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SOME NESTING HABITS OF CAROLINA CHICKADEES

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Abstract

A nesting study of Carolina Chickadees (*Parus carolinensis*) was conducted on a Knox County, Tennessee, farm in 1973. The first activities related to nest site preparation; excavation of loose sawdust from the nest box required two days, at one site. About 150 trips were made to construct the moss base of one nest, and 350 visits were made while lining another nest. All clutches were laid in April; incubation lasted 14-15 days. Only females excavated, constructed nests, and incubated. Nestlings in a brood of four were fed more often, gained weight more rapidly, and weighed more at fledging than the young in a brood of six. Young remained in the nest eighteen days. Excluding courtship and nest site selection activities, 42-54 days were required for nesting, during which adults visited each nest approximately 4,000 or more times.

Introduction

Although considerable information is available on the nesting habits of Carolina Chickadees (*Parus carolinensis*) (e.g., Brewer, 1961; Tanner, 1952), several aspects of their reproductive cycle have not been studied in Tennessee. This study attempted to fill that void.

Methods

Chickadees normally excavate a cavity or use an existing cavity, such as an abandoned woodpecker hole or a nest box, for a nest site. In order to study chickadee nesting activities more easily, I erected 50 nest boxes in December 1972. Each nest box had a cavity 9.5 x 8.9 x 23.0 cm with a 3.2 cm diameter entrance located 17 cm above the floor. A 5 cm layer of coarse sawdust was placed in 25 of the boxes. The boxes were stained dark green on the outside, and they were attached 1-2 m above the ground on living and dead trees of various diameters. Boxes were arranged regularly over the study area, such that they were at least 60 m apart.

The study area was a 40 ha mixed deciduous and coniferous wooded area surrounded by farm land in south Knox County, Tennessee. Dominant deciduous trees included oak (*Quercus* sp.), hickory (*Carya* sp.), and tulip poplar (*Liriodendron tulipifera*); Virginia Pine (*Pinus virginiana*) was the most abundant conifer. Selective logging during the previous 20 years had removed most of the trees larger than 40 cm diameter. A dense understory was present in most of the area.

The 1972 early winter population on the study area was estimated to be 40 chickadees. However, some of these chickadees had ranges that extended outside the study area. Twenty-seven chickadees were captured and banded at feeding stations on the study area prior to the 1973 nesting season. Modified McCamey traps (McCamey, 1961) were used to capture the chickadees. Based on the winter population, 20 pairs of chickadees could theoretically have been expected to nest on the study area. However, mortality, territorial activity, and emigration lowered the nesting population to approximately 10 pairs. Some unmated chickadees may also have been present.

Nest boxes were checked at intervals of 2-7 days during the nesting season. Observations on nesting activities were made with 7 x 50 binoculars and 20X telescope. Chickadees tolerated a quiet, still observer 15 m from the nest; therefore, observation blinds were not used. Nest visits by chickadees were monitored with portable event recorders similar to that described by Gibb (1955). These instruments provided a record of the number of visits to a nest and the time of each visit, but they did not distinguish between visits from males and females. Weights were taken with an Ohaus reloading balance which was accurate to 0.03 g.

Results

Many of the nest boxes were inspected by chickadees during March and April. Nests were constructed in three boxes, designated as B3, B8, and B15. Chickadees excavated sawdust from several other boxes without subsequently nesting. All nests were built in boxes which contained sawdust. The amount of sawdust excavated from each of the used boxes was estimated at about 50 per cent of the original 5 cm layer.

A pair of chickadees was observed for approximately four hours during the excavation of B25, which was later abandoned. Each chickadee had been color banded. Copulation of this pair was observed twice during excavation, which allowed determination of the sex of each bird. Most of the excavating (estimated at more than 90 per cent) was performed by the female; although the male occasionally entered the box, he rarely removed any sawdust. The female excavated sporadically, with bursts of activity followed by extended periods away from the box. During an activity period, the female made as many as five visits per minute to the box, each time entering the box, filling her beak with sawdust, exiting and dropping (while flying) the sawdust 2-4 m from the box, perching briefly, and then returning to the box. A faster type of excavation was seen part of the time: the chickadee gathered sawdust from the bottom of the box, rose to the entrance, perched on the inner edge, extended her head to the outside, dropped the sawdust, and then hopped down to the bottom of the box. The small amounts of sawdust under the boxes indicated that excavated material was normally carried away from the box and then dropped. Excavation required two days at B3; the amount of time spent excavating B8 and B15 is not known.

Nest construction began immediately after excavation and ended during incubation. However, only small amounts of material were added to the nests after the eggs were laid. Only females carried material into the boxes. The base of each nest was constructed of green moss collected from tree trunks and limbs in the vicinity of the nest. The moss was gathered in clumps of various sizes; occasionally, a clump exceeded the 3.2 cm entrance, in which case part of the moss dropped under the entrance. Bouts of nest building were broken with periods away from the box. During a five-hour period, the female at B15 made 75 visits to the box. This intensity of activity, plus the large amount of material carried in during each visit, resulted in raising the thickness of moss in the box by 5 cm. When completed, each nest contained a layer of moss 7.5-10 cm thick; activities of the young and adults later compacted the material. The lining of each nest consisted of rabbit (*Sylvilagus floridanus*) fur and/or soft plant material. The nest cup into which the eggs were laid was approximately 4-4.5 cm in diameter and originally about 4 cm deep. Later activities enlarged the nest cup. Lining the nest required more trips than base construction. Probably 150 visits were sufficient to build the moss base of B15, and over 350 visits were required for the lining of B3. While lining B3 the female made 143 trips on 9 April, 139 trips on 10 April (in spite of snow flurries), and 70 trips on 11 April.

