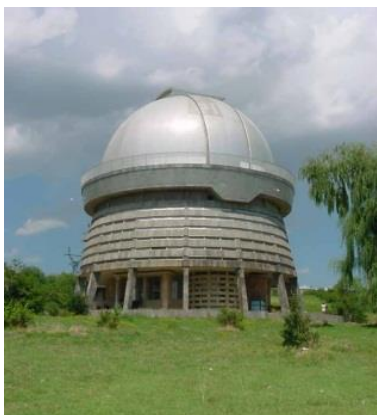


BYURAKAN ASTROPHYSICAL OBSERVATORY in 2011: ANNUAL REPORT

Introduction



Among the most important matters during 2011 one may mention the continuation and development of scientific projects related to **instability phenomena in the Universe** resulted in a number of important discoveries, active **international collaboration** (especially with France), a number of **research grants** by Byurakan astronomers, organization of a number of meetings, etc. BAO scientists won 4 ANSEF grants in 2011, as well as 3 French-Armenian (CNRS-SCS) joint projects were continued from 2010. There have been **32 publications in refereed journals**, including most important international ones. There were **34 missions** for research and participation in 22 meetings and schools.

As before, in 2011 too BAO was active in organization of meetings. An **Archaeoastronomy seminar** dedicated to Anania Shirakatsi's 1400th anniversary, the **ArAS X Annual Meeting** (both in Byurakan), a **Young Scientists Conference "50 years of Cosmic Era: Real and Virtual Studies of the Sky"** for the FSU students and young scientists (in Yerevan), a number of anniversary meetings and seminars, such as Paris Pismis – 100, Haik Harutyunian – 60, Vahe Oskanian – 90 and Bagrat Ioannissiani – 100 were held.

UNESCO included **Markarian survey** in its **Memory of the World (MOW) international register** and the Certificate was awarded on December 19 by the RA Vice-Minister of Foreign Affairs. On BAO's initiative, UNESCO included **Anania Shirakatsi's 1400th anniversary** among its important dates of the year 2012, and BAO now takes the leadership in organization of archaeoastronomy matters in Armenia and will organize a number of events in 2012.

Structure of BAO and research staff

BAO is one of the institutions of the Armenian **National Academy of Sciences (NAS)** and is affiliated to its **Division of Physics and Astrophysics**. BAO is being funded from the state budget through the **State Committee for Science (SCS) of the Ministry of Education and Science**, through Basic Program called "*Evolution of Cosmic Objects through their Activity*". All researchers and the technical and administrative services, altogether 82 persons, are maintained due to this program. The administration consists of 3 persons: the **Director (Dr. Haik Harutyunian)**, the **Deputy Director (Dr. Norair Melikian)**, and the **Scientific Secretary (Dr. Elena Nikogossian)**.

There is a **Scientific Council** that serves as an advisory board for the administration. It consists of 13 members, including the administration members, the director being its Chairman. Other members are: A.A. Hakopian, E.Ye. Khachikian, T.Yu. Magakian, T.H. Movsessian, A.G. Nikoghossian, E.S. Parsamian, H.V. Pikichian, L.A. Sargsyan, M.H. Gevorgyan (representative of the Young Scientists Council), D.M. Sedrakian (YSU).

There are several research groups headed by Haik Harutyunian, Edward Khachikian, Tigran Magakian, Norair Melikian, Areg Mickaelian, Arthur Nikoghossian, Elma Parsamian, Artashes Petrosian. Altogether 42 scientists work in these groups. Three laboratories of scientific-technical character, namely, the laboratories of the **2.6m telescope** (headed by Tigran Movsessian), **1m**

Schmidt telescope (Smbat Balayan), and **Smaller telescopes** (Artur Amirkhanian) service are also parts of Basic Program. Unfortunately, none of the BAO research groups won state thematic grants in 2011-2012 to increase funding through such additional source also coming through the SCS (altogether there were 130 such grants in Armenia).

BAO has a **Specialized Council** responsible for awarding scientific degrees (Candidate of Science equivalent to Ph.D. and Doctor of Science). E.S. Parsamian is its Chair, A.G. Nikoghossian is the Deputy Chair, A.A. Akopian is the Scientific Secretary, and the members are A.L. Gyulbudaghian, H.A. Harutyunian, E.Ye. Khachikian, and T.Yu. Magakian, as well as members from other institutions: M.G. Abrahamian, M.A. Kazarian, N.B. Yengibararian, D.M. Sedrakian, and Yu.L. Vardanian.

An attestation of all researchers was carried out in March 2011 resulting in changes of some research positions. Some astronomers work with low efficiency and had to step down in their positions (e.g. from Senior Research Associate to Research Associate) and some others with better results obtained higher positions.

Telescopes and infrastructure

During 2011, BAO telescopes continued working however with very low efficiency. At present the **2.6m telescope** is the only one providing scientific results but the mirror aluminization is still a problem. The Governmental funding is not enough to solve this problem and several attempts have been made to find alternative sources; projects have been submitted but with no results. Moreover, it needs a basic renewal of all electronic part, particularly the control system. This is one of the most important works of BAO to be done in the nearest future.

