



GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A  
PHYSICS AND SPACE SCIENCE

Volume 19 Issue 10 Version 1.0 Year 2019

Type : Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals

Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# Alexander Friedman's Cosmology of Expanding and Contracting Universe

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**GJSFR-A Classification:** FOR Code: 020103



ALEXANDERFRIEDMANSCOSMOLOGYOFEXPANDINGANDCONTRACTINGUNIVERSE

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# Alexander Friedman's Cosmology of Expanding and Contracting Universe

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**Abstract-** Einstein's theory of general relativity describes a static Universe. However, Alexander Friedman found periodic solutions of the Einstein's equations of general relativity, which describe periodically expanding and contracting Universe. It took Einstein 8 years to accept the Friedman's dynamic concept, but even 90 years later we still haven't embraced it. This article compares the Friedman's dynamic concept of expanding and contracting universe with the ancient cosmology of periodically expanding and contracting Universe described in the ancient Hindu astronomy Surya Siddhanta. The modern cosmology of Alexander Friedman is in full agreement with the ancient astronomy. Even Friedman's rough estimate of the time of one full cycle of expansion and contraction of the Universe (10 billion years) is astonishingly similar to the ancient exact number 8.64 billion years.

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## I. INTRODUCTION

Einstein published his relativistic theory in 1917. The fundamental equations of the general relativistic theory of Einstein,<sup>1</sup> which were based on the mathematics of the Riemann's spherical geometry, were:

$$R_{ij} - g_{ij} R/2 - \lambda g_{ij} = -kT_{ij}, \quad (1)$$

where  $\lambda$ , according to Einstein, is a cosmological constant (which meant that the world is static, i.e. frozen in time),<sup>1</sup> the constant  $k = 8\pi G/c^2$ ,  $T$  is the energy momentum tensor,  $R$  – Ricci tensor,  $g$  – metric tensor. De Sitter found another solution of the Einstein equations representing static universe with zero mass density and negative curvature of the space.<sup>2</sup> Einstein protested that zero mass means no inertia and the solution has no physical meaning.

Five years later, Alexander Friedman published the basic concepts of his theory in two consequent articles published in Zeitschrift fur Physik in 1922 and Zeitschrift fur Physik in 1924.<sup>3,4</sup> He also wrote and published in 1924 the book: "The World as a Space and Time" (in Russian),<sup>5</sup> but died of typhus in 1925.

Grounded in Riemann's geometry, Friedman found in addition to the static solutions of Einstein and de Sitter, a new class of non-static periodic solutions. He showed that the cosmic constant  $\lambda$  in the relativistic

theory of Einstein (assuming a static universe) might not be a constant. Then the equation (1) would describe a Universe that expands, and then contracts and collapses, to restart again from the same singularity point.

## II. ALEXANDER FRIEDMAN THEORY COMPARED TO ANCIENT ASTRONOMY

Friedman's solutions feature the space as a 3D hyper sphere with radius  $r$ , but its curvature changes in time  $t$ . Then the field equation (1) is transformed into a set of two ordinary differential equations for  $r(t)$ :

$$(r(t)/c^2)(dr/dt)^2 = A - r(t) + \lambda r(t)^3/3c^2. \quad (2)$$

This equation has a periodic solution in the interval  $0 < r < r_1$ , which means that the Universe starts from a singularity point  $r = 0$ , expand to a maximum radius  $r_1$  and then begins contracting back to the initial zero point. This means that the life of our Universe is finite – first it expands to radius  $r_1$ , then it starts to contract and ends with a crunch in the Black Hole that created it.

The Hubble telescope shows that more than 60% of the galaxies in our Universe are warped. A natural question arises: What will happen when all the galaxies are warped? The universe will stop expanding and start contracting to be recycled in the Black Hole that created it, so that with time a new Universe in perfect order can be created.

Surprisingly, the author of this article found the scenario of expanding and contracting Universe already described in the ancient Hindu astronomy Surya Siddhanta, which claims that the Universe is a dynamic system with endless number of alternating periodic creations and destructions.<sup>6</sup> The creation and expansion of the material world is one day of God Brahma and last 4.32 billion years.<sup>6</sup>

The material world is created in perfect order, but with time (following the entropy law) it becomes more and more disordered. This disordered world needs to be destroyed so that a new Universe with perfect order can be created. The contraction and destruction of the disordered material world is a period of darkness and it is called one night of God Brahma; it last another 4.32 billion years.<sup>6</sup>

In ancient Indian drawings, the Creator of the Universe, God Brahma, is pictured sitting on a lotus,

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which symbolizes vortex or anti-vortex. Anti-vortex must have created the Universe because only spinning counterclockwise anti-vortices emit energy. This is what the latest branch of modern physics - nonlinear physics – teaches - anti-vortices are singularity points, which rotate counterclockwise and emit energy. Thus, a Black Hole spinning counterclockwise, like an anti-vortex, and emitting energy, must have created the Universe.

