

The Unity of Being and Becoming (1975)

It appears that we soon will witness the emergence of a new image of world and man.^[1] I believe the scope of the change should be virtually unbounded, encompassing long-held and deep-rooted views of reality. Moreover, I suggest that the impending transformation reflects the workings of a process that is essentially *dialectical*.

Students of philosophy are familiar with Hegel's famous triad: thesis → antithesis → synthesis. This is the dialectic. For every idea, there exists or develops a contradiction. Change occurs through the reconciliation of opposites. Thesis is not merely replaced by antithesis; rather, opposites are *fused*, canceling the exclusive validity of either. A broader domain arises wherein old "opponents" may be relegated to the status of "special cases," if they are not discredited completely. Subsequently, the synthesis itself may be recognized as a higher-order thesis with its own developing antithesis. The circle closed by synthesis is thus reopened, the dialectical process taking on the general appearance of a mounting spiral.

The metamorphosis I am anticipating may be understood in these dialectical terms, seen as constituting a novel synthesis. In fact, the new worldview should encompass an opposition that is quite fundamental—that expressed in the notions of *Being* and *Becoming*. Being is associated with changelessness, Becoming with change. If the reconciliation of these conflicting themes indeed is in the works, is there a concrete image capable of portraying their integration in a graphic way? Can we develop a specific model of the synthesis that could serve as a guide in our time of transition?

THE WORLD AS BEING/BECOMING

Three Levels of Changelessness

To the naive observer, changelessness is equated with absolute rest. The ancient Greek philosophers of Elea (among whom

Parmenides was the leading figure) promoted the doctrine of Being at this most obvious level. Zeno, the chief student of Parmenides, is noted for his paradoxes of motion, one of the most famous of which involves Achilles's futile effort to overtake a tortoise in a foot race. This is the best known example of the Eleatic attempt to prove the impossibility of motion.

Democritus, another great philosopher of that era, ostensibly reinstated the idea of change. Instead of supposing that space was full (an underlying presumption of Eleatic philosophy), he assumed the existence of a void through which bodies could move freely. However, the large-scale, perceptible motions that seemingly brought about change were reducible to the imperceptible movements of atoms, which were thought to be themselves immutable. Since atoms were the unchanging bedrock of reality, the transformations that took place in the large-scale world were considered to be without real substance. Thus Democritus's viewpoint actually affirmed the Parmenidean doctrine of an "unchanging reality. . . behind or beyond the world of [changing] appearances" (Kerferd 1971, p. 34).

Philosopher Milic Capek (1961) informs us that all classical thinkers, including the atomists, had difficulty in accepting the primary quality of motion: "atomism, ancient as well as modern (Newtonian physics, for instance), retained the basic Eleatic belief in the constancy of being which in its quantity as well as quality is not subject to any change; change, though not completely denied, retained a half-spurious character, as it did not affect the ultimate units of material substances" (Capek 1961, p. 137).

This classical paradigm of Being, which in one form or another prevailed for centuries in the West and dominated the science of the nineteenth century, was significantly challenged by Einstein's theory of relativity. But was the new paradigm one of Becoming (change), or was changelessness being espoused at still another level?

At first glance, relativity—especially Einstein's *general* principle of relativity—does seem to transform the classical concept of Being into one of Becoming. In the classical view, bodies remain essentially the same regardless of their apparent motions, which are presumably instigated by outside forces. But a fundamental proposition of relativity theory is that force is unified with that upon which force acts; that is, force is *internalized*. The gravitational attraction of bodies is geometrically

interpreted in the general theory as a curvature of the space-time continuum. Yet space-time curvature does not express attraction as abstracted from the bodies themselves; rather, the bodies are identified with the curvature. The persistence of classical thinking might lead one to conclude that without the curvature, bodies would not be attracted to each other. The more appropriate statement is that without the curvature, there are no bodies! Hence, bodies are not static beings, for interactions are internal to their essences. Bodies *are* interactions, matter is energy, Being is Becoming.

