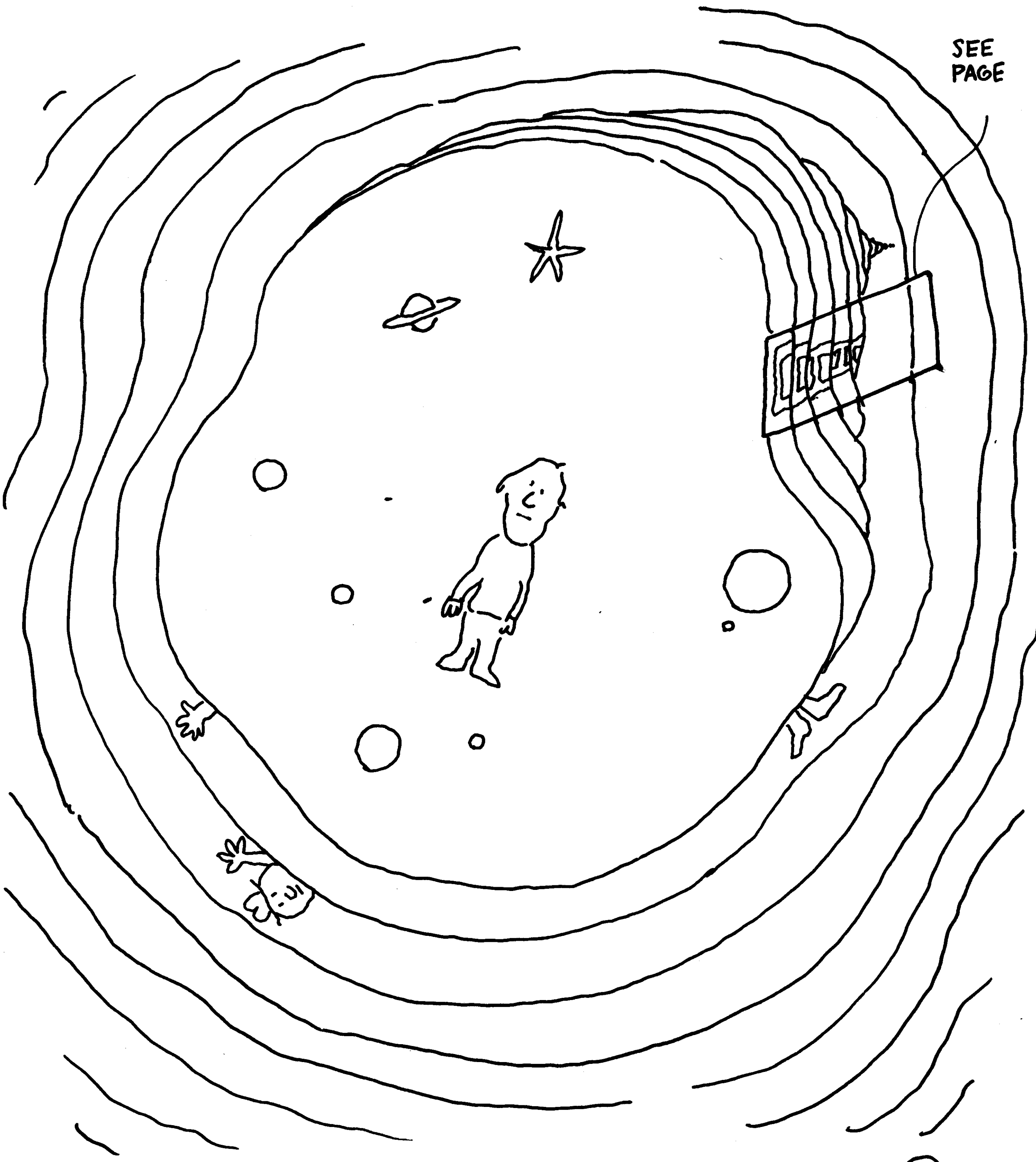
EACH INDIVIDUAL UNIVERSE CONSTRUCTION ALSO CONTAINS AN INDEFINITE NUMBER OF OTHER UNIVERSES, WITH ALL VARIATIONS AND ALL OTHER POSSIBILITIES



