

Chapter 1

Introduction

Individuation and the Quest for Unity

The quest for unity in science may be traced to the oldest, most basic of human drives: that toward *individuality*. To be “in-dividual” is to be undivided, to possess a unitary core, a coherent and stable center of identity. From its inception, human development is guided by the tendency toward individuation.

In Sigmund Freud’s approach, the emergence of internal unity is reflected in the infant’s “primary narcissism” (1914), the diffusely cohesive image of its own body that constitutes the earliest manifestation of the ego. The dialectical nature of the individuation process is brought out in Lacan’s (1953) elaboration on Freud. Lacan suggests that the first tentative appearance of an invariant body image occurs in the “mirror stage.” Here the child begins to develop a stable sense of its identity, to form an image of its own body as a whole, when the mother’s body can be mirrored back to it as its primary object or alter-ego. This possibility initially arises at around six months of age and depends, in turn, on the psychological separation of the infantile body from that of the mother. Developmental theorist Elizabeth Grosz (1994), in drawing on Lacan, thus observes that it is in the mirror stage that “the division between subject and object (even the subject’s capacity to take itself as an object) becomes possible for the first time” (p. 32). From the very outset then, one’s sense of oneself as an autonomous being is linked to one’s experience of the other.

In examining the original condition for the emergence of individuality, Grosz brings in the role played by *space*:

For the subject to take up a position as a subject, it must be able to be situated in the space occupied by its body. This anchoring of subjec-

tivity in its body is the condition of coherent identity, and, moreover, the condition under which the subject *has a perspective* on the world, and becomes a source for vision, a point from which vision emanates and to which light is focused. (p. 47)

The emergent subject is “the focal point organizing space. The representation of space is...a correlate of one’s ability to locate oneself as the point of reference of space: the space represented is a complement of the kind of subject who occupies it” (p. 47). Historically, the space in question, when fully developed, is “the perspectival space that has dominated perception at least since the Renaissance” (p. 48). In sum: “A stabilized body image, ...a consistent and abiding sense of self and bodily boundaries, requires and entails understanding one’s position vis-à-vis others, one’s place at the apex or organizing point in the perception of space” (p. 48). So, according to Grosz, the self takes form both in relation to others and to space.

Grosz cites Lacan’s observation that, in the mirror stage, “the total form of the body by which the subject anticipates in a mirage the maturation of his powers is given to him only as a *Gestalt*” (1994, p. 42). Her conclusion is that the “mirror image provides an anticipatory ideal of unity to which the ego will always aspire” (p. 42). Although this “model of bodily integrity” is something “the subject’s experience can never confirm,” although “the stability of the unified body image...is always precarious” (p. 43), just this imagined unity of the ego or subject is the

precondition...for all symbolic interactions and for an objective or scientific (i.e., measurable, quantifiable) form of space. The virtual duplication of the subject’s body, the creation of a symmetry measured from the mirror plane, is necessary for these more sophisticated, abstract, and derivative notions of spatiality. (Grosz 1994, p. 45)

With these words, Grosz intimates a link between science’s long quest for unity (symmetry, invariance, continuity) and the even longer search for unity that underlies the whole course of human development.

The connection actually was established years earlier by physicist David Bohm (1965) in his detailed study of the relationship between the notion of invariance in science and the perceptual development of the

child. Bohm demonstrated that the kind of activity in which physicists engage when they relate their initially variable empirical observations to invariant mathematical forms can be traced all the way back to the way in which the child's perceptual world crystallizes from the inchoate flux of infancy. Just as the child comes to recognize, for example, that an object momentarily hidden from view is the *same* object when it reappears, the physicist — operating at a vastly greater level of abstraction to be sure — recognizes that certain relationships between physical variables (force and mass, energy and frequency, etc.) remain invariant with changes in space-time coordinates. According to Bohm, the latter is the ultimate extension of the former.

It should be clear that achieving object constancy — whether we are speaking of objects perceived by the child or objects studied mathematically by the physicist — is dialectically coupled with gaining *subject* constancy. On the one hand, because one's imagined body serves as the frame of reference from which all observations are made, an object seen to change with changes in viewpoint or perspective can be taken as the same object only insofar as the observer's body is implicitly sensed as remaining the same. But the subject could not attain coherence and internal stability in the first place if the original chaos of nature did not already lend itself to being ordered. If a core identity is to take shape, if a cohesive individual is to come into being, "Mother Nature" cannot be entirely erratic; she must be able to mirror back to the subject a modicum of regularity and lawfulness. There can be a stable self "in here" only in relation to a world "out there" that offers some measure of consistent patterning. For the objects encountered in the natural environment to be susceptible to being ordered, the environment must place some constraints upon them. The milieu must be bounded or closed in such a way that the objects can properly be contained. Without placing such a limitation upon the objects, their initially unbounded flux could not become channeled into regular patterns. Functioning in this limitative capacity, the environment assumes the character of *space*.