Clutch sizes and the date the first eggs were laid were: B3—5 eggs, 14 April; B8—6 eggs, 18 April; and B15—7 eggs, 3 April. One egg was laid each day until the clutch was completed. Little adult activity was observed near the box during this time; usually the eggs were covered, either partially or completely, by a flap of soft lining material. The first night a female is known to have remained in the nest box was the night following the laying of the third egg in B15.

Incubation apparently began on the day prior to the laying of the last egg in B3 and B8, although no measurements were made to determine if egg temperatures had been raised. Incubation of B15 is thought to have begun on the second day following completion of the clutch. The females were responsible for all incubation. Males fed the females frequently and accompanied them on feeding trips. Nest attentive periods of the females varied from less than ten minutes to more than an hour. Insufficient data were gathered to indicate the true pattern. Incubation lasted 14 days in B3 and B8 and 15 days in B15, calculating from the day the last egg was laid to the day of hatching.

Hatching occurred in one day at each nest; however, at B3 I cracked one egg, at B8 two eggs failed to hatch, and at B15 I removed one egg (the third). Conceivably, some clutches could have hatched over a period longer than one day if all eggs had hatched.

During the nestling stage, adult activity at each nest was monitored more consistently than in earlier stages. Table I summarizes the data for B3 and B15. Many hours of night-time monitoring are not included here, as no activity was recorded. A predator robbed B8 of one egg and four young (3 days old) between 19:40 EDT 10 May and 10:48 11 May. The one remaining egg was taken between 20:00 11 May and 06:00 12 May and the nest was stirred. On 11 May, while the nest still contained one egg, chickadees made 21 visits to the nest.

TABLE I: *Comparison of chickadee nests with four and six young.*

	Nest B3 (4 nestlings)	Nest B15 (6 nestlings)
Hours monitored during nestling stage	195	178
Visits recorded	2545	2568
Visits/hour (mean of all days)	13.1	14.4
Feeds/nestling/hour (mean of all days)	3.3	2.4
Mean fledging weight (g)	9.9	8.9

No attempt was made at positive identification of all the food items brought to the young chickadees. Small (ca. 1 cm) caterpillars were frequently observed in the bill of the adult entering the box; small adult insects and spiders were also frequently recognized. Both males and females fed the young. The rate of feeding in B15 increased from 0.9 feeds/nestling/hour on day 1 to 3.6 feeds/nestling/hour on day 15. The rate of feeding in B3 increased from 1.6 feeds/nestling/hour on day 1 to 6.1 feeds/nestling/hour on days 16 and 17. Daily feeding rates are shown in Fig. 1. The young from B3 left the nest box between 09:00 and 10:00 19 May, the eighteenth day after hatching. The young from B15 fledged between 10:00 and 12:00 11 May, the eighteenth day after hatching.

The four young in B3 averaged 9.9 g in weight on the fourteenth day after hatching, and the six young in B15 averaged 8.9 g on the thirteenth day after hatching. Although not all young of each brood were weighed again, the young which were weighed showed no weight change. Apparently, the young from the brood of four fledged at weights averaging 1 g more than the young from the brood of six. The weights of young in each brood approximated adult weights. For example, eight adults captured on the study area on 22 March averaged 9.6 g with a range from 8.9 to 10.2 g. The weight of adult chickadees at the time the young fledged is not known, although it probably varied with the number of young being fed and the availability of food. Five weights of the adult female at B15 suggest the weight variation associated with the different stages of nesting. She weighed 9.2 g on 5 March, 9.4 g on 8 March, 9.5 g on 13 March, 11.6 g on 3 April (the day the first egg was laid), and 9.8 g on 4 May (the eleventh day of feeding young).

A total of 42 to 54 days was required for nesting: 5 to 13 days for nest construction, 5 to 7 days for egg laying, 14 or 15 days for incubation, and 18 days for nestling development. The most variable time was that required for nest construction. During each nesting the adults probably made over 4,000 visits to the nest, of which approximately 3,000 were for the purpose of feeding young. No second nesting attempts were observed on the study area.

