory Behavior_. Macmillan Company, New York (1965), p.34.

2. _Ibid._, p. 42.

3. _Ibid._, p. 63.

4. _Ibid._, p. 65.

5. Berlyne,D.E., _Conflict, Arousal and Curiosity_. McGraw Hill Company, Inc., New York, Toronto & London (1960), p. 194.

6. _Op. cit._, Fowler, p. 71.

7. Berlyne, D.E., "The Motivational Significance of Novelty," _New Society_, May 28, 1964, pp. 23-24.

8. _Op. cit._, Berlyne, _Conflict_, p. 116.

9. _Ibid._, p. 114.

10. _Ibid._, p. 114.

11. _Ibid._, p. 114.

12. _Ibid._, p. 215.

13. _Ibid._, p. 215.

14. _Ibid._, p. 282.

15. _Ibid._, p. 118.

16. Smock, D. & Holt, Bess Gene, "Children's Reactions to Novelty, An Experimental Study of Curiosity Motivation," _Child Development_, 1962, v. 33, pp. 631-642.

17. _Op. cit._, Berlyne,"Motivational Significance, p. 7.

18. _Op. cit._, Berlyne, _Conflict_, p. 20.

19. _Ibid._, p.21.

20. _Ibid._, p. 22.

21. _Ibid._, p. 40.

22. _Ibid._, p. 21.

23. _Ibid._, p. 26.

24. _Ibid._, p. 29.

25. _Ibid._, p. 29.

26. _Ibid._, p. 32.

27. _Op. cit._, Smock, p. 621.

28. _Ibid._, p. 632.

29. _Op. cit._, Berlyne, Conflict, p. 104.

30. _Ibid._, p. 105.

31. _Ibid._, p. 98.

32. _Ibid._, p. 98.

33. Dember, Wm., "Response by the Rat to Environmental Change," in Fowler, H., _Curiosity and Exploratory Behavior_. Macmillan Company, New York (1965), p.129.

34. _Op. cit._, Berlyne, _Conflict_, p. 107.

35. Berlyne, D.E., "Laughter, Humor and Play," written for Lendzey and Aronson, _Handbook of Social Psychology_, second edition, to be published, 1966, p. 48.

36. _Op. cit._, Berlyne, Conflict, p. 102.

37. Berlyne, D.E., "Complexity and Incongruity Variables as Determinants of Exploratory Choice and Evaluative Ratings," unpublished paper, p. 1.

38. _Op. cit._, Berlyne, Conflict, p. 112.

39. _Ibid._, p. 113.

40. Cantor, Gordon N., Cantor, Joan H., & Ditrichs, Raymond, "Observing Behavior in Preschool Children as a Function of Stimulus Complexity," _Child Development_, 1963, v. 34, no. 3, 683 - 689.

41. Welker, W., "Variability of Play and Exploratory Behavior in Chimpanzees," _Journal of Comparative and Physiological Psychology_, 1956, v. 49, 181 - 185.

42. _Op. cit._, Berlyne, "Complexity," p. 1.

43. _Op. cit._, Berlyne, Conflict, p. 102.

44. _Ibid._, p. 102.

45. _Ibid._, p. 102.

46. Ibid., p. 102.

47. Ibid., p. 99.

48. Ibid., p. 161.

49. Ibid., p. 116.

50. Bruner, Jerome S., Toward a Theory of Instruction. Belknap Press of 1966 Harvard University Press, Cambridge, Mass. (1966), p.115.

51. Op. cit., Berlyne, Conflict, p. 113.

52. Ibid., p. 116.

53. Butler, Robert A., "Incentive Conditions Which Influence Visual Exploration," Journal of Experimental Psychology, 1964, v. 48, 19 - 23.

54. Op. cit., Berlyne, Conflict, p. 117.

55. Ibid., p. 117.

56. Platt, John Rader, " The Fifth Need of Man," Horizon, July, 1959, v. 1, no. 6, p. 109.

57. Ibid., p.109.

58. Ibid., p. 109.

59. Ibid., p. 106.

60. Flavell, John H., The Developmental Psychology of Jean Piaget, D. Van Nostrand Co., Inc., Princeton, N.J., Toronto, New York, London (1963), p.79.

61. Op. cit., Berlyne, "Laughter," p. 41.

62. Maslow, Abraham H., Toward a Psychology of Being. D. Van Nostrand Co., Inc., Princeton, N.J., Toronto, New York, London (1962), p.54.

63. Vygotsky, L. S., Thought and Language. M.I.T. Press, Cambridge, Mass. (1962), p.

64. Thompson, Wm. R., & Shaeffer, Theodore Jr., "Early Environmental Stimulation," in Fiske, D. & Maddi, S., Functions of Varied Experience, Dorsey Press (1961), p.84.