Our second largest (and the most famous) **1m Schmidt telescope** was stopped in 1991 and due to changes from photographic plates to digital receivers it has not been anymore operated. Since 2010, a small group of students led by Vazgen Gabrielyan (YSU) started very serious activities in modernization of this telescope. It is now being automatically controlled and moved and is similar to robotic telescopes having remote control systems. A weather station near this telescope has been also installed and operated.

The **small telescopes** may serve for smaller research projects and educational purposes, however they do not have modern receivers and other equipment. One of them is being used for visitors for promotional purposes.

BAO has a rich **Photographic plate archive** of some 35,000 plates obtained mostly with 0.5m and 1m Schmidt telescopes and the 2.6m one, and among them the First Byurakan Survey (FBS or Markarian survey) 2000 spectroscopic plates are the most valuable ones. It is now available in digital form (**Digitized First Byurakan Survey, DFBS**) and may be used for further efficient studies at high galactic latitudes. The **Armenian Virtual Observatory (ArVO)** operates based on this survey and other astronomical data obtained and being obtained with our telescopes, as well as data from all world databases and archives.

Research at BAO

The main fields of investigation at BAO relate to non-stable phenomena in the Universe. This includes studies of non-stable stars and related objects in the Galactic Astronomy and activity in galaxies in the Extragalactic Astronomy, as well as search for new objects and large surveys. In addition, a group of theoreticians is always active in Byurakan working on topics initiated by V.A.

Ambartsumian (radiative transfer theory, principle of invariance). Several recent directions have been introduced during 1990s and 2000s, such as the Large-Scale Structure of the Universe and (alternative) Cosmology, Infrared Astronomy, X-ray Astronomy, Solar physics, Virtual Observatories (VOs). To describe the main results obtained during 2011, the abstracts of published papers are given.

Stars and Nebulae

The Variable Star SBS 0150+339

Erastova L.K. (Ap 54, 143, 2011)

Plates from the Second Byurakan Survey reveal two large increases in the brightness of this star in 1972 and 1975. Spectra of this variable have been obtained for the first time. It is not visible in plate H2133 from the Hamburg survey, which has a limiting brightness of $\sim 18^m$. Our data confirm that the star is an eruptive variable, most likely of the U Gem type.

New H α stars. NGC 6910 region. II

Melikyan N.D., Tamazyan V.S., **Karapetyan A.A.**, **Samsonyan A.A.**, **Kostandyan G.R.** (Ap 54, 203, 2011)

A search for H α objects in four fields with an overall area of about 0.14 square degrees in the region of NGC 6910 (the core of the known Cyg OB9 association) has led to the discovery of 64 emission stars, of which 49 are newly detected. The high surface density is indicative of a very rich T association or, possibly, of the projection of several T associations onto one another in this direction. The latter possibility is also indicated by the range of the R photometric stellar magnitudes of the emission stars, $9^m.68$ - $19^m.42$. A comparison with earlier observations shows that for many of the stars, the emission line intensity is variable. A P Cyg H α line profile is recorded for the star V 1515 Cyg with an emission component equivalent width that greatly exceeds the equivalent absorption width.

Emission stars in Cyg OB7. New flare stars. III

Melikyan N.D., Tamazyan V.S., **Karapetyan A.A.**, **Samsonyan A.A.** (Ap 54, 377, 2011)

A continued search for emission objects in three new fields within the association Cyg OB7 yielded eight new emission stars in one of these fields. No emission stars were detected in the other two fields, apparently because we have come to the boundary of the T association on this side. Two UV Cet-type flare stars have been detected in this region for the first time.

Variation in the Flare Activity of the Star UV Ceti

Melikyan N.D., Tamazyan V.S., **Samsonyan A.A.** (Ap 54, 469, 2011)

This is an analysis of the dependence of the flare activity of the well-known flare star UV Ceti on the linear distance between the components of this binary system. It is shown that its flaring activity clearly depends on the mutual distance of the components, while this kind of variability is not seen in isolated flare stars.

EMCCD Speckle Measurements, Differential Photometry and Dynamical Masses of Visual Binary Stars

Tamazyan, V.S.; ...; **Melikian, N.D.**; et al. (AIP Conf. Proc. 1346, 36, 2011)

We report results of the EMCCD speckle measurements and differential photometry conducted for 46 visual binaries with the 6 m telescope of SAO (Russia) in 2007. The orbits for COU 1281 and COU 1037 are calculated for the first time and those for CHA 137, COU 100, COU 1136, CHA 51, CHA 55, COU 206, ADS 13961 are improved. Using dynamical parallax, both distance and total mass estimates for these pairs were obtained. In general, dynamical parallaxes and total masses are in good agreement with Hipparcos data and standard mass-luminosity calibrations respectively.

Spectral Observations of the Eclipsing Binary RY Sct

Melikian N.D.; ...; **Karapetian A.A.**; **Kostandyan G.S.**; **Samsonyan A.L.** (AIP Conf. Proc. 1346, 96, 2011)

Results of spectral observations of the eclipsing binary star RY Sct carried out in 2005 and 2009 with the 2.6 m telescope of V.A. Ambartsumian Byurakan Astrophysical Observatory are presented. While RY Sct needs a further detailed study, some important circumstances should be indicated insofar. Maximal values of equivalent widths are observed close to the primary minimum, whereas the minimal ones are detected at the brightness maximum, at which spectral lines have very narrow profiles. Emission line HeI λ 6678A is seen during whole set of observations, but transformed into the weak absorption on almost half way from the secondary minimum to the maximum. Detection of P-Cyg profile variations in some lines indicates to the variable character of the mass outflow from the star. The estimated mean velocities of the blue-shifted

absorptions correspond to ~ 400 km/s. The main observational characteristics of RY Sct are strongly related with the orbital period. To all probability, its observed peculiarities and very complicated spectra are at least partially caused by the intensive and variable mass outflows.

