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THE COMMON NOTION of thinking and doing construes them as antithetical activities, and moreover esteems thinking to be a uniquely human capacity. The net effect is to enshrine intelligence in the brain—the human brain. What I want to show in this paper is that intelligence does not reside at such a doubly exclusive address: it resides in living bodies, human and nonhuman. Otherwise stated, the purpose is to show that the light-bulb theory, as it might be called, is erroneous; while the common notion requires a *deus ex machina* origin of thinking in the evolutionary world, the paleoanthropological case study presented here will show existential analyses to support evolutionary continuities. Let me set the stage for this alternative understanding of intelligence by clarifying quite briefly the sense in which paleoanthropological reconstructions are hermeneutical and illustrating the way in which they fall short of a complete hermeneutical account.

Thomas Kuhn brought to forceful awareness the fact that the normal practice of any science is hermeneutical. That is, whatever the data, *interpretation* is the mainstay of the enterprise and the pivotal point in the production of new knowledge. But in paleoanthropology, where it is a question of bones, of disconnected and/or isolated fragments of data, something more is needed in the way of interpretation to begin with. As I have elsewhere demonstrated, it is not simply a mat-

ter of interpreting bones in respect to age, taxon, and the like. This interpretation is only the prelude of the hermeneutical enterprise. Interpretation at this point places the fossil specimens in evolutionary time but it does not illuminate their living reality. The next interpretive step is to transform the bones into a text to be read and interpreted in the same way that an old manuscript or an old monument might be read and interpreted. As Ricoeur has suggested, "The human sciences may be said to be hermeneutical . . . inasmuch as their *object* displays some of the features constitutive of a text as text" (259).

Only when fleshed out and made to stand on their own do fossil bones take on animate meanings and find their ultimate interpretation within evolutionary history. In the hands of paleoanthropologists, however, fossil bones habitually fall short of their existential meanings. In other words, the hermeneutical enterprise peculiar to paleoanthropology is not fully recognized or carried out, and it is not carried out precisely in the sense that the sensory-kinetic world by which bones become flesh—or behaviors become living realities—is not re-created. The data used by the paleoanthropologist to assess early hominid intelligence, for example, center on fossil specimens in the form of brain endocasts and on certain behavioral analogies. The analogies are used heuristically, the rationale being that the life of ancient hominid creatures resembles in one way and another the life of present-day social carnivores, the life of present-day nonhuman primates, and the life of present-day hunter-gatherer societies. Brain endocasts, for their part, are associated with brain size, which in turn is consistently associated with intelligence even though the correlation between brain size and intelligence is not consistent, e.g., both Neanderthal and dolphin cranial capacity are larger than that of present-day

humans. Nevertheless in view of the fact that hominids progressively came to have bigger brains than their evolutionary cousins, the nonhuman primates, bigger brains are consistently equated with the capacity to handle more and more complex information. In effect, intelligence is spoken of mainly in terms of mental properties. While it might in rare instances be tied explicitly to perception, and in even rarer instances tied implicitly to action, language and thinking appear to be its closest and most dearly cherished kin, these latter accomplishments being taken of course as wholly mental phenomena and preeminently, if not exclusively, human achievements.

Now a paradoxical and key shortcoming of the above viewpoint is that the story of the evolution of intelligence remains at a general and abstract level; it is not rooted in the actual sensory-kinetic world in which long-ago evolutionary creatures lived their lives. In order to shed light on the evolution of hominid intelligence, it is not mere behavior which must be coaxed out of some old hominid bones; it is experience, which means in part an understanding of the way in which the world appeared to early hominid creatures. Hence the need for a deeper hermeneutics. To understand the sensory-kinetic ground upon which a creature differentiates and recognizes things and attributes of things in its world is to understand the species-specific meanings—the existential significations—which anchor its conjectured behaviors. Meanings engendered in experience are indeed the very ground of any conjectures about behaviors in the first place, whether those behaviors have to do with eating, mating, hunting, or whatever. It is vital to uncover this primordial, nonverbal stratum of meaning in order to re-create early hominid life and, in turn, gain a just understanding of the evolution of hominid intelligence.

An uncovering of existential significations in hunting behavior will flesh out and thereby exemplify the hermeneutical dimension lacking in paleoanthropological accounts. This elucidation of meanings will bear forcefully and directly upon an understanding of the evolution of hominid intelligence insofar as the latter is consistently pictured as seminal and as developmentally tied to early hominid hunting behavior. Itinerant examinations of the implications of these meanings in respect to chess-playing—typically considered a wholly mental undertaking—and to dancing—typically considered a wholly bodily undertaking—will furthermore shed light on present-day assumptions about intelligence. The procedure will be to summarize first, and in the briefest terms, the dominant themes in paleoanthropological accounts of hunting and then to probe a specific account for its existential significations.

