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2 | Occam's Razor and the Nutshell Earth

I could be bounded in a nutshell and count myself a king of infinite space.

Shakespeare, *Hamlet* II:2

There is an old joke about a drunk who, late one night, found himself leaning against a circular pillar. He walked around it several times, patting it, then sank to the ground. "S'no use," he groaned. "I'm all walled in."

Incredible as it may seem, there was once a flourishing religious cult in Florida called Koreshanity, whose guru taught that the earth is hollow and we live on the inside. Almost as hard to believe is that this crazy theory still has defenders. But before explaining how the theory raises deep questions concerning the role of simplicity in science, and drawing a parallel with parapsychology, a few words about the Florida colony.

The founder, Cyrus Reed Teed, began his career as a Baptist fundamentalist and an eclectic doctor. (Eclecticism was a fringe medical school of the late nineteenth century that stressed herbal remedies.) In 1869 Teed experienced what he called his Great Illumination. An angel revealed to him that the earth is a hollow shell and that we live on its inner surface. The sun, moon, and stars are all tiny objects moving about inside the sphere, obeying complicated laws that Teed struggled to explain in his 1870 book *The Cellular Cosmogony, or the Earth a Concave Sphere*.

Calling himself "Koresh" (the Hebrew word for Cyrus), Teed was convinced that God had called him to be the founder of a new faith, that the scientific establishment was persecuting him just as they had persecuted Galileo, and that anyone who doubted the earth's concavity was in the grip of the Antichrist. In the late 1890s he began moving his colony of believers from Chicago to a spot south of Fort Meyers, on Florida's Estero River, where he established the town of Estero. The cult's magazine the *Flaming Sword* did not expire until 1949, after an astonishing life of some 60 years. According to an article in *Southern Living* (May 1984), eight

of the cult's thirty buildings still stand and others are being restored. You can take a guided tour through them at the Koreshan State Historic Site, off U.S. 41, in Estero.

Old pseudosciences seldom die completely. In Hitler's Germany an aviator named Peter Bender became the leader of the *Hohlwelttheorie* (hollow-earth doctrine), which championed an inside-out cosmos. After his death the cult continued under the leadership of Karl Neupert, whose *Geokosmos* (Zurich and Leipzig, 1942) was the most widely read of his books. Other German books defending *Hohlwelttheorie* were published, and similar monographs popped up in Argentina.

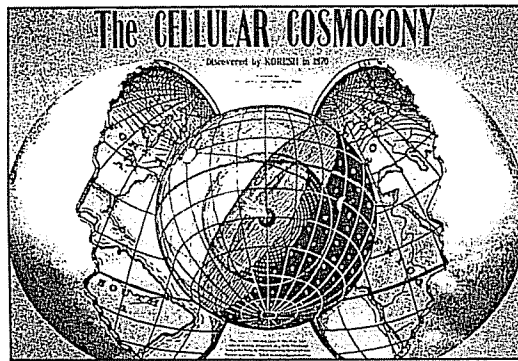
About ten years ago, a firm in Nevada City, California, was selling a 1972 English translation of a 1949 German book by Fritz Braun titled *Space and the Universe According to the Holy Scriptures*. The book went through several revisions in Germany, where the English translation was also published. I was unable to obtain any information about the Nevada City group. Braun's most unusual additions to the inside-out model are his putting God's throne in the center of the shrunken universe, within a metal sphere, and locating hell in the boundless region outside the earth. This conforms (Braun argues) to the Bible's picture of heaven as up, hell as down.

The inside-out model recently found its most sophisticated defender in Mostafa A. Abdelkader, of Alexandria, Egypt. Two of his papers were abstracted in the *Notices of the American Mathematical Society* (October 1981 and February 1982), and his article "A Geocosmos: Mapping Outer Space Into a Hollow Earth" was published in *Speculations in Science and Technology* (vol. 6, 1983, pp. 81-89), an Australian journal devoted to unorthodox science. The noted philosopher Paul Feyerabend is on its editorial board.

