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OLIY TA’LIM, FAN VA INNOVATSIYALAR VAZIRLIGI

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Xalqaro ilmiy-amaliy anjuman materiallari to‘plami
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TASHKILIY QO‘MITA

A.K.Qirg‘izboyev (bosh muharrir)	–	Nizomiy nomidagi TDPU rektori
B.S.Abdullayeva	–	TDPU ilmiy ishlar va innovatsiyalar bo‘yicha prorektor
G‘.F.Djabbarov (mas’ul muharrir)	–	TDPU fizika-matematika fakulteti dekani
E.B.Xujanov	–	Fizika va uni o‘qitish metodikasi kafedrasi mudiri, p.f.f.d., dotsent.
B.N.Nurillayev	–	Fizika va uni o‘qitish metodikasi kafedrasi dotsenti, p.f.n., professor v.b.
X.X.Tajiboyeva	–	Fizika va uni o‘qitish metodikasi kafedrasi dotsenti, p.f.n., dotsent
E.Q.Qalandarov	–	Fizika va uni o‘qitish metodikasi kafedrasi dotsenti, f.-m.f.n., dotsent
O‘.N.Xushvaqtov	–	Fizika va uni o‘qitish metodikasi kafedrasi katta o‘qituvchisi
H.N.Bozorov	–	Fizika va uni o‘qitish metodikasi kafedrasi dotsent v.b., p.f.f.d. (PhD)
G.O.Mirzayeva	–	Fizika va uni o‘qitish metodikasi kafedrasi o‘qituvchisi
I.T.Qurbonnazarov	–	Fizika va uni o‘qitish metodikasi kafedrasi o‘qituvchisi
U.A.Asrorov	–	Fizika va uni o‘qitish metodikasi kafedrasi o‘qituvchisi
B.B.Jo‘rayev	–	Fizika va uni o‘qitish metodikasi kafedrasi o‘qituvchisi

Taqrizchilar:

f.-m.f.d., professor F.M.Talipov
p.f.d., professor M.Qurbonov

Anjuman to‘plamiga kiritilgan maqolalarning mazmuniga mualliflar javobgar

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THE IMPORTANCE OF GALAXY GROUPS IN THE STUDY OF THE UNIVERSE

Kutlimuratov Sardor Sharipbayevich[1], Abduraxmonova Shoxsanam Rustam qizi[2]

[1]d.p.p.s., Associate Professor, Chirchik State Pedagogical University

[2]Student of master, Chirchik State Pedagogical University

Galaxy groups are collections of galaxies bound together by gravity, typically containing a few to a few dozen galaxies. They are smaller than galaxy clusters, which can contain hundreds or thousands of galaxies. A well-known example of a galaxy group is the Local Group, which includes the Milky Way, Andromeda (M31), and the Triangulum Galaxy (M33), along with over 50 smaller dwarf galaxies.

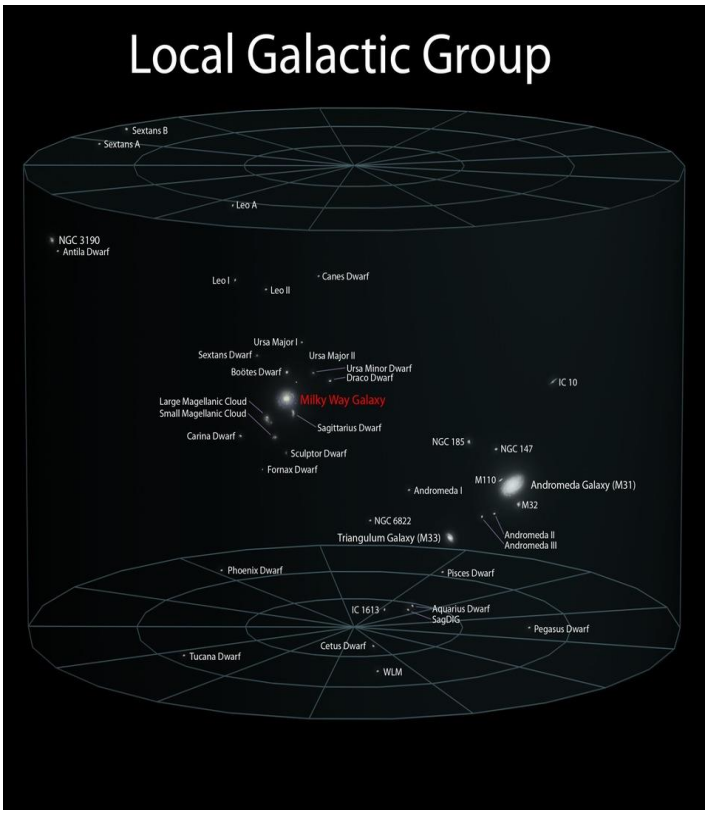

Figure.1

In addition, the universe has many galaxy groups. They are M81, Virgo Galaxy Group, M101 Group, Centaurus A, Sculptor Group and others.