65. Dubos, Rene, Man Adapting. Yale University Press, New Haven & London (1965), p.22.

66. Study cited by T.R.G. Bower, Faculty Seminar , M.I.T., Spring, 1966.

67. Barker, Roger G., & Wright, H.F., Midwest and Its Children. Harper & Row, New York (1955), p. 45.

68. Carr, Stephen, Class notes for Psychol. Functions of Envir. Form. M.I.T., Spring, 1966.

69. Gump, Paul V. & Schozzen, Phil, & Redl, Fritz, "The Behavior of the Same Child in Different Mileus," in Barker, Roger G.,The Stream of Behavior. Appleton-Century- Crofts, New York (1963), p.173.

70. Mendelowitz, Daniel M., Children Are Artists.

71. Muchow, Hanz & Martha, The Living Space of the Big City Child, Martin Riegal Derlag (1935), transl. March 1966, by Ulrike H. Hochreiter.

72. Berlyne,D.E., " Conflict and Information Theory Variables as Determinants of Human Perceptual Curiosity," Journal of Experimental Psychology, 1957, v. 53, p.404.

73. Bruner, Jerome S., & Tajfel,Henri, "Cognitive Risk and Environmental Change," in Harper, Robert J.C., & Anderson, Charles, The Cognitive Processes - Readings. Prentice Hall, Englewood Cliffs, N.J. (1964), p.485.

BIBLIOGRAPHY

Allport, Gordon W., _Personality, A Psychological Interpretation_. Henry Holt & Company, New York (1937).

Barker, Roger G., and Wright, H. F., _Midwest and Its Children_. Harper & Row, New York (1955).

Barker, Roger G., _One Boy's Day_. Harper & Bros. Publishers, New York (1951).

Berlyne, D. E., "Complexity and Incongruity Variables as Determinants of Exploratory Choice and Evaluative Ratings." unpublished paper.

Berlyne, D. E., "Conflict and Information Theory Variables as Determinants of Human Perceptual Curiosity," _Journal of Experimental Psychology_, 1957, v.53, 399-404.

Berlyne, D. E., "Emotional Aspects of Learning," _Annual Review of Psychology_, 1964, v.15, 115-142.

Berlyne, D. E., "Laughter, Humor and Play," written for Lendzey and Aronson, _Handbook of Social Psychology_, second edition, to be published, 1966.

Berlyne, D. E., "The Motivational Significance of Novelty," _New Society_, May 28, 1964, 23-24.

Berlyne, D. E., "Semantic Differential and Other Measures of Reaction to Visual Complexity," written for _Canadian Journal of Psychology_. (in press).

Berlyne, D. E., and Frommer, Frances D., "Some Determinants of the Incidence and Content of Children's Questions." unpublished paper.

Berlyne, D. E., _Conflict, Arousal and Curiosity_. McGraw-Hill Company, Inc., New York, Toronto & London (1960).

Bruner, Jerome S., and Tajfel, Henri, "Cognitive Risk and Environmental Change," in Harper, Robert J. C., and Anderson, Charles C., _The Cognitive Processes-Readings_. Prentice Hall, Englewood Cliffs, N. J. (1964), 471-485.

Bruner, Jerome S., "On Perceptual Readiness," _Psychological Review_, 64, 123-152.

Bruner, Jerome S.; Goodnow, Jacqueline; and Austin, George, _A Study of Thinking_. Science Editions (paper), New York (1962).

Bruner, Jerome S., _Toward A Theory of Instruction_. Belknap Press of 1966, Harvard University Press, Cambridge, Mass. (1966).

Butler, Robert A., "Incentive Conditions Which Influence Visual Exploration," _Journal of Experimental Psychology_, 1964, v.48, 19-23.

Butler, Robert A., "The Effect of Deprivation of Visual Incentive on Visual Exploration in Monkeys," in Fowler, H., _Curiosity and Exploratory Behavior_. Macmillan Company, New York (1965).

Cantor, Gordon N. and Joan H., & Ditrichs, Raymond, "Observing Behavior in Preschool Children as a Function of Stimulus Complexity," _Child Development_, 1963, v.34, no. 3, 683-689.

Dember, Wm., "Response by the Rat to Environmental Change," in Fowler, H., _Curiosity and Exploratory Behavior_, Macmillan Company, New York (1965).

Dubos, René, _Man Adapting_. Yale University Press, New Haven & London (1965).

Erickson, Erik H., _Childhood and Society_. W. W. Norton & Co., Inc., New York (1963).