A New Deep Low State of TT Ari?

Melikian, N.D.; ...; **Karapetian, A.A.;** **Kostandyan, G.S.** (AIP Conf. Proc. 1346, 101, 2011)

In this report, results of spectral and photometric study of TT Ari, one of the brightest cataclysmic variable stars, are reported. Observations were conducted in October and December, 2008 and November, 2009. Spectral observations on 12 and 13 November, 2009 detected the star in its second "deep low state" (DLS, hereinafter). Actually, the first hints to the brightness decrease appeared in late September, 2009 and became clear on October 3. In general, our spectra out of DLS are concordant with earlier data, although some distinctions at this stage are registered too. In particular, both the brightness and equivalent widths (EWs hereinafter) of the emission lines show variations that probably have periodic character. Observed variations in the symmetry of the wide absorption lines of Balmer series (beginning from H_{β}) might be caused by the appearance of the anti P Cyg profile, and H_{α} exhibits P Cyg profile consisting of two components. The spectra of TT Ari obtained at DLS remind those of T Tau stars of late G or early K spectral classes. Mean EWs of some emission lines at different epochs are given. An unusually strong increase of EWs is detected at low energetic state of TT Ari which exceeds those obtained at high energetic state by up to 20-25 times. The mean $EW_{H_{\alpha}}/EW_{H_{\beta}}$ ratio at "high" and "low" states shows that formation of these lines can be explained, at least partly, within a simple photoionization-recombination model.

CSO Bolocam 1.1 mm Continuum Mapping of the Braid Nebula Star Formation Region in Cygnus OB7

Aspin, C.; ...; **Magakian, T.Yu.;** **Movsessian, T.A.;** **Nikogossian, E.G.;** et al. (AJ 141, 139, 2011)

We present a 1.1 mm map of the Braid Nebula star formation region in Cygnus OB7 taken using Bolocam on the Caltech Submillimeter Observatory. Within the 1 deg^2 covered by the map, we have detected 55 cold dust clumps all of which are new detections. A number of these clumps are coincident with IRAS point sources although the majority are not. Some of the previously studied optical/near-IR sources are detected at 1.1 mm. We estimate total dust/gas masses for the 55 clumps together with peak visual extinctions. We conclude that over the whole region, approximately 20% of the clumps are associated with IRAS sources suggesting that these are protostellar objects. The remaining 80% are classed as starless clumps. In addition, both FU Orionis (FUor) like objects in the field, the Braid Star and HH 381 IRS, are associated with strong millimeter emission. This implies that FUor eruptions can occur at very early stages of pre-main-sequence life. Finally, we determine that the cumulative clump mass function for the region is very similar to that found in both the Perseus and ? Ophiuchus star-forming regions.

UWISH2 - the UKIRT Widefield Infrared Survey for H2

Froebrich, D.; ...; **Magakian, T.Y.;** **Movsessian, T.A.;** **Nikogossian, E.H.;** et al. (MNRAS 413, 480, 2011)

We present the goals and preliminary results of an unbiased, near-infrared, narrow-band imaging survey of the first galactic quadrant ($10^{\circ} < l < 65^{\circ}$; $-1^{\circ}3 < b < +1^{\circ}3$). This area includes most of the giant molecular clouds and massive star forming regions in the Northern hemisphere. The survey is centred on the 1-0 S(1) rovibrational line of H_2 , a proven tracer of hot, dense molecular gas in star-forming regions, around evolved stars, and in supernova remnants. The observations complement existing and upcoming photometric surveys (Spitzer-GLIMPSE, UKIDSS-GPS, JCMT-JPS, AKARI, Herschel Hi-GAL, etc.), though we probe a dynamically active component of star formation not covered by these broad-band surveys. Our narrow-band survey is currently more than 60 per cent complete. The median seeing in our images is 0.73 arcsec. The images have a 5 σ detection limit of point sources of $K? 18$ mag and the surface brightness limit is $10^{-19} \text{ W m}^{-2} \text{ arcsec}^{-2}$ when averaged over our typical seeing. Jets and outflows from both low- and high-mass young stellar objects are revealed, as are new planetary nebulae and - via a comparison with earlier K-band observations acquired as a part of the UKIDSS GPS - numerous variable stars. With their superior spatial resolution, the UWISH2 data also have the potential to reveal the true nature of many of the extended green objects found in the GLIMPSE survey.

