EQUIVALENCE PRINCIPLE

James A. Putnam

It is believed by relativists that because a person in free fall experiences no sense of being under the influence of a force, there is, for him, no force of gravity. He is merely doing a very natural thing as explained by the general theory of relativity. In general relativity the force of gravity does not need to be explained any more than does the experience of moving at a constant velocity with no resistance.

This claim gives gravity a different nature from all other forces. If physical unity exists at the true fundamental level, then it requires that gravity have the same nature as all other forces. For this kind of unity, Einstein's claim must be wrong. This claim is his *Equivalence Principle*. The error he made was to ascribe something to gravity that belongs to all acceleration. In principle, a body undergoing pure acceleration will feel nothing. The cause of the acceleration is not a factor if the acceleration is pure and complete in its application.

There is certainly something felt during most acceleration. What is it? What is felt is distortion and compression. These effects are the result of uneven acceleration. If a body is pushed on one side only it will undergo compression. If a body is pushed at one small part only it will undergo both compression and distortion. We feel the effects of changes in the distance between our molecules and atoms. We feel nothing if all particles in our body suddenly accelerate in perfect unison. During free fall due to gravity this situation is very closely approximated.

What, then, is to be said of the principle of equivalence? Let us examine a common example cited in support of this principle. The example is of a sequestered scientist inside a windowless room. The point stressed is that there is no way for the scientist to determine the difference between the effects of gravity or the effect of acceleration. Since the scientist cannot devise a test to determine why he remains standing on the floor, the conclusion is made that gravity and acceleration are the same phenomenon. In other words, if we can't tell the difference then there is no difference.

There is a revealing connection between this example and the importance of first properly understanding force. The connection is: An analysis of force tells us there is a difference for the scientist between the gravity situation and the acceleration situation. In the case of gravity, we know that there are two forces at work on the scientist. Gravity exerts a force on him trying to pull him downward. The floor of the room is exerting a second and separate force pushing upward against him. There are two equal but opposite forces at work. These two forces cause compression and distortion. In the case of acceleration there is only one force at work on the scientist. This force is the floor pushing him upward. It also causes compression and distortion. Therefore, the difference between the two situations is a difference in the number of forces felt.

The fact that the scientist cannot distinguish between the two cases does not prove that gravity and acceleration are equivalent. All he needs is a window to prove they are different. The available decisive empirical evidence is hidden from him due to the lack of a window or, better yet, a glass room. This is a scientific experiment and must be properly set up. It must enable the scientist to gather the necessary empirical evidence in order to properly interpret the phenomenon. There is either a material source of gravity which is stationary with respect to him or there is not. This is the decisive evidence that the windowless room makes unavailable to him. If he finds there is no source of gravity present, then he must be experiencing acceleration.

What the scientist does learn in the windowless room is: We cannot distinguish between different combinations of force so long as they add up to the same effect. In these two cases the effect felt is not acceleration. It is almost identical compression and distortion to the scientist's body. However, force does not need to be felt. Therefore, it is all force that should be investigated as having a common nature. The equivalence principle belongs to all force.