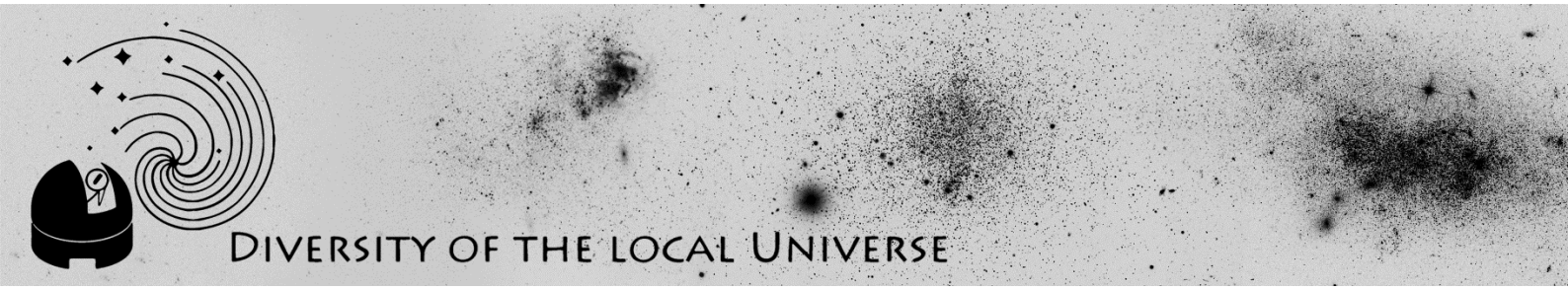

Conference Abstract Book

Nizhny Arkhyz, 30 September - 4 October 2019

Looking for a possible evolutionary relationship between circumgalactic gas clouds (DLAs, LLSs, pLLSs) and globular clusters

Acharova I.A. (Faculty of Physics, Southern Federal University, Rostov-on-Don, Russia), Sharina M.E. (Special Astrophysical Observatory, Russian Academy of Sciences, N. Arkhyz, KCh R, Russia)

Irina Acharova
Southern Federal University, Russia

The analysis carried out in the work indicates the possibility to consider dense clouds of circumgalactic gas (Dumped Lyman limit systems, partial Lyman limit systems and Lyman limit systems) observed in the neighbourhood of galaxies at redshifts of $0.1 < z < 1.1$ as being the residual parts of clouds, in which globular clusters (GC) have been formed. Conclusions have been drawn based on statistical analysis of the abundance of magnesium and iron in GCs and in circumgalactic clouds and on the spatial location of objects of both types. The amount of magnesium and iron, produced by first generations of GCs, does agree with hypotheses: 1) the minimum fraction of the mass of the galactic cloud that has transformed into the stars is 10%, while the mass of gas enriched with heavy elements is 20% of the original. 2) the maximum estimate of the mass of gas transformed to the stars is 25%, while the mass of the enriched part of the clouds is twice less than the original one. 3) the number of supernovae type 1a in the GC should be 2-4 times less (depending on the fraction of mass of the enriched part of the cloud) than the number of collapsing supernovae.

Role of environment on AGN activity

Amirnezam Amiri, Saeed Tavasoli, Gianfranco De Zotti

Amirnezam Amiri
IPM, Iran; Physics Department, Kharazmi University, Tehran, Iran

The amount of magnesium and iron, produced by first generations of GCs, does agree with hypotheses: 1) the minimum fraction of the mass of the galactic cloud that has transformed into the stars is 10%, while the mass of gas enriched with heavy elements is 20% of the original. 2) the maximum estimate of the mass of gas transformed to the stars is 25%, while the mass of the enriched part of the clouds is twice less than the original one. 3) the number of supernovae type 1a in the GC should be 2-4 times less (depending on the fraction of mass of the enriched part of the cloud) than the number of collapsing supernovae.

Poster

Orientation of the spins of the edge-on galaxies relative to the filaments

Antipova A., Makarov D.

Alexandra Antipova
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

We analyze the spin orientation of edge-on galaxies relative to the filaments of the large-scale structure of the Universe. We use the Revised Flat Galaxy Catalog, which contains 4236 flat galaxies with an axes ratio a/b>7. This simple criterion selects mostly late-type galaxies (Sc, Sd) oriented edge-on to a line of sight. The edge-on galaxies allows us to determine a spin orientation with high accuracy. We found very weak indication of an alighment of the spins with respect to the filaments on the 2-sigma level. We tested different dependancies of the alignment from galaxy properties, including the galaxy brightness, the distance from a filament, the redshift and the axes ratio a/b. The effect is most pronounced for the nearby (z<0.03) and the most thin galaxies (a/b>10).

Impact of the accretion of Sagittarius dwarf on the distribution of Milky Way's globular clusters

Naira Arakelyan
Lebedev Physical Institute of the Russian Academy of Sciences, Russia

In this work, a search was carried out for globular clusters (GCs) belonging to the Sagittarius tidal stream using the method of nearest neighbors and the analysis of radial velocities relative to the Galactic Standard of Rest (VGSR), age-metallicity (Fe/H) and proper motions for Gcs and for stars in the tidal stream. As a result, 2 lists were received: the main list consisting of 8 GCs (For 4 of 8 GCs there is a discrepancy in the proper motions, because of this they can be considered as candidates) and the list of candidates - 15 GCs. The anisotropy of the GCs distribution for GCs belonging to the tidal stream of Sagittarius and the anisotropy of the GCs distribution without GCs belonging to the stream was also measured. Measurements have shown that the stream affects the spatial distribution of GCs in the Galaxy.

The Dwarf Galaxy, its Black Hole and Stars In scope of Non-Inflationary Cosmology

Ara Avetisyan
Viktor Ambartsumian Observatory, Yerevan State University, Armenia

In scope of new alternative theory of cosmology ("Non-Inflationary Cosmology" (NIC)), dwarf galaxies (DG) can be considered as initial stage of general scenario of galaxies' formation. The mechanisms of generation of DG's BHs and stars are based on the conceptual new view on the evolution of the Universe, and on cosmological original principles and hypotheses disclosed by NIC [1–3,5–7]: Cosmological Small Bang (CSB), original explosion within the galactic model, caused by the sharp and abrupt large-scale Phase-Transition process of initial Bose-statistics into Fermi-one in the Matter Era, thanks to the emergence of Pauli Excursion Principle. Direct consequence of CSB – the Strong Shock Wave (SSW) – likely had accelerated the fragmentations of giant masses of matter outdoors from the "mother configuration" and compressing it within the core of galaxy, guaranteeing original effect – the "induced gravitational collapse", responsible for the generation of IMBH in the core of DG and SMBH within usual ones [1,2]. The CSB and SSW phenomena jointly could be as possible source of energetic activity of galaxies [4,7]. The recent experimental proof of Higgs Boson's existence in Nature has confirmed our earlier prediction about possible participation of Higgs bosons in the large-scale Bose-condensate state, becoming the more broadened cosmological model of galaxies [1,2,6]. The Higgs boson has essential cosmological mission also in construction scenario of fundamental new cosmological scales in Matter Era [3,5,6], describing the space-time typical measures of main cosmological phenomena and astrophysical processes. Thus, NIC has succeed in designing of original scales and corresponding scenarios for the generation of various types of galaxies: massive BHs in their cores, as well as low- and high-mass stars and variable SNs within the galaxy's disk, bulge and halo. The theory of NIC is able to explain also the morphological types of galaxies as well, especially the characteristics of DG with IMBH in their core. The mentioned phenomena and processes are jointly responsible for the generation of rotation curve of disk-galaxies, without hypothetical Dark-Matter's "mission" [7]. The theory of NIC is able to resolve the enigma of "merging-galaxy", especially explain the problem: "Might the single galaxy be borne with double SMBHs in own core"? In scope of NIC, the high-energy phenomena around the SMBH might reveal original mechanisms for the Gamma-astronomy, disclose the origin of possible source for HE-, and even VHE-gamma quanta [8,9]. Further investigations are devoted to the explanations of following tasks: Problem 1. Are DG "remnant of self-gravitational collapsing Bose-configurations", within which the phenomenon CSB has been breakdown after its several explosions? Might DG be generated from the giant fragmentations of "mother Bose-configuration", being thrown into nearby area via SSW? These theoretical predictions may be in tight correlation with recent observations, which unequivocally predicted that probably some local DG might be formed extremely early, during the Dark Ages within the first billion years after the Big Bang. In this regard, the theory of NIC now is very close to explain the astonishing discovery: how a SMBH in a small nearby galaxy may be grown in early history of the Universe? Problem 2. What is the nature of DGs' frequent and regular orbiting the larger galaxies in the Local Group? Furthermore, the observational fact that DGs' formation and activity are thought to be seriously influenced by the interaction with larger galaxies. In this regard, the theory of NIC is able to illustrate the mentioned issues simple and transparent thanks to joint action of CSB and SSW phenomena. The current investigations of NIC are connected with the modelling of scenario with fragmentations of "mother Bose-configuration", constructing on this base the possible explanation of other observational data. In this regard note, that the largest globular cluster in the Milky Way (Omega Centauri) is in fact the core of a dwarf galaxy, which own BH was absorbed by the Milky Way. Problem 3. Might the model of so called "coherent drop of bi-component Bose-condensate", disclosed in scope of NIC within the galactic IMBH or SMBH, operate as a candidate in role of real phenomenon for the energetic source and engine of galactic jet also in DG? References: [1] A. K. Avetissian, arXiv: 0711.2969 (2007). [2] A. K. Avetissian, Astrophysics, 51, 130 (2008). [3] A. K. Avetissian, Gravitation and Cosmology, 15,10 (2009). [4] A. K. Avetissian, In book: Evolution of Cosmic Objects Through their Physical Activity, Byurakan (2010). [5] A. K. Avetissian, Astronomical Society of the Pacific Conference Series, USA, 511, 236 (2017). [6] A. K. Avetissian, Gravitation and Cosmology, 24, 375 (2018). [7] A. K. Avetissian, Rep. NAS RA, 119, 142 (2019). [8] A. K. Avetissian, In book: Proceedings of MePHi 4th International Conference, Moscow (2019). [9] A. K. Avetissian, Proceedings of Int. Conf. on VHE Phenomena around SMBH, Yerevan (2019).