Or is it? Is Being transformed into Becoming by this dynamization of bodies? It depends on what is demanded of the concept of Becoming. In the present context, our demands are maximal. Becoming must entail change in its deepest sense to be a suitably potent antithesis of Being. Change has to involve genuine novelty, an irretrievable break with the past. We should not be able to negate it by reversal and so recover the state of affairs existing previously. In Capek's words, "novelty implies irreversibility" (Capek 1961, p. 341). However, Einsteinian relativity appears to mandate reversal in the end, for Einstein sought a closed four-dimensional geometry that would serve the classical aim of completely encompassing all the phenomena of the world. Such a self-contained, ultimately self-reflexive geometry would permit no further change. Indeed, Einstein himself came to the conclusion that three-dimensional Becoming may be conceived as Being in the four-dimensional realm (see Capek 1961, p. 158)—that what appears to us as change is, in a higher sense, unchanging.

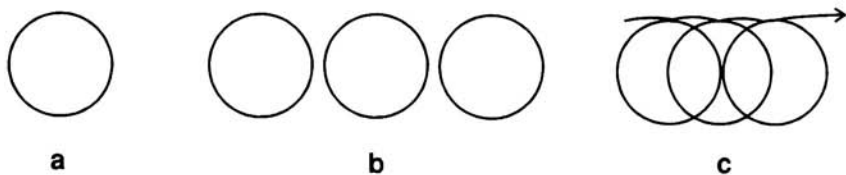
In sum, the idea of Becoming requires that motion or change be real, that it be internal to the entities moved (not merely applied to them from without), and that it be irreversible, introducing an entirely new state of affairs, one not permitting recovery of the old.

Being/Becoming: The Incubating Synthesis

Philosopher Nicholas Georgescu-Roegen (1971), a strong proponent of the dialectical approach, recently suggested a means of integrating the antithetical concepts of "reversibility" and "irreversibility." In the standard definition of these terms, a reversible process entails a complete return to an earlier state or

condition, whereas an irreversible operation involves an irretrievable departure. Deviating from conventional nomenclature, Georgescu-Roegen renamed the latter an *irrevocable* process, reserving the term *irreversibility* for his integrative concept. The "irreversible" event, in Georgescu-Roegen's sense, proceeds in one direction but returns periodically to a previous phase. He offered the example of a tree growing progressively despite losing its leaves each year. The general idea is illustrated in figure 1.1 (which is to be interpreted as portraying *temporal* relations, not merely spatial ones). In a world governed by irreversibility,² a system neither reverts completely to its initial condition (represented in fig. 1.1a by the lone circle), nor are its successive states entirely disconnected from each other (the irrevocability symbolized by fig. 1.1b). Rather, the states of a system overlap one another in a spiral fashion (as in fig. 1.1c). Accordingly, Georgescu-Roegen described the irreversible process as "a series of overlapping irrevocable processes" (1971, p. 200).

Figure 1.1



Reversibility (a), irrevocability (b), and irreversibility (c)

Irreversibility, applied to the question of determinism, leads directly to the notion of *partial* determinism. Thus Georgescu-Roegen concluded that although the present moment is determined by the past (the influence of reversibility), it must also possess an element of novelty (the influence of irrevocability). Capek (1961) brought out the epistemological consequences of this, asserting that while our knowledge of future states is necessarily incomplete, we successfully can make general predictions. In his discussion of perceptual models of physical reality, Capek provided a familiar example that can be interpreted as an instance

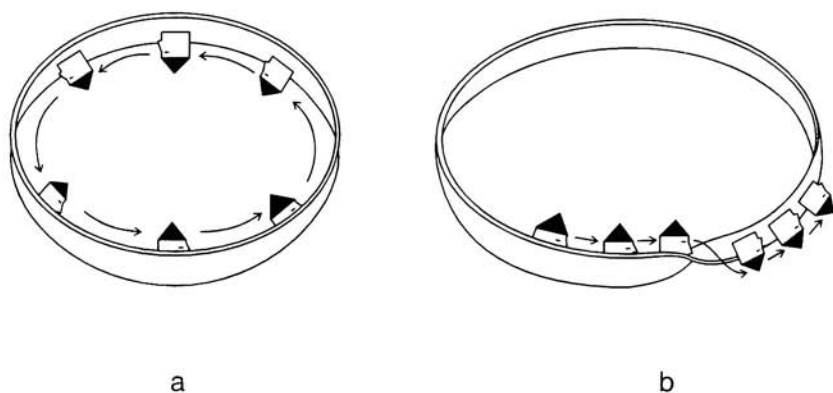
of partial determinism. He described an unfolding musical phrase: "The individual tones are not externally related units of which the melody is additively built, neither is their individuality . . . dissolved in the musical whole . . . Like every dynamic whole, it [the music] exhibits a synthesis of unity and multiplicity, of continuity and discontinuity" (Capek 1961, pp. 371–72).—Of determinism and indeterminism, we might add, based on our phenomenological experience with music. Insofar as the individual tones and tonal combinations persist, are not dissolved as the composition progresses, there is a basis for confirming our expectations. But the elements do not *wholly* retain their distinctiveness. There is a certain loss of individuality resulting from the transmutation of tones in the creatively unfolding temporal gestalt, and this is the aspect of our experience with music that cannot be predicted in advance.

