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'And Yet It Moves': Hegel on Zeno's Arrow

Zeno's paradoxes of motion offer Hegel an ideal field of exercise for portraying his ideas about logical contradiction. He presents the paradoxes in the section on Greek philosophy in the *Lectures on the History of Philosophy* (1816–30).[1] In both the Greater Logic (1812) and the *Encyclopedia Logic* (1830) he repeatedly utilizes Zeno's arguments as paradigms of the classical approach to the ontological implications of the principles of formal logic.

In this paper I want above all to shed light on Hegel's original (and largely ignored) treatment of Zeno's analysis of motion. To this end, I have chosen to concentrate mainly, though not exclusively, upon the arrow paradox (or 'the Arrow'). What Zeno *seems* to provide us with in this argument is the logical analysis of a physical phenomenon. The conclusion that Zeno draws from his analysis seems to entail the rejection of the phenomenon for the sake of logical purity. Such, at least, is the first impression that his argument makes upon the reader. And for many commentators, both ancient and modern, this impression has largely determined the character of their various attempts to find logical or mathematical solutions to the paradoxes. Hegel, however, takes a different approach to the issue. To understand his approach, one must first take into account Aristotle's criticism and Kant's appraisal of Zeno's thinking.

I

Since we do not know Zeno's own formulation of the paradox of the arrow, we have to rely on the arguments attributed to him by Aristotle, Epiphanius, Diogenes Laertius, and various other later commentators. The very thorough philological investigation of the Arrow provided by G. Vlastos (1966) allows us to boil down its many versions to an argument of the following kind:

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(I) The arrow cannot move in a place in which it is not.
But neither can it move in the place in which it is:
For this is a place equal to itself [supplied].
And everything is always at rest when it is in a place equal to itself.
But the flying arrow is always in the place in which it is.
Therefore, the flying arrow is always at rest (8).

An argument equivalent to this, but one in which the role of the law of noncontradiction is made explicit, would be the following:

(II) P1: Motion is changing of place.
P2: An object is at every moment *T* in only one place S.
P3: A moving object should at every moment *T1* both be in place *S1* and not be in *S1*.
P4: (P3) expresses a contradictory state of affairs.
C: Therefore, motion does not exist.

Before going into Aristotle's criticism of this paradox, I find it appropriate to make several general observations that will help to clarify the direction of the present study. Aristotle's (and also, incidentally, many modern analytic philosophers') criticism of the Arrow focuses upon certain premises of the argument. However, none of this criticism calls into question the transition from the premises to the conclusion. The latter is usually considered to follow legitimately from the former.The argument is considered not invalid, but unsound. The problem at issue here can be anticipated: On the one hand, the premises rejected by Aristotle (and in the twentieth century by Russell, Vlastos, and others) are the ones that allegedly contain a specific theory about the nature of space and time, according to which space is conceived as something composed of single *places* and time as something composed of single *moments*. But on the other hand, unstated premises of the following type are never called into question:

P5: States of affairs which find expression in self-contradictory propositions do not exist

As I will show, the originality of Hegel's approach lies in two basic factors: First, Hegel focuses his critical attention upon the unstated premise involved in the paradox. Second, he shows that the same conclusion follows when one assumes the discrete nature of space and time as when one assumes their continuous nature. Regardless of one's interpretation of space and time, Hegel argues, Zeno's self-contradictory description of motion validly follows. As Hegel puts it in his lectures on the history of philosophy: "Zeno's dialectic of matter has not been refuted to the present day" (*HP* 265).

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II

Aristotle's two most condensed assessments of the Arrow are to be found in book 6, chapter 9 of the *Physics*:[2]

> Zeno's reasoning, however, is fallacious, when he says that if everything when it occupies an equal space is at rest, and if that which is in locomotion is always in a now, the flying arrow is therefore motionless. This is false; for time is not composed of indivisible nows any more than any other magnitude is composed of indivisibles. (239b5)
>
> The third [paradox] is that already given above, to the effect that the flying arrow is at rest, which result follows from the assumption that time is composed of moments: if this assumption is not granted, the conclusion will not follow. (239b30)

One sees that Aristotle's criticism is based primarily upon the rejection of the atomistic assumptions allegedly made in the Arrow about the nature of space and time. In other words, in these passages Aristotle first attributes to Zeno an atomistic theory of space and time. He then rejects this theory and goes on to repudiate the whole argument as being based upon "false" (viz., atomistic) premises.

Book 6 of the *Physics* deals with the nature of space and time at considerable length. Given our thematic interest in Zeno's Arrow, however, a presentation of the following Aristotelian arguments will suffice to clarify Aristotle's criticism of the Arrow: First, space and time cannot be composed of *continuous* indivisible entities. In order for them to be continuous, "their extremities [would have to be] one" (231a21); but to have extremities is to be divisible into parts, and it is precisely this that is excluded by the atomistic assumption. Second, space and time cannot even be composed of *successive* indivisible entities, the reason being that these entities are in succession "if there is nothing of their own kind intermediate between them" (231b5); for example, whereas natural numbers can be said to be successive because the entities between them are numbers of a different kind, we cannot think of the space between two points on a line except as being "a line"; nor can we think of the time between two moments as being anything other than a "period of time" (231b5). But if the "atoms" composing space and time can be neither continuous nor successive, then they cannot make up space and time.

Aristotle offers these considerations in order to support his central thesis that our understanding of space and time and of their relationship in motion as something composed of indivisibles inevitably leads to the self-contradictory thought of a continuum that is divisible into discrete parts. Since we have to think of space as an uninterrupted continuum, the atomic points composing it would have to be both discrete and not discrete at the same time;

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since we have to think of time as an uninterrupted succession of moments, the atomic instants composing it would have to be both divisible and not divisible at the same time. Aristotle backs up his conclusions through repeated appeals to the principle of *tertium non datur:* "Nor can there be anything of any other kind between for it would be either indivisible or divisible, and if it is divisible, divisible either into indivisibles or into divisibles that are always divisible, in which case it is continuous" (231b10).

In the case of motion, the principle of the excluded middle is appealed to in even simpler terms: "Everthing must be either at rest or in motion" (232a10). Thus, in Aristotelian terms, Zeno's absurd consequences arise from the fact that the arrow is supposed somehow to traverse discrete points of space during discrete instants of time without being able to be anywhere in between. If space and time are composed of indivisibles, then "it will be possible for a thing to have completed a walk without ever walking" (232a10), or, more generally, "it would be possible for motion to be composed of something other than motions" (232a15).