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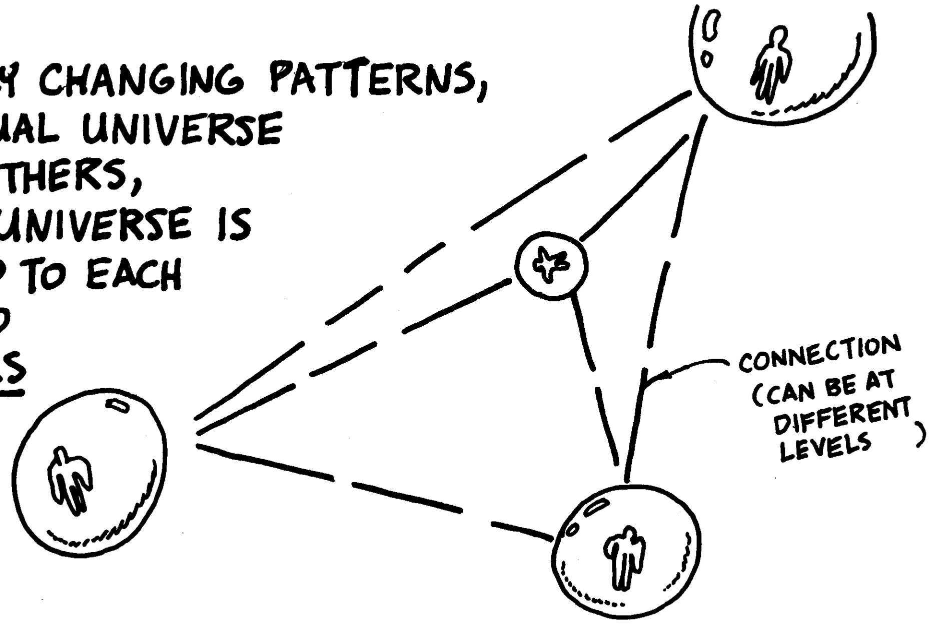
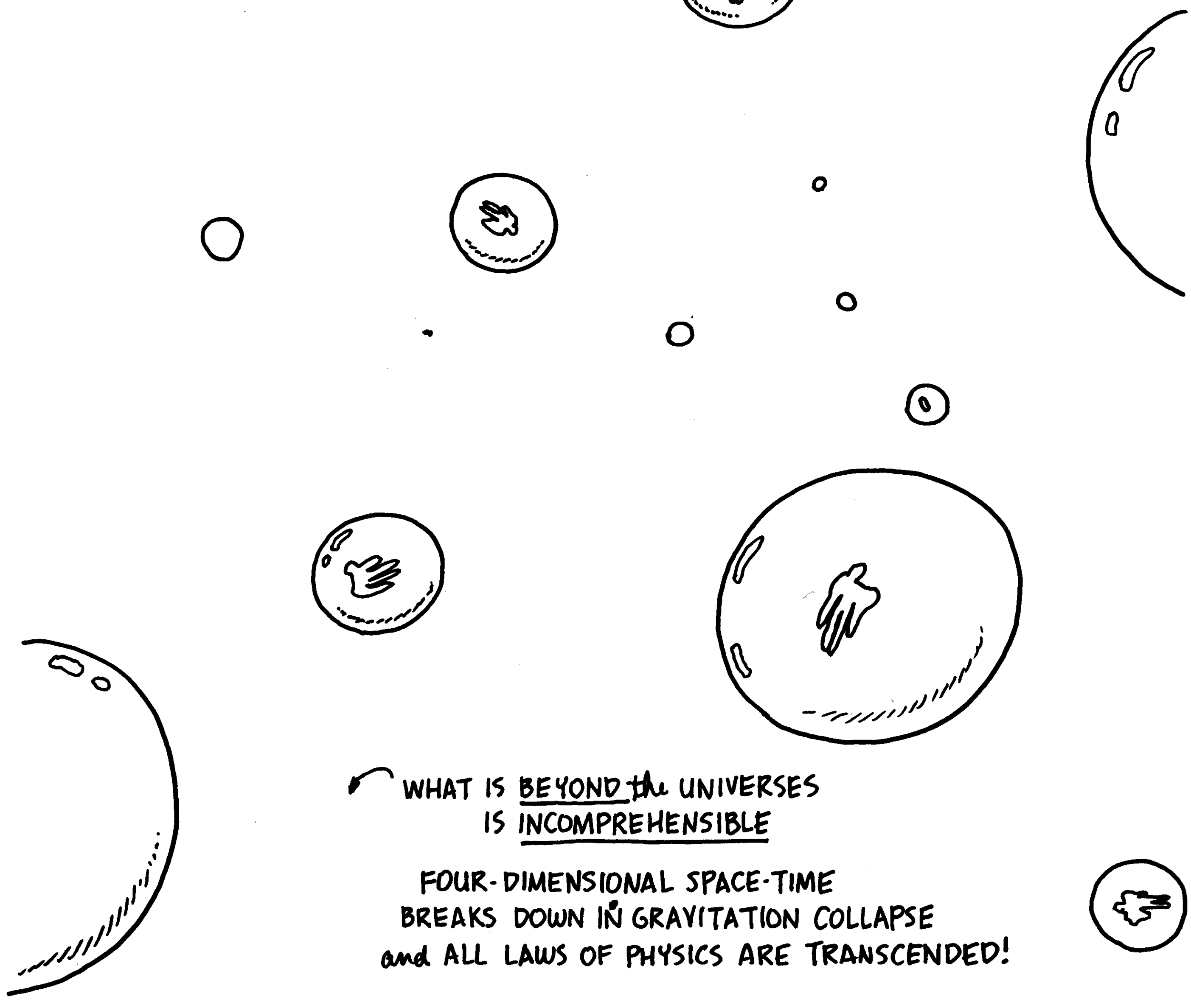
IN CONSTANTLY CHANGING PATTERNS,
EACH INDIVIDUAL UNIVERSE
FORMS ALL OTHERS,
AND EACH UNIVERSE IS
CONNECTED TO EACH
OTHER AND
<u>ALL OTHERS</u>



