

Seeing is Being

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ABSTRACT. Aspects of perceptual development in children are reviewed, and implications drawn for nurturing spatial abilities in urban environments. Emphasis is placed on the visual complexities of man-made urban surroundings, and their utilization in training. Further, attention is drawn to the individual child's imagination as a resource in developing his perceptual capabilities and flexibility of thought.

THE PURPOSE of this paper is to bring together some recent—and some older—thoughts on the role of spatial abilities in the learning and personality development of children in the city. The general emphasis our culture places on language seems intensified in urban environments; there is much more to read; there are many more people to talk to; there are, in many aspects of daily living, more behavioral alternatives that need to be described in language for convenient and rapid communication. Also, even I must admit, there are some things in the urban environment which one would rather not look at, let alone explore visually.

Verbal and spatial abilities tend to be quite independent of each other. This does not mean that if one is verbal, he or she cannot be spatial. Rather, information about whether one is verbal does not help predict whether one is also spatial. By and large, about one-fourth of the general population would be above average on both kinds of abilities, and another fourth would be below average on both. The remaining half of people in general are split between those high in verbal and low in spatial, and the converse. Thus, as I have elaborated elsewhere (*Merrifield 1971*), although our schools operate in such a way as to select primarily children with high verbal ability for further education, the chance is only about 50 percent that a child so selected will also be high in spatial ability. Because it seems that most of our really high-level planning and producing jobs call for both kinds of

abilities, we are missing the talents of many children by selecting too high on the verbal scale; it is quite possible that children not selected because of less than superior verbal skills could contribute greatly with verbal skills somewhat above average, combined with high spatial skills. But under our present system, they are seldom challenged to do what they can do best. Changing a system, however, often results in its veering toward the opposite extreme; selecting primarily on spatial abilities might well leave our society as impoverished in language as it is now in space. What is needed is a selection system that is at least two-dimensional or a substantial increase in the emphasis on spatial development within the existing system.

SPATIAL ABILITIES AND SURVIVAL

"Look out" is probably the most widely used expression of caution; its implication of spatial perception is obvious. But "looking" and "seeing" are different behaviors. To a large extent, it helps a great deal to know what one is looking for. As M. D. Vernon, a noted researcher and theorist in visual perception, puts it:

It must be remembered also that observers are very prone to make inferences from such fragments which... are much influenced by what the observer expects to perceive... the focus of attention... expectation... give rise to the identification of stimuli which in other circumstances would be completely ignored. (*1970*, p. 99).

In the country

Some city dwellers, it is true, think of the country as a frightening place. They conceptualize a "nature red in tooth and claw" in which the life of natural man tends to be, as one philosopher puts it, "nasty, brutish, and short." For each of those who think thus, there are probably two or three country dwellers who think the same of the city. The point is that the developmental aspects of perception and personality are much more related to what one does with obtained information than to the content of the data themselves.

In a rural setting, one's perceptions can easily be validated. Things tend to be what they appear to be; there are relatively fixed and constant relations between time and space. One is concerned with topography, and maps are representative of distance, elevations, and boundaries. Not all is isomorphic, however: a sudden recollection reminds me that I accepted Kansas as yellow on my map, because I lived there and could associate that color to the wheat fields at harvest time; but because Missouri was maroon, my first trip to Kansas City was something of a disappointment.

Spatial ability, perhaps because of these almost-constancies all around, often seems to be better developed in those whose early life has been spent in a rural, or at least nonurban, setting. It has been noted for many years that an unusually high proportion of engineers and scientists come from the Midwest; currently, perhaps because many aspects of physics and chemistry are less spatial than they were a generation ago, the proportions in "pure science" seem closer to the population proportions, but the predominance persists in engineering. In my own field of psychology, more experimentalists than would be expected come from the Midwest, while more clinicians come from urban areas. This phenomenon, of course, may be related to the possibility that if one wishes to make changes in the Midwest, it's more convenient to manipulate—in a positive sense—the natural environment, while in the city it is often the interpersonal environment that is most in need of adjustment.

In the city

To me, a major aspect of urban living is time, and time-related events; although we value our landmarks, we tend to verbalize about them and

to appreciate their historical and cultural significance as much as, and sometimes more than, their form or exact location. One is more concerned with topology than topography, and a desired street is "third stop on the A train" rather than a specified intersection. It was Gouverneur Morris, a dominant citizen early in our nation's history, who conceived the idea of smoothing off Manhattan Island; he did so, from the naturally flatter southern portion up to near what is now 34th Street. The impact of this ecological change on the development of the City was profound, as one can visualize by considering whether the current activity could take place on terrain like that in Central Park. Even quite recently, a submerged creek was discovered still running in the smooth-over area—unfortunately, it was precariously close to a computer installation in the basement of a new building.