The central cusps in dark matter halos: fact or fiction?

A.N. Baushev, S.V. Pilipenko

Anton Baushev
Bogoliubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Russia

We investigate the reliability of standard N-body simulations by modelling of the well-known Hernquist halo with the help of GADGET-2 code (which uses the tree algorithm to calculate the gravitational force) and ph4 code (which uses the direct summation). Comparing the results, we find that the core formation in the halo center (which is conventionally considered as the first sign of numerical effects, to be specific, of the collisional relaxation) has nothing to do with the collisional relaxation, being defined by the properties of the tree algorithm. This result casts doubts on the universally adopted criteria of the simulation reliability in the halo center. Though we use a halo model, which is theoretically proved to be stationary and stable, a sort of numerical 'violent relaxation' occurs. Its properties suggest that this effect is highly likely responsible for the central cusp formation in cosmological modelling of the large-scale structure, and then the 'core-cusp problem' is no more than a technical problem of N-body simulations.

Velocity Fields in the Local Universe

Chetan Bavdhankar
National Center for Nuclear Research, Warsaw

Peculiar velocity of galaxies is one of the very important probes of the cosmological model (Strauss and Willick (1995)). Since peculiar velocities are induced by gravity only, they can be used to obtain various cosmological parameters such as mean matter density or the growth of structure (Nusser and Davis (2011)). The large-scale fluctuations of the matter distribution can be determined using bulk flows where a given volume of the sample shows the net peculiar motion of galaxies. To study these velocity dependent properties, I have started with estimating observers motion using the radial peculiar velocities of the galaxies in observers frame. In this analysis, I have simulated 1000 galaxies in a volume of a sphere of radius 350Mpc. These galaxies have peculiar velocities in random directions with gaussian magnitudes. Then we try to recover the observer's motion from the observer frame updated data using chi-squared analysis. With real data, this type of analyses can be used to estimate the motion of the Local Group, bulk flows in at different scales, local voids, etc.

Velocity field from Cosmic-Flows-3

H. Courtois

Helene Courtois
University of Lyon, France

I will present the newest results obtained with Cosmic-flows-3 catalog of galaxy distance moduli and derived peculiar velocity field.

Invited talk

Ultra diffuse and low surface brightness galaxies: observational signatures and dark matter content

Arianna Di Cintio
Instituto de Astrofísica de Canarias, Spain

Recent observations of the low surface Brightness universe have uncovered a rich population of ultra diffuse galaxies,both in clusters and in the field. Cosmological simulations have finally managed to reproduce such objects: I will review current findings based on these NIHAO simulation suite,and discuss future challenges.

Poster

Emission characteristics of dust in cooling plasma

S.A. Drozdov, Y.A. Shchekinov

Sergey Drozdov
Astro Space Center of Lebedev Physics Institute of the Russian Academy of Sciences, Russia

The particular feature of a thermal state of dust grains immersed in a hot gas is that they experience temperature fluctuations in a wide range. Temperature distribution function depend of dust grain radius and plasma characteristics. In this work, the temperature distribution function for grains with sizes from 30 A to 3000 A for different gas temperatures and dencities is dicribed along with resulting dust emission spectra.

Segmenting the Universe into dynamically coherent basins

Alexandra Dupuy
Institut des 2 infinis de Lyon, France

A methodology to partition the universe using a definition similar as watersheds was introduced in Dupuy et al. 2019 and applied to the CosmicFlows–3 observational dataset. This article explores the concept with a series of tests conducted with cosmological dark matter simulations. In particular we are interested in quantifying the evolution with redshift of large scale structures when defined as segmented basins. This new definition is a robust tool since all basins show a density contrast δ above one (mean universe density) independently of the simulation spatial resolution or the redshift. Amother major finding is that density profiles of the basins show universality in slope.

Star Formation Processes and Energy Sources in Interstellar Gas

Ergun Ege
Istanbul University

Stars and interstellar matter in normal disk galaxies are marginally unstable to produce spiral arms and large-scale turbulent energy. If the spiral-shocked gas is dense enough, it can collapse further into giant cloud complexes and eventually stars. Young stellar feedback then destroys the clouds and produces more turbulence. The fraction of the observed turbulent energy that comes from large-scale cascades versus small-scale feedback is currently unknown. The importance of stellar feedback as a regulator for star formation is also unknown. This talk will review observations of these processes and comment on the various sources of turbulent energy.

Feedback-driven superbubbles and triggered star formation in nearby dwarf galaxies

Oleg Egorov, Tatiana Lozinskaya, Alexei Moiseev

Oleg Egorov
Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia

We present the results of the ongoing survey at the 6-m telescope of SAO RAS aimed to analyse the gas morphology, kinematics and ionization state in the nearby dwarf galaxies. A proximity of such galaxies, a thickness of their gaseous disks and a lack of spiral density waves allow one to study in details the feedback from massive stars regulating the ISM. We performed the observations with a scanning Fabry-Perot interferometer with high spectral (20 km/s) and spatial (20-50 pc) resolutions. We identified and analyzed several tens of the ionized superbubbles; certain signs of propagating star formation were found. We argue that at least in several galaxies the collision of the giant kpc-sized supershells plays important role in the triggering of a new burst of star formation. A multi-component emission line profiles are observed in many of star-forming regions and most probably related to the influence of stellar winds and supernovae. At the same time a complex kinematics of the ionized gas is also observed far from the young star clusters that points to the importance of the energy leakage and shock waves propagation as a driver of turbulence of the ISM, in particular - in the diffuse ionized gas.