Of course, the syntheses of unity and multiplicity, continuity and discontinuity, determinism and indeterminism, are but alternative expressions of the emerging concept we are presently calling "Being/Becoming." Yet Capek spoke of the great difficulty of enunciating "this paradoxical 'unity of opposites'" (1961, p. 372). He himself ruled out the possibility of constructing a visual model able to capture the fusion of Being and Becoming. Though the spiral has been mentioned, it is at best only a vaguely suggestive metaphor. I have asked myself, therefore, if it is possible to embody the union of opposites in a visual image that can be grasped at a glance, as it were, thereby surmounting verbal limitations in conveying the nature of paradox.

The Surface of Moebius: An Image of the Dialectic

In seeking a concrete embodiment of Being/Becoming, let us turn to the qualitative field of mathematics known as topology, and to the *Moebius surface*, a topological curiosity with unique transformational properties. The exercise in visualizing the Being/Becoming paradox begins with the construction of a Moebius strip (fig. 1.2b) by joining the ends of a narrow band of paper in such a way that one of the ends is given a half-twist (rotated through an angle of 180°). Next take another strip of paper and join the ends without twisting; this will produce a simple ring or cylinder (fig. 1.2a). Now, on one side of each of these strips place an asymmetric profile, like that shown in figure 1.2. (It does not

Figure 1.2



Cylindrical ring (a) and Moebius strip (b)

matter whether the profile faces left or right. What is critical is that it be asymmetric, for if a symmetric figure were chosen, an important difference between the two surfaces could not be observed.)

If we now imagine that this profile can move along the surface of either strip (as indicated by the arrows in fig. 1.2), we see that in the case of the cylindrical ring, the profile can go around and around indefinitely on the inside without ever coming into contact with the outside. (Crossing over the edge of the paper would break the continuity of movement and is thus prohibited in this exercise.) Here the cylindrical ring is seen to possess two independent, disconnected sides and is classified by topologists as a two-sided surface.

In the course of moving the profile along the Moebius strip, we discover its unique feature: the profile is transported from one side of the strip to the other without crossing an edge. This illustrates the mathematical attribute of *one-sidedness*. In both the cylindrical ring and the Moebius strip, we can match a point on one side with a corresponding point on the other. But in the former case, this pairing is superficial in a mathematical sense. *You* must do the matching, for the fusion of points is not inherent to the geometry of the ring. Consequently, points may be regarded

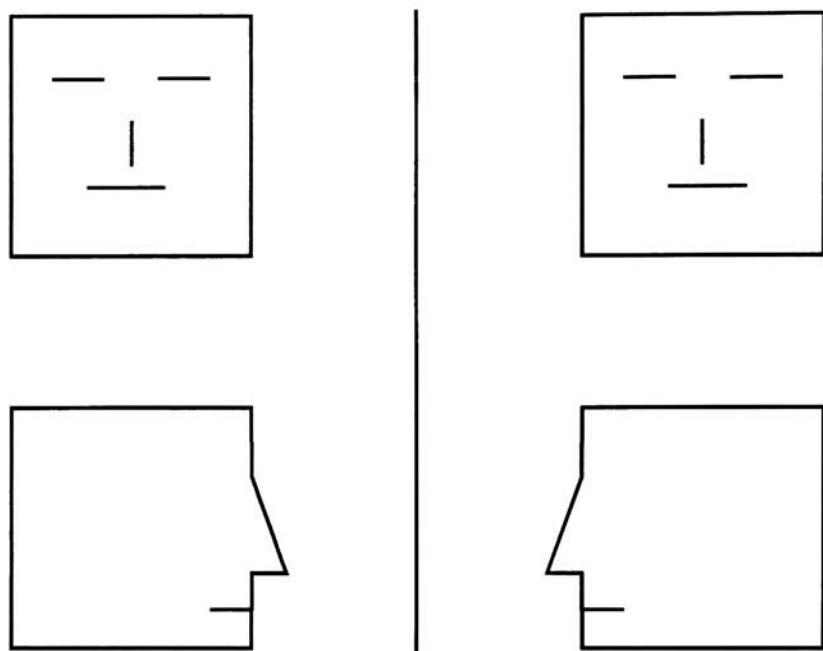
as insulated from and external to one another. It is true that in the Moebius case, if you place your index finger on any point along the strip, you will be able to put your thumb on a corresponding point on the opposite side. The Moebius strip does seem to have two sides, like the cylinder. But this holds only for the cross-section of the strip defined by thumb and forefinger. Taking the full length of the strip into account, we find that points on opposite sides are intimately connected—they can be thought of as “twisting” or “dissolving” into each other, as being bound together *internally*. Hence the topologist defines such pairs of points as *single* points, and the two sides of the Moebius as but *one* side. Already we begin to see in the Moebius surface a visual/geometric representation of the union of opposites.