Inner disc rearrangement revealed by dramatic brightness variations in the young star PV Cep

Kun, M.; ...; **Magakian, T.Yu.;** **Movsessian, T.A.;** et al. (MNRAS, 413, 2689, 2011)

Young Sun-like stars at the beginning of the pre-main-sequence (PMS) evolution are surrounded by accretion discs and remnant protostellar envelopes. Photometric and spectroscopic variations of these stars are driven by interactions of the star with the disc. Time-scales and wavelength dependence of the variability carry information on the physical mechanisms behind these interactions. We conducted multi-epoch, multiwavelength study of PV Cep, a strongly variable, accreting PMS star. By combining our own observations from 2004 to 2010 with archival and literature data, we show that PV Cep started a spectacular fading in 2005,

reaching an I_C-band amplitude of 4 mag. Analysis of variation of the optical and infrared fluxes, colour indices and emission line fluxes suggests that the photometric decline in 2005-2009 resulted from an interplay between variable accretion and circumstellar extinction: since the central luminosity of the system is dominated by accretion, a modest drop in the accretion rate could induce the drastic restructuring of the inner disc. Dust condensation in the inner disc region might have resulted in the enhancement of the circumstellar extinction.

Search of HH Objects and Emission-Line Stars in the Star Forming Regions. VII. Herbig-Haro Objects in the Vicinity of GM 2-41 Nebula

Nikoghosyan E.H., Magakian T.Yu., Movsessian T.A. (Ap 54, 496, 2011)

Five new Herbig-Haro objects (HH 1036-1040) have been discovered in the neighborhood of the nebula GM 2-41 in a region with an area of 14' × 14', at the center of the HII region DR 15 located in the southern periphery of the Cyg OB2 association. Four of them have a complex structure typical of HH flows. Hydrogen molecular emission is detected in the object HH 1036 using archived images from the Spitzer telescope. Two new infrared nebulae illuminated by very red young stellar objects are also found.

GM 2-4: a signpost for low- and intermediate-mass star formation

Khanzadyan, T.; Movsessian, T.A.; ...; Magakian, T.Yu.; ...; Nikogossian, E.H. (MNRAS 418, 1994, 2011)

We present a multi-wavelength study of the region towards the GM 2-4 nebula and the nearby source IRAS 05373+2340. Our near-infrared H₂ 1-0 S(1) line observations reveal various shock-excited features which are part of several bipolar outflows. We identify candidates for the driving sources of the outflows from a comparison of the multi-waveband archival data sets and spectral energy distribution (SED) modeling. The SED spectral slope (?) for all the protostars in the field was then compared with the visual extinction map. This comparison suggests that star formation progresses from north-east to south-west across this region. ^a Flux in 10⁻¹⁸ W m⁻² units and the background 1σ noise estimate is 1.15 × 10⁻¹⁹ W m⁻² calculated in the 6-arcsec circular aperture.

A subsample of white dwarfs among the FBS blue stellar objects

Sinamyanyan P.K., Mickaelian A.M. (Ap 54, 403, 2011)

Results are reported from studies of a subsample of white dwarfs in the second part of the FBS survey. Of the 217 WD identified in the FBS, most are DA dwarfs, but the subclasses DO, DOB, DB, DAB, DAZ, DZ, and DC are also encountered. Multiwavelength studies are conducted on the sample from the FBS survey: of the 217 white dwarfs, 178 coincide with 2MASS sources, GALEX (ultraviolet) data exist for 155, 23 are ROSAT x-ray sources, and SDSS data with stellar magnitudes in five photometric bands, u, g, r, i, and z, are available for 120. The WD sample from the FBS survey is compared with similar surveys (PG and SDSS). Average B and R magnitudes, as well as an average value of the length of the low dispersion spectra of white dwarfs from the DFBS are also given.

Temperature and surface gravitation of white dwarfs in the FBS survey from the SDSS

Sinamyanyan P.K. (Ap 54, 413, 2011)

Empirical formulas for the temperature and surface gravitation of white dwarfs are derived using data on temperature and the acceleration of gravity from the catalog of spectroscopically confirmed white dwarfs WD in the Sloan Digital Sky Survey Release 4 (SDSS DR4). These formulas are used to determine the temperature and acceleration of gravity for five spectroscopically confirmed white dwarfs from the FBS survey that were not included in the WD SDSS DR4 catalog, and also for 82 WD that had not been spectroscopically confirmed. As a result, the temperature and acceleration of gravity have been determined for 87 FBS white dwarfs that were not included in the SDSS WD catalog.

Two New N-Type Carbon Stars Found In the DFBS

Gigoyan K.S., Russeil D., Sarkissian A., Avtandilyan M. (Ap 54, 139, 2011)

Revised classification of the SBS carbon star candidates including the discovery of a new emission line dwarf carbon star

Rossi, C.; Gigoyan, K.S.; Avtandilyan, M.G.; Sclavi, S. (A&A 532, 69, 2011)

Context. Faint high-latitude carbon stars are rare objects commonly thought to be distant, luminous giants. For this reason, they are often used to probe the structure of the Galactic halo; however, more accurate investigation of photometric and spectroscopic surveys has revealed an increasing percentage of nearby objects with luminosities of main sequence stars. Aims: In the General Catalogue of the Second Byurakan Survey (SBS) only ten objects are indicated as carbon star candidates. This work aims at clarifying the nature of these stars. Methods: We analyzed new optical spectra and photometry and used astronomical databases available on the web. Results: We verified that two stars are N-type giants already confirmed by other surveys. We found that four candidates are M type stars and confirmed the carbon nature of the remaining four stars;

the characteristics of three of them are consistent with an early CH giant type. The fourth candidate, SBS 1310+561 identified with a high proper motion star, is a rare type of dwarf carbon showing emission lines in its optical spectrum. We estimated absolute magnitudes and distances to the dwarf carbon and the three CH stars. Conclusions: Our limited sample confirmed the increasing evidence that spectroscopy or colour alone are not conclusive luminosity discriminants for CH-type carbon stars. Based on observations made at the 1.52 m telescope of the Bologna Observatory and 1.83 m telescope of the Asiago Observatory.

