Does Gravity exist everywhere?

The famous French astronomer Arago wrote, "Were we not to see falling bodies every minute, we would count it a most surprising thing. By force of habit we regard gravity, the attraction the earth has for everything on it, natural and common. But when we are told that objects also attract each other, we can hardly believe it, since, generally, we never notice it.

Why is it, indeed, that the law of gravitation does not manifest itself anyways? Why do we never see tables, watermelons, or people attracting one another? Because for small objects the force of attraction is exceedingly small. Here is a graphic instance. Two persons at a distance of two meters apart do pull at each other. But the force exerted is minute, being under 0.01 mg for people of average weight. In other words, two persons pull at each other with the same force that a 0.00001-gram weight exerts on the scale pan. Only the extremely sensitive type of scales that scientists use in their laboratories will be able to register such a tiny weight. It goes without saying that this force will never affect us, being completely offset by the friction between our soles and the floor. To push a person standing on a wooden floor- where the friction between the soles and the floor is equivalent to 30 percent of his weight- you must exert a force of at least 20 Kg. And to compare that with the negligible pull of the hundredth of a milligram is simply ridiculous. A milligram is a thousandth of a gram; a gram is a thousandth of a kilogram, consequently 0.01 mg is exactly half of a thousand millionth of a force needed to pull a person away. Small wonder that in ordinary circumstances we never notice the mutual attraction that exists between objects.

But if friction were nonexistent, there would be nothing to prevent even the faintest of pulls from bringing bodies together. In our case of a force of 0.01 mg,

however, the speed with which the two persons, 2 meters apart, would draw closer to each other by 3 cm in the first hour, by 9 cm in the next hour, and 15 cm in the third hour; as you see, speed increases, the closer the two draw together, nevertheless it would take another five hours before the two persons would be drawn together.

Gravity is evident in cases when friction presents no obstacles, or, in other words, in the case of bodies at rest. It will act on a weight hanging on a piece of thread, causing it to dangle vertically down. However should there be some massive object nearby, it will pull the weight towards itself, making the thread deviate slightly from the vertical in the direction of the resultant between gravity and the pull of the massive object.

This was first observed by Maskelyne in 1775 near a bug mountain in Scotland. He compared the deflection of the plumb line with the direction towards the celestial pole on either side of the mountain. Subsequent more elaborate experiments conducted with the aid of specially devised scales, enabled scientists accurately to gauge the force of gravity.

The force of attraction between small masses is negligible. As the mass increases, so does the force of attraction increases accordingly, in direct proportion to their product. Many, are prone to exaggerate this force. A person, not a physicist tried to assure that the frequently observed mutual attraction between the ships at sea was a result of gravitation. However, it is easily reckoned that the gravitation has no role in it. Two 25,000-ton battleships will attract each other with a force of only 400g, when they are 100 meters apart. This is naturally too little for the ships

to move. The reason for this attraction is entirely different.

Though negligible in the case of small masses, gravitation proves to be quite a force when we have to do with the colossal masses of the celestial objects. Even the distant planet of Neptune, right out on the rim of the solar system attracts the earth towards itself with a force of 18 million tons. Despite the tremendous distance between the sun, and us it is only the gravitation that keeps the earth from straying off its orbit. Were the sun to cease its attraction, this planet of ours would dash off at a tangent to its orbit to race headlong into the infinite reaches of space.