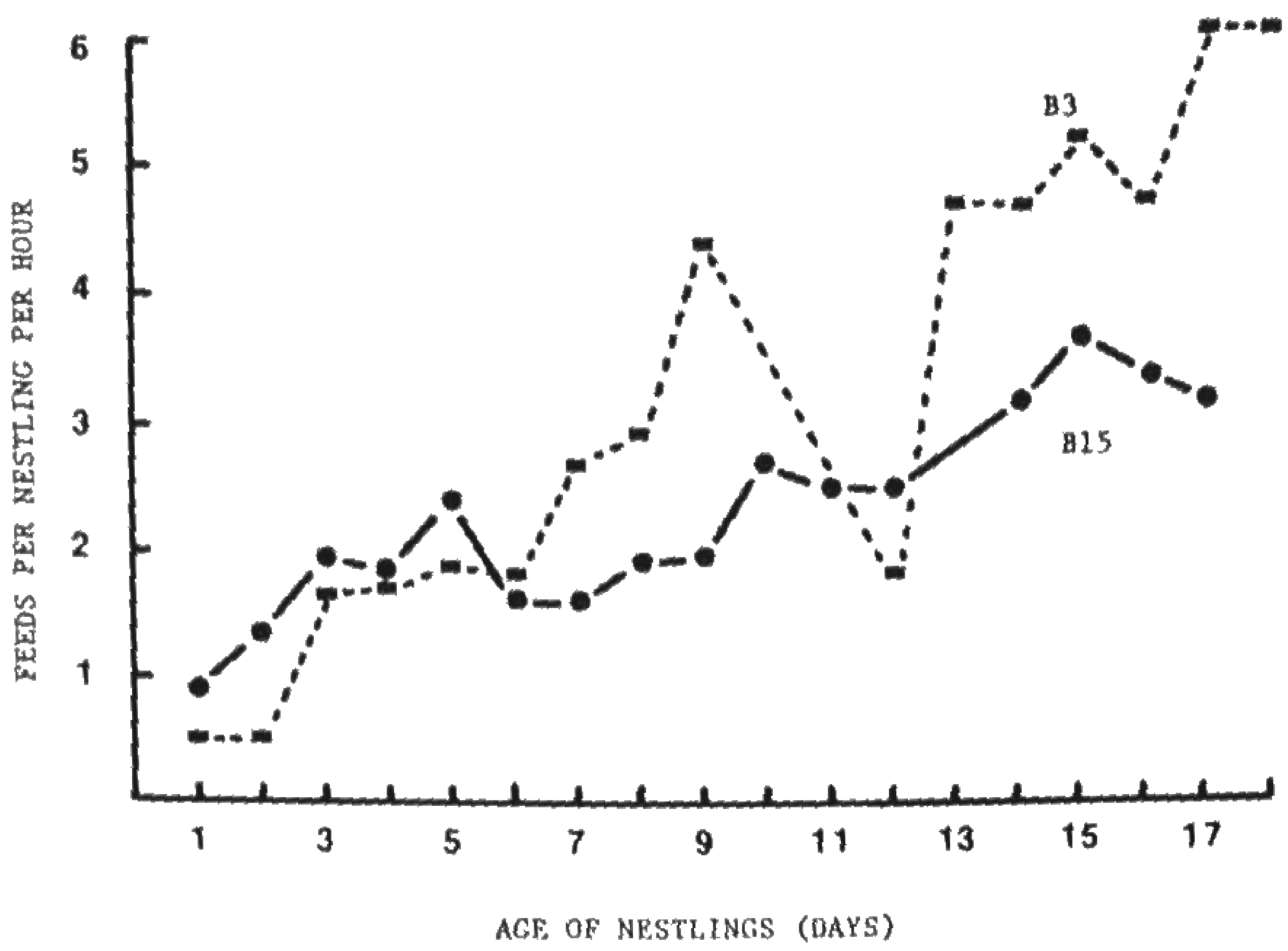

FIG. 1: *Feeding rates at chickadee nests with four nestlings (B3) and six nestlings (B15).*

DISCUSSION

The chickadees' apparent preference for nest boxes containing sawdust is consistent with Drury's (1958) observations that Black-capped Chickadees (*Parus atricapillus*) are more likely to use nest boxes filled with sawdust and peat than empty nest boxes. Brewer (1961) suggested that excavation may be an essential part of chickadee courtship, although he noted that chickadees sometimes used nest boxes where excavation was not possible. Brewer (1961) stated that both birds of a pair normally excavated, though in some cases one member of the pair, usually the female, did most of the excavating. Therefore, my observations at a single nest where only the female excavated may not be typical.

The length of the incubation period has been reported to vary from 11 to just over 14 days (Brewer, 1961). My results indicate an incubation period of 14 to 15 days. However, the length of effective incubation can only be inferred, unless the temperature of the eggs is measured. The length of the nestling period observed here was 18 days, which is two days longer than the time given by Brewer (1961).

Although a greater number of feeding visits was made by the parents of the large brood, the increase was not proportional to the increase in the number of young present. Consequently, nestlings in the small brood received more food, gained weight faster and fledged at a heavier weight than nestlings in the large brood. This additional weight was probably in the form of fat, which served as a food reserve during the period just after fledging. Lack (1966:38-40) showed that in Great Tits (*Parus major*), young from small broods fledged at greater weights and were more likely to survive than young from large broods.

Female chickadees seemingly contributed more to the nesting effort, since they did most of the excavating, constructed nests, laid and incubated eggs, and frequently fed the nestlings. The males were involved in territory defense, feeding the incubating female, and care of the young. However, the respective roles of the male and female are probably not adequately represented by my data, since I made few observations away from the nest sites and was not able to distinguish between male and female feeding visits to the nest. Also, broods were not followed after fledging to determine contributions of the parents.

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EXPANDING GEOGRAPHIC DIMENSIONS: A GEOGRAPHIC EPISTEMOLOGY

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A BRIEF SUMMARY

In recent literature, there is an emphasis on a "new look" at geographic landscape. The need for this "new look" is based on the idea that the eyes may deceive and conceptual knowledge be faulty. Therefore, a consensus should be the basis for judgment in all events in which landscape is involved. The regional geographer and the philosopher are joining their efforts in delving into new dimensions of landscape analysis. They are concerned with the origin, nature, and limits of knowledge of our physical environment—in short, with its geographic epistemology. Geographers may soon have the task of describing the landscape in six dimensions.