The ability of the Moebius strip to serve in this capacity extends still further. There is a sense in which it can accomplish a *restoration of symmetry*.

Symmetry may be defined in many ways. For our purposes, let us define it in terms of mirror reflection (which involves a correspondence in size, shape, and relative position of parts across a dividing line). The full-faced, two-dimensional form of figure 1.3 is judged symmetric with respect to the plane of the page because it corresponds exactly with, and thus can be carried into, its mirror image without being removed from that plane. On the other hand, the two-dimensional profile cannot be superimposed on its mirror image in the plane and is therefore considered asymmetric with regard to the plane.

But the profiles can, of course, be brought into point-to-point correspondence if one is lifted from the plane through the third dimension and turned over onto the other. Since the rotation necessary to superimpose right and left profiles is thus performable, the asymmetry of the profile may be considered relative. Though the profile is asymmetric with respect to the plane, a hyperdimensional rotation out of the plane can restore symmetry, in the sense that the necessary matching can be achieved.

Can the symmetry of the right-facing profile revolving around the cylindrical band be restored? To turn right into left, all we would need to do is turn the profile around in its place, rotate it through an angle of 180° about its own axis. The transformation of right into left also could be accomplished by transporting the profile over an edge of the band to the other side. But in neither case would the operation be inherent to the topology of the two-sided cylinder.

Figure 1.3

Mirror reflection of symmetric (upper row) and asymmetric (lower row) two-dimensional figures

The structure of the cylinder can be clarified by imagining a plane of symmetry bisecting it along its transverse (long) axis (here you might picture a large square of cardboard thrust through the paper ring, partitioning it lengthwise into two identical narrower rings). The profile of figure 1.2a moves in conformance with cylindrical structure if and only if its rotation is confined to the cylinder's plane of symmetry. This requirement clearly is not met by either of the above-mentioned operations designed to restore the *profile's* symmetry. The contrasting structure of the Moebius surface is revealed in the fact that it possesses no plane of symmetry like that of the cylinder. Thus, rather than restricting the profile to the two-dimensional plane that maintains its asymmetric orientation, rotation consistent

with the Moebius structure carries the profile into the third dimension, where its orientation is reversed (as shown in fig. 1.2b). So we see that on the Moebius surface, right is transformed into left geodesically, that is, by following the natural contour of the surface. Here, symmetry restoration is an internal feature of the topology.

The symmetry-restoring property of the Moebius strip confirms it as a convincing embodiment of dialectical process. The union of opposites can now be understood as the restoration of symmetry (fusion of right and left) by hyperdimensional rotation, which is uniquely accomplished by the Moebius. Yet is symmetry *restoration* enough? The interchange of Being and Becoming has been conceived as an opening spiral. The synthesis that resolves the conflict becomes a higher-order thesis calling forth opposition in a new arena. Every closing circle must point beyond its boundaries to novel potentialities for action, lest Being prevail over Becoming. This is the requirement of irreversibility to be met in the present context by denying the finality of symmetry restoration. The surface of Moebius actually satisfies this condition, for it not only integrates opposites, reconciling mutual asymmetry;^[3] it also is *itself* asymmetric (as already noted above, in observing that, unlike the cylindrical ring, it possesses no plane of symmetry). When the Moebius surface is formed, the paper can be twisted one way to produce a right-facing configuration or the other to create its mirror-reversed counterpart.