In Grosz's analysis of the individuation process, three principal terms can indeed be identified: subject, object, and space. This tripartite determination has a distinguished history. We can say, in fact, that, in its idealized form, it constitutes the basis of Western philosophy.

In the *Timaeus*, Plato states that “we must make a threefold distinction and think of that which becomes, that in which it becomes, and the model which it resembles” (1965, p. 69). The first term refers to any particular object that is discernible through the senses. The “model” for the transitory object is the “eternal object,” i.e., the changeless form or archetype. This perfect form is *eidōs*, a rational idea or ordering principle in the mind of the Demiurge. Using his archetypal thoughts as his blueprints, the Divine Creator or transcendent subject fashions an orderly world of particular objects and events. As for “that *in* which [an object] becomes,” Plato speaks of the “receptacle,” describing the latter as “invisible and formless, all-embracing” (1965, p. 70). It is the vessel used by the Demiurge to *contain* the changing forms without itself changing (1965, p. 69). Plato goes on to characterize the receptacle as *space* (1965, pp. 71–72). The Platonic notion of space constituted the seed for a concept that was to come to fruition and play a critical role in post-Renaissance science and mathematics.

Plato’s receptacle actually was not entirely changeless. At times it tended toward inhomogeneity, being given to “irrational motion...fleeting potencies and constantly changing tensions” (Graves 1971, p. 71) that made it susceptible to “springing a leak.” That is, Platonic space was prone to being ruptured, to losing its continuity. In the course of the next millennium, however, the concept of space evolved. By the time of Descartes, the notion of space had matured into that of a completely homogeneous continuum. Descartes related his continuum to the idea of *extension*.

Consider, as an illustration, the simplified space represented by a line segment. In the Cartesian approach, it is intuitively self-evident that the line, however short, has extension. It must then be continuous: it can possess no holes or gaps in it, since, if the point-elements composing it were not densely packed, we would not have a line at all but only a collection of extensionless points. The quality of being extended implies the infinite density of the constituent point-elements.

Yet, at the same time, intuitive reflection discloses the paradox that the absence of gaps in the continuum not only holds this classical space together but also permits it to be *indefinitely divided*. Without a gap in the line to interrupt the process, there is no obstacle to the endless partitioning of it into smaller and smaller segments. As a consequence, though the points constituting this continuum indeed are densely packed, they are

distinctly set apart from one another. However closely positioned any two points may be, a differentiating boundary permitting further division of the line always exists. As philosopher Milič Čapek put it in his critique of the classical notion of space, “no matter how minute a spatial interval may be, it must always be an *interval* separating two points, each of which is *external* to the other” (1961, p. 19).

The infinite divisibility of the extensive continuum also implies that its constituent elements themselves are unextended. Consequently, the point-elements of the line can have no internal properties, no structure of their own. An element can have no boundary that would separate an interior region of it from what would lie on the outside; *all* must be “on the outside,” as it were. In other words, the Cartesian line consists, not of internally substantial, concretely bounded entities, but only of abstract boundedness as such (Rosen 1994, p. 92). Sheer externality alone holds sway — what Heidegger called the “‘outside-of-one-another’ of the multiplicity of points” (1927/1962, p. 481). Moreover, whereas the point-elements of classical space are utterly unextended, when space is taken as a whole, its extension is unlimited, infinite. Although I have used a finite line segment for illustrative purposes, the line, considered as a dimension unto itself, actually would not be bounded in this way. Rather than its extension being terminated after reaching some arbitrary point, in principle, the line would continue indefinitely. This means that the sheer boundedness of the line is evidenced not only locally in respect to the infinitude of boundaries present within its smallest segment; we see it also in the line as a whole inasmuch as its infinite boundedness would be infinitely extended. Of course, this understanding of space is not limited to the line. Classically conceived, a space of any dimension is an infinitely bounded, infinitely extended continuum.

On the classical view, it would be a category mistake to interpret the infinitude of space as a characteristic of what is *object*. Space is not an object but is the “receptacle” of the objects, the changeless context within which objects are manifested. This distinction, initially made by Plato, is reflected in the thinking of Kant, who held that perceptions of particular objects and events are contingent, always given to variation, but that perceptual awareness is organized in terms of an immutable intuition of space. In the words of Fuller and McMurrin, Kant took the position that

“no matter what our sense-experience was like, it would necessarily be smeared over *space* and drawn out in *time*” (1957, Part 2, p. 220). Implied here is the categorial separation of *what* we observe — the circumscribed objects — from the *medium* through which we make our observations. We observe objects *by means of* space; we do not observe space. It is within the infinite boundedness of space that particular boundaries are formed, boundaries that enclose what is concrete and substantial. The concreteness of what appears within boundaries is the particularity of the object. In short, an object most essentially is that which is bounded, whereas space is the contextual boundedness that enables the finite object to appear.