The compact nebulae cn1 and cn2, coupled to infrared stellar clusters

Gyulbudaghian A.L. (Ap 54, 384, 2011)

This is a study of the compact nebulae cn1 and cn2 situated in the extended, bright nebula S235. ^{12}CO observations reveal the presence of blue and red outflows (i.e., a bipolar outflow) from the molecular cloud in which these nebulae are embedded. cn1 and cn2 are shown to be coupled to IR clusters of young stars, some of which have dust disks or envelopes (these are so-called young stellar objects, YSOs), with the YSOs grouped around the center of the clusters. cn1 is coupled to the infrared point source IRAS05377 + 3548, whose IR colors are close to those of T Tau stars. A chain of objects emerging from S235 (which clearly implies they are coupled in terms of evolution) is studied. These are the compact nebulae S235 A, B, and C, and the Herbig-Haro objects GGD5 and GGD6. A group of IR stars associated with GGD6 is also studied.

Two star-formation regions in Auriga

Gyulbudaghian A.L. (Ap 54, 476, 2011)

Two star-formation regions in Auriga are examined. Both regions are embedded in dark clouds and contain stars that are YSO (young stellar objects). The two groups are associated with HH objects and with jets (straight and spiral). ^{12}CO (1-0) observations of the first region (associated with the object CLN70) reveal the presence of red and blue molecular outflows (i.e., a bipolar outflow).

Structure of the magnetic field near the galactic plane

Andreasyan R.R., Balayan S.K., Movsesyan V.H. (Ap 54, 177, 2011)

A method is introduced for constructing two-color maps for the in-plane component of the magnetic field of our galaxy in (R, l) and (DM, l) coordinates. It is shown that, in agreement with the standard models of the galactic magnetic field, the magnetic field in neighboring spiral arms reverses direction. However, the magnetic field in the spiral arm of Sagittarius differs significantly from the standard magnetic field model, with the major difference being that the magnetic fields in the southern and northern hemispheres are oppositely directed in the spiral arm of Sagittarius. It is proposed that this distribution of the magnetic field can be explained best by assuming that the spiral arm of Sagittarius, or, at least, a magnetic spiral arm in that region, is not symmetric with respect to the galactic plane and lies mainly in the northern hemisphere.

On the Cosmic Ray-Induced Ionization Rate in Molecular Clouds

Yegikian A.G. (ISRN A&A 2011, 6, 2011)

Irradiation of dust in molecular clouds. II. Doses produced by cosmic rays

Yeghikyan A.G. (Ap 54, 87, 2011)

The fluxes of cosmic rays inside typical molecular clouds are calculated. Protons and α -particles with energies of $1 \text{ MeV} \leq A \leq 10 \text{ GeV}$ penetrate deeply enough to produce irradiation doses in the ice mantle of dust particles on the order of $0.1\text{-}1 \text{ eV/amu}$ over the 10-50 million year lifetime of clouds with and without star formation regions. The possible use of these results for interpreting laboratory experiments on the irradiation of ice mixtures of the type $\text{H}_2\text{O}:\text{CH}_3\text{OH}:\text{NH}_3:\text{CO}$ is discussed. Complex organic radiolysis products may play an important role in the prebiological evolution of the dust component of molecular clouds.

Extragalactic Astronomy

Multiwavelength study of 230 IRAS FSC galaxies

Hovhannisyan A., **Sargsyan L.A., Micaelian A.M.,** Weedman D.W. (Ap 54, 147, 2011)

A sample of 230 galaxies has been compiled based on their IRAS FSC fluxes to study their multiwavelength properties and carry out comparative analyses with other similar samples. To understand the nature of these galaxies, a comparison with a sample of bright ULIRGs having fluxes at $60 \mu\text{m}$ $f_{\nu} > 1 \text{ Jy}$ and 14 optically faint IRAS FSC galaxies is presented. This comparison shows that galaxies found by IRAS are not always strong infrared sources and that the objects from the sample of ULIRGs represent a sample of extreme galaxies, which are very powerful infrared sources. We have confirmed the consistency between Star Formation Rates (SFRs) calibrated based on luminosities of the PAH feature at $7.7 \mu\text{m}$ and radio 1.4 GHz flux densities. We

have estimated the extinction for our 230 objects using SFRs calibrated from the PAH feature compared to ultraviolet flux, which shows that only 1% of the ultraviolet continuum typically escapes extinction by dust within a starburst.