Ionized gas kinematics of void galaxies

Evgenia Egorova, Oleg Egorov, Alexei Moiseev

Evgenia Egorova
Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia

We compiled a sample of 16 void intermediate-luminosity galaxies that reveals unusual and perturbed appearance, and/or have relatively low metallicity for their luminosity in comparison with the standard relation. Our hypothesis is that such properties might be caused by the accretion of the external gas onto these galaxies or recent interactions and mergers. To examine this opportunity we use Fabry-Perot interferometer data in the Hα emission line obtained with 6m SAO RAS telescope (Russia) and deep optical photometry performed with 2.5m telescope of SAI MSU (Russia). In most galaxies we indeed observe non-circular ionized gas motions that might be caused by accretion or tidal disturbance. Four isolated galaxies reveal strong misalignments between the optical major axis and the ionized gas rotational axis. Possible scenarios of such misalignments are discussed.

Invited talk

Star Formation Processes and Energy Sources in Interstellar Gas

Bruce Elmegreen
IBM Research Division, T. J. Watson Research Center, USA

Stars and interstellar matter in normal disk galaxies are marginally unstable to produce spiral arms and large-scale turbulent energy. If the spiral-shocked gas is dense enough, it can collapse further into giant cloud complexes and eventually stars. Young stellar feedback then destroys the clouds and produces more turbulence. The fraction of the observed turbulent energy that comes from large-scale cascades versus small-scale feedback is currently unknown. The importance of stellar feedback as a regulator for star formation is also unknown. This talk will review observations of these processes and comment on the various sources of turbulent energy.

S-stars motion around relativistic compact object SgrA*

R. Gainutdinov (SPbSU) and Yu. V. Baryshev (SPbSU)

Rustam Gainutdinov
Saint Petersburg State University, Russia

A review of modern VLTI observations of the orbital motion of closest stars to the relativistic compact object SgrA* and its ability to test gravitation theories in the conditions of Post-Newtonian approximation. The observed orbital parameters, second order Doppler effect and gravitational redshift, measured for several S-stars, are compared with theoretical PN predictions.

Invited talk

From Large Volume Simulations to Near Field Cosmology

Stefan Gottlöber
Leibniz-Institut für Astrophysik, Germany

During the last decade we run a series of dark matter simulations with 3840^3 particles within volumes of $(2500/h\ \mathrm{Mpc})^3$, $(1000/h\ \mathrm{Mpc})^3$), $(400/h\ \mathrm{Mpc})^3$ and $(160/h\ \mathrm{Mpc})^3$. Galaxies have been derived applying the semianalytic models GALACTICUS, SAG, and SAGE to the Gigaparsec simulation. We have extendend this MultiDark project to an even larger volume ($4000/h\ \mathrm{Mpc})^3$) as well as to a smaller volume of $(64/h\ \mathrm{Mpc})^3$ for which we used constrained initial conditions from the CLUES project (https://www.clues-project.org). In the constrained simulations of CLUES numerical counterparts of the Virgo cluster and of the Local Group can be identified and allow to study Near Field Cosmology. I am going to review some results from these projects. I will also briefly introduce the CosmoSim database https://www.cosmosim.org/ from which access to the simulations is possible.

Stellar dynamics of nearby low surface brightness galaxies in integrated light: bridging the gap between dEs, UDGs and dSphs.

Kirill Grishin, Igor Chilingarian, Anton Afanasiev, Daniel Fabricant, Sean Moran

Kirill Grishin
Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia

Ultra-diffuse galaxies (UDGs) are spatially extended, low surface brightness stellar systems with regular elliptical-like morphology found in a wide range of environments. Studies of the internal dynamics and dark matter content of UDGs that would elucidate their formation and evolution have been hampered by their low surface brightnesses. Here we present spatially resolved velocity profiles, stellar velocity dispersions, ages and metallicities for 9 UDGs in the Coma cluster. We use intermediate-resolution spectra obtained with Binospec, the MMT's new high-throughput optical spectrograph. We derive dark matter fractions between 50 % and 90 % within the half-light radius using Jeans dynamical models. Three galaxies exhibit major axis rotation, two others have highly anisotropic stellar orbits, and one shows signs of triaxiality. In the Faber–Jackson and mass–metallicity relations, the 9 UDGs fill the gap between cluster dwarf elliptical (dE) and fainter dwarf spheroidal (dSph) galaxies. Overall, the observed properties of all 9 UDGs can be explained by a combination of internal processes (supernovae feedback) and environmental effects (ram-pressure stripping, interaction with neighbors). These observations suggest that UDGs and dEs are members of the same galaxy population.

Cosmological Phase Transitions of galaxy clusters in an expanding Universe

Nasser Demir, and T Masood

Naseer Iqbal
University of Kashmir, Srinagar, India

Galaxy clusters in an expanding universe are real observatories that help for studying the structure formation of the universe. It is being noticed that galaxy clustering phenomena takes place in few sequences like phase wise. We have developed a Simi analytical model based on thermodynamic and statistical mechanical approach that successfully shows how galaxies cluster and the whole process takes place from one moderately dense phase to a higher moderately dense phase owing to its density fluctuations. We see this change leading to a symmetry breaking in gravitational effects. The symmetry breaking will fully explain the kind of a gravitational phase transition taking place. We have also made use of clausis clapeyron heat equation to evaluate the kind of latent heat taking place as well. This work has developed an interest in knowing the construction of a phase diagram for the galaxy clustering phenomena on the basis of PT / PV curve.

Poster

H-alpha imaging galaxies in the Local Volume

S.S. Kaisin, I.D. Karachentsev

Serafim Kaisin
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

We present the emission H-alpha line observations of the Local Volume (LV) galaxies residing within 11 Mpc. The measured H-alpha fluxes are used to estimate the integrated (SFR) and specific (sSFR) star-formation rates for more than 500 LV galaxies. Most of them have also FUV-fluxes derived in GALEX survey. Comparing SFR(H-alpha) with SFR(FUV) allows us to distinguish dwarf galaxies with active and passive star formation on typical time-scales of 10 - 100 Myr.

Poster

Catalog & Atlas of the LV Galaxies

Kaisina E.I., Karachentsev I.D., Makarov D.I., Kaisin S.S.

Elena Kaisina
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

We present a database of galaxies in the Local Volume (LV) (https://www.sao.ru/lv/lvgdb/) having individual distance estimates within 11 Mpc or corrected radial velocities V LG $<$ 600 km s–1. It collects data on the following galaxy observables: angular diameters, apparent magnitudes in far-UV, B, and Ks bands, Hα and HI fluxes, morphological types, HI-line widths, radial velocities, and distance estimates. Also contains a consolidated set of optical images of all the galaxies from the SDSS and DSS surveys and Hα images of galaxies that were observed with the 6-m BTA telescope. The latest version of the Updated Nearby Galaxy Catalog (UNGC) (Karachentsev et al. 2013) contains 869 objects, now in the database more 1200 objects. We present the some main dependencies describing the updated sample LV galaxies: Hubble flow, distribution galaxies according to their distance estimates and on the sky, relation between the absolute magnitude, Holmberg diameter, and rotation velocity et al.

An analytical model for the structure evolution of satellite galaxies in the Milky Way and its application to both Cold and Warm dark matter

Xi Kang

Xi Kang
Purple Mountain Observatory, China

Studying the very inner structure of faint satellite galaxy in the Milky Way requires very high-resolution hydrodynamical simulations with realistic model for star formation, which are beginning to emerge only very recently. In this work we develop an analytical description to model the inner kinematic of galaxy and apply it to the MW satellites. Our aim is to investigate their constraints on the nature of dark matter, namely cold dark matter and warm dark matter. We use a Monte-Carlo method to produce merger trees of MW mass halos and a semi-analytical model to produce visible stars in the satellite galaxies. We consider a few important processes which can significantly affect the satellite kinematics. The first is the reduction of dark matter halo concentration in the warm dark matter model. The second is the baryonic feedback which will induce a flat inner profile with dependence on the star formation efficiency in the satellite galaxy. The third is the tidal stirring which can further reduce the satellite velocity dispersion. Using this model we can study the contribution of different baryonic process and set constraints on the WDM mass.