The spatial context is what mediates between object and *subject*. The latter (personified by the Demiurge in Plato’s *Timaeus*) is the third term of the classical account and corresponds to what is *unbounded*. That an object possesses boundaries speaks to Descartes’s characterization of it as *res extensa*, “an extended thing”: what has extension will be bounded. In contrast, the subject is *res cogitans*, a “thinking thing.” Entirely without extension in space, the subject has no boundaries or parts. As a consequence, it is indivisible. This is etymologically equivalent to stating that the subject is an *individual*. It is before this unbounded subjectivity that bounded objects are cast (the word “object” comes from the Latin, *obicere*, “to cast before”). The crux of classical cognition then, is *object-in-space-before-subject*. The object is *what* is experienced, the subject is the transcendent perspective *from* which the experience is had, and space is the medium *through* which the experience occurs. The relationship among these three terms is that of categorial separation.

Now, classically understood, the tripartite categorial division does not arise empirically; rather, it is taken as existing *a priori*, as always already given. However, even though the trichotomy is regarded as an ontological imperative present from the first, classical thinking can grant that one’s *knowledge* of the absolute threefold division does require time to develop. The classical viewpoint therefore can allow that the subject’s initial awareness of its individuality is associated with its sense of being “situated in the space occupied by its body” (Grosz 1994, p. 47). It is just that, on the classical view, this identification of subjectivity with embodiment in space merely reflects the subject’s immaturity, its ignorance of its true transcendental condition. Yet if the subject, at bottom, is in fact perfectly

indivisible thus transcendent of space, and if its objects are completely divisible thus immanent to space, could there be any genuine *interaction* between subject and object? This is of course but another way of stating the old *mind-body problem* that was never quite put to rest in the classical tradition: If mind and body are ontologically divided, how is it possible for them to interact? Assuming that some kind of interaction is undeniable, we appear led to the conclusion that Descartes's emphatic division of mind and body is in fact an idealization that overlooks the reality. While interaction does pose a difficulty for the dualistic species of classical thought, in monistic idealism the problem would appear to be obviated. Here the claim is made that, since only mind is real, since the body is naught but an illusion, in the final analysis mind-body interaction must be illusory. What idealism has never been able satisfactorily to explain, however, is why such an "illusion" would arise in the first place. In lieu of an explanation, we often are advised to accept the ultimate "mystery of it all." Note, moreover, that, if we look beneath the explicit content of what is asserted to its underlying form, we can see that "monistic" idealism is actually another form of *dualism*. Behind the assertion that body "is not real" is the subtler fact of syntax that body "*is*"; negated in overt content, the body is posited in underlying form; the covert effect of such a statement is to *maintain* the body. Mind is posited in the same basic way: "it is real." So, while the content of idealism discounts the body as "mere illusion" and affirms the mind as "real," the *form* of the classical statement, by positing body and mind in stark opposition to one another (one in simple negation, the other in simple affirmation), effectively renders them categorially distinct. In this failed denial of the body's reality, circumvention of the problem of interaction also fails.

From the dialectical standpoint, mind and body — or subject, object, and space — are not taken as pre-existent, fixed, and mutually exclusive categories. Rather, they are seen to develop in intimate relationship to one another. In fact, the dialectical approach that I propose enables us to see how classical thinking itself develops.

On this account, initially there is neither mind nor body, neither subject nor object nor space in any well-differentiated form — only an inchoate flux of embryonic possibilities. In the earliest fragment of Western philosophy, Anaximander referred to this undifferentiated condition as the