1-Table

№	Galaxy group's name	Number of members
1	Local Group	54
2	M 81 Group	34
3	Virgo Group	200

4	Coupled Septet Group	7
5	Leo triplet Group	3
6	Markarian’s Chain	8
7	Robert Quartet	4
8	Seyfert Sextet	5
9	Stefan Quartet	5
10	Wild Triplet	3
11	IC 342	10-12
12	Sculptor Group	13-30

The study of galaxy groups began first during the study of other universe facilities. That is, galaxy groups were identified in the process of studying other objects of the universe. Edvin Hubble discovered the Hubble Law used in determining the distance between galaxies in the early 20the century. His work proved the existence of galaxy groups and clusters. In 1930, Fritz Zwicky studied the movement of the galaxy clusters and discovered the existence of a dark substance. Later, many scientists and amateur astronomers have studied galaxy groups. For example, Kim-Vy H. Tran, Lyuk Simard, Enn I. Zabludoff and Jon S. Mulchaey published scientific article. This article is called “The Galaxy Population of X-Ray detected, Poor Groups” [1]. In this article, the authors investigate the quantitative morphology and star formation properties of galaxies within six nearby, X-ray-detected, poor galaxy groups. Utilizing multi-object spectroscopy, they analyze the characteristics of these galaxies to understand their formation and evolution within such environments. The research provides insights into how galaxies in these less massive groups differ from those in richer clusters, particularly in terms of their star formation rates and structural properties. The findings suggest that the processes governing galaxy evolution in poor groups may vary significantly from those in more densely populated clusters, highlighting the influence of environment on galactic development. For a more comprehensive understanding, this study can be considered alongside related research, such as "The Properties of Poor Groups of Galaxies. II. X-Ray and Optical Comparisons," which examines the X-ray and optical properties of similar galaxy groups.

The VizieR Online Data Catalog entry titled "Compact Groups of Galaxies in the Las Campanas Redshift Survey" by S. S. Allam and D. L. Tucker presents a catalog of compact galaxy groups identified within the Las Campanas Redshift Survey (LCRS). This catalog, known as the Las Campanas Compact Groups (LCCGs), comprises 76 compact groups with a median redshift of approximately 0.08. The physical properties of these groups are noted to be similar to those found in previous catalogs, such as those by Hickson (1982) and Barton et al. (1996). The LCCG catalog provides valuable data for studying galaxy interactions and evolution

within dense environments [2]. For information, Sahar S. Allam is an astronomer affiliated with Fermi National Accelerator Laboratory (Fermilab), specializing in astrophysics. Her research encompasses galaxy formation and evolution, large-scale structure of the universe, and observational cosmology. Allam has significantly contributed to major astronomical surveys, including the Sloan Digital Sky Survey (SDSS) and the Dark Energy Survey (DES). She co-authored several data releases for SDSS, such as the third data release in 2005 and the seventh in 2009, which have been pivotal in advancing astronomical research. In 2000, Allam co-authored a catalog identifying 76 compact groups of galaxies within the Las Campanas Redshift Survey (LCRS), known as the Las Campanas Compact Groups (LCCGs). This work provided valuable insights into galaxy interactions in dense environments. Her involvement in the Dark Energy Survey has been instrumental in understanding cosmic acceleration and the nature of dark energy. The DES collaboration has produced significant results, including cosmological constraints from galaxy clustering and weak lensing. Allam's extensive publication record reflects her active role in the astronomical community, contributing to our understanding of the universe through large-scale surveys and collaborative research.

The "Clusters and Groups of Galaxies in 2dF" catalog, compiled by Tago et al. in 2006, presents a comprehensive list of galaxy groups and clusters identified within the 2dF Galaxy Redshift Survey (2dF GRS) [3]. This catalog employs the friends-of-friends (FoF) algorithm with a constant linking length to determine group memberships, addressing issues found in previous studies that used variable linking lengths, which led to systematic growth in group sizes with distance from the observer. The catalog includes 10,058 groups in the Southern Hemisphere and 7,657 groups in the Northern Hemisphere, each containing at least two member galaxies. For each group, the catalog provides essential data such as equatorial coordinates, redshift measurements, and estimates of total luminosity, offering valuable insights into the large-scale structure of the universe. This dataset is instrumental for studying the distribution and properties of galaxy groups and clusters, facilitating research into the formation and evolution of cosmic structures.

Brian F. Gerke, Jeffrey A. Newman, Marc Davis, Christian Marinoni, Renbin Yan, Alison Coil, Charlie Conroy, Michael C. Cooper, S. M. Faber, Douglas P. Finkbeiner, Puragra Guhathakurta, Nick Kaiser, David C. Koo, Andrew C. Phillips, Benjamin J. Weiner, Christopher N. A. Willmer conducted research about The Deep2 Galaxy Redshift Survey. The DEEP2 Galaxy Redshift Survey is a significant astronomical project that has provided valuable insights into galaxy groups at high redshifts. The first results, published in 2005, utilized the initial 25% of DEEP2's spectroscopic data to identify galaxy groups and clusters in redshift space. This dataset encompassed 8,370 galaxies with confirmed redshifts ranging from 0.7 to 1.4,

covering an area of one square degree on the sky. The researchers employed the Voronoi-Delaunay Method for group identification, optimizing it through application to realistic mock galaxy catalogs. Their findings indicated that the group finder successfully identified approximately 78% of real groups and correctly assigned about 79% of true group members. Conversely, about 55% of the identified groups corresponded to real groups, with 46% of galaxies in groups being interloper field galaxies. This study also demonstrated the feasibility of measuring the distribution of groups in redshift and velocity dispersion, $n(\sigma, z)$, with accuracy limited by cosmic variance for dispersions greater than 350 km/s. These measurements hold promise for placing strong constraints on the equation of state of dark energy in future research. Additionally, the study presented the first DEEP2 group catalog, assigning 32% of galaxies to 899 distinct groups, 153 of which had velocity dispersions exceeding 350 km/s. This catalog represents the largest sample of spectroscopically detected groups at $z\sim1$ to date [4].

In conclusion, studying galaxy groups allows us to probe many aspects of the universe—from the evolution of galaxies to the behavior of dark matter and the expansion of the cosmos itself. By examining these structures, astronomers gain valuable insights into how the Universe grew and continues to evolve, and how galaxies interact within their environments. Understanding the role of galaxy groups is crucial not only for comprehending cosmic history but also for testing and refining the fundamental principles that govern the Universe.

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