I

In many different ways, geographers have been probing the frontiers of time and space; in so doing, they have perceived realms of knowledge traditionally beyond the intellectual frame of four physical dimensions. Consequently, in our endeavor for a higher level of excellence, we are now reaching inward toward a dimension of consciousness not yet adequately explored. In keeping with the endless march of sciences, geography has evolved into a new mode of reality, one that reaches beyond the usual physical realm into an abstract world of geographic thought.

Recent publications on the perception of landscape have lifted the lid on a metaphysical Pandora's box, allowing us to peer into additional dimensions of conception and perception. Therefore, it is prudent that validity for an expanded six-dimensional landscape be established through the development of a suitable body of theory. This study is an initial effort to serve that goal. Accordingly, the following comments are not designed for casual reading but rather are intended to justify, as scholarship demands, the expanding geographic frontiers.

II

"Neither the world nor our picture of it is identical with geography" (Lowenthal, 1961, p. 241). Nevertheless, though some of its aspects are esoteric and others are abstruse, geography does approach the real world in general discourse to a greater extent than do most other fields of study (Lowenthal, 1961). The science of geography, if there be such, is more generally employed in our daily occupations than is usually realized—a consideration of accordingly great moment to those concerned with a further probing of that elusive realm.

We are now on the threshold of new dimensions in geography that bear upon us with irresistible force and determined direction. We feel concern—some of our most cherished concepts are being shaken. Though we might be anxious about the dangers, we may also be elated about what the future holds for the field of geography.

III

In order to begin at the proper stage in the reasoning process, one must conceive of "being" as an "essence" in an absolute state. Therefore, when an object is defined theoretically, its nature must be absolute. In none of its possible modalities must it ever be conceived individually or universally, since both of these conceptions belong to the realm of rational interpretation and are the end products of the conceiving mind (Stace, 1932, p. 168). If we establish "essence" as a conceived absolute state rather than the absolute state itself (which is unknowable), we have converted metaphysics to a science by assigning it a proper object—i.e., the pure, undetermined nature of being (Ferm, 1950, p. 213). So it evolves that in our thought process we have entered into a scientifically structured fifth-dimensional landscape.

This could be an appropriate step for the geographer to take: that of interpreting the essential nature of material objects in a meaningful manner (though the true nature of the conceived but elusive object remains forever beyond the realm of intellectual grasp), while realizing that the rationally conceptualized world is solely of the reasoning power rather than of pure knowledge. If we left matters at this point, and lived in a completely fifth-dimensional world, our world would be an intellectual construct only and would not be very much fun (Stace, 1932, p. 111). If such rationalization is to be achieved and utilized as a basis on which to build, we must move to a "sensible" world in order to give the conceptual world a fuller meaning. So doing, we move beyond the realm of the "conceptualized" world—logically constructed—to the realm of the "perceived" world—all in proper order—and into an additional dimension.

This is not a new idea. More than two thousand years ago, Aristotle assumed the human intellect to be tuned toward "sensible" things from which it drew all its knowledge by way of sensation and conceptual abstraction (Ferm, 1950, p. 212). As a consequence, the proper object of our knowledge is in the essence of natural material things. If the geographer makes the above assumption, then he gently edges into the role of the metaphysician.

Problems are inevitable, and the dangers involved in the solutions are more nebulous because the only geography we know and have as working material is the one we perceive through our sensory organs. Continuously collected data, augmented by experience and embellished by varying degrees of imagination, constitute the sum total of our geographic knowledge (Lowenthal, 1961, p. 251). If our reasoning processes are projected from a frame of such questionable structure, we pursue disaster when we succumb to ambition, climb to heights where it is difficult to stand, and teeter on peaks from which it is impossible to fall without experiencing destruction. Better that we learn prudence amid an undisciplined multitude of personally perceived facts than demand truth from our vision. The dictates of our eyes can be terrible taskmasters.

Considering this, we can easily recognize the validity and wisdom in the remarks of the intrepid John K. Wright, who considered both the world outside and the picture in our heads and concluded that "the most fascinating *terrae incognitae* of all are those that lie in the minds and hearts of men" (1947, p. 15). In fact, this is the only world we have: according to those schooled and skilled in epistemology, the real world is unknowable. Our comprehensive world of ideas about the content of the earth's surface is subject to the same truth and error that we experience in judging good and evil. All we can hope for is the partial submission of all to a consensus (Lowenthal, 1961, p. 242). That which cannot be verified must be consigned to the intellectual forum of argument and debate. However, argument and debate are neither unholy nor lamentable; both are commendable as long as both are employed for production rather than for ostentation. One of the dangers we face is the temptation to bask in the warmth of metaphysical discourse involving presumed reality rather than to grasp for consensus at every turn of the road. As we revel in scholarly felicity, we are within easy reach of one of the most intriguing problems of our century: that of recognizing additional dimensions of our geographic landscape.