Invited talk

Dwarf galaxies in the Local Volume

I.D. Karachentsev, E.I. Kaisina

Igor Karachentsev
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

A catalog of 1060 Local volume (=LV) galaxies situated within a distance of 11 Mpc contains 870 dwarfs, i.e. 5/6 of the sample. Almost 40% of them have accurate distances measured with Hubble Space Telescope. Most of the LV dwarfs have been observed already in HI and Hα emission lines, as well in far-ultraviolet with GALEX. We present basic properties of the LV dwarfs, their HI-mass content and star formation rate in different local environments. We discuss a baryonic Tully-Fisher relation for the LV dwarfs, and apply it to determine TF-distances for several hundreds other local galaxies. The accurate distances and radial velocities of the LV dwarfs are used to estimate dark matter masses around the nearby luminous galaxies. We discuss also does the Local Group may be treated as a typical or uncommon representative of the LV population.

UGC 1198 - the galaxy with an inner polar disk/ring

G. M. Karataeva, O. A. Merkulova, L. V. Shalyapina, V. A. Yakovleva

Gul'nara Karataeva
St.Petersburg State University, Russia

We analyze new observational data obtained at the 6-m telescope of the Special Astrophysical Observatory of the Russian Academy of Sciences with the SCORPIO focal reducer for the peculiar galaxy UGC 1198. According to the results of the material obtained, it was concluded that UGC 1198 is a dwarf elliptical galaxy (dE) with signs of interaction. Our kinematic study of UGC 1198 showed that there are at least two systems. One of them is associated with the stellar system of UGC 1198 itself with a weak rotation around the small axis of the galaxy. The second system is associated with a gaseous disk/ring rotating at an angle of **72**$^\circ$ **to the equatorial plane of the galaxy**. A gaseous polar disk/ring could form during the merging of a dwarf elliptical galaxy with a galaxy of about the same or lower mass containing a gas. An average age of the stellar population in the region r $\geq 5''$ corresponds to $2\times\ 10^9$ years. It can be assumed that the interaction, as a result of which the galaxy under study was formed, occurred less than a billion years ago.

Kinematic study of the Virgo cluster

Olga Kashibadze, Igor Karachentsev, and Valentina Karachentseva

Olga Kashibadze
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

The work studies kinematic characteristics and distribution of galaxies with radial velocities $V_{LG} < 2600$ km/s in the region of 30 by 20 degrees centered on the radio galaxy M87. The sample contains 1537 galaxies; of them, 831 (54%) are concentrated within 6 degree zone corresponding to the virial radius of the cluster R_{vir} = 1.7 Mpc, and 738 galaxies (48%) have distance and peculiar velocity estimates. We identify the infall of galaxies towards the Virgo cluster core along the Virgo Southern Extention filament. From a 1D profile of the cluster we obtain the virial mass estimate of $(7.2\pm0.5)\times10^{14}$ Msun in tight agreement with its mass estimate via external infall pattern of galaxies. We conclude that the Virgo cluster outskirts does not contain significant amount of dark matter beyond its virial radius.

Poster

Interstellar UV radiation field in high redshift galaxies probed by Damped Lyman Alpha systems: measurements based on excitation of H2 rotational levels

Klimenko V.V., Balashev S.A.

Viacheslav Klimenko

The Ioffe Physical-Technical Institute of the Russian Academy of Sciences, Russia

We have calculated a database of photon-dominated region models of the diffuse molecular cloud for the grid of physical conditions of the interstellar medium. We have developed a method for determination of the physical parameters of ISM, namely - gas density and intensity of the interstellar UV radiation field. The method is based on the comparison of the population of molecular hydrogen rotational levels calculated in our PDR database with values measured in clouds at high redshifts detected in quasar spectra. We found that H_2-bearing medium in strong H2-bearing DLAs have typical values for the kinetic temperature, hydrogen density, and UV radiation field of, respectively, T 100 K, n 100 cm^{-3}, and I_{UV} about twice the intensity of the Draine field.

Interaction history of the LMC and SMC: Spectroscopic observations with SALT telescope of Cepheids from the Magellanic Bridge

Lemasle Bertrand, Kniazev Alexei, Valery Kovtyukh, Anna Jacyszyn-Dobrzeniecka, Eva Grebel

Alexei Kniazev
South African Astronomical Observatory, South Africa

The interaction between the Milky Way, the Large Magellanic Cloud (LMC) and the Small Magellanic Cloud (SMC) led to the formation of a complex Magellanic system, especially the Magellanic Bridge (MB), a stream of HI that linking both clouds which also includes stars. To better constrain numerical simulations describing the MW/LMC/SMC interactions we observed the entire Cepheid population in the Magellanic Bridge using spectral instruments installed at SALT telescope. The brightest Cepheids were observed with echelle (R 39000), where the rest was observed using the long-slit mode (R 2000). We will present this sample, our analysis and our first results.

Invited talk

High-resolution Environmental Simulations of The Immediate Area: the HESTIA project

Noam Libeskind
Leibniz-Institut für Astrophysik, Germany; Institut de Physique Nucléaire de Lyon, France

Owing to its proximity, the local volume or "cosmic near field" is the best observed region in the universe. As such it can provide key measurements that probe the nature of the universe on a fundamental level and in unprecedented detail. By constructing detailed gravitational maps of the local universe via surveys of direct distance measurements and the peculiar velocity field, we are able to reconstruct the full underlying density in the local universe as well initial conditions for cosmological simulations. These initial conditions can be used to simulate the Milky Way and Local Group at unprecedented resolution and constrained environmentally with gasdynamics and star formation. In this talk I will report on the HESTIA project, an attempt to simulate the Milky Way, the Local Group, and Local Universe all at once.

Spatial segregation and star formation in dwarf spheroidal galaxies: Local Group and beyond

Lidia Makarova, Dmitry Makarov

Lidia Makarova
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

Nearby dwarf galaxies is an excellent laboratory to study the processes of star formation in details, since the galaxies are resolved into individual stars, and their structure is relatively simple. Last years, we have discovered and studied a number of isolated nearby dwarf spheroidal galaxies. It is important to get detailed consideration to these rare objects, since the common recent scenario of dSphs formation suggests that such galaxies are formed due to the interaction between a rotationally supported dwarf irregular galaxy and a MW-sized host galaxy. Then rather isolated dwarfs should be exceptionally irregular, and the discovered objects should follow an other scenario of the formation and evolution. Using our HST/ACS observations of these objects, we homogeneously measured their star formation histories (SFHs). All objects demonstrate a complex SFH, with a significant portion of stars formed 10-13 Gyr ago. Nevertheless, the stars of middle ages (1-8 Gyr) are presented. In order to understand how the SF parameters influence the evolution of the dSphs, we also studied a sample of nearest dSphs in a different environment: isolated (d<2 Mpc); beyond the Local Group (LG) virial radius (but within the LG zero velocity sphere); the satellites of M31 located within the virial zone (300 kpc). We also significantly expanded our sample with 13 dwarf spheroidal galaxies of the nearby Centaurus A group. Using our and archival HST/ACS observations of the dSphs, we measured their SFHs. A comparative analysis of the parameters obtained give us a possibility to distinguish a possible effect of the spatial segregation on the dSphs evolution scenario.

The startling dynamics of HI-rich ultra-diffuse galaxies

Pavel E. Mancera Piña, Filippo Fraternali, Betsey Adams, Tom Oosterloo

Pavel E. Mancera Piña
Kapteyn Astronomical Institute, University of Groningen

We study the gas kinematics of six HI–rich ultra-diffuse galaxies (UDGs). Using a 3D kinematic modelling technique we derive robust circular velocities, revealing a startling feature: HI–rich UDGs are clear outliers from the baryonic Tully-Fisher relation, with circular velocities much lower than galaxies with similar baryonic mass. Notably, the baryon fraction of our UDG sample is consistent with the cosmological value: these UDGs are compatible with having no "missing baryons" within their virial radii. Moreover, the gravitational potential provided by the baryons is sufficient to account for the amplitude of the rotation curve out to the outermost measured point, contrary to other galaxies with similar circular velocities. We speculate that any formation scenario for these objects will require inefficient feedback and a broad diversity in the inner dark matter content.