We next encounter a higher-order topological structure, the *Klein bottle* (named after its discoverer, the German mathematician Felix Klein). The Klein bottle superimposes the right-twisted Moebius strip on its left-twisted mirror image, just as the strip superimposed the opposite-facing profiles. However, whereas the strip requires three dimensions to perform its function, the Klein bottle entails the fourth. This is why Klein-bottle operations can be conceived by us three-dimensional creatures only by exercising topological imagination—construction of the Klein bottle cannot be executed in three-dimensional space. When we employ such imagination, we realize that the Klein bottle, like the Moebius strip, must be asymmetric. If there is a right-oriented Klein bottle, there must be a left-oriented counterpart; and the existence of these opposites suggests a still higher topological form, the “hyper-Klein bottle,” which would require a fifth

dimension to accomplish its fusion of opposites. Clearly, the process being described is endless. We may say, in general, that the completion of hyperdimensional rotation at one level signals a commencement of rotation at the next. The emergence of novelty proceeds in this manner by hyperdimensional ascension. This is the dialectical spiral.¹⁴¹

HUMAN BEING/BECOMING: A QUESTION OF FREEDOM

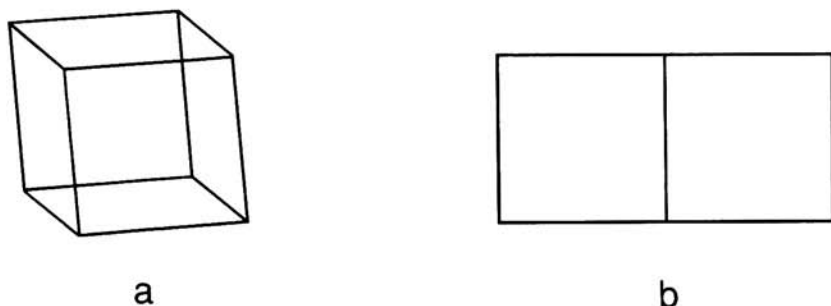
In the Moebius-Klein generality, the union of Being and Becoming is seen in its broadest scope. Here is a process that ultimately supersedes the limitations of any particular domain of space and time, since, indeed, it is the operation by which new domains are ceaselessly created. If this is the way reality unfolds—as a spiral of general reoccurrence and progressive advance that incorporates genuine novelty—should we not expect the same pattern to apply to the dynamics of a *given* space-time realm? In fact, the notion of partial determinism discussed above, wherein the future is neither strictly determined nor wholly indeterminate, evidently is just such an application. The example of a developing musical phrase dealt with our own particular dimension of time—our *fourth* dimension.

The question now is, can we, as human beings, play an active, deliberate role in shaping our dialectical advance, or must we conform to the pattern passively, being limited to the role of spectators? In other words, is the indeterminateness of our world to be understood as sheer randomness, or can it incorporate an element of freedom?

Surely we are not free-floating spirits detached from the worldly continuum. None of us is a *deus ex machina*, able to swoop in and effect change arbitrarily, in whatever manner we wish. Hence we cannot act against the grain of physical reality; in this sense, we are not free. But the human individual is not simply a *part* of the world. It seems more appropriate for us to think of ourselves as *aspects*. How do these two conditions differ? In attempting to distinguish the meaning of an aspect, let us experiment once again with a visual cue, this time with a figure from Gestalt psychology, the *Necker cube*.

The Necker cube (fig. 1.4a) is a two-dimensional projection into the third dimension. When you look at this structure from one perspective, it appears to hover above your line of sight. Then,

Figure 1.4



Necker cube (a) and divided rectangle (b)

suddenly shifting to the other viewpoint, you see it as if it were below you, and all the faces that seemed to be outside presently appear to lie inside. Though this reversal shows that the cube can be seen from two distinct perspectives, both are *aspects* of the cube, because each encompasses the whole configuration. Neither perspective should be thought of as merely contained *in* the cube the way the squares of figure 1.4b are contained within the divided rectangle.