To consider the idea of additional dimensions may strain the boundaries of the frontier of our spatial theories more than is appropriate at present. Nevertheless, the proper station of an inquiring mind is always on the frontier, which should be traversed continuously. "Too often," Whittlesey comments, "the world horizon is accepted in theory and rejected in practice" (1961, p. 243). If we were to accept the practice as well, and move into the new dimensions that a more thorough practice would suggest, a consensus in a larger frame would result. Thus, a consensus would better unify our thinking, establish a more determined direction of search, and structure our concepts on a stronger foundation.

IV

Insofar as we conceptualize earth phenomena, we do so by creating categories in our mind. As stated previously, we categorize from logical inference or from previous experiences. We make distinctions among the various intellectual concepts of a thing, rather than about the individual thing itself. This is a problem, because any number of individual concepts may represent the same real thing. To a certain extent, we have solved this problem by categorizing our concepts and reducing them to expressions of agreed-upon signs, sounds and symbols. In this manner, we have brought our conceptualized universe into consensus. This system seems to work, generally; at present, it is suitable for our purpose. Because it can, to some extent. be quantified and organized as a workable body of knowledge (Dewey, 1916, p. 240), our efforts can intensify in this dimension. Even though our sensory organs and sensible functions are the basis for all our perceived knowledge (Stace, 1932, p. 307), absolutely speaking, they do not and cannot guarantee the existence of objects in any acceptable form as in the case of our concepts (Stace, 1932, p. 25). So, in our systematic attempt at understanding, we have moved into the fifth dimension, a dimension of conceptualized knowldege. In this mode, our object is adequately established and suitable for sensory probes. Once natural landscapes are conceptualized, our perception of them is better controlled.

V

In order to go further and to probe deeper, geography must enter the world of human perception. Although our sensate functions are the progenitors of any world we know, other than that which is the product of our reason, visual data alone can be deceiving; all our sensory powers must be utilized in order to synthesize any sort of reality from a multitude of abstractions (Lowenthal. 1961, p. 244). Knowledge, which is the product of reasoning processes based on the experiences of the mature, well-ordered mind, is necessary for proper organization of objects—even those beyond our power of vision—in the space and time of a real world. Once these objects are organized, our perceptive powers supply additional information. A decline in one's sensory perception leads one to make false assumptions about a landscape, as does the very young child, whose perceptive powers have not yet developed. Our shared world view will evolve only to the extent that mature minds can agree on the image they can hold in common.

However, further complications arise from the fact that all our views are mutable. If the ancient Heraclitus is to be believed, "you cannot step twice into the same river. The flow is continuous and ever changing" (Russell, 1945, p. 45). If this opinion is accepted, then any randomly chosen group of geographers constitutes a committee not only on the universe but also on the majestic flow of landscape evolution. Much of our problem lies in comprehending all this, and our danger is compounded by the anthropocentric focus of our observations. Perception of our world must by necessity be centered in the observer, who fashions and passes on the significance of all he observes in terms of significance to himself (Hartshorne, 1959, p. 46). This, ultimately, is the basis of whatever consistency we have or know—and even then, only if an often-observed phenomenon can result in a consensus of observers—because, "in the final analysis," as Sir Kenneth Clarke states, "man is the ultimate measure of all things" (1971).

The more modern movements in epistemology were founded on the experimental sciences. (Reference here is to the psychological laboratory founded by W. M. Wundt (1832-1920) at Leipzig. Experimental investigation was conducted here for many years and was very effective in developing an understanding of the relationship between stimulus and sensation.) Findings from experimental laboratories, where correlations between intensity of stimulus and resultant sensation were carried on, eventually forced the philosopher to undertake the task of developing an epistemology of perception. Further, modern mathematics brought forth mathematical logic and caused the epistemological problems to be presented in a new and baffling form (newly developed mathematical systems in the 19th century allowed the epistemology of the *A Priori* to assume more stimulating aspects). The physical sciences, as well, made their contribution: consider the idea of material at the atomic and sub-atomic level and ponder how this material differs from the object of our ordinary sense perception. So the need for the epistemology to give plausible answers to the relation between the perceptual and the physical became monumental. Therefore, the problem of environmental perception not only becomes scientifically related but also becomes scientifically oriented, and is basically concerned with sensate interpretations. Again, the reality of objects is not guaranteed. And for those who find themselves contemplating this problem of landscape perception, a sixth dimension will gradually unfold.

An essay by R. B. Perry, entitled *A Realistic Theory of Independence* (Ferm, 1950, p. 520), postulates a new and specific aspect of human perception close to the center of the problem. Perry found that some physical things, some logical things, and some mathematical entities are independent of a knowing consciousness without sacrificing their independence. "Realism," theorizes W. P. Montague, "holds that things known may continue to exist unaltered when they are not known, or that things may pass in and out of the cognitive relation without prejudice to their reality" (Ferm, 1950). Montague further argues that there is no known correlation with or dependence upon the fact that "anyone else experiences it, perceives it, conceives it, or is in any way aware of it" (Ferm, 1950, p. 521). It is obvious that however scientific our approach may be, we have a problem and no apparent solution.