Star formation feedback in dwarf galaxies tracked by 3D spectroscopy with Fabry-Perot interferometers

Alexei Moiseev
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

Compared to the popular integral-field spectrographs, the Fabry-Perot interferometer (FPI) provides a unique combination of a large field of view, high spectral resolution, and detailed image sampling that are important to study the ionized interstellar medium in galaxies including the diffuse ionized gas. I briefly review recent results obtained by our team in studying nearby star-forming dwarf galaxies taken with the FPI at the 6-m SAO RAS telescope. Different methods of detection of wind-blown expanding shells and shock fronts related with stellar feedback processes are discussed: the velocity dispersion maps, the 'intensity-velocity dispersion', and the 'BPT-sigma' diagrams. First results of studying the ionized gas properties using the low-resolution (tunable-filter) FPI at the 1-m SAO RAS telescope and 2.5-m SAI MSU telescope are also considered.

Deep imaging of low surface brightness structures near galaxies

Aleksandr Mosenkov, Michael Rich, Noah Brosch, Shuki Koriski

Aleksandr Mosenkov
Central (Pulkovo) Astronomical Observatory of the Russian Academy of Sciences, Russia

Using two identical modest-sized telescopes with an aperture of 0.7m and a field of view of approximately 1 sq. degree, we obtained deep observations (down to 28-30 mag/arcsec^2 in the R band) for about 250 sq. degrees of the celestial sphere with a primary goal of detecting extended low surface brightness (LSB) features around nearby galaxies of different morphology, inclination, and environment. These LSB features, such as extended galaxy stellar halos (the HERON project), stellar streams and tails, heated disc material, and possibly complex non-spherical shapes of galaxy bulges, can be produced by minor merger events which are important drivers of the galaxy formation and evolution within the ΛCDM cosmological paradigm. Another goal of this work is searching for candidates to LSB and ultra diffuse galaxies in the obtained frames. We describe the methodology for detecting such galaxies and analyse the properties of the selected objects. Finally, we analyse the outer stellar component (thick disc or halo) and describe its shape (discy, boxy or roundy). We propose that for the target galaxies the environment (minor merging) and their structural composition (e.g. the relations between structural parameters of the thin and thick discs) define the shape of the outer galaxy isophotes.

Invited talk

Small-scale cosmology with dwarf galaxies

Oliver Muller
Observatoire astronomique de Strasbourg, University of Strasbourg, France

Dwarf galaxies are powerful testbeds to study cosmology on small-scales. In the Local Group, several discrepancies between theoretical predictions and observations of dwarfs have been identified and dubbed as a small-scale crisis. One of the most severe is the so-called plane-of-satellite problem, which describes the peculiar distribution and motion of dwarf galaxies around the Milky Way and the Andromeda galaxy. To extend these studies, we have conducted – and will conduct – several surveys with a multitude of small and large telescopes to probe other nearby galaxy groups and search for dwarf galaxies, ultra-diffuse galaxies, and tidal features. In my talk, I will provide evidence that some small-scale problems persist in other galaxy groups, most notably in the Centaurus A group. And more, I will present how a recently developed algorithm for medical image analysis can help us discover low-surface brightness features in astronomical images and can be used to process large ongoing and upcoming surveys to get a better census of satellite systems to study cosmology on small-scales.

Synergy of the SDSS and the WISE in the Stripe 82: physical properties of 15 million galaxies

Marat Musin, Haojing Yan, Jiasheng Huang

Marat Musin
National Astronomical Observatories, Chinese Academy of Sciences, China

We report the current results from our effort to synergize WISE and SDSS in the 300 square degree Stripe 82 region. Using the SDSS images as the prior, we fit the SDSS-detected objects to the WISE W1/W2 images to obtain consistent optical-to-IR SEDs. The major outcome consists of three catalogs: (1) the "SDSS+WISE" photometric catalog of 13 million SDSS-detected point sources, (2) the "SDSS+WISE" photometric catalog of 15 million galaxies with photometric redshifts, and (3) the catalog of "WISE Optical Dropouts", or "WoDrops", which are those detected in the W1/W2 images but do not have counterparts in the SDSS. We discuss the application of the extragalactic catalogs in the context of Global Stellar Mass Density and Cosmic Star Formation History.

BPT-σ relation in local galaxies.

D.V. Oparin

Dmitry Oparin
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

Study of the state of ionized gas in galaxies is crusial for understanding a galactic evolution and effects of stellar feedback. Emission lines ratio diagrams (also known as Baldwin-Phillips-Terlevich plots) is a traditional method for analysis of the state of the ionized gas emitting in the optical range. Although it helps easily to o separate main ionization sources (like young stars in the H II regions, active galactic nuclei et al.), there are difficulties appearing in intermediate cases. For objects with shocks ionization this problem could be solved by adding to classical BPT-diagrams an extra parameter — line-of-sight velocity dispersion of the ionized gas (σ). We combined velocity dispersion maps obtained with scanning Fabry-Perot Interferometer at the 6-m telescope BTA with emission line ratios obtained from the different integral-field spectroscopy data to analyse the interstellar medium in local galaxies with different sources of ionization.

Merging dwarf galaxies in local universe

Sanjaya Paudel

Sanjaya Paudel
Department of Astronomy and Center for Galaxy Evolution Research, Yonsei University, Seoul 03722, Korea

Our cosmology predicts a hierarchical scheme where the larger structures are built up by smaller units that merge. In this hierarchy, dwarf galaxies play a key role given their participation in the assembly of massive galaxies at earlier epochs and at present. Observational evidence of small scale hierarchical clustering of galaxies at the mass regime has remain elusive. We have published the largest publicly available catalog of interacting dwarf galaxies. It includes 177 nearby merging dwarf galaxies and it is overwhelmingly dominated by star-forming galaxies, and they are generally found significantly below the red sequence in the color–magnitude relation. The number of early-type galaxies is only 3 out of 177. I will discuss frequency merging dwarf in different environment and find out how the local environment affects interaction process and star-formation activities.

Invited talk

Stellar Streams from Globular Clusters in the Local Universe

Sarah Pearson
Center for Computational Astrophysics, Flatiron Institute, USA

From the vast population of stellar streams in the Milky Way, we know that the morphology of thin, stellar streams, in particular, can be used to test the distribution and nature of dark matter. It is therefore crucial to extend searches for these streams to other galaxies than the Milky Way. In this talk, I review the current and future prospects of detecting stellar streams in external galaxies with a focus on globular cluster streams. I create mock-stellar streams and inject them to data from the PAndAS M31 survey to produce simulated M31 backgrounds mimicking what WFIRST will observe in M31. Additionally, I estimate the distance limit to which globular cluster streams will be observable. Recent results demonstrate that for a 1 hour exposure, using conservative estimates, WFIRST should detect globular cluster streams in resolved stars in galaxies out to distances beyond 3.5 Mpc. This volume contains at least 199 galaxies of which >90% are dwarfs. If these external galaxies do not host spiral arms or galactic bars, gaps in their stellar streams provide an ideal test case for evidence of interactions with dark matter subhalos. Furthermore, obtaining a large samples of thin stellar streams can help constrain the orbital structure and hence the potentials of external halos.

An Intermediate-Mass black hole in a massive globular cluster

Renuka Pechetti, Anil Seth, Mark den Brok, Nelson Caldwel, Mark Gieles, Sebastian Kamann, Nora Lutzgendorf, Nadine Neumayer, Jay Strader, David Sand, Ricardo Schiavon, Karina Voggel, Mr. Andrew Stephens

Renuka Pechetti
University of Utah

Intermediate-mass black holes (IMBHs) are the bridge between the stellar-mass black holes and super-massive black holes. They are extremely difficult to observe as their effect on the surrounding stars is much weaker than a super-massive black hole. Hence, they require high-resolution measurements of the nearest possible targets. While only a handful of IMBH candidates exist, they can provide key information on the formation of the initial seeds of supermassive black holes and the origin of the galaxy–black hole scaling relations. We present the detection of an IMBH in the center of a massive globular cluster in the nearest galaxy M31. We derived the mass models using HST observations for the globular cluster and combined these with adaptive optics high spatial resolution kinematics derived from adaptive optics GEMINI/NIFS IFU observations. We then used Jeans anisotropic modeling to combine the mass models and kinematics to measure the black hole mass. This object is likely the stripped nucleus of a dwarf galaxy. We note this detection is more robust than any previous IMBH detection, including those in G1 or Omega Cen.