apeiron (see Rosen 2004). Literally meaning “without measure,” the old Greek word was variously interpreted as “limitless,” “boundless,” “indeterminate,” or “unintelligible” (Angeles 1981, p. 14). In the proto-scientific discipline of alchemy, the incipient state of affairs was termed *prime matter*: “prima materia, which is the original chaos and the sea” (Jung 1970, p. 9). From the primordial flux, a subject-object mirroring process ensues. That is, quasi-stable objects are differentiated from the chaotic background in relation to an emergent subject before whom the objects are cast. As indicated above, object and subject constancies mirror each other in mutual feedback, thereby enhancing each other. Object and subject thus emerge together from the ever-changing background turbulence and a modicum of unity or invariance arises in them. At the outset, the stability that is realized is highly tentative and the nascent transactions between subject and object are utterly nonlinear. The unity achieved for the object clearly cannot be said to *cause* the subject to be unified, nor is influence transmitted in the other direction, from subject to object. In their still immature, largely undifferentiated relationship, subject and object achieve their unity ensemble, joined inseparably in a recursive mirror play wherein the flow of influence is wholly reversible and cannot be dichotomously parsed. As the differentiation of subject and object advances however, the initial lack of orientation is superseded and an asymmetry sets in. Eventually the action appears to flow in but a single direction: *from* subject *to* object. The subject, functioning as the seemingly exclusive source of agency, divides the object for the purpose of identifying within it a unity (stability, invariance, etc.) that will further enhance the subject’s own unity. At this stage of development, the distinctions arising from the dialectical process have hardened into categorial divisions that are now assumed to have existed from the first. Only by virtue of the problem of interaction does the dialectic make its ghostlike presence felt: there is the haunting question of how the subject could exert any influence at all over an object from which it is categorically split. But this does not stop the subject from proceeding with its program of dividing the object so as to bring unity to itself.

In science, the subject proceeds by *analysis*, a word of Greek origin that means a “dissolving, a resolution of whole into parts; *ana*, up, back, and *lysis*, a loosing, from *lyein*, to loose.”² Or we may say equivalently that

“analysis” connotes “a breaking up.”³ The *modus operandi* of science then is to break things up, or — to use the more common manner of speech — it breaks things down. In fact, the process actually entails a *threefold* breakdown or division, since the object to be dissected must first be extracted from its context, and since the analyst him- or herself must assume a detached stance. In the humanistic program of classical science, the more effectively objects can be parted, the better they can be controlled, manipulated, and shaped so as to solidify the unity or integrity of the subject. By dividing the object into its parts, knowledge is gained of how the parts work together in the whole, and this clarification of the functioning of the object as an invariant whole contributes to the wholeness of the subject. Thus, whatever the purpose of the particular research, scientific analysis essentially involves a process of division that distills nature’s variability into invariant features in the interest of securing the *analyst’s* invariance (unity, stability, constancy, etc.). To be sure, the latter does not just refer to the unity of an individual person. In the work of science, personal needs have been sublimated into broader concerns about the welfare of humankind.

The scientific enterprise is well exemplified by the perennial search for the “basic building blocks” of nature. The object is to be analyzed into smaller and smaller components, dissected until we no longer can do so. At this point we will have “hit bedrock,” arrived at the fundamental constituents of the object, the atoms that compose it. The Greek word “atom” is functionally equivalent to the word “individual”: both mean “not divisible.” What is indivisible is immutable, not susceptible to change. Reaching the atomic substrate of nature thus would mean reaching the point where all of nature’s variability will have been eliminated. Nature would now be fully controllable. If the object could be manipulated at the atomic level, that of the ultimate “individual,” the individuality of the subject would gain its ultimate reinforcement.

In sum, from the child’s first tentative steps toward individuation to the sophisticated initiatives of science, the human enterprise has come to be governed implicitly by a fundamental formula: *object-in-space-before-subject*. The prime directive here is that objects be divided so as to secure and enhance the indivisibility of the subject, a task that is to be accomplished by situating the object within the infinite divisibility that is space. In the pages to follow we will see that — despite all the revolutions that

have transformed physics over the past century, the underlying approach has not changed. But we are going to discover that however effectively this way of achieving unity has worked in the past, when it comes to the *ultimate* unification of physics, no longer is that the case. To complete the project of realizing a unified field theory, gravitational and quantum mechanical forces are to be accounted for in an integrated manner. Why has this task proven so difficult? What is it about quantum gravity that makes it so resistant to treatment under the old formula? Unification of the forces in question necessitates operating at an exceedingly minute level of nature. It is at this subatomic level that the analytic subject had hoped to be able to gain complete control over nature's objectivity. Yet we are going to find that it is precisely at this level that the classical problem of *subject-object interaction* — which had been ignorable at larger scales — now no longer can be. Thus we shall see that addressing the ultimate problem of theoretical physics requires that, at the same time, we come to grips with an ultimate *philosophical* problem. In this book, I intend to demonstrate that a radically new, thoroughly dialectical approach is needed to meet the challenge, one that surpasses classical philosophy's threefold division of object, subject, and space in recognition of their intimate entwinement and transpermeation.

Notes

1. I will explicitly address the role of time in due course.
2. *Webster's New Twentieth Century Dictionary*, 2nd ed., s.v. "analysis."
3. *The American College Dictionary*, 1968 ed., s.v. "analysis."