In view of this line of argument, Aristotle seems to think that the situation would be different if Zeno had supposed that space and time are composed of the *infinitely* divisible. If space and time are infinitely divisible, then they are absolutely continuous, and an object moving in them could be thought of as moving "everywhere" (i.e. at every position). The paradox of the arrow would not arise to begin with. As Hegel points out, however, not much would be won by way of such a resolution of the Arrow, for there remain two other paradoxes of motion articulated by Zeno that *are* based on the assumption of the infinite divisibility (and therefore the continuous nature) of space and time. I am referring here to the paradoxes of "Dichotomy" and "Achilles."[3] By means of these paradoxes, Zeno demonstrates that a body in motion, inasmuch as it must pass through an infinite number of parts, not only will never reach its goal, but will not move at all.

Facing this new set of paradoxes arising from nonatomistic presuppositions about the nature of space and time, Aristotle resorts to the theory of the actuality and potentiality of the constituents of space and time. Space and time, he explains, cannot be considered to be *actually* divided into an infinite number of parts, but rather only *potentially* so divided. Aristotle apparently assumes that the distinction between actuality and potentiality will serve to eliminate the paradox involved in the concept of motion, but, instead of eliminating the paradox, the theory of the actuality and potentiality of space and time brings Aristotle's explanation much closer to Zeno's conclusion than he probably wished:

> Therefore to the question whether it is possible to pass through an infinite number of units either of time or of distance we must reply that in a sense

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> it is and in a sense it is not. If the units are actual, it is not possible; if they are potential, it is possible. For in the course of a continuous motion the traveller has traversed an infinite number of units in an accidental sense but not in an unqualified sense: for though it is an accidental characteristic of the distance to be an infinite number of half-distances, it is different in essence and being. It is also plain that unless we hold that the point of time that divides earlier from later always belongs only to the later so far as the thing is concerned, we shall be involved in the consequence that the same thing at the same moment is and is not, and that a thing is not at the moment when it has become. (263b5–10)

Aristotle maintains that points and instants constitute only the "potential" nature of space and time and are, therefore, no basis for an analysis of the physical event of real motion. The "actual" reality of space and time, he tells us, consists of *stretches* and *intervals.* These must be thought of as indivisible (atomic) but extended (continuous) at the same time. In each of these, the arrow can move without the slightest contradiction. But how can anyone maintain that the notion of an "atomic stretch" and that of an "atomic interval" are free from contradiction? If it is contradictory to think of durationless moments as entities constituting time, so it is to think of intervals that are not divisible into parts. And the self-contradictory character of adimensional points constituting space is hardly overcome by introducing indivisible entities stretching in space.

Aristotle's strategies for avoiding Zeno's conclusion seem to have entered a dead end: the elimination of atomism from the notions of space and time only strengthens a new group of paradoxes. The distinction between actuality and potentiality only brings the contradiction into a deeper, ontological level: it now becomes a contradiction between the infinite divisibility of potential space and time on the one side and the atomistic character of actual stretches and intervals on the other.

There is an additional obstacle to Aristotle's *Aufhebung* of Zeno: If the atomistic hypothesis is essential to the Arrow, then its conclusion is much too weak. If the arrow is at every "durationless instant" in an "adimensional point," then it is neither in motion nor at rest. (This last point is, incidentally, explicitly recognized by Aristotle himself in the broader context of his discussion concerning the nature of space and time in book 6 of the *Physics.*) If considered at a single moment, a thing "is not at rest: for at a now it is not possible for anything to be either in motion or at rest" (239a30–b1). However, Aristotle is apparently unwilling to grant that Zeno could have achieved this same insight.

For all the reasons presented, it seems that we ought to conclude that Zeno's views on motion are, strictly speaking, independent of any particular assumptions that Zeno himself may have made about the nature of space and

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time. This ought to lead one to suspect that the real bone of contention in the paradoxes lies buried, not in any of the metaphysical premises concerning space and time, but rather in the enthememtic character of the Arrow. The bone of contention may be, in other words, the hidden premise P5: "States of affairs which find expression in self-contradictory propositions do not exist." To say that this premise does not need to be made explicit because of its trivially true character is to assume a circularity: The premise is an "ontological" version of the principle of noncontradiction; it grounds its validity, therefore, on itself.

III

Kant dealt with the concept of physical motion in the chapter on "Phoronomy" (the "pure doctrine of motion") of his *Metaphysical Foundations of Natural Science* of 1786 (1985).[4] He also dealt briefly with a number of arguments ascribed to Zeno in Plato's *Parmenides* in the section on the "Antinomy of Pure Reason" in the First Critique.[5] Since Hegel's treatment of Zeno's paradoxes and, more generally, of logical contradiction is based on a critical evaluation of Kant's analysis of such concepts as antinomy, contradiction, and contrariety, this is the place to sketch the Kantian position.[6]

The "Phoronomy" contains several important observations on the nature of physical motion. Needless to say, all of Kant's observations in this context presuppose his distinction between objects of a possible experience on the one side and transcendental objects on the other. The first observation relevant to our context (expl. 1, obs. 2) is that "all motion that is an object of experience is merely relative" (1985, 481). Whether an empirical object moves in its empirical surroundings, or whether the surroundings move around the object, or whether both move in opposite directions at the same time, the resulting motion for the empirical observer remains unchanged. To assume that objects move in an absolutely fixed space is to assume the objective existence of a merely ideal entity: "To make this absolute space an actual thing means to mistake the logical universality . . . for a physical universality . . . , and to misunderstand reason in its idea" (482). If Zeno's arrow is understood as symbolizing real physical bodies, then this first observation of Kant is useful as a reminder that in the empirical world *motion* and *rest,* far from being contradictory, are rather relative terms. From the point of view of someone moving along with the arrow, the arrow is not in motion ("it is at rest in every place in which it is"); at the same time, from the point of view of the archer, the arrow is in motion (it is "changing of place").

Another important observation (expl. 2, obs. 1) is that motion and locomotion should not be identified: sometimes motion is locomotion, and some-

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times it is not. Therefore, an object can very well be in motion without changing of place, as is the case, for example, with rotatory motions.

These two facts—that motion and rest are not always contradictory and that motion and changing of place are not necessarily identical—are best illustrated in "Explanation 3," which follows in Kant's text. Locomotion, as we know, must be defined by two parameters: in Kant's terminology, by *velocity* and *direction.* If motion in general were identical to locomotion, it would have to be defined by these two parameters. Moreover, if rest were to mean nonmotion, then the values of both parameters for a body at rest would have to be zero. A simple experiment shows, however, that neither of these conclusions is consistent with the mathematical description of a body in motion.