Circlet of starforming clumps in NGC 4324

I. Proshina, A. Moiseev, O. Sil'chenko

Irina Proshina
Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia

There will be presented the results of a detailed study of the starforming clumps in the gas ring of a nearby galaxy NGC 4324. The study is based on the data obtained with an imaging instrument MaNGaL - a narrowband tunable filter - developed in the SAO RAS. The gas inflow could be a source of a fresh star formation burst in a lenticular galaxy.

Search for new very low metallicity galaxies in the Local Universe, study of their diversity and speculations on its origin

Pustilnik S.A., Egorova E.S., Kniazev A.Y., Perepelitsyna Y.A., Chengalur J.N.

Simon Pustilnik
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

We define Very Low Metallicity (VLM) dwarfs with Zo/30 < Z(gas) < Zo/20, and eXtremely Metal-Poor (XMP) dwarfs, with Zo/50 < Z(gas) < Zo/30. We overview an on-going project to search for new XMP/VLM galaxies in the Nearby Void Galaxy sample and its preliminary results. To date we found 17 new XMP and VLM void dwarfs in addition to 12 XMP and VLM objects found earlier in the Lynx-Cancer void. Examination of main properties of all known 27 XMP and 48 VLM galaxies gives us a clear evidence for their diversity. This, in turn, should be connected with different evolutionary paths of studied galaxies. We separate several prototype XMP and VLM dwarfs and their probable counterparts in the whole sample. Based on the known properties of each prototype XMP or VLM group, such as mass fraction of stars, degree of metallicity deficiency, colors of the oldest stellar population, interaction status, type of environment, and others, we discuss their most probable origin and evolutionary path.

Invited talk

Baryonic Structures in Panchromatic Surveys of the Local Universe

Thomas H. Puzia
Institute of Astrophysics, Pontificia Universidad Catolica de Chile, Chile

Ultra-high energy gamma-ray astronomy with the Baksan air shower array

V. S. Romanenko, V. B. Petkov, D. D. Dzhappuev, I. M. Dzaparova, E. A. Gorbacheva, I. S. Karpikov, M. M. Khadzhiev, N. F. Klimenko, A. U. Kudzhaev, A. N. Kurenya, A. S. Lidvansky, O. I. Mikhailova, G. I. Rubtsov, S. V. Troitsky, A. F. Yanin, Ya. V. Zhezher, K. V. Zhuravleva.

Viktor Romanenko

Baksan Neutrino Observatory of Institute for Nuclear Research of Russian Academy of Sciences, Russia

The Baksan EAS array is located at the Baksan Neutrino Observatory near Mount Elbrus at altitude of 1700 m above the sea level. The array is equipped with a large-area (175 m^2) muon detector which makes it possible to separate the primary photons from hadrons. Using experimental data accumulated for 9.2 years, preliminary estimates of the flux upper limit is deduced for cosmic gamma-rays with energies above 300 TeV. Currently the project to increase the EAS array is almost completed. This includes the muon detector with a total area of 410 m^2. It should result in a considerable improvement in the gamma-hadron separation and expand the potentialities of gamma astronomy with energies above 10 TeV at the Baksan EAS array. The status and the prospects of the experiment are discussed, and some preliminary data is also presented.

Revisiting the local Hubble flow

Jean-Baptiste Salomon
Observatoire de Besanẹon, UTINAM, France

We propose new estimations of the local Hubble flow based on a galaxy sample in the vicinity of the Local Group (LG), up to 3 Mpc. The main point of this study is to stress the importance of the position and velocity of the LG barycentre which will directly impact the position and velocity of the observed galaxies. And indeed, the barycentre parameters suffer great uncertainties mainly due to the inaccuracy of the Andromeda galaxy (M31) proper motion. We developed an original method in order to express distance and line of sight velocity of a galaxy directly in the LG barycentre referential frame taking into account, in a consistent way, all the observational uncertainties. We test the method against a simple model performing a linear fit of the velocity distance relation. Once our method validated, we apply the Lemaître-Tolman model to assess, with a non-linear fit, the LG mass, its zero velocity sphere and the local Hubble flow. Several values for these parameters are given with respect to various M31 proper motions, including the last estimation derived from the second Gaia data release.

Poster

The intraday variations of the polarization vector direction in blazar S5 0716+714

E. Shablovinskaya, V. Afanasiev

Elena Shablovinskaya
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

The bright radio source S5 0716+714, which is usually classified as a BL Lac object, is one of the most intensively studied blazar. S5 0716+714 demonstrates extremely peculiar properties, such as the shortest time-scale of optical and polarimetric variations observed in blazars. In the given talk, we present the results of a 9-h polarimetric monitoring of S5 0716+714 with a ∼70-s resolution carried out using the 6-m telescope BTA of the SAO RAS. The observation data analysis reveals the variability both in total and polarized light on the ∼1.5-hour timescales that specifies the size of the unresolved emitting region. The numerical model of polarization in jet with helical structure of magnetic field is suggested, and fitting the model reveals a magnetic field precession with a period adbout 15 days.

Spectroscopic studies of globular clusters in dwarf galaxies

Sharina M.E., Shimansky V.V.

Margarita Sharina
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

An overview of recent studies of globular clusters (GCs) in dwarf galaxies shows the significance of these objects for understanding the evolution of the host galaxies. In particular, we present the results of 6-m telescope (BTA) medium-resolution observations of four GCs in the dwarf spheroidal galaxy IKN. We have derived radial velocities, ages, metallicities and Mg, Ca and C elemental abundances. We judge about the horizontal branch types of the studied extragalactic GCs using the information gained from the spectra.

Poster

Stellar populations and orbits of poorly-studied globular clusters in our Galaxy

M. E. Sharina, M. V. Ryabova, M. I. Maricheva, and A. S. Gorban

Margarita Sharina
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

We consider orbital parameters and medium-resolution spectroscopic data for Galactic globular clusters Pal 3, Pal 2, Pal 4, Pal 10 obtained with the CARELEC spectrograph of the Observatoire de Haute Provence. We discuss the probable origin of the studied clusters.

Star formation in isolated HI bearing UDGs

Yuri Shchekinov

Yuri Shchekinov
Lebedev Physical Institute of the Russian Academy of Sciences, Russia

Possible mechanisms which might inhibit star formation in HI rich ultra diffuse galaxies are discussed. Among such most likely are connected with external UV and X-ray photons, though physical properties of the interstellar gas can also play role.

Spatial galaxy distribution in real and redshift space for the Local Universe

Shirokov S.I. (SAO RAS), Solov'ev I.A. (SPbSU), Sokolov I.V. (INASAN), Lovyagin N.Yu. (SPbSU), Sylos Labini F. (INFN), Baryshev Yu.V. (SPbSU)

Stanislav Shirokov
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

The Cosmicflows-2 catalog of about 8000 redshifts and peculiar velocities for the Local Universe galaxies gives opportunity for preliminary testing the LCDM prediction of strong changing in the slope of correlation function derived for the real space and for the redshift space. We apply the conditional density analysis and modified pair-wise distribution method to derive the slope of the power-law complete correlation function. Our results demonstrate that the observed change of slope is less than 0.1. Influence of incompleteness is restricted by comparison with the 2MRS redshift catalog. Comparison of the Local Universe structure with more distant large scale structure is discussed.

