



Grand Unified Self-Aggregation Theory

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Brief Introduction

The theory of self-aggregation introduced in this book is a new theory that integrates the microscopic and macroscopic aspects and can establish the evolution model of the universe. It is rooted in the fundamental theories of traditional physics and can closely follow the hotspots and development trends of cutting-edge science. It is based on the in-depth exploration of microscopic particles and large-scale celestial structures in the macroscopic universe. It reveals the little-known uncertainties existing in the research of universal gravitation theory, nuclear and particle physics, wave-particle duality of light, quantum entanglement, gravitational lensing, gravitational redshift, aberration of light, gas molecular pressure theory, celestial magnetic fields, equivalence principle, the Big Bang, black holes, dark matter, dark energy, etc. It provides more reasonable explanations for some of the unsolved mysteries in natural phenomena, clearly presenting the structural mechanism and essence of all things in the universe, making the unity of strong interaction, weak interaction, electromagnetic interaction and universal gravitation possible.

It is particularly worth mentioning that the theory of self-aggregation can also provide a more accurate and vivid analysis and definition of the mechanisms of thermal expansion and contraction, temperature, heat conduction, stress, and strain of substances, which are different from traditional theories. Be able to provide specific formulas for estimating the power and energy dissipation of the universe's expansion. The tensile strength and heat of vaporization of substances can be directly calculated by using the unified gravitational constant for calculating the gravitational interaction between celestial bodies. The calculation accuracy of the heat of vaporization has been significantly improved compared with all current empirical formulas.

This book is suitable for professionals engaged in physics research and teaching to read, and can also serve as an extracurricular reference for undergraduate and graduate students on campus.

Foreword

From the beginning of the last century to the present more than a hundred years, with the rapid development of science and technology, physics research has made remarkable achievements in the following two aspects.

The first is the realization of the deep exploration of the micro atomic and subatomic “small universe”. During this period, atomic physics, nuclear physics and particle physics have developed into frontier science to explore the structure of matter, and relativity and quantum theory have also been born, thus establishing the relativistic view of space-time and quantum mechanics. In terms of particle detection, from the modern electron microscope, to STM - scanning tunneling microscope, and then to accelerator particle microprobes - large accelerators and various large-scale particle spectrometers are widely used, people have been able to observe the scale of the object from molecular and monatomic structures (10^{-9} to 10^{-10} m), fine to nuclear and particle structures (10^{-14} to 10^{-17} m).

The second is the achievement of a more extensive and deep exploration of large-scale celestial structures of the macrocosm. In the process, astrophysics has evolved into the mainstream of astronomy, with the most notable achievement being the birth of modern cosmology, which is based on Einstein’s theory of relativity, large-scale astronomical observations and the fact of universal redshifts in extragalactic galaxies and cosmic background radiation. In terms of astronomical observation, in addition to the impressive results achieved by traditional optical telescopes, the development of radio reception technology has dramatically improved the overall level of astronomical observation by utilizing various wavelengths other than visible light for astronomical observation, especially the application of large-scale radio telescopes, which has enabled the human horizon to expand across the

Milky Way to extragalactic galaxies, reaching a spatial distance of 15 billion light years. This means the arrival of the era of full-wave astronomy.

However, it is worth noting that although physics has achieved unprecedented success in the exploration of microscopic matter and macroscopic celestial observation, it still faces many difficulties and challenges, and there is even a situation in which the theories become more and more complicated and the mysteries become more and more numerous as the exploration progresses. For example, the structure of matter is divided into molecules, atoms, nuclei, quarks, gluons and other different levels, and each of these levels can be related to each other and form an organic whole, but there is no correlation between the molecular van der Waals forces, the nuclear forces of nucleons, and the strong interaction of quarks established through theories. If the effects of electromagnetic interactions, weak interactions and gravity are taken into account, it is more complicated and cannot form a unified system of forces. For another example, the universe model constructed under the framework of the traditional theory has obvious structural defects because it only has gravity but no repulsive force, which makes it impossible for people to search for dark matter and dark energy, and also leads to the adoption of the Big Bang model of the universe and the introduction of irregular singularities as a matter of necessity. It is always difficult to make a reasonable explanation for the phenomenon of accelerated expansion of the universe in terms of the principles of mechanics and dynamics. At present, although the study of dark matter and dark energy has become the interdisciplinary hotspot of particle physics, astrophysics and cosmology, the existing theoretical basis and research depth still cannot reveal their nature, that is, human beings know nothing about the dark matter and dark energy that account for the vast majority of the total mass energy of the universe. This means that the so-called knowledge content that we have known and mastered in the past only accounts for less than 5% of the information of the entire universe, and the vast majority of it is still outside the scope of cognition. This is unbelievable, but we have to accept this embarrassing reality.