If we think of an empirical body moving with uniform velocity, first from point A to point B in half a second, and then from point B to point A in half a second, and if we reflect upon the fact that the total time employed by the body for one back-and-forth movement is one second, we are led to conclude that the body is in motion at every instant and point of its way, *including* the "point of return," namely, point B; if the body would rest at point B, the total time of an oscillation would have to be greater than one second. At the same time, if we reflect upon the fact that direction is one of the necessary ingredients of motion, and that the body at point B is not supposed to move in any of the two possible directions (neither toward point B nor toward point A), we should conclude that the body does not have any direction and is, therefore, motionless. But how can a body be both in motion and motionless in one and the same place at one and the same time? It can, is Kant's answer, if its motion in said place is not misunderstood as locomotion, and if its being at rest is not misunderstood as absolute lack of motion. A correct description of the body's state at point B is the following: the body at point B has the same uniform velocity it has in every other point of its path (i.e., its $v \neq 0$). The body at point B therefore does not rest for any length of time in a possible experience. The body, we must conclude, is in motion. At the same time, however, no direction can be given for it at point B, and it is therefore lacking all spatial motion. The body, we must conclude, is not in motion.

The logical distinction between a body's being at rest (for a period of time) and its lacking all movement (for no time at all) finds a simple description in mathematical terms: $v = s/t$, (in order to have $v = 0$, we have to set $t > 0$):

$$v = s/t = 0/x{>}0 = 0$$

This is the clear mathematical description of rest, which implies some (however small) permanence in time. For $t = 0$, $v = s/t = 0/0$ is represented

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by an irrational number; for $t = 0$, we have not rest, but lack of permanence in time.

These Kantian reflections upon the paradoxes involved in our concept of physical motion are intended to be useful preliminaries to a modern defense of Zeno's arguments, not a faithful interpretation of them. They obviously rest on a programmatic separation of thought and image alien to pre-Socratic philosophy. The psychological fact that we cannot represent to ourselves a lack of movement without representing rest is no argument against the "higher" requirement of idealistic philosophy, which is to *think* of motion, *not to represent* it.

In the "Antinomy of Pure Reason" Kant deals briefly with a number of arguments ascribed to Zeno in Plato's *Parmenides:* the argument about the finitude versus the infinity of God or the universe; the argument regarding the motion or state of rest of the universe as a whole; finally the argument concerning the so-called "likeness" and "unlikeness" of the universe with respect to every other thing. Kant writes, "Zeno of Elea, a subtle dialectician, was severely reprimanded by Plato as a mischievous sophist who, to show his skill, would set out to prove a proposition through convincing arguments and then immediately overthrow them by other arguments equally strong" (1965, A502=B530). Kant sets himself the task of defending Zeno against Plato's accusations. He singles out Zeno's demonstration that God—in other words, the universe—is neither in motion nor at rest and maintains that this conclusion is far from being merely "false." Rather, it is seen to express an important "truth of reason": Inasmuch as the universe is all there is, the allegedly contradictory predicates of 'being-in-motion' and 'being-at-rest' are in point of fact merely *contraries.* In this vein, Kant writes, "If by the word 'God' he meant the universe, he would certainly have to say that it is neither abidingly present in its place, that is, at rest, nor that it changes its place, that is, is in motion; because all places are in the universe, and the universe is not, therefore, itself in any place" (A502=B532). On these terms, the proposition that the same object is neither at rest nor not at rest can be false in both members of the conjunction—and this notwithstanding the contradictory form of the proposition. In other words, Kant is saying that there can be objects of reference to which neither of two formally contradictory predicates applies. It is in keeping with this point that Kant draws out his famous distinction between dialectical and analytical opposition: "I beg permission to entitle this kind of opposition *dialectical,* and that of contradictories *analytical.* Thus of two dialectically opposed judgments both may be false; for the one is not a mere contradictory of the other, but says something more than is required for a simple contradiction" (A504=B532).

Kant's treatment of Zeno does not go into the particulars of the classical paradoxes of motion. Still, it does anticipate Hegel's views on them: in order

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to decide whether or not a contradiction is what it appears to be on a purely formal level, it is necessary to refer its symbols to *non*formal objects of reference—not, of course, to physical objects, but to conceptual ones. Whether or not "*x* is neither finite nor nonfinite" is a contradiction and, thus, false is not decided by the form of the statement. The upshot of this lesson is that the contradictory *form* of a description does not *necessarily* lead to the nullification of the *content* of that description.

In the antinomies, the nonformal object of reference is, of course, the transcendental concept of 'World'. Being the object of an Idea of pure reason, this object escapes the bounds of all possible empirical referentiality. Hence, *prima facie* at least, it seems that Kant's treatment of motion in the antinomies takes place at an ontological level very different than that of Zeno's discussion of the perceived arrow in flight. (The same holds for "Achilles" and the other objects utilized by Zeno to illustrate his arguments.) However, if we focus on *motion per se* as the fundamental theme of Zeno's paradoxes, then what Kant has to say in the "Transcendental Dialectic" about contrariety and contradiction could be of direct applicability to the paradoxes of motion. From a Kantian point of view, of course, the blurring of the distinction between contradiction and contrariety would be applicable only provided that one basic condition be met. In order to plausibly maintain that the concepts of motion and rest are not directly contradictory when applied to one and the same object, one would have to adhere to the foundational distinction between transcendent and empirical objects or, to be more precise, between things-in-themselves and things as appearances. Without this epistemic distinction, Zeno's arrow must remain caught between the horns of contradiction: it both moves and does not move; it both is and is not. But in conformity with that distinction, what appears to be contradictory when predicated of an object qua object of empirical intuition is not necessarily so when the object is *conceived* (albeit not *known*) from the side of its noumenal determinacy. The distinction between phenomenon and noumenon offers a way of transcending the Arrow's conclusion by maintaining the validity of its premises that is in certain respects similar to the way provided by the Aristotelian distinction between potentiality and actuality. A crucial question, however, immediately arises at this juncture: Is the theoretical commitment to such a foundational distinction in the final analysis a philosophically supportable commitment? Hegel, for his part, does not think it is.

IV

In his lectures on Zeno, Hegel aims neither to resolve nor to transcend the paradoxes. His argumentative strategy thus differs fundamentally from those

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of Aristotle and Kant. Hegel's task is both to uncover the conceptual sources of the paradoxes and to show their logical consistency. He wants us to grasp the immanent rationality of Zeno's contradictory descriptions of motion and therefore praises Zeno as the thinker with whom "dialectic . . . , properly speaking, begins" (*HP* 261).