Hunting: A Paleoanthropological Case Study

Early hominid hunting is typically defined in terms of what it required as well as what it accomplished. Thus it is discussed in terms of technology, cooperation, sharing, communication, a sexual division of labor, the having of a base camp, knowledge of a wider territory and of the habits of a variety of animals. Only when an actual analogy to present-day nonhuman and human hunting behaviors is made, however, do existential significations begin to show through the behavioral characteristic being discussed. The significations are apparent, for example, in the statement that "wolves and wild dogs have a sharp eye for spotting the more vulnerable member of a herd"; that animals depend on "important intentional clues by watching one another"; and that hunters place "a great premium on quietness" (Leakey and Levin, 154-55). From definition as a form of behavior,

hunting becomes a real-life existential event in which certain powers of physiognomic awareness and a certain domain of kinetic possibilities emerge. In short, a certain sensory-kinetic world comes to life.

Concrete aspects of this existential reality can be uncovered by taking up the behavioral account of hunting offered by two zoologists, Peters and Mech, in their article "Behavioral and Intellectual Adaptations of Selected Mammalian Predators to the Problem of Hunting Large Animals." Through an investigation of what they designate as "behavioral solutions to the problems of detection, apprehension and use of large prey" (279), Peters and Mech want to show the relationship between a hunting way of life and the development of intelligence in hominids. Specifically, their purpose is to examine particular adaptive behaviors common to present-day nonhuman hunting animals and to show how "increased degrees" of these adaptive behaviors fostered human intelligence. They identify the behavioral solutions in terms of four behavioral traits: persistence, cooperation, strategy, and cognitive mapping,* each of which is taken as being "of significant value to any organism dependent on the capture of large prey" (280).

Persistence: While Peters and Mech acknowledge the claim of other zoologists that persistence in early hominids "selected for increased attention span leading to an expansion of the brain which resulted in the emergency of genus *Homo*" (296), they do not see the trait as necessary to the evolutionary success of early hominid hunters. Although they end by dismissing it as a factor, we will examine it briefly in order to bring out a fundamental and widespread belief about in-

* A modest conceptual disorder should be noted: *cognitive mapping* is listed as a behavioral trait when, as will be evident, it is conceived and treated as a brain product.

telligence, one which assumes and maintains an evolutionary human/nonhuman discontinuity.

In zoological research, bodily activities of nonhuman animals are not considered to be anything more than a behavioral substrate of intelligence. Thus persistence in wolves, for example, is never spoken of in terms of attention span, let alone an *increased* attention span; it is spoken of only in terms of certain bodily doings—keeping up a chase at full speed, for instance, for twenty minutes. In effect, that a wolf persists in doing something is not itself a sign of intelligence; only what is taken as a mental product of some kind—an increased attention span—is a mark of intelligence. The reasoning is roughly as follows:

1) Intelligence is not a bodily phenomenon but may be fostered by bodily activities.
2) Persistence is just such a bodily activity—a trait which may contribute significantly to the behavioral substrate of intelligence.
3) To evolve intellectually, hominids evolved "progressively higher degrees" of e.g., persistence; that is, they evolved "an increased attention span" (Peters and Mech, 296, 297).
4) Behavioral traits such as persistence are therefore not of themselves signs of intelligence in the nonhuman animal world; they are merely bodily doings.

In this line of reasoning, a metamorphosis takes place in the behavioral trait between the second and third postulates. A quantitative shift gives way to a qualitative difference in kind. In this way it is possible to avoid suggesting that nonhuman animals are intelligent, or if they are, that their intelligence is the same in kind as that of humans and that intelligence is in any way a bodily phenomenon. In effect, evolu-

tionary continuities are resolutely and soundly blocked.

An interesting implication of this line of thinking becomes evident when a different-in-kind nonhuman animal intelligence is granted rather than no intelligence at all. The implication can be traced out by asking whether the persistence of a dancer toward mastery of a plié sequence signifies a human or a nonhuman intelligence. If the former, what are the higher degrees of persistence to be attributed to the dancer? What *is* different about a wolf persisting in a run for twenty minutes and a dancer's persisting in a plié sequence for twenty minutes? Since both are, from the postulate point of view, wholly and simply bodily doings, both would seem to engender the same kind of intelligence. In short, the dancer's intelligence appears to be on a par with the wolf's.