Some of the above phenomena are indeed puzzling, and it is reasonable to say that the most basic elements constituting the entire universe should

be simple and regular, not so intricate and unfathomable. Over the years, the author has repeatedly thought about the question of whether there is a possibility that due to the imperfections of the existing basic physical theories, human vision is limited or distorted, so that people cannot clarify the objective nature and laws of everything in the universe, in the search for the mystery of the universe as if the blind man feeling the elephant, unintentionally confuse certain concepts or benchmarks, there are serious dislocations and a lack of a sense of direction, resulting in some of the big dark clouds that shroud modern physics always recurring. This also indicates that mankind's understanding of the laws of the evolution of the universe, as well as the cognition of the basic physical laws still needs to undergo a fundamental change.

Very fortunately, a new theory that can dispel all the dark clouds of the century may have been born, and it is the theory of self-aggregation introduced in this book. This theory has found brand-new laws and principles of physics, covering the basic elements of building the micro-world and macro celestial bodies, and is the basic theory leading the development of new physics, which can make up for the defects of traditional theories, answer most difficult problems encountered in today's physics, make it clear that there are not only the aggregation force (gravitation) but also the repulsive force in the universe and the formation mechanism and properties of these two forces are revealed through the self-aggregation theoretical model. This may be the long-awaited fundamental theory that will bring about fundamental changes and bring hope for new breakthroughs in physics.

This book applies the basic principles of the theory of self-aggregation, creates the unified theory of gravity, the theory of self-aggregation cosmology, the theory of self-aggregation optics, and the molecular theory of self-aggregation gases, etc., which can solve the mystery of the origin of dark matter, dark energy, inertial force, and celestial magnetic field, can establish a model of wave-particle biphasicity of light, reveal the nature of quantum decoherence and the mechanism of the generation of the phenomenon of quantum entanglement, theoretically proves the violation of the Equivalence Principle is proved theoretically and also has a new interpretation of gravitational redshift, gravitational lensing, optical traveling difference, black

hole, Big Bang theory and so on.

The theory of self-aggregation not only follows the basic principles of conservation of energy, conservation of momentum and mechanics, but also can be very concise expression of the inner nature structural mechanism of all things in the universe, just like "DNA" reveals the phenomenon of life, can explain the interaction between various microscopic substances and macroscopic celestial bodies from the first principle, which brings new thinking and ideas to the hotspot research of particle physics, astrophysics and cosmology. The Nuclear Body Force deduced from the self-aggregation theory is the core force of the universe, which has both aggregation and repulsion, and is the link between micro and macro, so that many phenomena and laws in the universe can be searched for in micro particles inside the matter, and vice versa. Thus, it profoundly reveals the formation mechanism of the universe and the changing law of the expansion or contraction of the universe, and makes the unification of the four interactions possible. In addition, the theoretical model established by the self-aggregation theory can more accurately and graphically analyze and define in detail the mechanism of matter such as thermal expansion and cold contraction, temperature, thermal conductivity, stress, strain, etc., can give the specific formula to estimate the expansion power and energy dissipation of the universe, and also provide a new method to calculate the tensile strength and the heat of vaporization of matter. Among them, the calculation accuracy of the heat of vaporization is substantially improved over the current empirical formulas and is of practical value.

The theory of self-aggregation is based on the assumption of self-aggregation. This hypothesis comes from a whim of the author more than 40 years ago, and has written an unpublished paper, but it has been shelved for many years for various reasons, and it was not until the end of 2019 that I began to write a book to formally propose the self-aggregation theory to the world. It must be pointed out that some of the relevant calculations involved in this book are mainly considered for the discussion of the principle of self-aggregation, the parameters used and the selection of models, interfaces, carriers, etc., are only preliminarily determined according to the author's research, and there will inevitably have errors, which need to be further

discussed and corrected in the future research process. One thing is certain, however, that none of this in any way diminishes the unique charm and persuasiveness of the self-aggregation theory. It can be predicted that the self-aggregation theory will likely trigger a subversive revolution in physics community, which will lead to the systematization and simplification of the basic theory, and more conducive to people's understanding of the ever-changing universe. Let us look forward to the birth of a new theory and the arrival of a new era!

The establishment of the self-aggregation theory and the publication of this book are thanks to my parents and family. It is with their long-term care, love and help that I can overcome difficulties in life and gather enough courage and energy to climb to the top of the world. It can be said that the advent of the self-aggregation theory is full of the expectations, wisdom and spirituality of the families of Qian (father) and Zhao (mother). It also shows the soul of the nation that strives for self-improvement. In addition, I would like to thank my classmate and good friend Professor Wang Yongjun, who was very concerned about the preparation of this book and put forward valuable comments and suggestions on the content of this book. I would also like to express my sincere thanks to all the relatives and friends who have cared and supported the publication of this book.