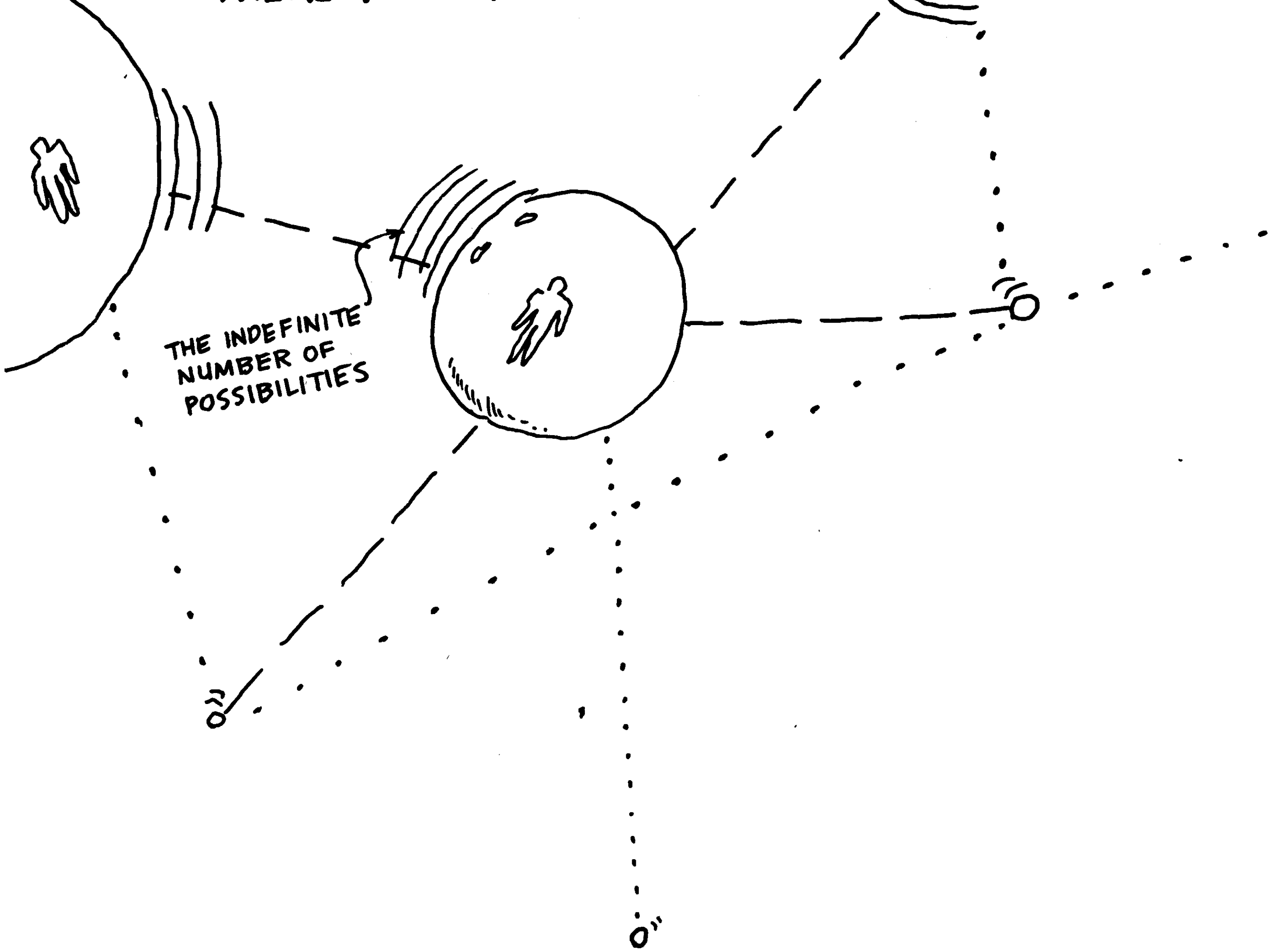


WHAT IS <u>BEYOND</u> the UNIVERSES
IS <u>INCOMPREHENSIBLE</u>

FOUR-DIMENSIONAL SPACE-TIME
BREAKS DOWN IN GRAVITATION COLLAPSE
and ALL LAWS OF PHYSICS ARE TRANSCENDED!