The first step in Hegel's lectures is devoted to the crucial task of eliminating any naïve (*begriffsloser*) understanding of Zeno's intentions. The latter's conclusion about the 'impossibility of motion' is to be comprehended not as a proof of the irreality of physical motion, but rather as a proof of the inherently contradictory character of our concept of motion. Zeno's main achievement, in other words, does not consist in his making use of what could be called a surreptitious ontological argument with a change of sign. (By this I mean an argument of the following type: "Since the concept of motion entails a logical contradiction, empirical motion cannot exist.") Philosophers have often enough been accused of denying the most obvious and solid of facts owing to their ignorance or their disrespect for the "real world." In antiquity, Thales and Zeno were privileged targets of this kind of attack. Hegel, himself a target, puts the meaning of the Zenonian arguments into proper philosophical perspective:

> If Aristotle says that Zeno denied movement because it contains an inner contradiction, it is not to be understood to mean that movement did not exist at all. The point is not that there is movement and that this phenomenon exists; the fact that there is movement is as sensuously certain as that there are elephants; it is not in this sense that Zeno meant to deny movement. The point in question concerns its truth. Movement, however, is held to be untrue, because the conception of it involves a contradiction; by that he meant to say that no true Being can be predicated of it. (*HP* 266)[7]

The simple-mindedness of commonsense attacks against philosophical arguments is best symbolized by the ancients' anecdote about Diogenes the Cynic, who is said to have "quite simply refuted these arguments against movement; without speaking he rose and walked about, contradicting them by action" (267). Before entering into a theoretical discussion of Zeno's paradoxes, Hegel wants to clear our path of this kind of metaphysical prejudice. He states, "When reasons are disputed, the only valid refutation is one derived from reasons; men have not merely to satisfy themselves by sensuous assurance, but also to understand. . . . It is necessary to think of motion as Zeno thought of it, and yet to carry this theory of motion further still" (267–68). The naïve gesture of refuting arguments by pointing to empirical facts indicates the presence of unreflected ontological presuppositions about an immediate relation between thought and empirical reality. The cynic's metaphysical prejudices are the very opposite of rational thinking: the event in question is indeed performed, but its explanation remains equally obscure.

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In Hegel's interpretation, what Zeno really demonstrates is not a delusion of the senses, but a contradiction in thought. In the unlikely event that we do live in a world of illusory motion and change, we would have to blame the illusion on our thinking, not on our perception. Whatever we perceive is real to perception. Only thought draws a distinction between "false" perceptions and "true" ones. As Kant had already pointed out, "Truth or illusion is not in the object, insofar as it is intuited, but in the judgment about it, insofar as it is thought. It is therefore correct to say that the senses do not err—not because they always judge rightly but because they do not judge at all" (1965, A293=B350). In order to grasp the revolutionary import of Zeno's contribution to the history of thought, then, we must *think* motion and describe the thought instead of describing the mental representations and sensual perceptions that may accompany it.

The second step in Hegel's strategy is, consequently, to let stand the contradiction in the concept of motion made evident by Zeno and to ferret out its roots in the contradictoriness of the concepts of space and time. The point of departure of the Dichotomy, as well as of Achilles, seems to be the assumption of the continuous nature of space and time. But the concept of such continuity, Hegel argues, develops into its contradictory, discreteness. Precisely because they are continuous, they can be thought of as infinitely divisible. Take, for example, the concept of a continuous line. Such a line must be thought of as something everywhere divisible, that is, as everywhere divisible into parts. An infinitely divisible line is therefore conceived as something composed of an infinite number of parts, these being what we call points. But a point is defined in terms contradictory to those that define a line: the point is adimensional; the line is nothing but dimension. According to Hegel's somewhat peculiar terminology, whereas the concept of a line is 'pure self-identity' (or pure dimension), the concept of a point is 'pure negativity' (absolute lack of dimension). The point, says Hegel, represents the "destruction of all connection"; the line represents connection par excellence, 'absolute cohesion' (*HP* 268).[8] These paradoxes are based on the conceptual experiment of bisecting again and again that which is presupposed as being continuous, which is to say, nondivisible. Contradiction is already at work here. As for the Arrow, let us assume for the sake of the argument that the point of departure of it is the opposite notion of space and time, namely, their atomistic nature. Space and time are accordingly supposed to be a collection of 'here(s)' and 'now(s)', but the concept of discreteness develops into its contradictory, continuity. Every point is identical to every other point, every instant to every other instant; they are all equally defined as 'the state in which the arrow is'. Every 'here' on the arrow's path is nothing but a 'here' equal to the arrow, and every 'now' of its flight is a 'now' in which the arrow exists. But inasmuch as the points and instants of these

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discrete entities are identical, they are not distinguishable from each other: the atomistic whole is truly the *absolute continuum.* To use Hegel's terms, the 'pure negativity' represented by points and instants passes over into 'pure self-identity'.

The idea of space and time as continuous leads to the idea of their atomistic nature; the idea of their atomistic nature leads to the idea of their continuity. But if space and time contain this contradiction, so must their mutual relationship as it is expressed in motion. As Hegel puts the matter, "The flying arrow . . . is always in the self-same Now and the self-same Here, in the indistinguishable. . . . That, however, is what we call rest and not motion. In the Here and Now, the becoming 'other' is abrogated . . . ; since in the Here and Now as such, there is no difference, continuity is here made to prevail against the mere belief in diversity. Each place is a different place, and thus the same" (*HP* 274–75).[9]

This shows that the two formally contradictory determinations of 'continuity' and 'discreteness' do not stand in a relation of mutual exclusion when applied to the notions of space and time. According to Hegel, Zeno's great merit is to have shown that when continuity is assumed, discreteness turns out to be its 'moment', and that when "discreteness is presupposed, continuity is maintained" (*HP* 275). Zeno's contribution to philosophy is, hence, an original one. It is not at all a repetition of Parmenidean concepts from a different point of view, as Plato makes Socrates say in the *Parmenides:*

> I see, Parmenides, said Socrates, that Zeno's intention is to associate himself with you by means of his treatise no less intimately than by his personal attachment. In a way, his book states the same position as your own; only by varying the form he tries to delude us into thinking that his thesis is a different one. You assert . . . unity; he asserts no plurality; . . . your arguments seem to have nothing in common, though really they come to very much the same thing. (*Parmenides,* 128a–128b).

Contrary to Plato, Hegel considers Zeno's thinking to represent an authentically new stage in the ancients' understanding of being (or of logos). Parmenides demonstrated that Being is one and immutable on the grounds that its opposite cannot be. He used the apparent falsity manifested by the self-contradictory character of non-Being in order to establish the exclusive truth of Being. But Hegel objects, claiming that to develop an antithesis *ad absurdum* in order to prove the truth of the thesis is a rather dull and formal affair. After all, by employing the same method in the antinomies, Kant was able to show that the world could be conceived to be both limited and unlimited, both discrete and continuous, determined both by natural necessity and by freedom, both dependent upon an absolute being and independent of it.