Since following the entropy law with time the Universe becomes more and more disordered, the period of creation and expansion must be followed by a dark period of contraction and destruction because the disordered universe needs to be sucked back in, crushed, and dismantled, so that with time a new universe in perfect order can be created. Thus, during the dark period of destruction the Black Hole must spin clockwise, like a vortex, and suck energy in, to suck in and destroy the already disordered Universe.

When we say that the old disordered universe is sucked in, cracked into pieces and dismantled, this means the universe was transformed back into anti-matter. Only a scenario like this could explain why dark matter seems to dominate our Universe.<sup>7</sup> If dark matter dominates, our Universe is more than middle age and the fact that 60% of the middle age galaxies are warped means exactly this.

Alexander Friedman assumed that the total mass of the Universe is  $5 \times 10^{21}$  solar masses. Based on this, he estimated that the full period of expansion and contraction of his periodic Universe would be  $10^{10}$  years, which means 10 billion years. Let us compare now this number with the numbers in the ancient Hindu astronomy Surya Siddhanta.<sup>6</sup>

According to Surya Siddhanta, the period of creation and expansion of the Universe (called one day of God Brahma) lasts 4.32 billion years.<sup>6</sup> The period of contraction and destruction of the disordered Universe (called one night of Brahma) lasts another 4.32 billion years. The whole cycle would be 8.64 billion years according to the ancient astronomy, which agrees well with the rough estimate of Alexander Friedman of 10 billion years.

As you can see, not only the concepts of expanding and contracting Universe are the same in the ancient texts and the theory of Friedman, the rough Friedman's estimate of the lifetime of the Universe is close to the exact number of the ancients. It took Einstein 8 years to accept the Friedman's concept of periodically expanding and contracting Universe. There is a proverb saying: *"Even the wisest one could be a little bit slow in accepting new concepts."*

### III. THE IMPACT OF THE FREIDMAN'S THEORY ON OUR CONCEPT FOR THE UNIVERSE

It took Einstein 8 years to accept the concept of expanding and contracting Universe, but we have still

not accepted the Freidman's dynamic concept of periodically expanding and contracting Universe more than 90 years after Freiedman's genius work. This leaves unanswered the question why we have so much dark matter in our Universe.

Opposite to any logic, most of our scientists still believe that a Big Bang created the Universe and our Universe is immortal and ever expanding. The Big Bang nonsense<sup>8</sup> started in 1927, just two years after the death of Alexander Friedman. The Catholic Belgian priest George Lemaitre started it. Ironically, in Physics Today of 2012, Ari Belenkiy still claimed that the Friedman's cosmology "provides the basis for our current view of the Big Bang"<sup>9</sup>, which is not true.

### IV. CONCLUSIONS

Our modern cosmology chose to believe that our Universe was created through explosion called Big Bang.<sup>8</sup> I, personally, have troubles understanding how explosion could create a Universe in perfect order. Explosion is something fast and uncontrollable, and if our Universe was created in perfect order, explosion couldn't have created it.

Since observations with the Hubble telescope show that 60% of the middle-age galaxies like ours are warped, and our galaxy is also warped, this means that our Universe is more than middle age and becomes more and more disordered as it ages.<sup>10</sup>

What will happen as more and more galaxies get warped with time? The answer comes automatically: when the disorder reaches a critical value, and the expansion of our Universe reaches the critical radius  $r_1$ , our Universe needs to stop expanding and start retrieving back to be destroyed in the singularity point that created it.

Anti-vortex created our expanding material Universe in perfect order - it was a singularity whirlpool of dark antimatter rotating counterclockwise and producing light matter in perfect order, which was expanding. The light period of creation and expansion lasts 4.32 billion years.

As our material world ages and becomes more and more disordered, the expansion will stop at radius  $r_1$ , where a dark ring of anti-matter at the periphery of our Universe would change the time  $t$  to  $-t$ , and the Universe would start spinning in opposite direction, i.e. spinning clockwise and retrieving.

The created spinning clockwise vortex would start sucking back the disordered material Universe to bring it back to the singularity point – the Black Hole that created it, engulf it, crush it, and destroy it by turning it back into dark antimatter. This takes another 4.32 billion years. When the pressure on the light matter at the center of the Black Hole reaches a critical value, the contraction will stop.<sup>11</sup>

The vortex that was spinning clockwise and sucking will now turn into anti-vortex that spin counterclockwise and create a new expanding material Universe in perfect order. Since the energy of the transfer of matter into anti-matter and vise-versa is now considered to be 100%, the cycles of creation and destruction would last forever.

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