Returning to the Moebius strip, its one-sided character implies this quality of aspecthood. At any and every point along the surface, we must concede that a given side is but one of two sides. Yet when the entire length of the strip is considered, each side covers *both* sides, due to the intimate connectedness of the one-sided surface, just as each perspective of the Necker cube, being an aspect, uses the whole to express itself.

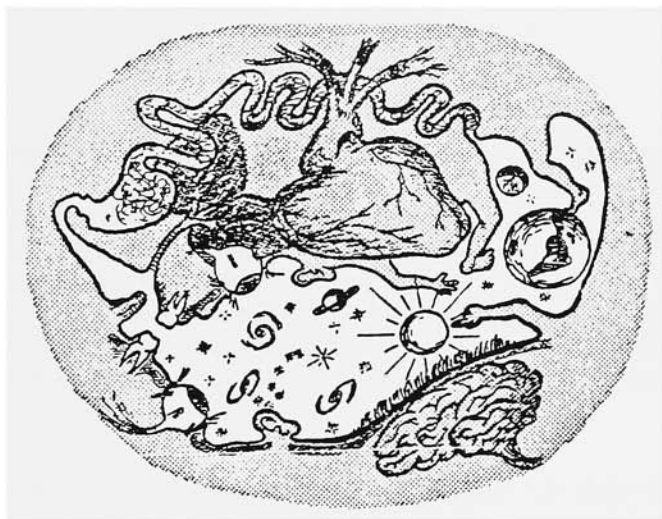
Before examining the broader significance of these observations, I would like to underscore the paradoxically reflexive nature of Moebius movement. The totality of the Moebius strip is embraced by each of its sides owing to the fact that the sides are internally bound together as one. Therefore, since sides share a common identity, Moebius passage through the higher dimension that carries one side into another geodesically may be said to involve the turning back of the side upon *itself*. Of course, the distinctness of the sides is not simply negated when the Moebius structure is taken as a whole; the Moebius surface

is not "one-sided" in the simple, undifferentiated sense of the single side of the cylindrical ring. The paradox is that, although opposing sides of the Moebius are fundamentally identified, they maintain their *difference* as well; the Moebius is one-sided while *also* being two-sided (the standard topological classification only names the former). Thus, in the Moebius transformation, reflexive self-reference and reference to other are thoroughly blended. Enveloping the whole, the Moebius aspect turns back upon itself and, at the same time, upholds what is different.

It may seem difficult to extend the relation of the aspect to the whole found in the Necker cube and Moebius strip to a person's relation with the world around him. In this regard, it is interesting to note that physicist George Gamow's (1961) discussion of the "unusual" properties of the Moebius strip appears in the same chapter wherein he describes a mental/topological operation through which a man transforms himself so that the entire universe is squeezed into the cavity of his body (see fig. 1.5). The objective world is entirely encompassed by one of its subjects in this "inside-out" universe. Here, the subject is not just a part of the world; by virtue of his ability to embrace it, he is an *aspect*.

In a similar vein, philosopher Oliver Reiser speculated that "the atom is a galaxy turned inside out, rotated through a higher dimension" (1966, p. 412). But while Reiser emphasized the general importance of "circumversion" (the action of turning inside out [Reiser 1966, p. 495]) and stated that it is only possible by a hyperdimensional movement, he was uncertain as to just how the performance of such an operation might be conceived. The topology of the Moebius surface offers a clue in this regard; it provides a basis for the occurrence of circumversion through a natural, internal transformation.

We see more clearly the implications of "hyperdimensional aspecthood" for our issue of human freedom when we recognize that the human is the being who projects himself into the fourth dimension—"the being who hurls himself toward a future and who is conscious of imagining himself as being in the future" (Sartre 1957, p. 16). It is in this reflexive action, where subject becomes aware of itself as object, that man is an aspect of the world, not just a part. Identified with the world yet distinct from it, man can incorporate the world without losing his individual identity in the process. Though he is only a "side" of reality, a

Figure 1.5

Inside-out Universe

From George Gamow's *One Two Three . . . Infinity*
(New York: Bantam Books, 1961).

side that is an aspect may spread its influence to the whole in a manner impossible for an isolated part. In the subject's intimate connection with the objective world—in our ability to propel ourselves into its future, its higher dimension of potentiality—each of us can consider possibilities and choose a course of action. What is indeterminate, we can determine. As aspects of the world, we are free.