Invited talk

Lenticular galaxies of the Local Universe: Effect of environments

Olga Sil'chenko
Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia

Lenticular galaxies are the second most abundant type of non-dwarf galaxies in the Local Universe, after spirals: according e.g. to the APM survey (Naim et al. 1995) or to EFIGI catalogue (Baillard et al. 2011), they constitute about 15%. Despite their dominance in clusters of galaxies where they may reach 60% of the galaxy population, the majority of S0s inhabit rather rarified environments, being members of groups and sometimes being even isolated. Evolutionary paths of S0s in clusters, in groups, and in isolation may be quite different. Recent observational findings imply that the S0s in clusters and S0s in the field have different structure – different types of radial brightness profiles (Erwin et al. 2012, Sil'chenko et al. 2018) as well as different thickness of their stellar disks. And the properties of their disk stellar populations are also different: the cluster S0s have all very old stellar disks while the S0s in the field often demonstrate some gas content and current star formation in the rings. I would discuss possible mechanisms of S0 smooth thick disk formation, by specifying in particular environment impact on the S0 shaping.

Invited talk

The Lowest Metallicity Galaxies

Evan Skillman
Minnesota Institute for Astrophysics, University of Minnesota, USA

There has been significant progress in identifying new, low metallicity star-forming galaxies. Additionally, there has been progress with better understanding of the evolutionary paths of these galaxies. Based on experiences with nebular abundances from the ISM and star formation histories and photometric abundances from resolved stellar populations, I will share what I believe to be securely known about the extremely low metallicity star forming galaxies. I will close with an update on the status of the primordial helium abundance.

Poster

Search of correlation between galaxies with H2O maser and without H2O maser

Volkov Konstantin and Parfenov Sergey

Ksenia Smirnova
Ural Federal University, Russia

The work presents a study of the characteristics of ultraviolet and infrared radiation – the luminosity of radiation, the ratios of radiation fluxes – of galaxies in which water molecules (H2O) megamasers are observed, and their comparison with the characteristics obtained for galaxies in which megamasers H2O are not detected. Observations of megamasers are of great scientific interest, since, for example, they provide estimates of the masses of supermassive black holes in the centers of galaxies with which they are associated. However, the detection of megamasers is difficult and to increase its probability, it is important to study the characteristics of the radiation characteristics of galaxies with already detected megamasers in different wavelength ranges. The work considers two samples of galaxies with the most similar morphological types. One of the samples included galaxies with maser radiation, and the other – galaxies without maser radiation. As a result of the work, a relationship was found between ultraviolet radiation and PAH radiation for both types of galaxies.

The GRB-Cosmology Data Base of observed and calculated parameters for applications in cosmological tests

Shirokov S.I. (SAO RAS), Sokolov I.V. (INASAN), Solov'ev D.I. (SAO RAS), Lovyagin N.Yu. (SPbSU), Solov'ev I.A. (SPbSU), Baryshev Yu.V. (SPbSU)

Dmitry Solovyov

Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

We present a GRB-Cosmology Data Base of gamma, optical and radio catalogs including SAO RAS observations with main observed and calculated parameters, which can be used for number of cosmological tests of the local and high redshift Universe. The name, instrument, coordinates, fluence, photon index, duration, redshift, energy frame, spectral parameters, bolometric values, isotropic equivalent energy and luminosity, and other key parameters, including known corrections for different biases and selection effects, SN Ia calibration of Amati and Yonetoku relations also are included. The data base catalogs can be used for such cosmological tests as Hubble diagram construction, spatial large scale GRB distributions, spatial distribution of galaxies and galaxy clusters indicated by GRB's line-of-sight, photometric and spectroscopic distances of galaxies in the deep GRB fields.

Invited talk

Galaxy formation from out of equilibrium gravitational dynamics

Francesco Sylos Labini
Enrico Fermi Center, Italia; Institute for Complex Systems, Italia

The complex spatial structure evident in spiral galaxies is understood either in terms of instabilities of quasi-stationary states, or a result of dissipative non-gravitational interactions. We illustrate here that purely self-gravitating systems evolving from quite simple initial configurations can give rise easily to structures of this kind of which the lifetime can be large compared to the dynamical characteristic time, but short compared to the collisional relaxation time scale. More specifically, for a broad range of non-spherical and non-uniform rotating initial conditions, gravitational relaxation gives rise quite generically to long-lived non-stationary structures of a rich variety, characterized by spiral-like arms, bars and even ring-like structure in special cases. These structures are a feature of the intrinsically out-of-equilibrium nature of the system's collapse, associated with a part of the system's mass while the bulk is well virialized. They are characterized by predominantly radial motions in their outermost parts, but also incorporate an extended flattened region which rotates coherently about a well virialized core of triaxial shape with an approximately isotropic velocity dispersion. We briefly discuss the possible relevance of these simple toy models to the observed structure of real galaxies. We conclude by stressing that these simple models illustrate the possibility that the observed apparent motions of spiral galaxies might be explained by non-trivial non-stationary mass and velocity distributions without invoking a large amount of dark matter halo or a modification of Newtonian gravity.

Poster

Study of PN population in nearby dwarf galaxy NGC3077

Sypkova A.M., Moiseev A.V.

Anastasiia Sypkova
Saint Petersburg State University, Russia

Planetary nebulae (PNe) in nearby galaxies are drawing particular attention due to their role as metallicity indicators, which is important in order to investigate chemical composition and expand the understanding of the star formation history. Also, PNe can be used as a tracker of the internal kinematics of a galaxy. Last but not least, the PNe luminosity function is a well-known distance indicator. NGC3077 is an interesting nearby local dwarf galaxy in M81 group, but no PNe have been mapped in this galaxy yet. In order to identify planetary nebula candidates in this galaxy, we used observations with a tunable-filter imager at the 2.5-m SAI MSU telescope in various emission lines. Compact objects were selected, their ionisation state was analysed via line-ratio diagrams. Several PN candidates were confirmed by spectroscopic observations at the 6-m SAO RAS telescope.

Stellar and dark matter density in the Local Universe

Karachentsev, I. D.; Telikova, K. N.

Ksenia Telikova
Ioffe Institute, Russia

Using recent all-sky catalogs of galaxy groups, we accurately calculated the mean density profiles for stellar and dark matter in the Local Universe up to distance scales of 135 Mpc. We found that the luminous mater density reaches its global asymptotic value when averaged over sphere of radius greater than 40 Mpc, while the dark matter density is much smaller than the cosmological value, within a sphere of 40 Mpc dark matter density drop to Ωm = 0.09-0.14. We conclude that the major part of the dark matter is located outside the virial and collapsing zones of groups and clusters.

Poster

The distance to the irregular galaxy Cassiopeia 1

Nikolay Tikhonov
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

Based on archival images of the Hubble Space Telescope, stellar photometry of the dwarf irregular galaxy Cassiopeia 1 (Cas1) located in the Milky Way zone was carried out. Measurements of the distance to the galaxy, obtained by other authors showed values from 0.7 to 5.2 Mpc. On the obtained Hertzsprung-Ressel diagram, we identified all types of stars and a branch of red giants, which was used to determine the distance using the TRGB method. The calculated values D=1.6±0.1 Mpc and MV = -14.2 indicate that Cas1 is located near the Local Group and is isolated from other galaxies. The measurement showed that the red giants of this galaxy have a very low metallicity ([Fe/H] = -2.8).

Poster

Semi-dark dwarf galaxy Coma P on the periphery of the Virgo cluster

Tikhonov N.A., Galazutdinova O.A., Karataeva G.M.

Nikolay Tikhonov
Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

Based on archival images of the Hubble Space Telescope, stellar photometry of the Coma P dwarf galaxy was carried out. Study of morphology and apparent distribution of the stars showed that Coma P consists of two interacting dwarf galaxies. Weak star formation is observed in the brighter galaxy, while in the second galaxy star formation is absent; because of the very low surface brightness, the second galaxy can be called 'dark'. The distance to the galaxies, measured by the TRGB method (D = 12.7 Mpc), indicates that Coma P is located on the periphery of the Virgo galaxy cluster.

Invited talk

The Local Void

R. Brent Tully
Institute for Astronomy, University of Hawaii, USA

The Milky Way sits next to a large void that has been poorly studied because it straddles the zone of obscuration in the direction toward the Galactic center. However the density structure of the universe can be reconstructed from the gradients of the peculiar motions galaxies as test particles. The required information has become quite detailed locally thanks to the measurement of tip of the red giant branch distances, which are embedded within the extensive Cosmicflows-3 program. A clear picture emerges of the Local Void.