A diagram of the subway and bus routes of a major city, particularly New York, brings home the meaning of "arterial". To speak of the anatomy of a city is not a far cry from reality, and surely the subways make a good analogy for the circulatory system; if I may be permitted a bit of figurative language, the train pulses from stop to stop, some of the bodies it carries leave full of energy for work, others leave tired from previous efforts, and bodies waiting—some tired, some energized—get on to ride elsewhere. Or, as Ezra Pound (1916) described the scene in the Paris Metro, "... these faces in the crowd, Petals on a wet, black bough."

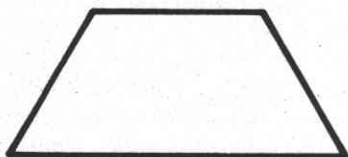
It has been of great interest to me to become aware, over the past several years, of how much a city is a collection of neighborhoods, as well as an integrated whole. It may be another example of the limits to attention span which has been characterized as the "magic number 7, plus or minus 2." I have not counted up the significant boundary indicators for neighborhoods, but I would predict that whoever does will find their number between 5 and 9; I would make the same prediction whether the neighborhood were in a rural setting, where it might well cover substantial distance, or in a city, where it might be homogeneous and coherent over only a few blocks. Humans tend to limit the psychological size of the configurations they attend to, and simultaneously to explore in great detail within that configuration. Geertz (1975), an anthropologist, tells us of the differing names

by which a man may be known, depending on where he is at a given time; Levi-Strauss has long emphasized the attention that "primitive" tribes give to vegetation used for food and medicine; most of us have heard of the many kinds of snow differentiated in functional ways by the Eskimo language. It is believable that a Manhattan urchin, when told by a tourist who was seeking directions to distant areas (Westchester, Nassau County, Staten Island) that "You sure don't know much," responded "But I ain't lost, mister!" One can be sure that the child was intimately familiar with most essential aspects of his neighborhood, including perhaps which side of the street to walk on at different times of day. On the other hand, one may wish to say a word for the visitor, as Leverett Saltonstall did in 1939, when he described, "The real New England Yankee" as "A person who takes the midnight train home from New York."

Summary

In either setting—and of course both have been described with some exaggeration, for emphasis on their differences—the key to maintaining one's self is attention to both configuration and detail, essentially to the innate complexity of living. Vernon (1970) puts it nicely:

Nevertheless we have suggested that from infancy upwards the child builds up complex integrations, or schemata, by means of which what is perceived at any moment is related to memories and knowledge . . . immediate perception is modified and corrected to give rise to more veridical impressions of the environment . . . in all complex stimulus situations cognitive processes of inference, reasoning and judgment may be employed in coding incoming information. (p. 240)



PATTERN RECOGNITION

Among the more intriguing of the spatial abilities is that (or those) involved in what is usually called "pattern recognition." There may be but one aptitude that is mostly responsible for this phenomenon, as some earlier theorists alleged; on the other hand, this behavior, like problem-solving and creativity, may be really the resultant of a complex of aptitudes (Guilford 1967), each of which is necessary but none sufficient to the challenge of discovering the pattern in a series of events, a configuration of lines, a confluence of gully washes, a rolling roiling skyful of clouds. Smith (1964: 217) quotes K. Lorenz, the Gestalt theorist, in support of the idea that the exercise of this complex of aptitudes is something awesome to behold and, at the same time, tremendously rewarding to the one who is able to "see the picture."

Most child psychologists and many teachers have heard of the relatively recent and still continuing work of Witkin and his colleagues (Witkin, Dyk, Faterson, Goodenough and Karp 1962) on psychological differentiation. In these studies, the phenomenon of interest is whether the child is able to discern figure from ground or, in less esoteric language, the object or meaningful pattern from its background or surrounding context. A major device in assessing children's aptitudes along this line has been the Embedded Figures Test, in which the child is asked to look at a number of different pictures and, in each one, find a familiar shape, e. g. a triangle (figure 1).

