

The universe is subtle but not bizarre

This title is a paraphrase of Albert Einstein's famous declaration "Raffiniert ist der Herrgott aber boeshaft ist er nicht." It expresses a firm conviction among at least some physicists that the universe is orderly and will yield its mysteries to human intelligence. The ancient role of physics was to banish monsters from the woods and bring order out of chaos. However, today a majority of professional cosmologists believe that all manner of bizarre life forms exist in infinite numbers.

If one's assumptions lead to bizarre physical consequences, and these resist resolution for long times, physicists should ask whether a fundamental change in those assumptions is necessary. Cosmology, the study of the universe at large scales and near the time of the big bang, is the branch of physics where false assumptions will most rapidly lead to bizarreness.

There is currently a standard cosmological model (SCM). Its basic premises are that the universe on large scales is homogeneous and isotropic and the earth does not stand at a preferred location. This latter premise is attractive, at least superficially, since it seems to be an

extension of Copernicus' idea that the earth is not the center of the solar system. It has been elevated to a principle: the so-called "Copernican Principle". Any two of the fundamental premises imply the third. The major source of support for the three premises is the remarkable isotropy of the cosmic background radiation (CBR). Apart from one part in 100,000 fluctuations, the CBR looks the same in every direction. However, without assuming the "Copernican Principle", isotropy does not, by itself, imply homogeneity. In addition, even if it is ultimately established that the visible universe is homogeneous, it is an additional unproven assumption that this homogeneity extends to infinity. Many cosmologists believe that our visible universe lies within a "multiverse", an infinite vat of chaotic bubbles without beginning or end. One should note that Copernicus did not say there was no center of the solar system (his universe), only that the earth was displaced from that center.

The assumption of homogeneity has philosophical implications. Everything, that can happen, happens infinitely often. This implies that every individual of every species has an infinite number of identical twins.

In addition, every type of monster that is biologically possible, even if it is not known to exist on earth, exists at an infinite number of locations at each instant of time.

A related problem that directly attacks the power of physics theory is the "measure problem". In an infinite, homogeneous universe, since every event occurs an infinite number of times, all probabilities are proportional to the undefined expression: infinity over infinity.

It is reasonable to ask whether there exist viable alternative cosmological theories that avoid the bizarre properties of the standard model. Gary Goldstein and I have proposed that there exists only a finite amount of matter. This avoids the [weird features](#) of the standard cosmology and is [consistent](#) with Einstein's theory.