Infrared Spectra and Spectral Energy Distributions for Dusty Starbursts and Active Galactic Nuclei
Sargsyan, L.; ...; Mickaelian, A. (ApJ 730, 19, 2011)

We present spectroscopic results for all galaxies observed with the Spitzer Infrared Spectrograph (IRS) that also have total infrared fluxes f_{IR} measured with the Infrared Astronomical Satellite (IRAS), also using AKARI photometry when available. Infrared luminosities and spectral energy distributions (SEDs) from 8 μm to 160 μm are compared to polycyclic aromatic hydrocarbon emission from starburst galaxies or mid-infrared dust continuum from active galactic nuclei (AGNs) at rest-frame wavelengths $\sim 8 \mu\text{m}$. A total of 301 spectra are analyzed for which IRS and IRAS include the same unresolved source, as measured by the ratio $f_{\nu}(\text{IRAS } 25 \mu\text{m})/f_{\nu}(\text{IRS } 25 \mu\text{m})$. Sources have $0.004 < z < 0.34$ and $42.5 < \log L_{\text{IR}} < 46.8$ (erg s^{-1}) and cover the full range of starburst galaxy and AGN classifications. Individual spectra are provided electronically, but averages and dispersions are presented. We find that $\log [L_{\text{IR}}/L_{\nu}(7.7 \mu\text{m})] = 0.74 \pm 0.18$ in starbursts, $\log [L_{\text{IR}}/L_{\nu}(7.7 \mu\text{m})] = 0.96 \pm 0.26$ in composite sources (starburst plus AGN), $\log [L_{\text{IR}}/L_{\nu}(7.9 \mu\text{m})] = 0.80 \pm 0.25$ in AGNs with silicate absorption, and that $\log [L_{\text{IR}}/L_{\nu}(7.9 \mu\text{m})] = 0.51 \pm 0.21$ in AGNs with silicate emission. L_{IR} for the most luminous absorption and emission AGNs are similar and 2.5 times larger than for the most luminous starbursts. AGNs have systematically flatter SEDs than starbursts or composites, but their dispersion in SEDs overlaps starbursts. Sources with the strongest far-infrared luminosity from cool dust components are composite sources, indicating that these sources may contain the most obscured starbursts.

On the variability of emission spectrum of the Sy2 galaxy Mark 6

Khachikian E.Ye., Asatrian N.S., Burenkov A.N. (Ap 54, 26, 2011)

According to Ambartsumyan, one of the forms of galactic activity is the outflow of gaseous material in the form of jets or clouds from the region of the nucleus at velocities up to hundreds or thousands of km/s, which sometimes leads to the breakup of the nucleus and the ejection of large bursts of material from it. Quite a lot is known about the results of these ejections, especially for quasars and active galaxies. They have been detected and studied in detail with regard to changes in their outer appearance. However, the exact time of the ejections is not known, although statistically they occur frequently and irregularly. The detection of changes in the spectra of galaxies is of special interest, but these are much harder to detect over short times. Nevertheless, the probability of detecting the time of an ejection within a short time is nonzero. Additional new emission components of the hydrogen $H\alpha$, $H\beta$, and $H\gamma$ lines over a year in the spectrum of the Sy2 galaxy Mark 6 were first discovered by Khachikian and Weedman in 1969. This paper describes the origin and subsequent interesting fate of this new hydrogen formation (cloud).

Luminosity function of the field galaxies

Mahtessian A.P. (Ap 54, 162, 2011)

The Schmidt method for constructing the luminosity function of galaxies is generalized to include the dependence of the density of galaxies on distance in the near universe. The logarithmic luminosity function (LLF) of the field galaxies as a function of morphological type is constructed. It is found that the LLF for all the galaxies, as well as separately for elliptical and lenticular galaxies, can be represented as a Schechter function within a narrow range of absolute magnitudes. The LLF for spiral galaxies is a Schechter function over a rather wide range of absolute magnitudes, $-21.0 < M < -14$. The parameter M^* varies little over the spiral galaxies. The parameter α in the Schechter function decreases on going from early to later spirals. On going from elliptical to lenticular galaxies, from early spiral galaxies and onward to later spiral galaxies, a decrease in the average luminosity of the galaxies is observed in the bright end, $-23 < M < -17.8$. The completeness and average density of the samples are estimated for galaxies of different morphological types. The average number density of all the galaxies within the range $-23 < M < -13$ is 0.126 Mpc^{-3} .

Markarian galaxies and their environment

Mahtessian, A.P.; Movsessian, V.G.; Mahtessian, L.A. // (AstLet 37, 448, 2011)

The relationship between the characteristics of Markarian galaxies (MGs) and those of galaxy groups is studied. The list that we have compiled by a physically justified method is used as galaxy groups. The following results have been obtained. (1) The frequency of occurrence of MGs in rich groups is lower than that in poor groups and single galaxies. In this parameter, single galaxies and members of poor groups differ insignificantly from one another. (2) There is no noticeable relationship between the characteristics of groups and the presence of MGs in them. (3) MGs in groups and single galaxies do not differ in their spectroscopic characteristics. (4) MGs do not conform to the fact corroborated for decades that the relative number of elliptical and lenticular galaxies in groups is higher than that among single galaxies.

Five supernova survey galaxies in the southern hemisphere. II. The supernova rates

Hakobyan A.A., Petrosian A.R., Mamon G.A., et al. (Ap 54, 301, 2011)

Based on the database compiled in the first article of this series, with 56 SN events discovered in 3838 galaxies of the southern hemisphere, we compute the rate of supernovae (SNe) of different types along the Hubble sequence normalized to the optical and near-infrared luminosities as well as to the stellar mass of the galaxies. We find that the rates of all SN types show a dependence on both morphology and colors of the galaxies, and therefore, on the star-formation activity. The rate of core-collapse (CC) SNe is confirmed to be closely related to the Star Formation Rate (SFR) and only indirectly to the total mass of the galaxies. The rate of SNe Ia can be explained by assuming that at least 15% of Ia events in spiral galaxies originates in relatively young stellar populations. We find that the rates show no modulation with nuclear activity or environment. The ratio of SN rates between types Ib/c and II shows no trend with spiral type.