Although Abdelkader acknowledges his indebtedness to Braun, he gives to the concave-earth model a mathematical precision lacking in all earlier accounts. Imagine the earth's surface to be a perfect sphere. Using simple equations, Abdelkader performs on space what geometers call an "inversion" with respect to the sphere. All points outside the sphere are exchanged with all points inside. The sphere's center maps to infinity, and infinity maps to the center. Inversion theory is often used by geometers for proving



Cyrus Reed Teed, "Koresh"



Left: Drawing of Teed's concave-earth cosmogony. (Courtesy Donald F. Simanek.)



Right: Karl Neupert, another promoter of the hollow-earth doctrine.

difficult theorems, and it has been extremely useful in physics.

After inverting the cosmos, Abdelkader then applies the same inversion to all the laws of physics. The result is a consistent physics that cannot be falsified by any conceivable observation or experiment! Of course the equations for the laws become horribly complex. Light rays follow circular arcs, the velocity of light goes to zero as it approaches the center of inversion, and all sorts of other bizarre modifications of laws are required. To an observer in this inverted universe everything looks and measures exactly the same as in the Copernican model, even though the heavenly bodies become minuscule. Day and night, eclipses, and the orbits of the sun, moon, and planets—everything—can be explained by suitably inverted laws. Instead of the earth rotating, the shrunken celestial bodies revolve the opposite way around the earth's "axis." Because light follows curved paths, the sun seems to set as usual below the "horizon" as it travels a conical helix, six months in one direction and six months in the other. The Foucault pendulum, Coriolis effects, and other inertial "proofs" of the earth's rotation are all accounted for by the drastically modified laws.

Could you confirm the theory by taking off in a spaceship to see if you would quickly reach the other side by following a diameter of the sphere? No, because the closer you got to the center of inversion the smaller your ship would become and the slower it would move. You would soon find yourself traveling through what would appear to be vast galaxies. If the universe before inversion was open and infinite, you would never reach the center. It would be a singularity at which your size and speed would be zero, and time would stop completely. Of course you could avoid the

singularity and get to the other side, but the trip would take as long as traveling to the outer edge of an expanding Copernican universe, and back again. The fastest way to get to the other side would be to fly around the inner surface of the hollow earth.

Abdelkader says his main reason for believing in his inverted model is the relief it brings from the anxiety of thinking the universe is so immense that the earth fades into insignificance. Braun earlier expressed the same emotion by writing that once you accept his model "the fearful distances of billions of light years, the infinite emptiness and senselessness" of the Copernican model disappears. A Freudian would say that the inside-out universe expresses an unconscious urge to return to the warmth and security of the womb.

Nowhere does Abdelkader invoke the Koran or his religious faith, though I suspect that Muslim fundamentalism lurks in the background in the same way that Christian fundamentalism underlies flat-earth theories and the cosmological models of Teed and the German concave-earthers. Teed liked to quote Isaiah 40:12, "[God] hath measured the waters in the hollow of his hand." Abdelkader also thinks that cosmic rays are best explained by his cosmology and that a definitive test of his model could be made by drilling a hole straight down through the earth. If his model is correct, would it not penetrate the earth's shell and open a hole to outer space?

It would not. A true inversion of infinite space would produce an infinitely thick shell of solid rock all the way to eternity. As the drill went "down," it would get larger and longer, and move more rapidly, until it passed through the "point at infinity," which corresponds to the earth's center before inversion. After that, the drill would start boring into the earth on the opposite side. The drill would emerge from the earth at a point antipodal to where it began drilling.

The matter is controversial, but most mathematicians believe that an inside-out universe, with properly adjusted physical laws, is empirically irrefutable. Why, then, does science reject it? The answer is that the price one has to pay in complicating physical laws is too high. A similar situation arises in relativity theory. There is nothing "wrong" in supposing the earth fixed, as Ptolemy believed it was, with the cosmos whirling around it. The question of which frame of reference is "right," a fixed earth or a fixed universe, is as meaningless as asking whether you stand on the earth or the earth stands on your feet. Only relative motions are "real," but the complexity of description required when the earth is taken as the preferred fixed frame is too great a price to pay.