While there does not seem to be good reason for finding the similarity disturbing, there are good reasons for finding disturbing the idea that the intelligence in question is discontinuous with, and of a lower order than, another kind of intelligence labelled "human," or "properly human." If we in fact look at the actual phenomena themselves—the twenty-minute run and the twenty-minute plié sequence—it is certainly apparent that in each, judgments are being made, decisions are being taken, controls are being exercised, and so on, all in the name of certain noticings, certain awarenesses of a particular happening-in-process. Whatever the endeavor, an intelligent persistence would seem indeed to be first and foremost a bodily intelligence in that it is not a *blind* persistence. It is alive *with* meanings and it is kept alive *by* meanings, all of which are generated by a sensory-kinetic grasp of the situation at hand. The moment those meanings are acknowledged and taken into account—whether a matter of direc-

tional configurations, positional changes, temporal patterns, or tensional shifts—it is apparent not only that more is going on than might meet a behaviorist's or human supremacist's eye, but that more must be taken into account in any serious and complete appraisal of a creature's intelligence—whether wolf or dancer. It might even be added that a chess-player's persistence is intelligent not because of an attention span of a certain length but because of a sensory-kinetic perspicuity which grounds the very possibility of a steadfast and unwavering attack.

The rectitude and implications of the double-faced belief—that nonhuman animal behaviors are nothing but bodily doings and that bodily doings cannot be characterized as intelligent—will be thematic implicitly and explicitly throughout the uncovering of existential significations of each of the other behavioral traits. Of these remaining traits, there is virtual unanimity of opinion: cooperation, strategy, and cognitive mapping, are each considered *bona fide* cornerstones of hominid intelligence. In what follows, the procedure will be to examine three existential significations in respect to each trait, to show that a full-bodied nonhuman intelligence is evident in every case, and, in effect, to show that evolutionary continuities may be validated existentially.

Cooperation: What does it mean for a group of predators to be able to detect suitable prey out of a milling mass of animals or to test a herd by rushing it? It means that physiognomic powers of perception are honed to a rich and fine acuity. The predatory animals read individual and mass movements of the prey animals, not as symbols but as existential events. They read each other's movements in like manner. Animals engaged in a hunt are in fact thinking in movement in the sense of putting together a kinetic

drama, forging it out of the very sinew and stride of their being. Physiognomic perception is a fundamental structure of this thoughtful drama. Group-hunting predators are attentive to and understand straight off certain behaviors as certain states of affairs—e.g., "that animal is vulnerable"—or as certain actions or possibilities of action—e.g., "my colleague over there is now going to rush the herd from the side and I will balance his efforts by changing the direction of my rush also." Cooperation in this sense is grounded in being attentive and in noticing. Without a quintessential awareness of the direction, rhythm, and flow of individual and mass movements by prey and fellow predator alike, there could be no concerted action toward picking out a suitable prey. To cooperate in hunting is to notice and to understand these movements—these comportments—as lines of force, as potential increases in vulnerability, and the like. Moreover it is to understand these comportments straightaway. It is not a question of an animal's wondering: "What did *that* mean?" or "I wonder what he meant by that. . . ." There is an immediacy of meaning which bespeaks a ready and sharp intelligence not to be confounded either with stimulus-response models of behavior or with an intelligence devoid of thought, i.e., a Piagetian sensori-motor intelligence.

There is a reverse side of this capacity to think in movement. It is not only physiognomic, it is kinetic; there are meanings *in* the flesh as well as *of* the flesh. Indeed, the drama is nothing other than a continuous unfolding of these meanings. But there is not a perception, and then a movement which answers it, then another perception, and so on. Readings of qualitative nuances are coextensive with the creating and shaping of the ongoing scene itself. In other words, there is a simultaneous immediacy of physiognomic and ki-

netic meanings: the animal is finely attuned to the situation at hand, and at the same time finely tuning the situation at hand. These are not two different meaningful "acts." If they were, the hunt would literally dis-integrate. Rather than an ongoing drama being created and lived out moment by moment, there would be a series of startings and stoppings in which beginnings and endings would have to be artificially and arbitrarily assigned.

A hunt is quite obviously not such a series of discrete, externally connected events. Neither is it a segmented series of active and reflective moments with animals removing themselves from the hunt from time to time in order to ponder the erstwhile ongoing goings-on: if it were, there would be no hunt but perhaps something akin to a football game. Viewed kinetically, a hunt is a flow of internally linked events which are anchored in a constantly unfolding present toward an undetermined future. Because the situation is dynamic, in perpetual flux, what needs to be done is constantly being re-defined by the qualitative sum of all individual actions and maneuvers. From this perspective, to cooperate is to see shifting spatial relations, to see vulnerabilities, to see moving lines of force, and simultaneously to see, in both a global and individual sense, what needs to be done.