Surveys and Databases

Accurate photometry and variability of First Byurakan Survey blue stellar objects

Mickaelian, A.M.; Mikayelyan, G.A.; Sinamyan, P.K. (MNRAS 415, 1061, 2011)

A new method for combined calculations of magnitudes based on accurate measurements of POSS1 and POSS2 epoch plates is given. The photometric accuracy of various surveys and catalogs has been estimated and established and statistical weights for each of them have been calculated. To achieve the best possible magnitudes, weighted averaging of data from USNO-A2.0, APM, MAPS, USNO-B1.0, and GSC 2.3.2 catalogs have been used. The rms accuracy of magnitudes achieved for POSS1 is 0.184 mag for B and 0.173 mag for R and for POSS2 is 0.138 mag for B and 0.128 mag for R. We have derived the best POSS1 and POSS2 magnitudes for the FBS blue stellar objects. We have refined the transformation formulae between the POSS1 and POSS2 magnitudes and SDSS ones and standard UBV system. Using these accurate magnitudes, we have estimated the variability of the FBS blue stellar objects and revealed probable and possible variables. We have worked out methods to control and exclude accidental errors that appear in any survey. We have compared and combined our results with those given in NSVS database and obtained better candidates for variability. Having excluded variables, we have combined POSS1 and POSS2 data for the rest of objects to achieve even better magnitudes and colors; the rms being smaller than 0.1 mag both in B and R and for the B-R colors. This approach has been applied to the First Byurakan Survey blue stellar objects containing significant number of white dwarfs, cataclysmic variables, as well as extragalactic objects (quasars, Seyferts, BL Lac objects). Altogether 336 variable objects have been revealed with POSS2-POSS1 $\geq 3\sigma$ of the errors. An electronic table of these objects is given. Candidate variables are divided into 4 classes: extreme, strong, probable and possible variables. For a more reliable sample of variable objects we excluded possible ones from the list and were left with 161 objects. Analyzing radio and X-ray properties of these objects, we have revealed their nature and re-discovered or revealed candidate AGN, CVs, WDs and other objects.

The Second Byurakan Survey galaxies. I. The optical database

Gyulzadyan M., ..., Adibekyan V.Zh., ..., Petrosian A., Stepanian J.A. (Ap 54, 15, 2011)

A database for the entire catalog of the Second Byurakan Survey (SBS) galaxies is presented. It contains new measurements of their optical parameters and additional information taken from the literature and other databases. The measurements were made using I_{pg} (near-infrared), F_{pg} (red), and J_{pg} (blue) band images from photographic sky survey plates obtained by the Palomar Schmidt telescope and extracted from the STScI Digital Sky Survey (DSS). The database provides accurate coordinates, morphological type, spectral and activity classes, apparent magnitudes and diameters, axial ratios and position angles, as well as number counts of neighboring objects in a circle of radius 50 kpc. The total number of individual SBS objects in the database is now 1676. The 188 Markarian galaxies that were re-discovered by SBS are not included in this database. We also include redshifts that are now available for 1576 SBS objects, as well as 2MASS infrared magnitudes for 1117 SBS galaxies.

Astronomical Catalogs Cross-Correlation Objectives and Illustration of a New Correlation

Algorithm

Knyazyan A., Mickaelian A., Astsatryan H. (CSIT-2011, 2011)

The process of astronomical catalogs cross-correlation, its difficulties, and evictions of final results from expected values during utilization of programming method and illustration of a new cross-correlation algorithm are presented.

Theoretical Astrophysics

Group-theoretical description of radiative transfer in one-dimensional media

Nikoghossian A.G. (Ap 54, 126, 2011)

Group theory is used to describe a procedure for adding inhomogeneous absorbing and scattering atmospheres in a one-dimensional approximation. The inhomogeneity originates in the variation of the scattering coefficient with depth. Group representations are derived for the composition of media in three different cases: inhomogeneous atmospheres in which the scattering coefficient varies continuously with depth, composite or multicomponent atmospheres, and the special case of homogeneous atmospheres. We extend an earlier proposal to solve problems in radiative transfer theory by first finding global characteristics of a medium (reflection and transmission coefficients) and then determining the internal radiation field for an entire family of media without solving any new equations. Semi-infinite atmospheres are examined separately. For some special depth dependences of the scattering coefficients it is possible to obtain simple analytic solutions expressed in terms of elementary functions. An algorithm for numerical solution of radiative transfer problems in inhomogeneous atmospheres is described.

Bilinear integrals of the radiative transfer equation

Nikoghossian A.G. (Ap 54, 242, 2011)

It is shown that the group of problems in the theory of radiative transfer that are reducible to the sourcefree problem admits a class of integrals involving quadratic moments of the intensity of arbitrarily high orders. Based on a variational principle, it is found that these integrals, which include the R-integral, follow from the corresponding conservation laws. Some of the results are generalized to the case of anisotropic scattering.

