

## **Editor's Note:**

# **Isotropic Space with Discrete Gravitational-field Sources. On the Theory of a Nonhomogeneous Isotropic Universe**

by **M. F. Shirokov and I. Z. Fisher**, *Astronomicheskiy Zhurnal* **39**, 899 (1962). (English translation first published in *Soviet Astronomy A.J.* **6**, 699 (1963).)

This paper is on the borderline of what may be called “old science”. However, just like several of the papers published in this series so far, it is well on the way into oblivion — because the idea it proposed was radically new, caught the public unprepared, and came from a place from which great discoveries have not been supposed to emanate. In short, the authors observed that when the Einstein equations are applied to cosmology, a definition of averaging the geometry and matter distribution must be provided, and the averaging procedure will not commute with calculating the Einstein tensor from the metric tensor. The averaged small-scale geometry will contribute a “polarization term” to the large-scale effective field equations. This “polarization term” mimics repulsive gravitation and, in the scheme used in the paper, prevents the Big Bang singularity.

Several details of the paper call for refinement, and a satisfactory refinement is still lacking. For example, the procedure of averaging proposed by the authors (4-volume averages of components of the metric tensor) is not covariant and has no geometrical interpretation. Moreover, the main conclusion (prevention of the Big Bang) follows when the consideration is extended beyond the range of its applicability: the metric was initially assumed to be just a small perturbation of the Robertson–Walker geometry (the authors were well aware of the second problem). However, a great new idea it certainly was. It has occurred to several other authors later;

Ref. 1 below lists 15 papers in which various definitions of averaging have been independently proposed, and this number does not include follow-up papers published later.

In a few places, the text from *Soviet Astronomy* has been modified by this editor towards (it is hoped) a better consistency with the original Russian text. All these intrusions are marked and explained in editor's footnotes.

— *Andrzej Kasiński, Associate Editor*

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## REFERENCE

1. Kasiński, A. (1998). *Inhomogeneous Cosmological Models* (Cambridge University Press, Cambridge).

## Brief biographies

### M. F. Shirokov

Mikhail Fedorovich Shirokov was born in 1901 in Nikulino (Vladimir district, Russia) in a peasant family. In the period 1919–1921 he studied at the Department of Mathematics and Physics of the State University of Perm, where he learnt relativity from lectures by A. A. Friedman. Then, in 1921–1925, he studied at the Moscow University and graduated from there.

In the period 1929–1941 he worked in several applied science institutes run by industrial enterprises. From 1941 he was the head of the physics chair at Moscow Institute for Aviation. There, he taught physics to audiences that included, among others, the Soviet cosmonauts.

The subjects of his scientific work were kinetic theory, dynamics and thermodynamics of gases (including turbulent motion), acoustics of moving

sound sources and, beginning with the 1950s, relativity and gravitation. Among other things, he predicted that the frequency of oscillations of test bodies on circular orbits in the Schwarzschild field should depend on the direction of oscillation. In 1958, he published a monograph on *Physical foundations of gas dynamics*.

M. F. Shirokov died on 24th October 1982.

— A. Krasinski

Based on the obituary written by V. B. Braginskii, Yu. S. Vladimirov, O. S. Ivanitskaya, N. V. Mitskevich, F. A. Nikolaev, K. A. Piragas, A. A. Sokolov, K. P. Stanyukovich, F. I. Fedorov and R. I. Khrapko, *Uspekhi Fizicheskikh Nauk* **141**, 719 (1983).

### I. Z. Fisher

Iosif Zalmanovich Fisher was born in Minsk, Byelorussia, on February 24, 1919, and completed his studies at the University of Minsk on the eve of the Great Patriotic War in the summer of 1941. Exempted from military service because of weak sight, he went to the front as a volunteer. He was awarded some orders and medals. During the whole war this “strange” sergeant of artillery carried in his knapsack the *Quantum Mechanics* of Dirac and studied it every spare minute.

Having returned to Minsk after the war, Fisher became an Assistant Professor at the Department of Theoretical Physics at the University of Minsk. His first scientific work dealt with General Relativity. He defended the Ph.D. thesis *Gravitational fields of some elementary particles* in 1947. It was one of the first attempts to unify gravitation and strong interactions.

In the fifties he changed his research field to the theory of liquids. He was very successful in it. His research from that period (which resulted, among others, in a second Ph.D. degree in 1959) is summarized in the monograph *Statistical Theory of Liquids* (1961).

In 1960 I. Z. Fisher became professor of theoretical physics at the University of Minsk. In 1963 he went to Odessa, Ukraine, where he was appointed the head of the Department of Theoretical Physics at the University of Odessa. Here he created a well-known school in the theory of liquid state.

I. Z. Fisher published some 200 papers. Towards the end of his life he had to leave off scientific work because of a painful and lingering illness. He died in Odessa on May 25, 1995.

— *Michael N. Polozov*  
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