There is a deeper aspect of this capacity to think in movement which undergirds the very possibility of cooperating. To cooperate is already to be an individual among other individuals; it is to have an interanimate world. To cooperate is thus a social gesture, a reciprocal acknowledgement of Otherness which anchors the very possibility of being perceptually attuned to, and of kinetically tuning, a global situation at hand. This coming together toward a mutually chosen end might be described in Sartrean terms as one's being for others as one is for oneself; a choosing

for one's good and at the same time a choice for the good of the other; a balancing of one's own autonomy, and at the same time, a full recognition of the autonomy of the other. Balancing and choosing in this way are not abstract reflective maneuvers but actively lived-through structures of the hunt itself in the form of judgments, discriminations, and actions. They are palpable forms of intelligence which are grounded in the having of an interanimate world. There could, after all, be no 'common good' unless there were in the first place communal ways in which animals share a certain viewpoint upon, and motivation toward a world. It is precisely this communality which Leakey points toward when he writes of the importance of "intentional clues" (155) among social carnivores. These clues have barely been acknowledged much less seriously taken up and analyzed. They may indeed lie beyond the reach of human understanding since humans do not and/or cannot notice what a nonhuman animal notices: as Thomas Nagel pointed out in a well-known article, they are unable to articulate *its* perceptions. Yet although humans may fail to accede in any actual lived-through sense to the communality of a particular nonhuman animal world, they cannot thereby ignore or dismiss it. To do so can result in precipitous and skewed judgments concerning the nature of nonhuman animal intelligence.

The hazard and even folly of the latter judgments can be sharply illustrated in the following manner. Cooperation in humans can in some basic instances be capsulated by the notion of "playing by the rules," a practice which obviously presupposes the fundamental existential reality of an interanimate world. To play by the rules in a chess game, for example, is to cooperate in observing certain codes of conduct relative both to one's opponent and to each of the pieces of the game. Playing by the rules is not, however, a

human invention. It is as much in evidence in the play of nonhuman animals as it is in their ritual battles, perhaps most conspicuously in the finale of these battles when the submissive gesture of the one animal is not violated by the other. If it is argued that higher degrees of cooperation are present in human interactions—for example, that the rules of chess are more complicated than those of nonhuman animal play or ritual battles—one would be hard put to reconcile that claim with the following report by Teleki in 1974 ("Chimpanzee Subsistence Technology") which, though it does not deal with cooperation or playing by the rules, *does* deal both with a kind of hunt and with precipitous human estimations of nonhuman *and human* animal intelligence.

> Having repeatedly observed individuals approach a mound, make a rapid visual scan of the surface while standing on or beside it, and reach decisively out—with a high degree of accuracy—to uncover a tunnel, I was soon impressed by the apparent ease with which tunnels could be located. In attempting to learn the technique, I applied several experimental procedures: examining in minute detail all crack patterns, protuberances, depressions and other 'topographic' features in the clay. But, after weeks of futile searching for the essential clue, I had to resort to scraping sound surfaces with a jacknife until a tunnel was inadvertently exposed. My inability to find any physical features which could serve as visual clues eventually led me to realize that chimpanzees may possess knowledge far beyond my expectations.

Teleki, a widely known and respected primate anthropologist, spent almost two years studying chimpanzees in Gombe National Park in Tanzania. The quoted passage appears in his discussion of the ability of chimpanzees to locate termite tunnels. It demonstrates clearly that there is more to nonhuman animal intelligence than meets a naive (or arrogant) human eye, and that a good deal needs to be learned

about nonhuman animals before pronouncing judgment on their intelligence.

Under- and over-estimations of intelligence—so called lower and higher degrees of cooperation—aside, the sense of communality which underlies cooperation and which makes hunting possible, whether in terms of a communally maintained silence or of a communally centered attention on a communally chosen prey, bespeaks a nonverbal understanding of I and Other as individually potent forces in a global drama. Short of an understanding of these interanimate dynamics, one hunting animal could hardly cooperate with another.

Strategy: At least one well-known study by Menzel has shown chimpanzees to use a deceptive strategy similar to that of the lioness who, as Peters and Mech describe her, pretended after a kill as if nothing had happened so that her take would not have to be shared with others. To deceive a fellow creature is to know what one's fellow creature would normally do given a certain situation. It is to know not in words but in one's bones how to manipulate another's behavior for one's own end. This knowledge grows spontaneously, but only because, as a certain kind of creature in the world, an animal—whether human or nonhuman—notices certain things and not others. In short, every creature lives in a species-specific sensory-kinetic world. A striking example will elaborate this fact.

