第5回サルビア講座

A Study of the Universal Gravity

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In his speech at the Royal Society in 1884, Lord Rayleigh referred that increasing knowledge brings with it increasing power and great as are the triumphs of the present century we may well believe that they are but a foretaste of what discovery and invention have yet in store for mankind. In this age of rapid progress, when newly developed technology becomes obsolete in a few years, his criticism must be more conspicuously justified.

When I ponder the discovery of the universal gravity and thereafter, which is the major subject of the present extension lecture, so called, the Salvia lecture, I feel as if we live in the same age contemporary with Lord Rayleigh; we have understood a lot of things associated with the universal gravity beyond the laboratory scale over the galaxies in the end of the last century, while much more secret things must be hidden behind our established knowledge.

On the above basis, I presented in my lecture how the universal gravity was discovered and developed up to the modern times. The history of the universal gravity started with a naive theory of Aristotle of 4 BC. Through J. Kepler and G. Galilei, I. Newton finally arrived at the goal of the universal gravity. Of course, this was a great step toward correct understanding of the nature. However, at the same time, he assumed the absolute time and space, whose existence was not approved by G. Galilei but has been believed for a long time until A. Einstein released the theory of special relativity in 1905 guided by the Lorentzian transformation, general concept of the Galileian transformation. In fact, the theory of the special relativity could satisfactorily explain invariance of light velocity which was experimentally established by A. A. Michelson and E. W. Morley in 1887. Invariance of the light velocity led to the negative of Ether which was introduced as a possible medium of the light propagation by I. Newton. A. Einstein proved that the space and time were closely connected to the universal gravity by his theory of the general relativity published in 1916, which was experimentally verified by the British physicist in 1919.

Astronomers and physicists can easily understand that the only fields where the universal gravity plays a dominant role is the galaxies because the gravitational force is far smaller than, for example, the electromagnetic force as far as the system is concerned with the laboratory scale. Therefore, many scientists oriented their special interest to the gravitational phenomena occuring in the universe. One of them is the discovery of the black hole and neutron star; the former is formed when its mass is large enough to deform the space and time surrounding the star to inside bend the light trajectories, and the latter is formed in the supernovae, the last evolution step of the stars.

A possible subject in the future might be the GW (Gravitational Wave) and the WINPS (Weakly Interacting Massive Particle). The GW was, for the first time, predicted by A. Einstein but its direct evidence has not been experimentally proved though indirect observation was already done by observing the change of signal periods for the neutron stars binary. In the many laboratories in the world, the detector (antenna) of GW are almost ready to start the measurement. The WINPS was proposed to explain the missing mass of the universe in the later part of the last century. In spite of the elaborate experimental efforts to observe this particle, no evidence has been found in the laboratory scale measurement until now.