This task could serve as a test item for measuring the aptitude factor that Guilford

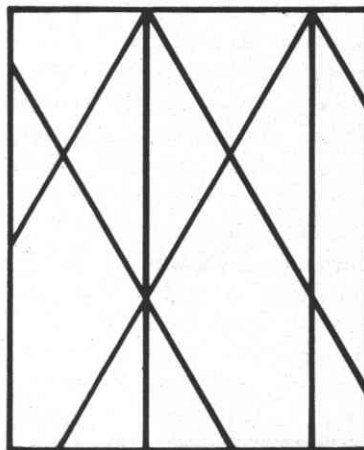


Figure 1. An example of an embedded figure.

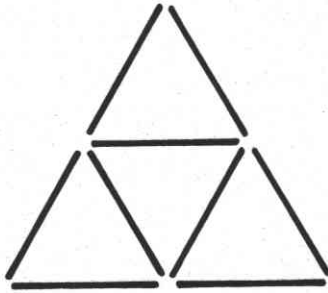


Figure 2. An exercise in spatial flexibility.

(1967) refers to as "convergent thinking about figural systems." His work on the definition and measurement of intelligence is a landmark in the field, but the categories of thinking processes, varieties of context, and types of format are too complicated to discuss further here. Those interested in techniques for developing spatial abilities in children should certainly consult Guilford's work. To return to figure 1, the trapezoid on the left is hidden in the rectangle on the right. It is the same size and shape in both. Its location in the rectangle is described in a note at the end of this paper, for those who prefer to look rather than see.¹ A similar task (figure 2) also involves figural material and the disembedding of a specific shape. In addition, however, it requires greater consideration of alternatives, and a somewhat looser approach to the definition of the task. In the figure, there are four small triangles. It should be easy for many to see how to remove two of the little sticks and have only three triangles, with no sticks left over dangling and no triangle incomplete. Taking off any corner will do the job. Now consider the possibility of removing two sticks and leaving only two triangles. The key to this problem is in the same note as that for figure 1. The study of illusions, such as the staircase which sometimes leads up and sometimes down, and the Necker cube, and others no doubt well remembered from introductory courses in psychology, is another part of this emphasis on transformations in space, on redefinitions in conceptual areas. Transformations and redefinitions, in turn, are central to problem-solving and creativity in any field.

Many psychologists have attempted to relate performance on spatial tasks such as the embedded figures to personality traits. The general run of the literature suggests that those who are poor at the task, whom Witkin would

call field-dependent, are, more often than not, sensitive to their environment and adaptive, but in extreme cases overly conforming to the point of being self-destructive. In contrast, those who do well (field-independent) are believed to be more objective and assertive and to have strong ego boundaries; in the extreme they, too, become maladaptive, exhibiting such behaviors as aggressiveness, heedless insensitivity, and sometimes just plain stubbornness (Smith 1964 : 238).

Psychology has traditionally attempted to reduce its explanatory discourse about behavior to the neurological level wherever possible. Although a great deal of the research in spatial abilities is concerned with "softer" measures such as aptitudes and temperament traits, the Gestalt emphasis has always had a substantial concern for neurological analogs at least, if not full-fledged explanations. A recent article suggests that exposure to complex surroundings early in life can produce changes in neurological structures, changes that seem to be related to pattern perception. Greenough (1975) states:

It seems clear that the brain's anatomy can be altered by a variety of experiences. Almost certainly, the new synaptic connections which we and others have found following various environmental manipulations do play some role in the functioning of the brain. (p. 46)

Greenough reports (table 1) that differences in the amount of neurological growth seemed to be related statistically to the environmental complexity to which young rats were exposed during the first weeks of their lives.

One should note, especially for our purposes here, the substantial proportions of variance attributable to differences between litters, and to the interaction effects of litter and environmental condition. These findings strongly suggest that there are major differences between individuals in this kind of neurological develop-

Table 1.—Estimated proportions of variance accounted for by treatment variables

Cell type	Environmental condition	Litter set	Interaction	Total
Layer 2 pyramidal	11.8	6.8	25.8	44.4
Layer 4 stellate	17.3	22.5	18.9	58.7
Layer 4 pyramidal	11.4	23.8	21.8	57.0
Layer 5 pyramidal	18.0	14.8	11.0	43.8

From Greenough 1975: 43.

ment. Still, the pattern is striking, and the import of the influence of experience on development at the neurological level turns much of the argument for innate capability around; caution must be taken, however, to differentiate between that argument and the hereditarian argument with which it is sometimes merged; the latter, of course, gains potential support from the large individual differences found. If individual differences persisted in strains from parent to litter, then of course the hereditarian position would be strengthened. At any rate, in humans, trainability (which may have hereditary components) has not yet, in my opinion, been matched with training sufficient to capitalize fully on the potential productivity of each individual in what is called the "normal" population.