B

THERE IS NO BEGINNING
THERE IS NO END
THERE IS ONLY CHANGE



THE CONTINUALLY CHANGING CONNECTIONS AMONG THE INDIVIDUAL UNIVERSES AND THE FORMATION OF ALL THE INDIVIDUAL REALITIES CONSTITUTE A <u>CONTINUAL PROCESS</u>

<u>THERE IS NO BEGINNING AND THERE IS NO END</u>

EACH REALITY IS CONSTANTLY FORMING AND AFFECTING ALL OTHER REALITIES <u>BEYOND TIME</u>

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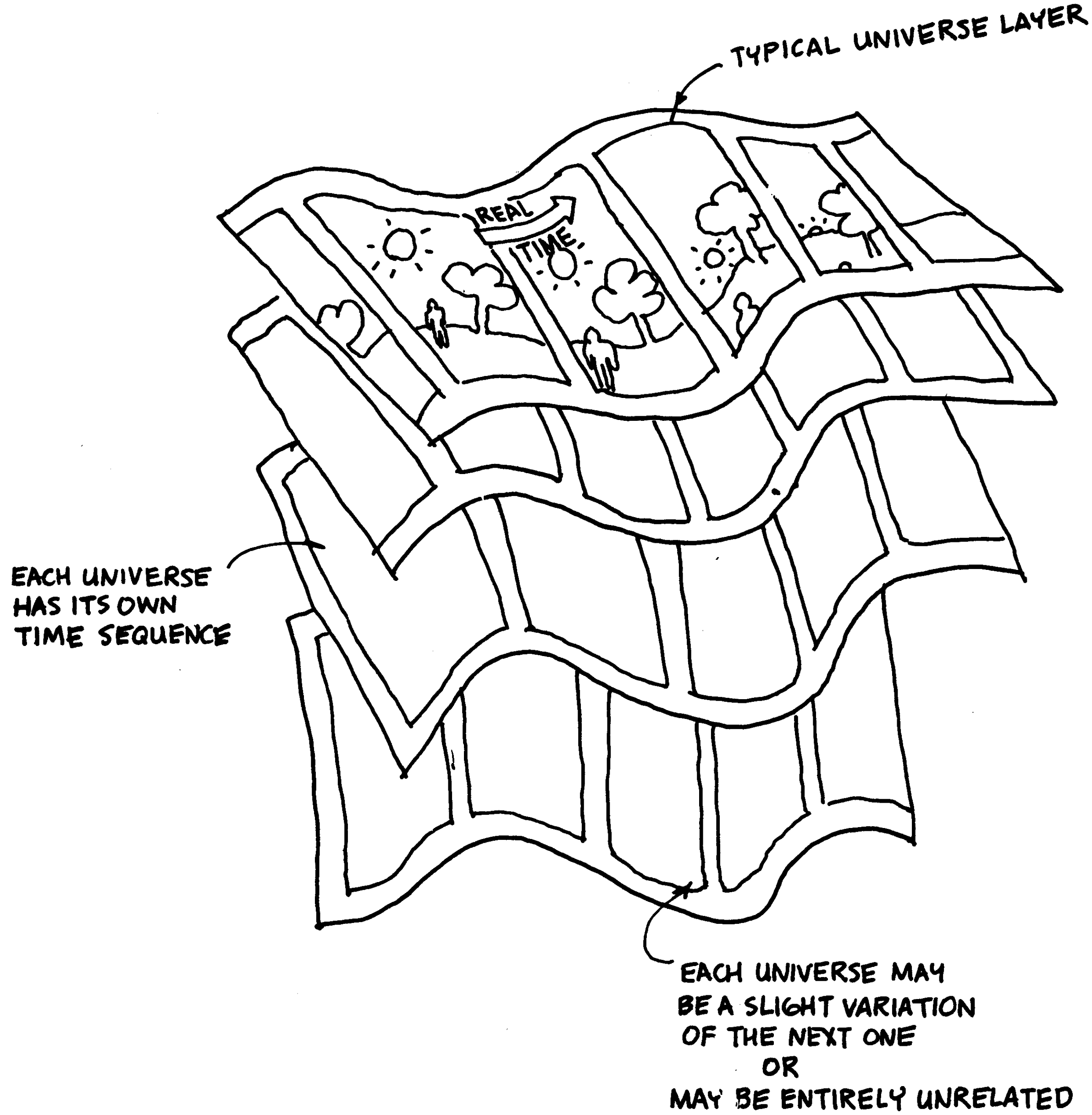
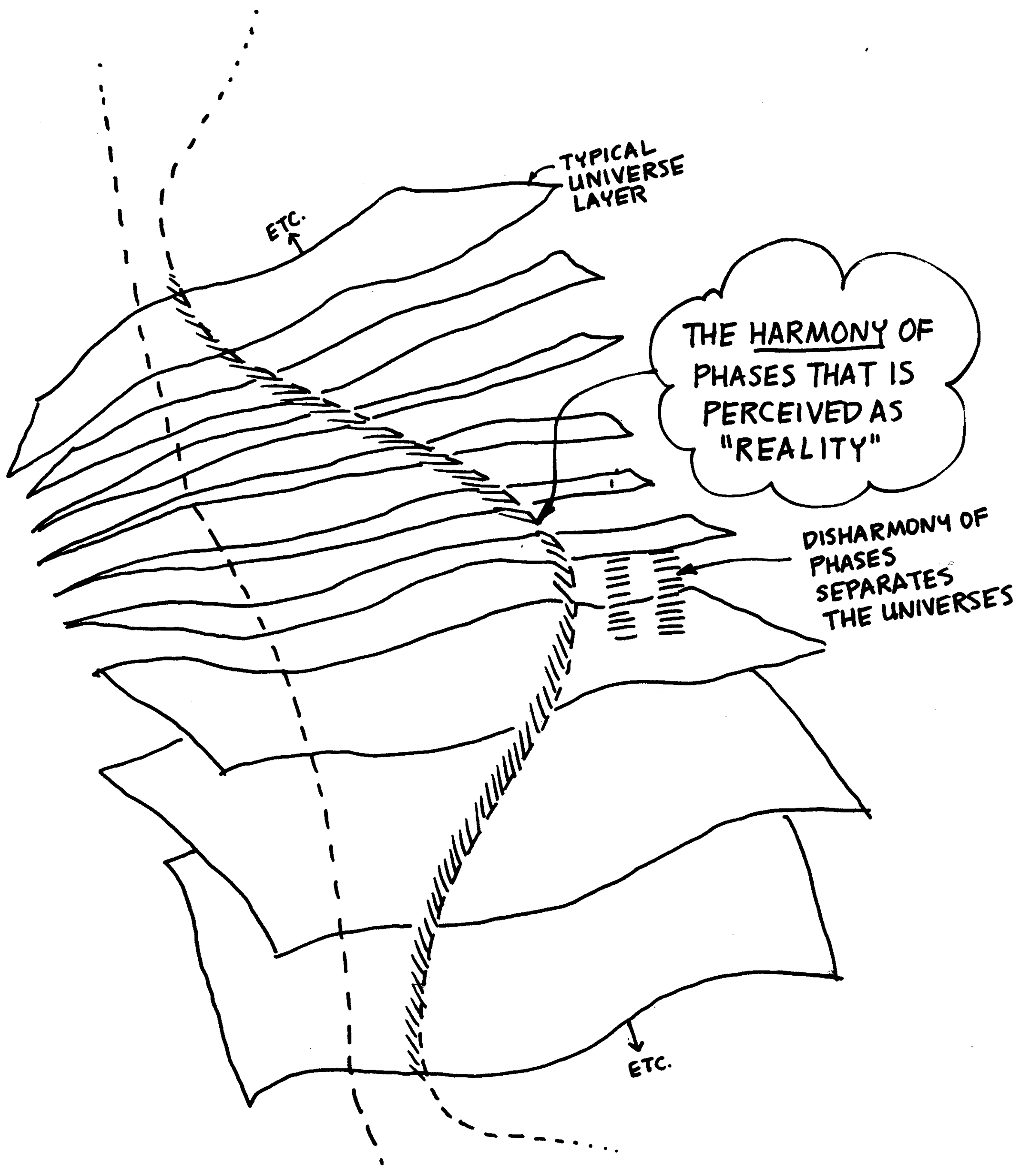
FOR EACH OF US, AN INDEFINITE NUMBER OF UNIVERSES EXISTS SIMULTANEOUSLY



(B)