What is remarkable about the Clever Hans affair in the context of strategic deception is not that the horse, Clever Hans, unwittingly fooled his keeper for so long into thinking that he, Clever Hans, could add and subtract, but that he, Clever Hans, put two and two together in the way that he did. *This* feat is not remarked upon at all. Yet it tells so much about the very core of all animal behavior—human and nonhu-

man; namely, physiognomic perception, a matter for Clever Hans of perceiving a slight raising of eyebrows and a slight bending of the trunk of his keeper. Now it does not matter if Clever Hans did not *willfully* deceive his fellow creature but only wanted to continue getting sugar lumps. What matters is that deception occurred because Clever Hans noticed certain relationships. No one taught him to do this. He used his native powers of physiognomic perception and arrived at certain meanings. Precisely because he led all who witnessed his considerable feat to misconstrue his behavior, was *his* putting two and two together not as intelligent as the genuine act of adding?

There is a further aspect of deception in the case of the hunting lioness in that physiognomic knowledge is used by choice toward a certain end. To deceive in the way the lioness deceived is to know that to behave in a certain manner is to *appear* in a certain way, and by so appearing, to precipitate certain behaviors in others. By the same token, to choose how one will appear is to choose among possible courses of action. Thinking here is thus a judgment-mediated anticipation: if I act in a certain way, so also will my fellow creatures. The thinking is manifest in an intentional act. In fact, the lioness who looks around casually as though nothing has happened is like the chess player who willfully dissembles after his/her move. By eye movements, gaze, and/or posture, the player attempts to keep actual ends and concerns from view.

The second aspect of strategy to be singled out concerns the practice of aiming charges ahead of running prey. While anticipation is acknowledged to be a factor here, it is spoken of only abstractly as an ability to plan for and/or expect certain outcomes. The question is, what does anticipation mean in existential terms? It means that there is a general, but not imprecise, knowledge an animal has about the way in

which creatures in its environment behave and may be expected to behave. More specifically, it means knowledge of one's fellow creatures as moving lines of force and of oneself as a moving line of force. To bring these lines of force into coincidence with one another is in fact the very essence of the hunt, its *raison d'etre,* and it obviously requires thinking. To anticipate a future in terms of *moving lines of force* is to think concretely in kinetic terms and in so doing to wield a concrete power of intelligence. This concretely realized power is as apparent in chess as it is in hunting. Indeed it is not amiss at all to speak of aiming charges ahead in respect to chess. To think in movement toward a future moment is in both cases to have a sense of the power of movement—in potential as well as actual terms, that is, as possible or present lines of force which can meet, and in such a way that one line can cancel out the other.

Finally, a third aspect of strategy may be uncovered. When a lioness waits in ambush for a prey in order to take it by surprise, or when any creature stalks another with the same visible intent, a nonverbal judgment-mediated anticipation and choice are being articulated in the flesh: if I do thus and so, then that creature will do thus and so. Further, a choice among possible actions is apparent, the choice here being to dissemble: to pretend not to be where one is, to pretend not to be doing what one is doing, to give the appearance of having no ill intentions, and the like—all to the end that the prey is taken by surprise.

What is striking over and above the anticipation and the choosing is the intentional core of surprise itself. Like cooperation, surprise entails an acknowledgement of an Other, a recognition of another creature as an individual leading its own life, as being vulnerable in certain ways, and so on. But more than this, surprise is the creation of a certain kind of world, one in

which sound and silence have value, and in which the visuality of movement and of oneself as a visual form have value too. In short, surprise necessitates the creation of a certain sensory-kinetic world, one in which quietness and visual stillness are paramount. A creature which would take another by surprise must therefore transform its native vocal and kinetic proclivities. Thus it is that chimpanzees which are normally quite vocal become silent and remain so until the prey is captured or the hunt is aborted; that social carnivores, whose success also depends upon noticing "intentional clues," refrain from vocalizing at all, "any vocalization being a potential giveaway when prey is being stalked"; and that "contemporary [human] hunters place a great premium on quietness throughout an excursion, even while the prey has not yet been sighted" (Leakey and Lewin, 155). No matter what species the hunter, to surprise is uniformly to make oneself a certain kind of creature, and in the process to create a certain kind of world replete with certain meanings. It is, at the same time, to know the *power* of the unexpected in the world of living beings. This knowledge is not in any sense a rote—or what some might call "an instinctual"—knowledge. As Peters and Mech point out, "neither occultation nor attention to alertness are employed stereotypically, and stalks often fail when lionesses do not use these techniques" (291). It is thus not a matter of built-in behavior patterns but of intelligence in the sense of having learned—or not learned—the value of certain strategies. Quietness and visual stillness are meanings which are learned and which are brought into the world by the hunting animal itself.