At the other end of the continuum, one notes the studies of sensory deprivation, either purposeful in the laboratory or accidental, as in many large institutions. These findings suggest that children who are not frequently and appropriately stimulated through exposure to culturally relevant patterns fall rapidly behind their age peers who have lived in more complex environments. As we noted earlier, it seems to be the complexity rather than the subject matter per se that contributes to the development of such pervasive and necessary clusters of aptitudes as pattern recognition (*Vernon 1970*).

TRAINING

But, one may well ask, how can we begin to train children without substantial equipment? How can we mount and manage the field trips which would carry city children to complex natural environments? How can we create, in the city, sufficient complexity to be stimulating, such as different ecological complexes, different varieties of plant and animals and birds? As a partial answer, or at least a comment, let me recall that gentle lady, Emily Dickinson, "I thought that nature was enough, Till human nature came," and suggest that in the cities the human problems are sufficiently complex to challenge us all.

More directly to the point, there are two major sources of complexity available to the urban child. One is the urban environment itself, of which I have spoken briefly and to which I shall return. The second has been quite properly

emphasized by Richard de Mille. He speaks forcefully of the development of human imagination, and has provided an imaginative guide for teachers, parents, and interested adults to use with children.

Visualization enters into such disparate activities as painting, sculpture, choreography, architecture, astronautics, engineering, and photography. It is also helpful in playing baseball, moving furniture, and driving a car... Despite the wide range of differences, visualization is a common human ability. Furthermore, it is very unusual for anyone, especially a child, to say that he cannot *imagine* anything. A person who can *imagine*, or *pretend*, can play imagination games. In a group of children playing the games, we may be sure that some are experiencing more vivid, exact, and constant images than others. But each is imagining in his own way. That is all that is necessary. (*de Mille, 1973 : 23-24*)

In his book, he provides several intriguing exercises which are not inappropriate for adult participation. Here is a portion of one of them.

When we walk around, we are walking through air. You can't see it, but if you swing your hand around, you can feel it. Air is easy to walk through... Trees or bricks or rocks are too hard to walk through, except in your imagination.

This game is called HARD.

Be outdoors, walking. / Walk through some tall grass. / Walk through some bushes. / Walk up to a thick hedge. / Walk right through it. / Walk up to a big tree trunk. / Walk right through it.

Find a big rock. / Walk into the middle of it and look around inside it. / Have it look rocky in there. / Walk out on the other side of the rock. (*de Mille, 1973: 159-160*)

With regard to the urban environment itself, where would you find a beaver on the Lexington Avenue Subway? Perhaps in Van Cortlandt Park, just beyond the northern terminus, but definitely in a ceramic tile in Astor Place. The imagination drives on, with an assist from history, from Astor Place to Astoria, Oregon, where in 1811 a young man who would have to be called an "eager beaver" (if that slang is not completely old hat) established a trading post that led to a railroad empire. Where are there gargoyles, and lions, and other fancies in fabricated iron and stone? Almost everywhere, or at least within a short walk. The visual complexities abound, outside as well as inside museums. It is for those who wish, to see; it is for those who see, to teach others.

Shakespeare, in *As You Like It*, speaks through his favorite character of "books in running brooks." Our rivers—East, Harlem, and Hudson—are hardly brooks, but their tides have contributed much to the affairs of men. And as for "sermons in stones," see the glimmery

shadows contrasting with spears of brilliance as morning breaks behind St. Patrick's Cathedral, or as light pauses momentarily on the spires of St. John The Divine. Later in the day, the red blush of sunset on midtown Manhattan's western slope rivals the great displays in western canyons. And finally, on a clear night, the moon-silvered skeins supporting Verrazano's bridge seem almost too frail for their task, yet beautiful enough that one considers not caring about strength. These are the results of man's imagination, man's vision, man's application of his spatial aptitudes. Not only is seeing being, to repeat the phrase with which I began, but what we can help others to see must contribute greatly to what they can become.

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¹The trapezoid in Figure 1 has its right arm on the top of the rectangle; it is tilted up and to the left about 50 degrees from its initial position. In Figure 2, no one said the triangles had to be the same size. Remove any two of the three inside sticks.