THE "ORDINARY" REALITY WE PERCEIVE IS NOT ONE UNIVERSE

IT IS THE HARMONY OF PHASES OF MOVEMENTS OF AN INDEFINITE NUMBER OF UNIVERSES



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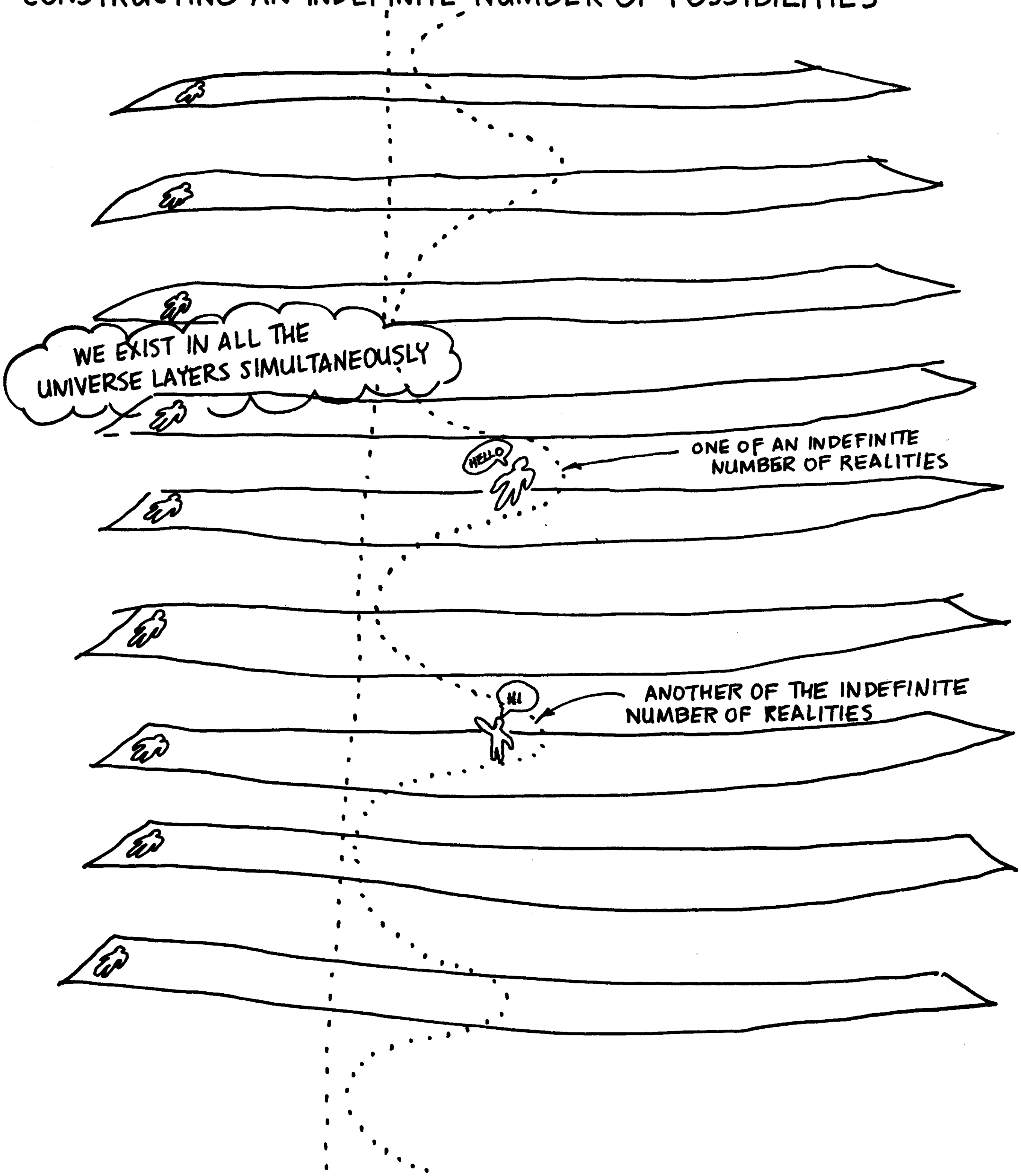
ALL THINGS ARE POSSIBLE!

THERE IS AN INDEFINITE NUMBER OF HARMONIES CONSTRUCTING AN INDEFINITE NUMBER OF POSSIBILITIES



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Einstein's theory of relativity has shown that space and time are not absolute, as originally thought. Similarly, truth in science is not absolute. All the scientist can do is make models that attempt to describe, predict, and explain experience. Science is simply a magical set of rules and attitudes that works in a certain limited context of experience.