A particular implication of these existential significations of strategy merits attention. Deception, kinetic planning, and surprise all bespeak an intentionality. The implication of their presence in hunting can be

stated in the form of a thesis, namely, that any hunting animal capable of creating meanings is intelligent. To the immediate follow-up question, Where is the dividing line: which are those who can and those who cannot?, one might best answer with Husserl: "to the things themselves."

An illustration of this approach may be had by considering what is going on in the course of a dance technique class. What meanings are being created in learning a new plié sequence, for example? A dancer might say that meanings are being created only at the point where thinking in movement is a matter of kinesthetic rather than visual noticings and movings. Where the would-be dancer is caught up in the visuality of movement as a technique to be learned, meanings are not yet created insofar as they do not yet emanate from a self-generated flow of movement. Instead they are being *appropriated:* they are anchored in replication—in the precision of certain visually specified and foreordained placements, for example, or in the punctuality of certain visually specified arrivals at certain foreordained points. What is to be distinguished is thus the capacity to replicate certain gestures and in turn arrive at preeminently visual meanings, from the power to create certain gestures and with them, preeminently kinesthetic meanings. In other words, a mimetic intelligence can be distinguished from a kinesthetic intelligence; appropriated meanings can be distinguished from self-generated ones. The distinctions are akin to the difference in behaviors of two species of wasps whose sequential behavioral preparations on behalf of their soon-to-be offspring were consistently interrupted by an experimental procedure. In one species of wasp, the sequence of behaviors was recommenced each time from the very beginning, no matter when or where the sequence was interrupted. In the other

species of wasp, the sequence of behaviors changed. This species eventually altered its behavior in light of the changing conditions in which it found itself. It was not replicating a certain sequence of behaviors but was listening to what was actually going on, so to speak. It aimed toward orchestrating a whole, gearing the actualities of its preparations to the situation at hand. Analogously, one might say that in replicating gestures, the dancer is moving through a form; in creating kinesthetic meanings, the form is moving through her. Clearly there is a difference between going through visually anchored motions—or prepackaged behavioral repertoires—and living in the flow of movement—or in the immediacy of the situation—itself. The difference would seem to lie in the presence of an autonomous intelligence at work.

Cognitive Mapping: What does it mean to conclude that certain "insightful" behaviors by wolves, such as taking shortcuts to eliminate a bend in the road, preclude "any explanation other than that the wolves knew where they were going?" (Peters and Mech, 293). Why would anyone doubt in the first place that hunting wolves—or migratory birds, for that matter—know where they are going? Why would anyone think them spatial dull-wits? Perhaps it is a matter of *our* being spatial dull-wits were we to find ourselves on an open tundra—or sea; perhaps it is for our benefit that cognitive maps are introduced and reified. In order to get at existential significations, a summary exposition and critique of cognitive mapping is needed and this because, as noted earlier, cognitive mapping is not actually a behavioral trait; it is conceived and treated as an activity of certain brains—bird brains, turtle brains, and bee brains as well as wolf and early hominid brains. The most expedient way to begin is by summarizing O'Keefe and Nadel's

precis of their recent, highly applauded book, *The Hippocampus as a Cognitive Map,* which appeared in *The Brain and Behavioral Sciences.*

Though cognitive maps are theorized as constructed and stored in the brain and though they are at times reified literally beyond belief—of which more later—O'Keefe and Nadel emphasize the fact that they are built up through the animal's actually moving in, and exploring a given terrain. There thus seems to be a sizeable inconsistency insofar as O'Keefe and Nadel postulate two separate spatial systems—one of which is cognitive and one of which is not. On the one hand there is what they call egocentric space, the matrix of which is the body; and on the other hand, there is what they call nonegocentric or absolute space, the matrix of which is the brain. The inconsistency lies in the fact that if a cognitive map is defined as the brain's nonegocentric way of organizing "sensory inputs" (O'Keefe and Nadel, 488), then, quite apart from the fact that "sensory inputs" are necessarily egocentric in the most fundamental sense, why would the brain have to enlist an egocentric body to move it around in order to gain ideas of the distance between these inputs, for example, or of their directional relationships? The answer of course is that the brain is powerless to supply spatial vectors. Knowledge of spatial relationships depends upon noticing and moving. Paying attention to the way things look, smell, feel, and sound, necessarily figures in the forefront if an animal finds and knows its way about effectively and efficiently. Being able to think in these terms would seem in an evolutionary sense, part and parcel of all successful animate existence. But furthermore, knowledge of spatial relationships is fundamentally a matter of *thinking in movement.* This means that, if there is such a thing as a cognitive map, sensing and moving are inextricably bound: sensory

inputs by themselves are meaningless. In fact from the viewpoint of neuroanatomy, sensory events are structurally as well as functionally thoroughly interlaced with motor events.