Probably, a more sophisticated rendering of the theory of realism is epistemological dualism (Ferm, 1950, p. 525), which holds that an object of knowledge is known only through the "content of knowledge, i.e., through the meditation of idea." The approach is dualistic because the "idea" of the object—representationalism—and the "object of knowledge" are two numerically distinct elements in the knowledge situation. An advantage here is that human error—an illusion which can be crucial and disastrous in monistic realism (i.e., all knowledge is immediate and presentational)—is not necessarily a problem here, if the dualistic theory is fully embraced. One further advantage is that there is no defined or even implied point of intersection of the mind and matter. All the associated complicated intellectual maneuvering that such an intersection would generate is eliminated.

Now let us see how this logic is carried one step further. The Konigsberg philosopher, Immanuel Kant, offered creditable support to the epistemic form of knowledge by interpreting data from experiences in the abstract. Kant plunged into the maelstrom of metaphysics; he brought with him, when he resurfaced, what is probably his greatest contribution to philosophy. He succeeded in achieving the highest of all generalization, which somehow seems to be the only way to find the substantial essence in any scheme of reality and to understand its ultimate significance. He did this by showing that, while the specific content of our ideas comes from experiences, the form of our ideas comes from our own inner make-up. Kant said that "truths derive their necessary character from the inherent character of our minds, from the inevitable manner in which our minds operate" (Durant, 1971, p. 60). He believed that the mind of man is an active, logically arranged organ that coordinates and molds experiences into ideas, wishes, and standards of values. Further, he stated that both space and time are not "simply things we see, but necessary modes of perception" (Durant, 1971, p. 204).

Geographers should find a special interest in an extension of Kant's logic. Kant believed, not that our conceptions conform to objects, but that objects conform to our conceptions.

We cannot know things as they really are in themselves. The human mind determines the way we perceive things, and the human mind is self-determining and free.

Kant waded into deeper waters when he raised one of the more important questions involving epistemological discussions, the question of the reality of physical objects. We assume that a world of physical objects exists independent of our minds. Further, we assume that some of these objects are experienced by us through our sense organs and that others exist without being experienced—the latter, we accept through assumptions. If we experience the reality of some objects and assume the reality of others, and both processes are mental activities intellectually manipulated, then we are free to make any assumption about the landscape we wish, controlled by our state of mind at the time of observation. Therefore, the only objects we can ever know are in our minds and in no certain way in reality. We can never say that there are physical objects in the geographic landscape; we simply have to accept their existence on faith. Under these circumstances, largely uncontrolled landscapes may assume some unusual qualities along with some fantastic proportions.

Kant had this in mind when he wrote in his *Critique on Pure Reason* that "it still remains a scandal to philosophy . . . that the existence of things outside . . . must be accepted merely on faith, and that, if anyone thinks good to doubt their existence, we are unable to counter his doubts by any satisfactory proof" (Vesey, 1971, p. 60). To remedy this "scandalous" situation is another incentive for the geographer to evolve new approaches to understanding a world of physical objects that has, so far, been taken on faith: maybe we can move further.

Descartes and Locke, whose almost casual views on the subject introduced the modern period, offer scholarly support. Later Santayana, Strong, Rogers, Lovejoy, Pratt, and Drake generally endorsed the theory. Although they differed in details, there was general agreement. In sum, the theory may be outlined as follows: first, the mind is directly confronted with sense-data which constitute the content of knowledge; second, physical objects exist independently of the mind and are known through the mediation of the sense-data; third, material objects are numerically distinct from the data by which they are known (Ferm, 1950, p. 525).

Some argument exists as to the definition of "idea" and the correctness of its use. Possibly, the word should be reserved for "non-physical senses or experienced particulars" (Lovejoy, 1930, p. 298), because the mind is directly aware of "idea" and "can afford evidence of inference to an order of existence of events that are unperceived," or "casually related to the senses" (Lovejoy, 1930). Even so, there is no real conflict. Because no external object can ever be identical with what our senses perceive, the geographer can quite correctly employ the term "idea," within the limits of this paper, as representing physical landscape phenomena.

VII

What really concerns us most is that landscape observers tend, much too often, to elevate an appearance of reality to the rank of reality; and, having done so, to declare their views as valid. The formal absolutizing of an experience easily becomes the level of excellence by which field performance is measured. For this reason, a limited system is continued. Even though a certain value in this technique probably should be preserved, the technique is generally so irrevocably bound to the formal, antiquated method of observing landscape that the task of separating them seems impossible. Our best thinking at present seems to be moving toward the position that the reality of any object, expressed by any statement or viewed through any eyes, is exactly what it was intended to be by the subject observer. If this is, as it appears to be, a step forward from Kantian thinking, then we have progressed.

Edmund Husserl, the founder of phenomonology (who was deeply influenced by Kant), conceived knowledge in terms of consciousness, which is intentional and always oriented toward some external subject (Husserl, 1965, p. 22). If the subject is other than a person (i.e., a material, non-thinking object), then the subject cannot account for its own existence. The conscious man must account for it and must dispose of the essence of material landscape objects of his consciousness (Husserl, 1965, p. 29). In this manner, man does as he must; in so doing, he assumes a certain dominion over things. Objects are therefore subject to man's interpretative whim. In this mode, real objects assume an intentional arbitrary and often capricious reality.

