# The Interaction of Our Universe with a Universe Based on Fundamental Principles and Constituents that are Different than Ours: Problems and Possibilities

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**Abstract.** Let us suppose that universes can exist that are based on different fundamental principles than ours, have constituents that are different than ours (particles and fields), and for which the fundamental constants (if any) are different from ours. We will refer to a universe showing any of these differences as an *alternative universe*. A universe might have only minor differences from ours, such as in the values of some fundamental constants, and in that case we will refer to it as a *parallel universe*. However, universes in general could differ substantially from ours. For instance, Tegmark (2007) has suggested that the various types of fundamental principles a universe could have might correspond to the set of all mathematical structures. Furthermore, because there is considerable diversity in the forms of mathematical structures, this view implies that there could be a considerable range in the types of universe that are possible. Even supposing there are alternative universes, it is not known whether any of them could interact with ours. (By *interaction* is meant the ability for a universe to produce a change in another universe.) However, we will assume that some of them can, and more specifically localized change, on the constituents of our universe. The question we will ask in this article is: if a localized change is made in our universe by an alternative universe, are there any general characteristics of the change and if so, what? Presumably the changes made would reflect the differences in basic principles between the two universes. If the other universe is a parallel universe, with the only difference being relatively small changes in the fundamental constants, probably the only changes to our universe would be within the limits that the differences in fundamental constants would allow. On the other hand, the conservation laws are a central feature of our universe. What happens if the other universe lacks any or all of our conservation laws? Presumably the localized changes made to constituents of our universe would then not be in accord with our conservation laws. But the fundamental principles of our universe provide that the conservation laws should be consistent over the system they pertain to. An extra jolt of energy, for instance, cannot suddenly be added to one particle in a system for no reason. So if an alternative universe adds this jolt, the further motion of that particle, and of other particles which become affected, would perturb the system. Clearly, random changes from such a universe to ours would be undesirable. It is of interest to note, however, that we have no evidence that random perturbations of this kind are occurring in our universe. It's possible that they are occurring and we don't recognize them. Or perhaps there is some effect we don't know about that prevents changes that are incompatible with our physical laws from entering the universe. Or perhaps our assumptions are wrong, and there are no alternative universes, or none that differ substantially from ours. Another alternative for producing localized changes, which circumvents the above problems, is also explored.