Thus if the world is alive with spatial meanings peculiar to the lifestyle of different animal species, then whatever may be a particular brain's equipment, those meanings are as inscribed in the animal's sensings as they are called forth by them; and they are as ingrained in the animal's movements as they are created by them. In other words, as Merleau-Ponty said, albeit in a different context, there are many ways to be a body. Whatever might be the virtues of a postulated entity such as a cognitive map, its fundamental basis in experience cannot be perfunctorily recognized, then passed over, which is simply another way of saying that the living body is at the origin of all spatial knowledge.

Now although living bodies are clearly Darwinian bodies, i.e., the kind of bodies Darwin observed and wrote about, and not the once-removed-from-life bodies typical of today's zoology, they are not commonly admitted into accounts of the evolution of human intelligence. Thus when Peters and Mech ask how early hominids could have competed for large live prey with other meat-eating species, they answer that the hominids evolved intellectually. In their scenario, the living body is taken as a token adaptive gesture, a necessary but intellectually inconsequential epiphenomenon of cortical evolution. It is this conceptual view which is the basis of the postulate system enumerated earlier; it is this view which allows Peters and Mech to write, "What is tool-using but the ability to see how an object can be employed in a strategic manner? Toolmaking would require just a second similar insightful step, plus the physical ability in the form of digits with high manipulability"

(297). One can barely refrain from asking, Is that really all? In the first case just a matter of seeing and in the latter just a little pianistic nimbleness in the way of fingers; just a brain with two orbs and a few workable digits thrown in? But wait a moment. Where in this scenario is the body which knows a potential tool when it sifts through and feels a cluster of stones? Where are the hands and fingers which discriminate pointedness from bluntness and smoothness from jaggedness? Where is the thinking body which runs with, and wields tools and in so doing tests and proves their efficacy? Where, in brief, is the living body, the Darwinian animal, the flesh and blood creature in such a scenario? This body or animal or creature is not a brain hooked up to a manipulable "mechanism." Neither is it a brain's way of gadding about. The thinking body has a brain, but in the same way that it has nerves and knees; *everything* works in this body; *everything* enters into its sensient-kinetic life. The model of a disembodied spatial intelligence runs counter to experience, which shows that if cognitive maps there be, they are a brain's possibility only because they are grounded in the existential reality of a living body.

Now if spatial cognitions first of all bespeak a living body, they also bespeak a brain whose products cannot be reified *in place of* a living body. Reification ultimately fails for two reasons which may be briefly set forth as follows.

It has been a precept of the brain sciences for over 100 years that certain cortical areas are responsible for certain abilities and that lesions at particular sites produce certain behavioral deficits. The theory is borne out by the fact that a lesion in Broca's area results in labored speech and articulatory difficulties while a lesion in Wernicke's area results in utterances which are syntactically correct but semantically pe-

culiar or nonsensical. What is queer, however, is that in normal persons, stimulation of Broca's area does not produce unlabored, well-articulated speech, but only cries, vocalizations having no resemblance to speech. Reification fails in the first place because no electrical stimulation of the brain has ever given rise to a word. What is at stake is thus the credibility of the assumption that a certain place in the brain is responsible for a certain behavior. When stimulated in the purportedly appropriate place, the brain is utterly speechless. The hub of the problem is that if cortical lesions are the means by which abnormalities in function are cortically localized, there is no concrete evidence, but only an assumption, that normality of function is the result of no cortical lesions in the specified area. That assumption has in fact been recognized by some brain neuroanatomists as absurd and in need of corrections: "Consider the brain structure named the subthalamic necleus," write two such scientists. "Its destruction in the human brain leads to the motor dysfunction known as hemiballism, in which the patient uncontrollably makes motions that resemble the throwing of a ball. Is the normal function of the intact subthalamic nucleus therefore the suppression of motions resembling the throwing of a ball? Of course not; the condition represents only the action of a central nervous system unbalanced by the absence of a subthalamic nucleus" (Nauta and Feirtag, 88). Thus, while hippocampal lesions produced in rats, rabbits, and cats result in faulty or deficient spatial behavior, that is, in faulty cognitive maps according to the theory, it is erroneous to conclude that an intact hippocampus produces intact cognitive maps.