To the philosopher Martin Heidegger, Husserl's pupil, phenomenology is that which reveals the nature of its existence: "Let the thing force itself into one of our ready made conceptual straitjackets." He believed that we cannot know an object by conquering or subduing it, but only by letting it be and allowing it to reveal itself in its own good time. However, when it does reveal itself (and here. the geographer should be interested), the object will be phenomenally received and the imagery sieved through the basic mode of our biological existence. This is characterized by mood or feeling, by understanding—understanding of "being," in which our existence is rooted—and by speech. To Heidegger, speech served to let the object be seen not only through the symbols representing words and sounds as a viable, living part of reality, but also through an attunement to a "thing" or "being" that reaches down to a level of comprehension below that of articulation. (The reader must not assume that the concept of "beings" (Greek: einai) or the concept expressed in the Indo-European Copula "to be" (the "being of the thing which is") has herein received proper attention. Such a subject is much too complicated for this study. Here, only Heidegger's casual brush with natural, material objects has come under discussion, as a concern appropriate to the central theme of this paper. At this point, for those interested in Heidegger's thoughts on the nature of "being" and "beings," it is suggested that reference be made to one of his greatest books, *Sein und Zeit (Being and Time)*, published in 1927. This book has become something of a systematic bible of Existentialist thinking. Heidegger proposes a renewal of the problem of "being" as first confronted by the Greeks.) Even for Heidegger, one of the world's most profound thinkers on the nature of "being," the reality of natural objects had meaning only through human interpretation.

A difficulty arises in treating this subject because we think of man and the material world as separate entities. We are accustomed to thinking in this manner because of the conditioning we receive from our cultural world (which we created in the first place). However, our assumption is impossible: when I perceive a tree, a bit of the material natural world, I do so by the induction of the human dimension, which allows the only reality I know or can ever know. These things cannot be understood outside of the human dimension—making me, without question, an inseparable part of nature (Barrett, 1962, pp. 210-12). If we accept this seriously, we can have no doubt about the ontological status of the natural world. If I thought the material world out of existence, I would think myself out of existence; therefore, a world without man is impossible and unthinkable. Material objects are, in reality, only what man thinks they are. Phenomenology received a rather vigorous infusion from Kierkegaard, who conceived ship to God. In this theological-anthropological proposition, man is absolutely original, radically personal, and unique. This requires acceptance of the notion that man's thinking assertions are applicable only to the thinker himself, and do not have validity for others (Luijpen and Koren). So, as it was before, it is still a matter of consensus; and this is where the matter

In view of the above statement, the geographer should avoid being arbitrary. Though this might seem the proper road to travel, it might be that giving over the world to man's arbitrary affirmations, as already stated, would not serve a useful purpose. The objective world, on the other hand, would destroy the subject as *existent* affirmation of the world. The subject would no longer be a *real* subject.

In no way does this negate the existence of reality. It is unquestionably there. The world existed before man. Considering our physical nature, the world had to exist before man. There would be very little point in thinking of it as being otherwise. What needs to be accepted is that the world of man is radically human.

It follows, then, that man's consciousness is not locked inside a container with only its own meanings. Being conscious is a mode of world-consciousness by which the *existent* subject of human worlds corresponds to natural worlds. Logically, there cannot be an independent consideration of man and materials as separate entities. The next dimension in which man stands and thinks of landscape is the reciprocal association between subject and world. If he speaks or thinks outside this dimension, he no longer speaks of anything of consequence.

This reciprocity of "primitive fact" is the pivot of the idea of *existence-intentionally*, and constitutes the source of light of the original intuition on which this last dimension is founded.

VIII

In the functional area of perception (Amer. Assoc. of Geog., 1969), a strong sense of belonging to and identifying with a specific location may strongly influence perceptive abilities (Fried & Gleicher, 1961, pp. 305-15). To what extent the hidden dimension (Hall, 1966) functions as a determining factor cannot readily be established. We do know from observation that this sense of belonging springs from several sources; principal among these is perception. Through continuously scanning a constant flow of details associated with an area of the landscape, familiarity is developed to the point at which identity is possible. But little of consequence to the observer is gleaned from this massive supply of presented data. Due to the nature of his background, the observer's "everyday perception tends to be selective, creative, fleeting, inexact, generalized, stereotyped" (Sprout & Sprout, 1956, p. 10); the bond between man and territory gradually strengthens, through the personal interests, desires, and cultural character which influence man's selection and result in the uniqueness of his association.

Evidence also exists that a strong instinctual motivation is provided for territorial identity; and, should this motivation be exercised, it can be validated through observed phenomena of unquestioned authority (Lorentz, 1967, p. 82). These data argue most eloquently that our selectively perceived intelligence may involve a biological foundation of a prejudicial nature (Howard, 1964). An impressive body of literature supports the thesis that an inherent, instinctive pattern exists within members of the animal kingdom, programming them and impelling them to seek stimulation from any available source, to assure continuance through survival of the species, and to establish an identity with a spot of earth. The pattern is known to followers of this school of thought as the "territorial imperative" (Ardrey, 1966, pp. 329-44).

An extension of this line of thought tends to complicate the problem through the introduction of additional critical elements which can have far-reaching implications. Suppose that our selective and prejudicial perceptions—should the above thesis apply also to man—be linked to a place which corresponds to a politically organized unit of society. Though our primary concern is a place of individual origin, most places have a corresponding political identitity; and we are not going astray in considering implications of the latter. In the case of a salmon, the place is a stream; for a bird—though all species have differing characteristics—the place may be a few inches on the branch of a tree. However, human society in its space-culture organization is more politically complicated, and man's greater political consciousness conditions still further his perceptive orientation pattern. Within the framework of three biological imperatives—stimulation, survival of the species, and territoriality—we are, in a very large measure, what we want to be.