The opposite is the case with respect to choosing between Euclidian space and the non-Euclidian spacetime of general relativity. It is possible

to preserve Euclidian space and modify the laws of relativity accordingly—indeed, just such a proposal was advanced by Alfred North Whitehead—but here simplicity is on the side of non-Euclidian space. In the space-time of relativity, light continues to move in straight lines, rigid objects do not alter their shapes, and gravity becomes identical with inertia. It is only when we talk in a Euclidian language that gravity bends light, objects contract at fast relative speeds, and gravity and inertia appear as distinct forces.

Conventionalism is the term used for points of view that emphasize the extent to which mathematicians and scientists adopt basic axioms not because they are “true” but because they are the most convenient. Rudolf Carnap called it the “principle of tolerance,” which he once expressed by saying, “Logic has no morals.” One is free to adopt any set of axioms provided the system that follows is consistent and useful. One primary criterion of usefulness is simplicity. The inside-out model of the universe is rejected not because it is “untrue” but because an application of Occam’s Razor—the law of parsimony—makes the Copernican model enormously simpler.

Abdelkader’s geocosmos poses an extreme example of a choice between two conventions, one simple and the other insanely complicated. But on all levels of science Occam’s Razor is a powerful tool. I will cite only one instance from thousands in the literature of psychic research. When parapsychologist Charles Honorton saw his friend Felicia Parise seemingly use psychokinesis to move a plastic pill bottle across a kitchen counter, the film of this great event showed her hands creeping slowly forward on each side of the bottle. The simplest explanation is that an “invisible” thread, stretched horizontally above the table from one hand to the other, propelled the bottle. The bottle even moved in little jumps, just as it would if friction resisted the pressure of an extremely fine, slightly elastic nylon thread. This conjecture gains support from the facts that Honorton did not know that invisible thread could be used in this manner to move light objects away from a person, that he did not examine Felicia’s hands before the experiment, and that Felicia has never repeated the miracle.

Why do some parapsychologists, after simple tricks like this have been explained to them by magicians, refuse to thank the explainers or to alter their beliefs about the genuineness of the phenomena? Occam’s Razor suggests the following hypothesis: They lack the courage to admit that, like the drunk, they had patted a pillar instead of a surrounding wall.

Addendum

Here is how geometrical inversion works for inverting the plane with respect to a circle. Exactly the same procedure inverts space with respect to a sphere.

Let o be the circle’s center, r the radius, and p any point inside the circle. The inverse of p is p' outside the circle. The two points lie on a straight line with $(op)(op') = r^2$.

Given p , its inverse can be located by the simple procedure shown in the illustration. Draw a perpendicular from p to the circle’s circumference at point x , then extend a tangent to x (a line perpendicular to r). It will intersect the horizontal line at p' . Reversing the construction locates p when p' is given.

The point at the center of the circle (or center of the earth) goes to infinity after inversion. This of course alters the topology as well as the metric of the universe, leading to such causal anomalies as the drill that goes through the center of the inverted cosmos to emerge on the sphere’s opposite side. Philosophers of science disagree over whether causal anomalies of this sort prevent an inside-out universe from being empirically refutable. For a good discussion of this curious controversy, see “Quine on Space-Time,” by J. J. C. Smart, in *The Philosophy of W. V. Quine*, edited by Lewis Hahn and Paul Schilpp (Open Court, 1986).