Poster

Photometric Reverberation Mapping Project at the Zeiss-1000 of SAO RAS. Current status

Uklein R.I. (SAO RAS), Malygin E.A. (Kazan Federal University, Russia), Shablovinskaya E.S. (SAO RAS), Grokhovskaya A.A. (SAO RAS) and Perepelitsyn A.E. (SAO RAS)

Roman Uklein

Special Astrophysical Observatory of the Russian Academy of Sciences, Russia

The improvement of the calibration dependence for determining the size of the broad-line region (BLR) from the observed optical luminosity of active galactic nuclei (AGN) is a necessary task to study fundamental parameters of distant AGNs such as the mass of the central supermassive black hole. The most popular method of the BLR size estimation is the reverberation mapping based on measuring the time delay between the continuum flux and the flux in the emission lines. In our work, we apply the method of photometric reverberation mapping in mid-band filters, adapted for observations on the 1-m Zeiss-1000 telescope SAO RAS, for the study of AGN with broad lines in the range of redshifts $0.1 < z < 0.8$. The report describes the technique of observations and data processing, provides a sample of objects and demonstrates the stability of the used method.

Calibration of the tip of the red giants branch using GAIA dr2

Dmitry Makarov, Usachev Pavel

Pavel Usachev
Saint Petersburg State University, Russia

The Tip of the Red Giant Branch (TRGB) is proved as an excellent distance indicator, based on old stellar populations. GAIA data release 2 allows us to calibrate a zero point of TRGB using direct distance measurements of red giants in our Galaxy. In this work we show how to construct the color dependence of TRGB using data of SDSS and Pan-STARRS surveys. The main uncertainty is associated with the transformation of photometric systems, the accuracy of parallax measurements and the correction for Galactic extinction.

Superbubbles in face-on galaxies: energy budget and velocity dispersion

E.O. Vasiliev, Yu.A. Shchekinov

Evgenii Vasiliev
Southern Federal University, Russia

Numerous (super)bubbles formed by supernova (SNe) explosions and stellar winds are widely observed in face-on galaxies. Some features of these superbubbles (e.g., energy budget, size, expansion velocity etc.) are determined in observations of various spectral lines (e.g., H-alpha and H1 21 cm) emitted by gas in the shell of a bubble and by stellar population inside it. To interpret observations theoretically for determining the bubble evolution 'standard' scaling relations are normally used. They relations include size, expansion velocity, total energy of SNe explosions and surrounding gas properties. Based of three dimensional simulations of the dynamics of the bubble formed by multiple SNe explosions we found significant deviations from the well-known scaling relations. We re-examine these relations and apply our estimates of energetic and dynamic characteristics of bubbles to those observed in nearby dwarf galaxies.

Nature of central emission nebulae in the dwarf galaxy NGC 185

Vučetić M. M., Ilić D., Egorov O. V., Moiseev A., Onić D., Arbutina B., Petrov N., Pannuti T. N., Urošević D.

Milica Vučetić
University of Belgrade, Serbia

In this paper we present new optical observations of NGC 185 galaxy that are intended to reveal the status of supernova remnants (SNRs) in this dwarf elliptical. Our deep photometric study with the 2-m telescope at Rozhen National Astronomical Observatory through narrow-band Hα and [SII] filters has revealed complex structure of the interstellar medium in the center of the galaxy, implying the presence of more than one SNR, previously known in this galaxy. Additionally, we carried out spectroscopic observations using the SCORPIO multi-mode spectrograph at the 6-m telescope at Special Astrophysical Observatory of the Russian Academy of Science, both in low and high resolution modes, to confirm the classification of the SNR candidates and to study the kinematics of the detected nebulae. Our observation detected enhanced [SII]/Hα and [NII]/Hα line ratios, as well as relatively high expansion velocities of the observed nebulae, motivating the classification of these sources as SNRs. We have found that NGC 185 hosts at least two optical SNRs, and possible one HII region. We re-analyzed archival XMM-Newton observations, which indicate the presence of an extended source in projection of one of optical SNRs, whereas the archival VLA radio image shows weak, unresolved emission in the center of NGC 185.

Invited talk

Sweating the small stuff: Or how I learned to START worrying and love the smallest galaxies

Coral Wheeler
California Institute of Technology, Pasadena, USA

The currently favored cosmological paradigm, Lambda Cold Dark Matter Theory (LCDM), has been widely successful in predicting the counts, clustering, colors, morphologies, and evolution of galaxies on large scales, as well as a variety of cosmological observables. Despite these successes, several challenges have arisen to this model in recent years, most of them occurring at the smallest scales — those of dwarf galaxies (Mstar $<$ 10^9 Msun). To investigate these challenges, I will introduce a suite of extremely high-resolution cosmological (GIZMO/FIRE2) simulations of dwarf galaxies (Mhalo 10^{10} Msun), run to z = 0 with 30 Msun and sub-pc resolution, sufficient (for the first time) to resolve the internal structure of individual supernovae remnants within the cooling radius. Every halo with Mhalo $>$ $10^{8.6}$ Msun is populated by a resolved stellar galaxy, suggesting very low-mass dwarfs may be ubiquitous in the field. This new generation of simulations allows us to probe smaller physical scales than previously possible in cosmological simulations, and to make more detailed predictions for the counts, star formation histories, and chemical composition of the lowest mass galaxies ever observed. My simulations confirm many results at lower resolution, suggesting they are numerically robust (for a given physical model), but I also discover several intriguing discrepancies with observations. I will also discuss the implications of my work for t the emerging low surface-brightness sky.

On the nature of low-luminous spiral galaxies

Zaitseva N.A., Zasov A.V., Khoperskov A.V., Khrapov S.S.

Natalia Zaitseva
Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia

Spiral structure (both flocculent and Grand Design) is very rare observed in dwarf galaxies (dS), and its formation evidently requires some specific conditions. In this work we prepared a list of nearly 150 dS-galaxies found by viewing images of the late-type galaxies with $B < 15$ m and $M_B > -18$ m. By general properties as well as by the presence of a bar or isolation index these galaxies do not differ noticeably from dIrr or Sm-types of similar luminosity, velocity of rotation or specific angular momenta, except that they have an average lower gas (HI) content. Moreover, the spiral structure is practically absent in disks with rotation speed less than 60 km/s. We tested the possibility of spiral structures formation in dwarf galaxies due to gravitational instability of a disk by numerical simulations of self-consistent gravitating stellar-gas disk dynamics. Gas fraction, kinematic characteristics radial profiles, stellar and dark halo masses were varied. It is shown that the gravitational mechanism of spiral formation is effective only for gas rotation speed not less than 60-70 km/s, and a small relative thickness of a disk corresponding to its marginal stability. The reduced gas content in a significant part of dS-galaxies may be a result of more efficient star formation in thin disks.

Poster

BPT-sigma relation in nearby dwarf galaxies

Behjat Zarei Jalalabadi, Alexei Moiseev

Behjat Zarei Jalalabadi
University of Birjand, Iran

In order to study the state of galactic ISM the intensity emission line ratios (BPT diagrams, named after "Baldwin, Phillips & Telervich") are used to separate main ionization sources: hot massive young OB stars in the star formation HII regions, active galactic nuclei, shock waves related with supernova remnants and other feedback processes like a supersonic turbulence generated by stellar winds. In the intermediate cases, for example, when the contributions of radiation from OB stars and from shock waves mix, identification becomes uncertain, and the issue remains unresolved on what determines the observed conditions of the diffuse ionized gas including the one on large distances from the galactic plane. Adding of an extra parameter - the gas velocity dispersion in the line-of-sight to classical diagnostic diagrams (i.e. "BPT-sigma"relations) helps to find a solution. We announced the project aimed for expanding a sample of objects to study the "BPT-sigma"relation in the interstellar medium of the local star forming galaxies. We are going to combine the ionized gas velocity dispersion maps derived from the scanning Fabry-Perot interferometer observations at the SAO RAS 6-m telescope with the emission lines ratio obtained from the archival long-slit spectroscopic data. The first results of this study is presented.