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Zeno's fundamental contribution to philosophy is to have gone one step further than Parmenides in the search for the truth of being. Hegel writes, "Falsity must not be demonstrated through another, and as untrue because the opposite is true, but in itself; we find this rational perception in Zeno" (*HP* 264). Instead of rejecting motion (or change, or becoming) as contradicting the only true predicates of Being, Zeno assumed motion in the premises of his arguments and fought the battle "within the enemy's camp" (264). In doing this, he contended that motion is condemned to nullity by virtue of its own conceptual determinacy.

The dialectic displayed by the ancients is designated by Hegel in various ways. He calls it 'negative', subjective', or 'external dialectic'. This dialectic either questions only one side of its object and concludes by dogmatically upholding the other or, as was the case with the Sophists, keeps questioning alternatively both sides forever, remaining undecided and indifferent toward any one predicate and its contradictory. The latter is a procedure that ends in empty relativism. Hegel observes that although elements of this 'external' dialectic are still to be found in Zeno, his work shows a new and constructive pattern of thought, which Hegel terms 'positive', 'objective', or 'internal' dialectic. This form of dialectic lies in the discovery that the very notion of a certain object contains opposite characteristics, some of which find expression in contradictory sentences.[10] Hegel asserts, "According to the ordinary ideas of science, where propositions result from proof, proof is the movement of intelligence, a connection brought about by mediation. Dialectic is either (a) external dialectic, in which this movement is different from the comprehension of the movement or (b) not a movement of our intelligence only, but what proceeds from the nature of the thing itself, i.e., from the pure Notion of the content" (*HP* 264). If we can overcome our metaphysical prejudices about how the world should be allowed to be, we will be able to follow Zeno's description of motion and to discover that the very notion of a moving object requires it to be, at instant T1, both in the place L1 and not in the place L1. This is a correct description of motion and remains so whether we assume that space and time are composed of discrete entities or that they are absolutely continuous or that they are composed of atomic stretches and intervals. If the arrow must be at rest at every ideal point and instant, it can nonetheless move in the ideal spatial and temporal line of its path; and if it moves in ideal infinitesimal stretches and intervals, it will still be at rest at every place in which it is.

In Zeno's own terms, however, the contradictory character of the determinations that apply to one and the same "thing" (or, to use Hegel's more precise formulation, to the 'thing itself, i.e., . . . the pure Notion of the content') has the power to destroy its concept. This is the still undeveloped element in

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Zeno's dialectical thinking. On the one hand, as opposed to the merely 'external' and 'subjective' dialectic of the Sophists, Zeno is able to attain the "immanent contemplation of the object. . . . In regarding it thus, it shows from itself that it contains opposed determinations, and thus breaks up" (*HP* 265). On the other hand, Zeno's thought comes to a standstill in the very act of destroying its own concept: "The result of this dialectic is null, the negative; the affirmative in it does not yet appear. . . . The Eleatics . . . got no further than the fact that through contradiction the object is a nothing" (265).

In the history of ancient thought, Hegel claims, Zeno's arguments play a role similar to the one played in the history of modern thought by Kant's antinomies. In those arguments, Zeno achieved the knowledge of the inherently contradictory character of space and time or "matter"—and he rejected this knowledge. Zeno's Eleatic conclusion was that "'the truth is one, all else is untrue', just as the Kantian philosophy resulted in 'we know appearances only'" (*HP* 277). It was the task of Hegel's *Science of Logic* to produce affirmative results from the disintegration of concepts initiated in antiquity by Zeno's radical mind.

V

Hegel's arguments in favor of simultaneously acknowledging the contradictory character and the real existence of motion can arouse suspicion unless they are placed in the wider context of his theoretical philosophy. Only an explication of Hegel's use of the terms *logic, reality,* and *validity* can make plausible his claims regarding the reality of contradictions.

Hegel's concept of *logic* is broader than the standard twentieth-century use allows. Rather than applying exclusively to the logical foundations of mathematics or language, Hegel's term includes modes of knowledge and metaphysical concepts as well. Aspects of the Hegelian meaning are present in our own language when we speak of "the logic of a discourse" or "the logic of one's actions." The extension of the term *logic* to include epistemological and metaphysical notions is by no means a Hegelian invention. Although Aristotle and the medieval Aristotelians used the term to identify sets of rules and principles of valid inference, Kant used the term 'transcendental logic' to characterize a tool for the discovery and assessment of categories that would guarantee the objective validity of our experience of the phenomenal world. Going one step further, Hegel's speculative logic is intended to guarantee the objective validity of our experience of the world in itself. This is done by pointing out the aporetic nature of Kant's distinction between appearances and the thing-in-itself: if, as Kant states, the categories are conditions of the possibility of both our knowledge of objects and of the

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objects themselves, albeit as appearances (1965, A57=B82), then what lies "behind" our knowledge and its objects is one and the same "thing." The *metaphysical* distinction between *phenomena* and *noumena* collapses, and what is left to constitute reality is the thinking mind or, in Hegel's terminology, the 'Concept'. The *Science of Logic* is an exposition of the 'Concept', its nature and its *modus operandi.* The *Logic,* therefore, deals with rules and principles valid both for minds and for nature. The single objects of experience, as well as experience as a whole, are structured and organized by the same logic. The subject matter of the *Science of Logic* is not the nature of human thinking stripped of any content (which, incidentally, is for Hegel a sheer impossibility), but the nature of thinking and its objects. The many ways in which the human mind grasps its world are not immediate, ahistorical ways; they are the product of nature's complex journey from unconscious forms of existence to self-conscious thought, the journey Hegel had presented in the *Phenomenology of Spirit,* which had shown that the most sophisticated form of self-consciousness (namely, thought thinking itself) is not the abstract opposite of unconscious, unthinking nature. The former is the result of the latter and, as such, is immanent in it. This is the sense in which Hegel maintains that thought is present in Nature as well as in Mind. What the *Phenomenology* develops in a historical manner, the *Logic* expounds systematically: since "reality" is a natural, historical, social, and spiritual whole, the logical determinations of thinking and the ontological determinations of reality are completely and systematically dependent upon each other for their meaning and validity: "Thus *logic* coincides with *metaphysics,* with the science of *things* grasped in *thoughts* that used to be taken to express the *essentialities* of the *things.*"[11]

This context is essential to an understanding of Hegel's insistence on the omnipresence of contradiction in mind and in reality. Errol E. Harris (1983) has aptly characterized this omnipresence with the following words: according to Hegel, "contradiction is ubiquitous both in thought and in reality" and "it is the principle of all movement and activity, which it would not be unless it were an irritant, that is, if it were tolerable" (167). Referring to the role of contradiction in reality, Hegel writes:

> There is *nothing at all* anywhere, in which contradiction—i.e., opposed determinations—cannot and should not be exhibited. The abstracting activity of the understanding is a clinging on to One determinacy by force, an effort to obscure and to remove the consciousness of the other one that is contained in it.—But if the contradiction is exhibited and recognized in any object or concept whatever, then the conclusion that is usually drawn is: "*Therefore* this object is *nothing.*" Thus Zeno first showed that movement contradicts itself, and that it therefore *is* not; likewise the Ancients

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> recognised *coming to be* and *passing away,* the two kinds of becoming, as untrue determinations, by saying that the *one,* i.e., the Absolute, does not come into being or pass away. (*Enc.* par. 89)
>
> Becoming contains being and nothing within itself and it does this in such a way that they simply overturn into one another and reciprocally sublate one another as well as themselves. In that way becoming proves itself to be what is thoroughly restless, but unable to maintain itself in this abstract restlessness. . . . But the result of this process is not empty nothing; instead it is being that is identical with negation, which we call *being-there* [Dasein]—and its significance proves to be, first of all, this: that it is what has become. (*Enc.* par. 89, addition)

Referring to the role played by contradiction in rational thinking, Hegel shows in the "Greater Logic" that contradiction is the "truth" (i.e., the essence) of the first determinations of reflection, namely, identity, difference, and opposition. This should be "grasped and enunciated as a law": "*Everything is inherently contradictory,* . . . this law . . . expresses . . . the truth and the essential nature of things. The contradiction which makes its appearance in opposition, is only the developed nothing that is contained in identity and that appears in the expression that the law of identity says *nothing*" (*Sc.L.* 439).

By claiming that contradiction is a universal feature of reality and thinking Hegel does not intend to deny the truth of the principle of noncontradiction in formal logical contexts. The principles of formal logic are not denied in Hegel's Logic; rather, they are contained in it as a "logic of understanding," whereas the principles of speculative logic represent a "logic of reason": "The mere *logic of the understanding* is contained in the speculative Logic and can easily be made out of the latter; nothing more is needed for this than the omission of the dialectical and the rational; in this way it becomes *what is usually called logic*" (*Enc.* par. 82).

Formal logic is valid if restricted to its use as an instrument of the empirical sciences and of common sense. The limitations of formal logic are due, according to Hegel, to the metaphysical assumptions upon which it (together with the empirical sciences and common sense) rests. Two of these assumptions are fundamental: (1) The objects of our knowledge are in themselves completely independent of our knowing minds or, in Harris's words, they are "mere givenness and externality" (1983, 6). This assumption underlies the logicians' claim that their subject matter is exclusively formal and as such applicable to any content whatsoever. (2) The world is an aggregate of atomic objects and facts. Objects and facts are not supposed to have any logic of their own, that is, they are not supposed to be really related to each other in any way except when apprehended or interpreted by minds.

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Once these assumptions are challenged, however, the relationship between logic and the world is bound to change from one of indifference to one of mutual dependency. For practical or didactical purposes we might do *as if* formal logical principles, rules, and inferences were about letters and graphic symbols only. Philosophical, metalogical thinking or "speculative logic," however, reveals a different story. This story is told in the *Science of Logic.* Here Hegel shows that the assumption of thought-independent facts or objects, as well as the inverse assumption of a thinking independent from facts or objects, is loaded with insolvable difficulties. In addition, much of the meaning of *dialectic,* according to Hegel's own use, consists in an anti-atomistic thesis about reality and, consequently, about the thinking and knowing of reality. He therefore postulates a dialectical identity of thinking and reality and provides a demonstration of it in the *Logic.* By *dialectical identity,* Hegel means one that is not based on immediate intuition or mere convention ("let's posit A = A' . . ."). It is, rather, an identity that includes (1) the demonstration that two items initially assumed different are logically the same and (2) the awareness of the former differences, which in the course of the demonstration turn out to be aspects or "moments" of that identity.

The phrase "Objective Idealism" is meant precisely to characterize the basic tenet mentioned above: that the 'Concept' is present in Nature as well as in Mind. For the limited purposes of our discussion of contradiction, this philosophical position has the following consequence: If Mind is capable of, or even actively engaged in, contradictions, so must be Nature. Denying that rational thinking is capable of engaging in contradictions is akin to denying that the moral agent is capable of doing wrong. However, as the capability of chosing wrong makes the agent a moral one in the first place, so the very capability of formulating and understanding contradictions defines the rational mind. If contradiction belongs to the very nature of Reason, and the latter constitutes the essence of Nature, then contradiction belongs to Nature. This is the background of some of Hegel's most provocative passages about contradiction in nature:

> Nature is what it is through its determinate existence, and it should not therefore be deified. It is wrong to regard and treat the sun, the moon, animals, plants etc. as works of God superior to the deeds and events of humanity. Nature is *implicitly* divine in that it is in the Idea; but in *reality* its being does not correspond to its Notion, *and it is rather the unresolved contradiction.* (*Enc.* par. 248; 1970)

> But it is one of the fundamental prejudices of logic, as hitherto understood and of ordinary thinking, that contradiction is not so characteristically essential and immanent a determination as identity; but in fact, if it were a question of grading the two determinations and they had to be kept separate, then contradiction would have to be taken as the profounder determi-

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> nation and more characteristic of essence. For as against contradiction, identity is merely the determination of the simple immediate, of dead being; but contradiction is the root of all movement and vitality; it is only in so far as something has a contradiction within it that it moves, has an urge and activity. (*Sc.L.* 439)
>
> He who claims that nothing exists which carries in it a contradiction as an identity of opposed determinations is at the same time claiming that nothing alive exists. Indeed the force of life and, even more, the power of the Spirit, consists in positing the contradiction in itself, in enduring and overcoming it. (1970b, 162; my translation)

Some skeptical readers might be willing to grant that the characterization of highly complex, encompassing processes, such as those of organic life as "contradictions," is a powerful rhetorical or metaphorical device. But most will reject this characterization with reference to a particular, partial phenomenon, such as locomotion or a singular arrow's trajectory. In this regard, Hegel's reasoning needs a more detailed reconstruction.

