2007 – jubilee year for Estonian astronomy

- 100 years from the birth of A. Kipper (1907)
- 95 years from the birth of H. Keres (1912)
- 90 years from the birth of G. Kuzmin (1917)
- 85 years from the publication of E. Öpik’s estimation of the distance to M31 and demonstration of the extragalactic nature of spiral nebulae (1922)
- 70 years from the birth of M. Jõeveer (1937)
- 60 years of Institute (1947)
- 55 years from the publication of Kuzmin’s major papers on the density of matter in the Galactic plane and Galactic model (1952)
- 50 years from the begin of building the new observatory (1957)
- 35 years from the 1st European Astronomy Meeting where announcement on dark coronas around galaxies was made
- 30 years from the IAU Symposium on Large-Scale Structure of the Universe (Tallinn 1977)
There were almost no professional Estonian scientists available when Tartu University was reopened in 1919 as an Estonian University. Director Prof. T. Rootsmae (1919–1959) – former high-school teacher. Formation of Estonian terminology in astronomy. Stellar kinematics in relation to the evolution of stars and the Galaxy. Results published in Estonian (1943 – 1953) and Russian (1961), conclusions similar to Eggen, Lynden-Bell & Sandage (1962).
Ernst Öpik (1893 – 1985)

Returned 1921 from Russia, scientific experience from Moscow and Tashkent Universities

Observer in Tartu Observatory 1921 – 1944
Astronomer in Hamburg, Armagh and Maryland Universities (1944–1985)
Distance to the Andromeda nebula and extragalactic nature of spiral nebulae (1922)
Structure and evolution of stars (1922-1937)
Grigori Kuzmin

Born April 8, 1917 in Vyborg, Finland
1924 emigrated to Tallinn, Estonia
1935 graduated High-School in Tallinn
1940 graduated cum laude Tartu University
1938 publication of 1st papers
1940 assistant in Tartu Observatory
1942 master thesis
1952 PhD thesis
1960–1982 head, department of galactic studies
1961 member of Estonian Academy of Sciences
1970 Doctor of sciences
1971 Bredichin Prize, Professor
1976–1982 IAU Commission 33 vice-president & president
1982 Professor-emeritus
1988, April 22 deceased
Grigori and Zoja, June, 1940
Grigori in 1948 at Tähetorn, in Rootsmäe's office
The Astrosovet plenum, 1953
G. Kuzmin presenting his results on modeling the Galaxy, the local matter density, and $3^{rd}$ integral on motion in the 1953 conference. Leading Soviet astronomers understood that in Tartu Observatory the astronomical studies are in top level, and give support to plans of building the new observatory.
Young astronomers JE, H. Eelsalu, V. Tiit, Ch. Villmann ja E. Humal spoke at the plenum.

The plenum supported building of the new observatory.
Participants of the plenum in for of the Park Hotell
In summer 1953 possible locations of the new observatory around Tartu were searched. Here A. Kipper, H. Keres and V. Riives are overlooking selected sites. For a new site a flat hill near the village Tõravere was selected. The building work started in 1957, first astronomers moved to new observatory in 1961.
The first conference at the new observatory – he summer school of cosmology in July, 1962 (left) Participants at Tähetorn (old observatory): Zeldovich, Pontecorvo, Šklovski, Sagdejev, Massevitš and others (right)
The observatory was opened with a conference in 1964 under the motto “Science is carried by search for truth that is as sincere and honest as Nature itself” (T. Rootsmäe)
Madame Struve at the 1964 conference. Kuzmin planting a tree.
GK presenting his formula on Galactic Potential ~ 1970
G Kuzmin work on Galactic modeling

Inhomogeneous (non-constant) density spheroids, models of M31 (1943) and Galaxy (1952)

The mass distribution function (the mass of an ellipsoidal layer of unit thickness at the equator) is defined as follows:

$$\mu(a) = 4\pi \epsilon \rho(a) a^2,$$

(1)

where $a$ is the major semiaxis of the equidensity ellipsoid, $\rho(a)$ is the spatial density, and $\epsilon$ the axial ratio of the ellipsoid. The circular velocity $V(R)$ can be calculated from the mass function:

$$V^2(R) = G \int_0^R \frac{\mu(R)dR}{\sqrt{R^2 - a^2 \epsilon^2}},$$

(2)

where $\epsilon = \sqrt{1 - \epsilon^2}$ is the eccentricity of the ellipsoid.

From the circular velocity the mass function is found as solution of the integral equation:

$$\mu(a) = \frac{2}{\pi G} \int_0^a \frac{dV^2(R)}{dR} \frac{RdR}{a\sqrt{a^2 - R^2}}.$$

(3)

Mass distribution of the Galaxy can be expressed as a sum of ellipsoidal non-homogeneous components (populations) or using a changing effective axial ratio $\epsilon$. 
G Kuzmin work on Galactic modeling

Dynamical density of matter in Solar vicinity (local dark matter problem)
Introduction of Kuzmin constant (1952)

Poisson equation in cylindrical coordinates

\[ 4\pi G \rho = -\frac{\partial^2 \Phi}{\partial z^2} - \frac{\partial^2 \Phi}{\partial R^2} - \frac{1}{R} \frac{\partial \Phi}{\partial R} \]  

(1)

can be written in form

\[ 4\pi G \rho = C^2 - 2(A^2 - B^2) \]  

(2)

where

\[ C^2 = -\frac{\partial^2 \Phi}{\partial z^2}; \]  

(3)

C is Kuzmin constant, and A, B Oort constants.

Near the Galactic plane the C term dominates and determines the dynamical density. It can be expressed through the ratio of velocity and density dispersions in vertical direction of flat populations. Main result: dynamical density is equal to the stellar density – there is no local dark matter in the Solar vicinity.
G Kuzmin as a teacher

As University professor Kuzmin hold lectures on several astronomical and geophysical disciplines. His lectures on stellar dynamics were very original and inspiring.

Kuzmin’s students followed his major activities in practical stellar dynamics directed to the determination of Galactic parameters and models (JE, H. Eelsalu, M. Jõeveer) and theoretical studies (S. Kutuzov, Ü.-I. Veltmann, G. Malasidze).

A major activity of GK was editing of Tartu Publications. He often suggested major revisions of papers, concerning both scientific content and style. Often his suggestions were fundamental and changed the original paper substantially, so he could be a coauthor of many published papers. In this way he was a teacher for almost all Tartu post-WWII astronomers.
Relaxing after a meeting
The search for a theory of the spiral structure (A. Toomre)
General discussion about dynamics of the galaxies