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Shenzhen, China
January 22, 2022

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Chapter 1: Unified Theory of Gravity

This chapter first studies and analyzes the derivation process of the law of gravitation, and reveals the little-known uncertainties in it, so as to draw readers' attention and trigger deeper thinking. Then, with unique creativity and ideas, a new theoretical model is adopted to re-derive the original gravitational formula and the concept of internal gravitational mass is introduced. The resulting new gravitational constant and unified gravitational formula obtained are not only applicable to the exploration of large-scale celestial objects in the macro universe, but also applicable to the study of the microscopic world of matter; it can not only be used to calculate the gravitational attraction between celestial objects, but also to estimate the tensile stress, molecular bonding force, atomic nuclear force of matter. Although this is inconceivable to traditional theories, the self-aggregation theory gives a reasonable explanation and provides strong support for the theoretical models used and the internal gravitational mass. This chapter can be used as an introduction to the book, lay the groundwork for introducing the self-aggregation theory in the subsequent chapters and the eventual unraveling of gravity and other cosmic mysteries.

1.1 Law of Gravitation

1.1.1 Background

The English physicist Issac Newton (1643-1727) had not yet invented calculus and the theory of mechanics had not yet been systematically established when he formulated the law of gravitation. He was first inspired by Kepler's three laws and learned that the rotation of the planets around the sun depends on the centripetal force, the magnitude of which is proportional

to the product of the mass of the planet and the mass of the Sun, and is inversely proportional to the square of the distance between them. Later he verified it through the motion between the moon and the earth, and proved by applying the calculus he invented that a spherical body with a symmetrical density distribution has the same gravitational force on an external mass point as the mass concentrated in its center of mass. It wasn't until more than 20 years later, in 1687, that Newton formally published the law of gravitation.

In the more than 300 years since then, despite the unparalleled achievements of the law of gravitation in astrophysics, people have not been able to understand some questions about it: what is the mechanism by which gravity is generated? Nor do we know why it can be so powerful in the vast universe, but inside the objects seems insignificant, even negligible? Why is its magnitude related to its mass? And why is its constant G so difficult to measure? So much so that from the end of the 18th century by the British physicist Henry Cavendish (1731-1810) for the first time to detect its value to the present, a total of nearly two hundred years of efforts, still can not reach the ideal measurement accuracy. Therefore, it can be said that mankind's research on gravity and its laws is just at the beginning, and there are still many issues that need to be further explored.

1.1.2 The Derivation of the Law of Gravitation

1. Attraction of the Continuum on an External Mass Point with a Unit Mass

Let W be a continuum of arbitrary size and shape, and i be any point in it. In the space inertial cartesian coordinate system, let the coordinates of point i be (ξ, η, ζ) and the mass be dm . The gravitational force of i on a mass point $P(x, y, z)$ outside W is

$$F_{pi} = -G \frac{1}{r^2} dm \quad (1.1)$$

The distance between two points

$$r = \sqrt{(x - \xi)^2 + (y - \eta)^2 + (z - \zeta)^2} \quad (1.2)$$

Then the components of the gravitational force F_{pi} between two mass points in the three coordinate axes are

$$F_{xi} = F_{pi} \frac{\partial r}{\partial x} = -G \frac{1}{r^2} dm \frac{x - \xi}{r} = -G \frac{x - \xi}{r^3} dm \quad (1.3a)$$

$$F_{yi} = F_{pi} \frac{\partial r}{\partial y} = -G \frac{1}{r^2} dm \frac{y - \eta}{r} = -G \frac{y - \eta}{r^3} dm \quad (1.3b)$$

$$F_{zi} = F_{pi} \frac{\partial r}{\partial z} = -G \frac{1}{r^2} dm \frac{z - \zeta}{r} = -G \frac{z - \zeta}{r^3} dm \quad (1.3c)$$

The gravitational force of the whole continuum W on point P unit mass should be the sum of all points within it on point P . Its components on the three axes are

$$F_x = -G \int \frac{x - \xi}{r^3} dm \quad (1.4a)$$

$$F_y = -G \int \frac{y - \eta}{r^3} dm \quad (1.4b)$$

$$F_z = -G \int \frac{z - \zeta}{r^3} dm \quad (1.4c)$$

If the bit function (potential energy at point P unit mass) U is introduced, let

$$U = G \int \frac{dm}{r} \quad (1.5)$$

Then there is

$$F_x = \frac{\partial U}{\partial X} \quad (1.6a)$$

$$F_y = \frac{\partial U}{\partial Y} \quad (1.6b)$$

$$F_z = \frac{\partial U}{\partial Z} \quad (1.6c)$$

2. The Attraction of a Homogeneous Spherical Shell to an External Mass Point with a Unit mass

As shown in Figure (1-1), W is a uniform spherical shell with radius equal to k , density ρ is constant, and thickness dk is infinitesimal. The unit mass point P outside the shell is on the X -axis with the center of the sphere, and its mass value is 1.