When confronted with perceptions conveyed through the senses, a self-conscious mind forms a concept of things corresponding to those perceptions. Whereas in some sense perceptions are singular occurrences in the mind, the concepts formed to grasp them are not. If there were a singular concept for each singular perception, concepts and perceptions would coincide. Objects and the world (two notions that in this case could not even be formed) would be chaotic aggregates or amalgams of flashlike sensations incapable of being grasped in language or thought. Concepts therefore, Hegel says, are not "singular." However, they are not "particular" either. They group different perceptions and then different kinds of perceptions together to yield particulars: the objects of our world. These in turn are grouped together in systems, classes, or aggregates of objects (i.e., in larger "particulars"). The concepts that determine our world are "universals."

Conceptual activity consists in finding that which is common first to different perceptual occurrences and then to distinct and already conceptualized perceptions. The language of ontology calls "that which is common" the "essence" of things, meaning the "true being" behind their mere appearances; the language of logic calls it the "identity" of things, meaning the "truth" behind the mere multiplicity and difference of those appearances. Concepts, therefore, name the identity in the difference of our world. Strictly speaking, however, they do not just "name" this identity or essence. They *are* the identity or essence itself since, as was argued in the preceding paragraph, there would not be any objects at all, let alone a world, if it were not for the universalizing activity of the mind.

Let us recapitulate this last point: in Hegel's terminology, sense perceptions are *singulars,* objects are *particulars,* and concepts are *universals.* It is

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the encounter between the universal and the singular that produces the particular. But what about truth? That is, what about the "real truth" of the particulars, the truth of the objects of our experience? The truth of each particular object cannot reside in its singular, perceptual aspect because as a sensory aggregate of perceptions (or even as a singular perception, if there were such a thing) an object is not an object at all. As metaphysics has been telling us since its inception, the truth of things is not to be found in their existence. The truth, rather, has its permanent dwelling place in the object's universality. Metaphysics called it the essence of the thing. Hegel calls it the concept of the thing: The truth, he writes, is the concept.

Each particular thing, as long as it is *a thing,* that is, as long as it is *for a mind,* contains its own concept. Each particular thing contains a universal: "If we were to deprive a dog of its animality we could not say what it is" (*Enc.* par. 24, addition 1). Animality, however, or an animal in general, is nowhere to be met with in reality. We *meet* only the dog, but we *know* it to be a dog because we have the concept of an animal. However, not only do we live in an experiential world of Kantian appearances, but we encounter illusions as well. Particular things often seem to correspond to their concept while philosophical argument can show that actually they do not. Because natural language is connected more intuitively with the truths of philosophy than with formalized ones, it expresses this awareness through its emphatic use of the notion of truth: a friend, says Hegel, can be a true or an untrue friend; a State, a true or an untrue State. A true friend is one who corresponds to the concept of "friend"; a true State is one that corresponds to the concept of "State":

> In the philosophical sense . . . "truth" . . . means the agreement of a content with itself. . . . Besides, the deeper (philosophical) meaning of "truth" is also partly found in ordinary linguistic usage already. We speak, for instance, of a "true" friend, and by that we understand one whose way of acting conforms with the concept of friendship; and in the same way we speak also of a "true" work of art. To say of something that it is "untrue" is as much as to say that it is bad, that it involves an inner inadequacy. A bad State, in this sense, is an "untrue" State; and what is bad and untrue consists always in a contradiction between the object's determination or concept and its existence. (*Enc.* par. 24, addition 2)

Philosophy, Hegel tells us, "can be determined in general terms as a *thinking consideration* of objects" (*Enc.* par. 2). Philosophical logic, the science of concepts, is what provides us with the thread of Ariadne leading out of the world's Minotauric labyrinth. It teaches us that "all finite things . . . are affected with untruth; they have a concept, but their existence is not adequate to it. For this reason they must go to the ground [*Zugrundegehen,* literally "to perish"]. . . . The animal as something singular has its concept in

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its kind, and the kind frees itself from singularity through death" (*Enc.* par. 24, addition 2).

In consonance with the broad conception of logic described at the beginning of this section, Hegel's conception of truth designates more than the adequacy of thoughts to things, let alone the "correspondence" between states of affairs and propositions. Truth is the *coincidence of a thing with its concept* or the dialectical, not the tautological or immediate, *identity of a thing with itself.* The classical determination of truth as *adaequatio rei et intellectus* is dogmatic because it does not offer any explanation of how or wherein the thing and the thought can be adequate to each other. To a consciousness not trained in speculative thinking, this adequacy must appear as something ever new and surprising, the unexpected result of an inexplicable relationship between heterogeneous substances. Hegel's account approaches the problem of truth by tracing the conditions of the possibility of the "adequacy" of knowledge and reality back to the source of the act of cognition, instead of focusing on its outcome. The coincidence of knowledge and reality is grounded in their being aspects of one and the same 'Concept'. This is what Hegel means when he describes the character of philosophical truth by means of the metaphor: in truth, reason becomes aware of itself.

We are now ready to follow Hegel's specific reasoning with regards to Zeno's argument of the arrow. Just as the universal concept of animality, along with many other concepts, belongs to the singular existence of the dog, the conceptual determinations of motion in general belong to the locomotion of singular objects. It follows that if the concept of motion in general contains a contradiction, as exemplified in the conclusion of Zeno's own argument (see part 1, [I]) or in premise 3 of my reconstruction of it (part 1, [II]) so too will the locomotion of Zeno's arrow. Hegel would agree with the classical empiricist objection that we cannot possibly have an empirical experience of contradictions: his reply, however, would be that the objection misses the point. The point is not that we *experience* contradictions in the arrow's motion, but that we must *think* of it as a contradictory event. After all, we never have an empirical experience of motion in general while we base our scientific knowledge of the empirical world on this concept. To the second classical objection, that the arrow's locomotion cannot in itself be contradictory (the objection exemplified by premise 3 and the conclusion of argument [II] in part 1), Hegel replies that it is epistemologically naïve. First, it is naïve insofar as it presupposes that locomotion exists "in itself," that is, apart from any conceptualization in terms of motion in general. To paraphrase Hegel's dictum about the dog, if we were to deprive locomotion of its motion, we could not say what it is. Second, it is naïve insofar as it assumes that contradiction is an objective quality that can be either asserted of or

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denied to things. But contradiction, like beauty, is in the eye of the beholder, which in our context is the Mind's eye. The idea that a moving object should at every given moment both be and not be in one and the same place is a conceptual determination that belongs to the physical world *insofar as it is thought.* In Hegel's terminology, to be a universal or a concept is the essence of both so-called objective Nature and so-called subjective Mind. Their "actual difference" consists in their being two different forms of existence of the same essence. This "actual difference" is brought about by a unique feature of human thinking. Nature (or the dog) is *in* itself a universal, but this universality is not *for* it. A human being, however, although in itself a universal, becomes through thinking a universal in-and-for-itself: "Nature does not bring the *nous* to consciousness for itself: only man reduplicates himself in such a way that he is the universal that is *for* the universal" (*Enc.* par. 24, addition 1).