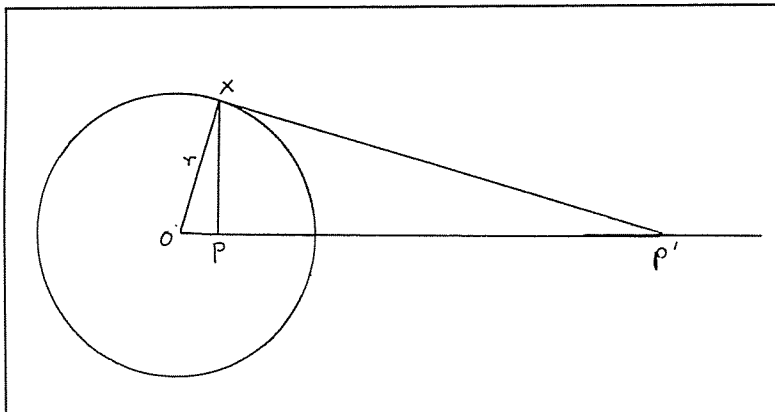
Inversion of the universe can be performed with respect to any sphere, a fact that prompted the following letter from Forrest Johnson, of Goleta, California. It appeared in the *Skeptical Inquirer*, Winter, 1989.

I was interested to read Martin Gardner’s column about Abdelkader’s inversion hypothesis (*SI*, Summer 1988), which holds that the earth is inside-out and the rest of the universe is within. However, I would like to suggest an alternative.

Suppose, not the earth, but the moon were inverted. The earth would orbit inside of the moon, and everything else would be within the earth’s orbit. The same mathematics that support Abdelkader’s inversion hypothesis would support my lunar inversion hypothesis. In fact, there is no scientific reason to prefer one to the other. Anyone who agrees with Abdelkader’s hypothesis must agree that mine is equally plausible.

But—oops!—what about Mars? Could it be inverted? How about the sun? Or Alpha Centauri? Or some planet in a distant galaxy? The same model would support any of them as containing the universe. There is nothing special about the earth; the others are just as likely.

Suppose there are 10^{23} eligible bodies in the universe. Then the chance that we happen to be standing on the inside of the particular one that contains the rest is $1/10^{23}$, or pretty close to zero.



How to invert a circle . . .

Therefore, even if we accept Abdelkader's reasoning and agree that the universe is inverted, it still requires a leap of faith to believe that we are on the perimeter. We would, much more likely, be a tiny speck near the center of a vast and unknown world. A humbling thought!

The many-worlds interpretation of quantum mechanics is another theory that seems empirically nonfalsifiable, but such an extreme violation of simplicity that only a small minority of physicists are willing to defend it.

3 | Wilhelm Reich, the Rainmaker

Of the many fringe psychotherapies that flourished in the fifties, the two most bizarre were each founded by a paranoid egotist who had not the foggiest understanding of scientific method or even of the fields in which he claimed revolutionary discoveries. One was Scientology, the other was orgonomy.

Orgone energy—an energy no physicist outside orgonomy circles has detected—was “discovered” by Wilhelm Reich, who began his tragic career as an Austrian associate of Freud. After being expelled from the German Communist Party, and later from the International Psychoanalytic Association, Reich eventually settled in the United States, where he established a “laboratory” at Rangeley, Maine. Reich first discovered orgone energy in living things, hence its name, but he soon became convinced that it was a primeval force responsible for the evolution of the universe, for gravity, for life, and for the energy released in sexual orgasms. He announced that he had created living cells from inorganic matter and that cancer cells are actually protozoa that “have a tail and move in the manner of fish.” Orgone energy, he insisted, made the sky blue and caused stars to twinkle, as if physicists hadn't long understood such phenomena.

Reich's main therapeutic tool was what he called an “orgone accumulator.” It is a box about the size of a phone booth, its walls made of alternating layers of metal and organic material. (One is on display in St. Louis's National Museum of Quackery.) There are no electrical connections. You sit inside to soak up orgone energy that accumulates inside the box like heat in a greenhouse. The concentrated orgone is said to relieve symptoms of almost every illness from cancer to impotence. Smaller models, such as the shooter box, the orgone blanket, and the orgone funnel, apply orgone to ailing body parts.

Thousands of intelligent people with only a dim knowledge of science—including writers, artists, actors, educators, even philosophers—sat inside orgone boxes and believed they were enormously benefited. The comic Orson Bean sang the praises of orgonomy in his book *Me and the Orgone*.