Further, man is more complicated biologically and more sophisticated intellectually than are other animals, and creates a more elaborate structuring of the former as well as the latter around his preferred mode of existence. Perception is thereby further compounded and made less reliable for the landscape observer. To be properly instructed on this subject would require delving into the "hidden dimension" and would cause considerable pain as well as embarrassment. By a wise dispensation, a metaphysical veil seems to have been drawn over this mysterious realm, sparing us the humbling experience. Many of the influencing factors in human perception are beyond the pale of human understanding. At present, though we have observed the natural order of things, we are at a loss to explain some of them, other than by instinct. "Area loyalty," patriotism, and religious identity, among others, are feelings which cannot be explained, even though they exercise a monumental conditioning effect over our choice and manner of perceiving elements.

To the extent that these feelings operate, a nation-state may exist where "political union" combines with territorial space to form a single entity. The strength and internal cohesion that such a nation-state possesses is directly proportional to the manner in which its constituency perceives it to exist, to their conceptualized "idea" of their national vocation, and to their view of their ultimate self-significance (Tillich, 1961, pp. 14-18). It can be reasoned that the origin of a nation-state, or any other form of organized society, properly dates as a reality from the time it is perceived to exist and structurally conceived in consensus by its constituent members, and will owe its continued pre-eminence over its subjects largely to the duration of that intellectual situation. Accordingly, the thesis of "territoriality" is, as much as anything else, a biological construct, mentally interpretated and implemented. It exists strictly in the minds and hearts of its people, and in no way represents a physical reality.

The "biological territory" idea seems to be intensified by, and to have as a prerequisite to its successful fulfillment, an imperative beyond space. Speaking now and in future context, the concept of territory, area, or space (as previously stated) has a biological meaning: the defense of an identified and associated area. A biological nation would have, at the foundation of its existence, a supposed biological morality to "describe that conduct dictated by innate command which sacrifices individual interests for a larger or longer good" (Ardrey, 1966, p. 245). More is needed, however, to complete the pattern. Augmentation gleaned from experience (i.e., from the learning situation) is required. Though one may have an inborn passion for his home region, he must acquire, in a learning situation, his knowledge of that region's boundaries. Such knowledge is not, of course, instinct. One must learn exactly where to defend his area's outer limits and the location of its core position. Though it is a paradox, to be sure, he who defends the primacy of instinct in the transactions of man finds himself defending the primacy of the mind as well (Ardrey, 1966). Thus, the pattern is completed. The point here is that if the learning process is so deeply involved with the instinctive behavior of preprogrammed individuals, perceived data from the landscape collected through the "senses" will accordingly be modified by the biological nature and history of the observer.

IX

The "intellectual situation" alluded to above is a part of the pattern, and its time frame involves one additional aspect of major importance: that of tradition. Tradition, in the final analysis, has its origin in a vast sea of visual impressions perceived under controlled circumstances, and consequently conceived as the mood of the observer requires. Somehow, some of these impressions must be made to persist through a long period of time; in this mode, we consider tradition.

In order to be useful, a multitude of impressions must first be rendered harmonious; we wisely pay tribute to consensus when such harmony is achieved. When a consensus persists for a considerable span of time, a tradition is created. Traditions tell us who we are and where we are going. They represent the voice of the prophets, the precepts of religion, and the authority of law; in combination, they form the foundation of our nation-states. History, whose duty it is to record the past for the instruction of the future, would be ill-advised to tamper with its responsibility. Contempt for tradition confirms the possession of a hasty judgment.

It becomes increasingly obvious that the concepts involved in "territoriality," if staunchly upheld, become all-pervasive and permeate every fiber of the social structure. Thus, the significance of perception to man and to the geographer becomes clear. Environmental perception is on its way to becoming a prevailing force. The geographer, whose duty it is to reconcile the interests of the present with those of the future, is confronted with a colossal task. In addition to his other burdens, he is being encumbered by a new role: he is becoming a philosopher.

The study of the universe rather than the study of individuals is generally the primary object of science and of knowledge. The geographer-metaphysician stands at what could be a parting of the ways. One way leads to concerns with conceptual entities—namely logic; the other way leads to concerns with the sensate qualities of natural objects themselves. Hopefully, both can be rationalized into proper sequence for a uniform geographic approach, and the two categories of universals —the object of science of real things and the object of logic—can be harmonized. This mechanical problem should be resolved before the problem of dimensions is approached. But this resolution should not be difficult, because in large measure both problems are cut from the same cloth. When we have negotiated this rocky road we will find, hopefully, that there is a common nature in conceived reality and perceived reality which will provide a suitable realm for our studies.

Actually, we have assumed the existence of this realm for several hundred years. However, should our mathematical logicians and our metaphysicians find this assumption to be false—which is doubtful—we could conceivably find ourselves without a discipline. As it is generally understood, the idea of common natures is one of the foundation stones of modern geography. We must also admit and accept the idea that such universals exist solely in the mind and have no reality except through logical and perceptual deductions.

In conclusion, let me suggest that the next great task of geography probably will be to identify and define geographic landscapes in six dimensions.

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