Flavell, John H., _The Developmental Psychology of Jean Piaget_. D. Van Nostrand Co., Inc., Princeton, N. J.; Toronto; New York; London (1963).

Fowler, Harry, _Curiosity and Exploratory Behavior_. Macmillan Company, New York (1965).

Gesell, Arnold, and Ilg, Frances L., _The Child From Five to Ten_. Harper Bros. Publishers, New York and London (1946).

Glanzer, Marray, "Stimulus Satiation, An Explanation of Spontaneous Alternation and Related Phenomena," from Psychological Review, 1953, v.60, 257, 268, reprinted in Fowler, H., _Curiosity and Exploratory Behavior_, Macmillan Company, New York (1965).

Goodenough, Florence, "The Measure of Mental Growth in Children," in Carmichael, Leonard, _Manual of Child Psychology_. Wiley & Sons Ltd., New York (1946).

Gump, Paul V.; Schozzen, Phil; and Redl, Fritz, "The Behavior of the Same Child in Different Milieus," in Barker, Roger G., _The Stream of Behavior_. Appleton-Century-Crofts, New York (1963), 169-202.

Harlow, Harry F.; Kuenne, Margaret; and Meyer, Donald R., "Learning Motivated by a Manipulation Drive," _Journal of Experimental Psychology_, 1950, v.40, 228-234.

Jones, Harold E., "Environmental Influences on Mental Development" in Carmichael, Leonard, _Manual of Child Psychology_, Wiley & Sons Ltd., New York (1946).

Lukashok, Alvin K., and Lynch, Kevin, "Some Childhood Memories of the City," _Journal of the American Institute of Planners_, Summer 1956.

Maddi, S., "Unexpectedness, Affective Tone and Behavior," in Fiske, D., and
        Maddi, S., <u>Functions of Varied Experience</u>. Dorsey Press (1961)
        380-401.

Maslow, Abraham, H., <u>Toward a Psychology of Being</u>. D. Van Nostrand Company, Inc.,
        Princeton, New Jersey; Toronto; New York; London (1962).

Mendelowitz, Daniel M., <u>Children Are Artists</u>. Stanford University Press,
        Stanford, Calif. (1963).

Miller, G. A., <u>Psychology, The Science of Mental Life</u>. Harper & Row, New York
        (1962).

Montgomery, K. C., "The Role of the Exploratory Drive in Learning," <u>Journal of
        Comparative and Physiological Psychology</u>, 1954, v.47, 60-64.

Muchow, Hans and Martha, <u>The Living Space of the Big City Child</u>. Martin Riegal
        Derlag (1935), translated March 1966 by Vlrike H. Hochreiter.

Myers, Arlo K., and Miller, Neal E., "Evidence for Learning Motivated by
        Exploration," in Fowler, H., <u>Curiosity and Exploratory Behavior</u>,
        Macmillan Company, New York (1965).

Piaget, Jean, <u>The Child's Conception of the World</u>. Harcourt Brace, New York;
        Kegan, Paul, Trench, Trubner & Co., Ltd., London (1929).

Platt, John Rader, "The Fifth Need of Man," <u>Horizon</u>, July 1959, Vol. 1, no. 6,
        pp. 106-111.

Riesen, Austin, "Stimulation as a Requirement for Growth and Function in
        Behavioral Development," in Fiske, D., and Maddi, S., <u>Functions
        of Varied Experience</u>, Dorsey Press (1961), 57-80.

Searles, Harold F., <u>The Non Human Environment</u>. International Universities
        Press, Inc., New York (1960).

Smock, D. & Holt, Bess Gene, "Children's Reactions to Novelty, An Experimental
        Study of Curiosity Motivation," <u>Child Development</u>, 1962,
        v.33, 631-642.

Thompson, Wm. R., & Shaeffer, Theodore, Jr., "Early Environmental Stimulation,"
        in Fiske, D. & Maddi, S., <u>Functions of Varied Experience</u>,"
        Dorsey Press (1961), 81-105.

Thorpe, Louis P., <u>Child Psychology and Development</u>. Ronald Press Co., New York
        (1955).

Vygotsky, L. S., <u>Thought and Language</u>. M.I.T. Press, Cambridge, Mass. (1962).

Welker, W., "Variability of Play and Exploratory Behavior in Chimpanzees,"
        <u>Journal of Comparative and Physiological Psychology</u>, 1956, v.49,
        181-185.

White, Robert W., "Motivation Reconsidered: The Concept of Competence," in
Fiske, D., and Maddi, S., _Functions of Varied Experience_.
Dorsey Press (1961), 278-325.