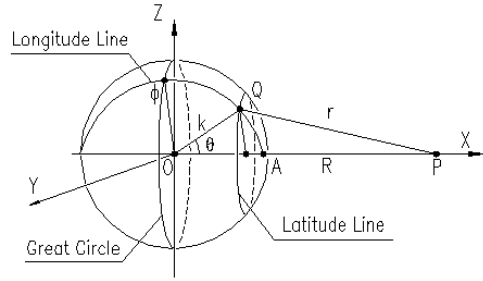


Figure 1-1 Attraction of a homogeneous spherical shell W to an external mass point

The corresponding bit function (potential energy) is

$$U_i = G\rho dk \iiint_W \frac{ds}{r} \quad (1.7)$$

Where ds is the area element on W . The corresponding component of the total gravity on each axis is expressed as an integral

$$F_x = \frac{\partial U}{\partial X} = G\rho dk \iiint_W \frac{ds}{r^2} \frac{\partial r}{\partial x} \quad (1.8a)$$

$$F_y = \frac{\partial U}{\partial Y} = G\rho dk \iiint_W \frac{ds}{r^2} \frac{\partial r}{\partial y} \quad (1.8b)$$

$$F_z = \frac{\partial U}{\partial Z} = G\rho dk \iiint_W \frac{ds}{r^2} \frac{\partial r}{\partial z} \quad (1.8c)$$

According to the provisions of the law of universal gravitation, the gravitational force generated by each mass point on a uniform spherical shell at point P is along the direction of their respective lines to point P , that is, it corresponds to the existence of innumerable oblique pulls in different directions between the uniform spherical shell and the P mass point. Since the spherical shell is uniform and axisymmetric with respect to the X axis, the force components on the Y and Z axes perpendicular to the X axis are completely cancelled, then $F_y = 0$, $F_z = 0$.

In order to facilitate the calculation, the above rectangular coordinate system can be changed to the spherical coordinate system, using the diameter

k , longitude φ , latitude θ to represent the coordinates of each mass point on the spherical shell.

As shown in Figure (1-1), after the spherical coordinates are adopted for the uniform spherical shell, the intersection point A of OP and spherical shell W is taken as the pole of the spherical coordinates, and the cross-section circle on the XZ plane is taken as the basic great circle for calculating longitude. For any point Q in W , θ represents the intersection angle between OP and OQ . Then θ is the colatitude in the plane coordinates of Q . So the area element at point Q is

$$ds = k^2 \sin\theta d\varphi d\theta \quad (1.9)$$

Where φ is the longitude of point Q . If the integral is limited to the entire sphere, then

$$\begin{aligned} U_i &= G\rho dk \int_0^{2\pi} d\varphi \int_0^\pi \frac{k^2 \sin\theta}{r} d\theta \\ &= 2\pi G\rho k^2 \int_0^\pi \frac{\sin\theta}{r} d\theta \end{aligned} \quad (1.10)$$

$r^2 = R^2 + k^2 - 2Rk\cos\theta$, and R and r^2 are constants for points that change on the sphere

$$r dr = Rk \sin\theta d\theta$$

It can be used to transform equation (1.10) into an integral over r , and the integral interval $\theta = \pi$, $r = R+k$; when $\theta = 0$, $r = R-k$. Thus there is

$$U_i = 2\pi G\rho k \frac{dk}{R} \int_{R-k}^{R+k} dr = 4\pi G\rho k^2 \frac{dk}{R} \quad (1.11)$$

Where $4\pi k^2$ is the area of W , $4\pi k^2 dk$ is its volume, and $4\pi\rho k^2 dk$ is its total mass M , then the above formula can be written as

$$U_i = \frac{GM}{R} \quad (1.12)$$

This formula indicates the potential energy generated by the attraction of W to the unit mass point P , which is equivalent to the attractive potential energy of P when all the mass of W is concentrated at point O . This conclusion can be generalized to more general situations.

3. The Attraction of a Uniform Spherical Shell of a Certain Thickness to an Outer Unit Mass Point

If the thickness of a spherical shell W is not infinitely small, but a