The second reason why reification fails is because it flies in the face of actual experience. Reification is perhaps at its most unbelievable extreme in the fol-

lowing passage by O'Keefe and Nadel: "If an animal is hungry," they write, "the map of the environment in which it finds itself can be consulted to see if there is a representation of food there. If there is, then the map can be used to generate a motor programme which will take the animal from its current position in the map to the location containing food" (490). Aside from the very difficult notion that the animal itself is "in the map" rather than the real world, it is difficult to imagine an animal trying to satisfy its hunger by consulting a map to see if food is located on it. One need only ask whether a sniffing animal is sniffing at a map in its brain and turning its head this way and that to contemplate representations of the world in its brain or sniffing and pondering the world directly. Surely it locates its food not on a map but in the real world—and just as surely it feels its hunger pangs directly and does not consult a map to find out where *they* are. Specific areas of the brain undoubtedly modulate certain behaviors but it is a mistake to reify these modulations, make them into *actual things* which a brain *produces* and which the living animal whose brain it is, consults—or rather, which some *other* portion of its brain consults. Such reification mixes first and third person worlds in such a way as to confound understanding of *either* a living body *or* a brain. Of course by making cognitive maps a product of brain activity, spatial intelligence is virtually uncontaminated by the body. One might almost say that, being nonegocentric, it is virtually uncontaminated by the animal itself. But of course just as there can be no spatial intelligence without a living subject, so there can be no spatial intelligence without a world. Brain products do not have a world; only a living body has a world. Hence if there is such a thing as spatial intelligence in the form of cognitive maps, that in-

telligence and those maps could only be generated within the context of a subject/world relationship.

The uncovering of these two existential significations leads directly to a third which might be formulated in the form of a question. Is the term *cognitive mapping* simply a dressed-up way of talking about the mundane-sounding reality of kinesthetic memory—or more generally, of sensory-kinetic memory? If a wolf can travel five miles to the site of a kill made several days previously, surely it can do so because it has been there before and because it *remembers* being there before. Why would the sensory-kinetic memory of that lived-through experience be ignored or minimized? The answer would seem again to be a matter of enshrining the brain, of making intelligence a unique biological endowment untainted by a body. Yet clearly, whatever brain structures might modulate the spatial aspects of experience, knowledge of a terrain exists and endures not because a brain has been there but because the animal itself has been there in person—or in animal. A cognitive map allows the transposition of a living reality into an objective, third-person account of reality, but at the expense of straining empirical fact and of skewing the concept of intelligence in the process. Basically it would seem to be a question of where one puts memory: if it is the animal who remembers, then memory is anchored in a living sensory-kinetic awareness; if it is the brain that remembers, then memory is anchored in an hypostatized map.

There is no reason of course why a sensory-kinetic memory could not be conceptualized and even partially explained in terms of a cognitive map, provided that the map was understood as the work of a living body in the context of a real world. An understanding of *this* cognitive map would in fact mean an understanding of how sensory-kinetic powers and sensiti-

vities ground spatial intelligence. Such an account would not necessarily omit reference to a brain insofar as from a neuroanatomical viewpoint, a brain is neither more nor less than a certain body in face of a certain world. Understanding *that* body/world relationship would seem to be equivalent to understanding at the deepest possible level what a brain is all about. Actually, that understanding is not far removed from the long-held thesis of Roger Sperry, the brain specialist whose work is at the cornerstone of right and left hemispheric differentiations. On the basis of his experimental work over many years, and taking into account evolutionary changes in cortical structures, Sperry conceives of the brain as an organ of and for movement. In contrast to O'Keefe and Nadel's thesis that there is a spatial system "which has the properties of the Kantian, apriori, absolute system . . . [and which] is not tied to the body but provides the organism with a maplike representation which acts as a framework for organizing its sensory inputs (488), Sperry would undoubtedly urge with Evart, another brain neurophysiologist whose work conceptually parallels his own, that "understanding of the human nervous system, even its most complex intellectual functions, may be enriched if the operation of the brain is analyzed in terms of its motor output rather than in terms of its sensory input" (Evart, 103).

Throughout the long tradition of emphasis on sensory input, the tendency has been to support the light-bulb theory mentioned at the beginning of this paper: a body is only a token arrangement of sensory receptors in the service of a *causa sui* intelligent brain. Yet it must be said too that in existential terms, there is no input and no output but only sensing-moving creatures whose intelligence is not enshrined in a brain of whatever size, but deployed in the world.

The trick is to understand in each case a certain form of intelligence as a certain domain of sensory-kinetic powers alive in the world. Only through such understandings can the evolution of hominid intelligence achieve a living significance and be fully comprehended. Indeed, an understanding of the hunting lifestyle of our long-ago ancestors would be immeasurably enriched if cooperation, strategy, and cognitive mapping, were not treated simply as behavioral traits whose "extended development into intelligence" (Peters and Mech, 296) separates us from all other creatures, but if their existential significations were recognized and in turn, their differential modes of expression across the animal kingdom were assayed. By pursuing this alternative view of intelligence, we might eventually come to a just assessment of the evolutionary residues and uniquenesses of human intelligence.

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