> The basic texture of research consists of dreams into which the threads of reasoning, measurement and calculation are woven.
>
> ALBERT SZENT-GYORGYI

> What quantities are observable should not be our choice, but should be given, should be indicated to us by the theory.
>
> As far as the laws of mathematics refer to reality, they are not certain; and so far as they are certain, they do not refer to reality.
>
> Imagination is more important than knowledge.
>
> ALBERT EINSTEIN

> What we need is imagination. We have to find a new view of the world.
>
> RICHARD P. FEYNMAN

> For any speculation which does not at first glance look crazy, there is no hope.
>
> FREEMAN DYSON

I take great pleasure in acknowledging the understanding and patience of Sharon Allegra Moore and her invaluable help in preparing this commentary for publication.

A

May the universe in some strange sense be "brought into being" by the participation of those who participate? . . . the vital act is the act of participation. "Participator" is the incontrovertible new concept given by quantum mechanics. It strikes down the term "observer" of classical theory, the man who stands safely behind the thick glass wall and watches what goes on without taking part. It can't be done, quantum mechanics says.

J. A. WHEELER (with C. Misner and K. S. Thorne), *Gravitation* (Freeman, San Francisco, 1973), p. 1273.

The idea that consciousness is at the root of the material universe can be traced back to Parmenides, Bishop Berkeley, Alfred North Whitehead, and astronomer James Jeans, who said that the universe looks less and less like a big machine and more and more like a great thought. In physics, this point of view was initiated, perhaps unwittingly, by Niels Bohr and Werner Heisenberg (whose work on the uncertainty principle shows that the influence of the observer is unavoidable) and is now being carried forward by a number of other visionary physicists.

The new physics is based on Einstein's vision of a unified field theory, which has been neglected by the physics establishment. One of the major creators of the new physics is John A. Wheeler, who remarked in a lecture at the Oxford Relativity Conference, February 16, 1974: "There may be no such thing as 'the glittering central mechanism of the universe.' . . . Not machinery but magic may be the better description of the treasure that is waiting."

B

The idea that reality is composed of an indefinite number of coexisting universes is expressed in modern physics by Wheeler's concept of superspace. The singularities of space-time are exit and entry points connecting these different universes. The interpenetration of the universes can be pictured as a quantum mechanical scattering in superspace. If, as Kant says, space-time is a construct of the human intellect, then perhaps superspace is a construct of the cosmic intellect! According to Wheeler, a single point of superspace stands for an entire three-dimensional geometry (3-geometry). How can we think of a 3-geometry?

> Nothing illustrates a 2-geometry more clearly than an automobile fender. In whatever way coordinates are painted on its surface, in whatever way the points of that surface are named or renamed, the fender keeps the same 2-geometry. Similarly for a 3-geometry.
>
> J. A. WHEELER, "Superspace and the Nature of Quantum Geometrodynamics," *Battelle Rencontres 1967* (Benjamin, New York, 1967), p. 246.

Is the "surface" of a 3-geometry smooth? From far away, the surface of an automobile fender appears smooth. But if you look at it through a microscope the surface appears very rough. Similarly for the 3-geometry, where, according to Wheeler, "geometry fluctuates violently at small distances." Wheeler goes on to say:

> The space of quantum geometrodynamics can be compared to a carpet of foam spread over a slowly undulating landscape. . . . The continual microscopic changes in the carpet of foam as new bubbles appear and old ones disappear symbolize the quantum fluctuations in the geometry.
>
> WHEELER, "Superspace and Quantum Geometrodynamics," p. 264.

I have elaborated on Wheeler's imagery. The bubbles that continually appear and disappear in the geometry of space are miniblackholes and miniwhiteholes. Each can be of either positive or negative mass. The miniblackholes are virtual particles; the miniwhiteholes are virtual antiparticles. Virtual means that the particles have only a transient existence, being continually created and destroyed.

Each bubble contains a tiny singularity connecting different points in superspace. What do we mean by a singularity in space-time? To explain this most important concept, I quote the words of Roger Penrose:

> According to present-day theory, all the phenomena of physics take place within the framework of . . . the space-time continuum. . . There is the definite possibility that some future theory may be found which describes nature more accurately than the present theory, but for which the . . . picture of space-time would not be appropriate. We should not close our minds to such a possibility, but also we should keep in mind the extraordinary range over which the present-day view is such an excellent approximation. . . . We may take as a tentative definition of a *singularity,* a region at which curvatures have become so large that the local physics becomes drastically altered—perhaps because of a breakdown in the smooth . . . picture of space-time. . . . Singularities in space-time would be expected to result but . . . these singularities would not be visible from the outside. Instead there ensues something of the nature of a "hole" in space, into which objects can fall and out of which no object or signal can escape. . . . But even the present theory of space-time (and by this I mean Einstein's 1916 theory of general relativity) contains surprises and insights which are only just beginning to be explored in any detail. . . . It is my personal view that there is a deep connection between quantum theory and general relativity, so that it may actually be a mistake to attempt to build up the subjects separately.
>
> R. PENROSE, "Structure of Space-Time," *Battelle Rencontres 1967* (Benjamin, New York, 1967), pp. 121–125.