It is the dual nature of the self-conscious mind that allows us to consider the arrow's locomotion as being both real and self-contradictory. My experience of a flying arrow conveys to me the real existence of this particular spatio-temporal event. My theoretical reconstruction of this experience reveals to me the self-contradictory character of its essence as a conceptual universal. Logic, which is thinking taking itself as its content, brings both aspects together. The arrow really moves through space and time, and the truth of this particular event consists precisely in its coinciding with the universal concept of motion. Motion is constituted by the dialectical identity of permanence and change. Motion *is* permanence through change. So the locomotion of the arrow must be grasped as the dialectical identity of its permanence through the difference of its spatio-temporal states. The flying arrow is a special instance of what Hegel calls "the identity of identity and difference." The flying arrow *is* a contradictory event. And yet it moves.

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NOTES

1. Hegel, *Hegel's Lectures on the History of Philosophy* (1974). Hereafter cited as *HP.*

2. All citations of Aristotle are given in accordance with the page and line numbers of the Bekker edition of the Greek text (1831). The English version is taken from the Revised Oxford Translation, edited by Jonathan Barnes.

3. Aristotle's summary of these two paradoxes may be of help at this juncture: "The first [the Dichotomy] asserts the non-existence of motion on the ground that that which is in locomotion must arrive at the half-way stage before it arrives at the goal. . . . The second is the so-called Achilles, and it amounts to this, that in a race the quickest runner can never overtake the slowest, since the pursuer must first reach the point whence the pursued started, so that the slower must always hold a lead. This argument is the same in principle as that which depends on bisection, though it differs from it in that the spaces with which we have

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successively to deal are not divided into halves. The result of the argument is that the slower is not overtaken" (*Physics* 239b10–20).

4. My treatment of this matter focuses upon chapter 1, expl. 3, and the corresponding observation.

5. All quotes from the *Critique of Pure Reason* are taken from Kant, *Critique of Pure Reason* (1965).

6. I was made aware of the importance of Kant's treatment of contradiction in this context by the enlightening book of M. Wolff, *Der Begriff des Widerspruchs. Eine Studie zur Dialektik Kants und Hegels* (1981).

7. Hegel's conception that one can deny truth to something existing while at the same time recognizing its existence obviously presupposes a peculiar use of the concept of truth. The latter is in turn tied to a technical use of *Begriff* (*concept,* sometimes translated as *notion*). The *Begriff* of a thing, event, natural or historical phenomenon is, according to Hegel's technical usage, the state toward which the thing develops by virtue of its own internal structure. For example, the *Begriff* of a person is self-consciousness, which is not just given with the bare fact of consciousness, but is the goal toward which consciousness develops in humans. The same pattern is present in Hegel's interpretation of the relationship between religion and philosophy: religion is knowledge of the truth, but in the medium of *Vorstellung* (*figurative thought*); it is not yet self-conscious truth or the *Begriff* of truth. Religion necessarily turns into speculative philosophy. Philosophical (or, more precisely, speculative) thinking is the *Begriff* of religion, the self-conscious grasping of its truth. Hegel uses *Begriff* in the same way for nonhuman contexts: the concept of the acorn is, for instance, the oak tree. This use of *concept* allows Hegel to substitute *truth* (*Wahrheit,* as distinguished from *Wirklichkeit,* i.e., actuality) for concept in contexts like the one quoted in the text. For a further explication of Hegel's use of *Begriff* and his definition of *truth,* see part 5 of this study.

8. Further aspects of the dialectic immanent in the basic concepts of Euclidean geometry are analyzed by Hegel in the context of his treatment of finitude and infinity in the Greater Logic. See *Hegel's Science of Logic* (1969, vol. 1, sec. 1, chap. 2, B, [b]). Hereafter cited as *Sc.L.*

9. This dialectic that inhabits the most elementary constituents of our sensibility and thinking had, of course, been explicated in greater detail by Hegel years earlier in the *Phenomenology of Spirit,* (1807, chap. 1, sec. 95–105). The pure immediacy of an experience, Hegel wrote there, can be expressed at first by a name given to it, the demonstrative *this,* or else by its two components, the parameters *here* and *now.* Hegel's analysis of these concepts in the *Phenomenology* revealed that, far from being denominations of the most concrete and unique experiences possible, they apply to all possible experiences and are therefore true "universals." Any differences between experiences is abrogated in the postulation of their absolute difference from each other.

10. The most thorough argument for Hegel's repeated assertion that objects "in general" (i.e., our concept of them) are intrinsically contradictory is to be found in the *Science of Logic* (vol. 1, book 2, sec. 2, chap. 1), which contains an analysis of the concept of 'Existence' as referred to 'Matter or Appearance' (in contrast to the existence of Kant's nonmaterial thing-in-itself). The relevant chapter opens with an analysis of "The Thing and its Properties" and concludes with the discovery of the "Dissolution of the Thing." The dissolution takes place in virtue of the internal contradictions of the concept of a thing as a unitary whole of different properties. The "Remark" to this chapter contains a concerted attack against commonsense explanations of the unity and multiplicity of material objects.The assumption of the "porosity of matters" allows common sense to "solve" the puzzle of their simultaneous presence in one and the same perceived object by substituting for the concept of simultaneity that of "interpenetration." The "Remark" shows the difficulties faced by any attempt to explain away this logically contradictory thought: that one and the same object and each of its parts consist in different material properties and that the latter, far from excluding each other,

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subsist simultaneously as differences within this unity. Once again, explanations based on the "interpenetration" of "porous matters" make use of figurative instead of speculative thinking:

The usual excuse by which ordinary thinking evades the *contradiction* of the *independent* subsistence of a *number* of *matters* in *one* thing, or their mutual *indifference* in their *interpenetration* bases itself on the *smallness* of the parts and of the pores. Where difference-in-itself, contradiction, and the negation of negation occur, in general, where thinking should be *in terms of the Notion,* ordinary thinking falls back onto external, *quantitative* difference; in regard to coming-to-be and passing away, it has recourse to gradualness, and in regard to being, to *smallness* in which . . . the contradiction [is reduced to] a confusion . . . But the further moment in the Notion of the thing is that in this thing one matter is present where the other matter is, and the matter that penetrates is also penetrated in the same point; in other words, the self-subsistent is immediately the self-subsistence of an other. This is contradictory; but the thing is nothing else but this very contradiction; and that is why it is Appearance." (*Sc.L.* 497–98)

11. Hegel, *The Encyclopaedia Logic* (1991), par. 24. Hereafter cited as *Enc.*

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