•

In the new physics, space-time (4-geometry) is not fundamental; superspace is fundamental:

> *Space-time* is a concept of limited validity. . . . There is no such thing as a 4-geometry in quantum geometrodynamics. . . . One can say that propagation takes place in superspace, but not by following any one classical history of space . . . (rather) *by summation of contributions from an infinite variety of such histories* . . . this extension of Feynman's concept of "sum over histories." . . . These considerations reveal that the concepts of space-time and time itself are not primary but secondary ideas in the structure of physical theory. These concepts are valid in the classical approximation. However, they have neither meaning nor application under circumstances when quantum geometrodynamical effects become important. Then one has to forego that view of nature in which every event, past, present or future, occupies its preordained position in a grand catalog called "space-time." There is no space-time, there is no time, there is no before, there is no after. The question what happens "next" is without meaning. . . . [Near the singularity] "events" and the "time ordering of events" are without meaning.
>
> WHEELER, "Superspace and Quantum Geometrodynamcs," pp. 252–253.

The reality we experience in ordinary states of consciousness is due to the constructive interference of the dynamic phases or "actions" associated with each of the indefinite number of coexisting universes. I suspect that consciousness may be able to alter the patterns of constructive interference to create separate but equally real realities.

The precise nature of the interpenetrating universes and the transitions between them by superspace scattering through the singularities is an exciting problem for the physics of the near future.

G

The conjectured biogravitational field would be a strong, finite-range gravity consisting of massive gravitons on a scale of approximately 10^{-4}cm, with a rest energy of approximately one electron volt and a strength comparable to that of electrical forces.

Each biograviton generates its own effective curved, multiply-connected space-time, controlling events on the scale of 10^{-4}cm, which is the scale of organization of biological processes.

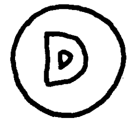
There might indeed be a hierarchy of finite-range gravitational fields, one for each major scale of organization of matter in space-time. The nuclear f-gravity field of Abdus Salam would be one member of this hierarchy.

The short range of action of these strong gravitational fields would ensure that the strong gravity forces could not act over large distances, in accord with experiment. Even if the range began to be appreciable, the strong gravitational force in the presence of virtual negative mass fluctuations might be confused with the more conventional quantum electromagnetic forces. For example, on the f-gravity level, the strong gravitational force is not recognized as such but is interpreted as an independent nuclear force by physicists using a phenomenological approach. (Negative mass saturates the strong gravitational force in the atomic nucleus.)

The entire hierarchy of gravitational fields could be generated as collective features of the fundamental Einstein gravitational field. This is described in my cosmic bootstrap hypothesis, which is in the spirit of a unified field theory (see note Q).

The Russians A. Dubrov and V. Anisimov also have investigated the possibility of a biogravitational field that would organize living matter. The Russian work does not appear to recognize the necessity of a strong finite-range interaction. Ordinary gravity would be much too weak to play a significant role in biological phenomena.

Most scientists believe that a biogravitational field is not needed to explain biological organization. They believe that the DNA code contains all the information needed to shape biological systems.



As perceived from within space-time, living systems are self-organizing. Self-organization is a characteristic feature of the gravitational field that determines the very shape of space itself. Gravity and living systems are nonlinear. They self-organize. In the case of living systems, orderly growth is coded into DNA molecules. Nonlinearity in electrochemical reaction pathways of biological processes provides feedback patterns that are responsible for self-organization. On a deeper level there may be self-organizing biogravitational fields whose structure determines the shape of biological molecules, cellular differentiation, and the overall shape of living systems.

E

I

Self-organizing fields generate matter. Einstein repeatedly stressed this view in his unified field theory, where the particle is simply a singularity or very high space-time concentration of the nonlinear master field. De Broglie and Bohm formulated quantum theory along similar lines. They conceived of a particle as a singularity in a wave field. The particle is guided by that wave field. A recent experiment by Holt seems to confirm the findings of de Broglie and Bohm. However, more experiments are necessary to settle the issue. I have recently discovered what may be a direct connection between Einstein's point of view and that of de Broglie and Bohm.