Solution of linear radiative transport problems in plane-parallel atmospheres. I

Nikoghossian A.G. (Ap 54, 553, 2011)

A new method for determining various quantities describing the radiation field in an inhomogeneous, plane-parallel atmosphere is proposed in this two-part paper. The essence of this method is the reduction of the boundary value problems which arise during the customary statement of various astrophysical problems associated with solving the radiative transfer equations to initial value problems. Compared to previous attempts in this area, the proposed method is universal and simple. The first part of this paper deals with one-dimensional media. Scalar, as well as vector-matrix problems relating to the diffusion of radiation in spectral lines with frequency redistribution are examined.

Hubble expansion of the universe and structural features of atomic nuclei

Harutyunian H.A. (Ap 54, 290, 2011)

An attempt is made to study the concept of "black holes" from the standpoint of the axioms of modern physics. It is found that matter which lies inside a Schwarzschild sphere must disappear, both as a source of electromagnetic waves and as a source of a gravitational field. To resolve this paradox a hypothesis is proposed according to which the accelerated expansion of the universe interacts with atomic nuclei in such a way as to transfer a positive energy to every nucleus in accordance with its volume. The influx of energy into a nucleus gradually neutralizes its binding energy, so that there is an increase in the mass of the nucleus, as well as of its component nucleons. This mechanism suggests that during the inverse process, when matter is compressed, the opposite phenomenon should be observed with a release of binding energy, and the average mass of the nucleons involved in this process should decrease; that is, part of the mass of the material is simply converted into energy.

Two-step spacetime deformation-induced dynamical torsion

Ter-Kazarian, G.T. (CQG 28, 055003, 2011)

We extend the geometrical ideas of the spacetime deformations to study the physical foundation of the post-Riemannian geometry. To this aim, we construct the theory of two-step spacetime deformation as a guiding principle. We address the theory of teleparallel gravity and construct a consistent Einstein-Cartan (EC) theory with the dynamical torsion. We show that the equations of the standard EC theory, in which the equation defining torsion is the algebraic type and, in fact, no propagation of torsion is allowed, can be equivalently replaced by the set of modified EC equations in which the torsion, in general, is dynamical. The special physical constraint imposed upon the spacetime deformations yields the short-range propagating spin-spin interaction.

Probing the origin of inertia behind spacetime deformation

Ter-Kazarian G.T. (eprint arXiv:1105.5932, 2011)

To investigate the origin and nature of inertia, we introduce a new concept of hypothetical 2D, so-called, "master-space" (MS), subject to certain rules. The MS, embedded in the background 4D-spacetime, is an indispensable individual companion to the particle of interest, without relation to every other particle. We argue

that a deformation/(distortion of local internal properties) of MS is the origin of inertia. With this perspective in sight, we construct the alternative relativistic theory of inertia (RTI), which allows to compute the relativistic inertial force acting on an arbitrary point-like observer due to its “absolute acceleration”. We go beyond the hypothesis of locality with an emphasis on distortion of MS, which allows to improve essentially the standard metric and other relevant geometrical structures related to the noninertial reference frame of an arbitrary accelerated observer. We compute the inertial force exerted on the photon in a gravitating system in the semi-Riemann space. Despite the totally different and independent physical sources of gravitation and inertia, this approach furnishes justification for the introduction of the principle of equivalence. Consequently, we relate the inertia effects to the more general post-Riemannian geometry. We derive a general expression of the relativistic inertial force exerted on the extended spinning body moving in the Riemann-Cartan space.

Exoplanets

The Young Exoplanet Transit Initiative (YETI)

Neuhauser, R.; ...; **Nikogossian, E.H.**; ...; **Movsessian, T.**; **Harutyunyan, H.**; et al. (AN 332, 547, 2011)

We present the Young Exoplanet Transit Initiative (YETI), in which we use several 0.2 to 2.6-m telescopes around the world to monitor continuously young (≤ 100 Myr), nearby (≤ 1 kpc) stellar clusters mainly to detect young transiting planets (and to study other variability phenomena on time-scales from minutes to years). The telescope network enables us to observe the targets continuously for several days in order not to miss any transit. The runs are typically one to two weeks long, about three runs per year per cluster in two or three subsequent years for about ten clusters. There are thousands of stars detectable in each field with several hundred known cluster members, e.g. in the first cluster observed, Tr-37, a typical cluster for the YETI survey, there are at least 469 known young stars detected in YETI data down to $R=16.5$ mag with sufficient precision of 50 millimag rms (5 mmag rms down to $R=14.5$ mag) to detect transits, so that we can expect at least about one young transiting object in this cluster. If we observe ~ 10 similar clusters, we can expect to detect ~ 10 young transiting planets with radius determinations. The precision given above is for a typical telescope of the YETI network, namely the 60/90-cm Jena telescope (similar brightness limit, namely within ± 1 mag, for the others) so that planetary transits can be detected. For targets with a periodic transit-like light curve, we obtain spectroscopy to ensure that the star is young and that the transiting object can be sub-stellar; then, we obtain Adaptive Optics infrared images and spectra, to exclude other bright eclipsing stars in the (larger) optical PSF; we carry out other observations as needed to rule out other false positive scenarios; finally, we also perform spectroscopy to determine the mass of the transiting companion. For planets with mass and radius determinations, we can calculate the mean density and probe the internal structure. We aim to constrain planet formation models and their time-scales by discovering planets younger than ~ 100 Myr and determining not only their orbital parameters, but also measuring their true masses and radii, which is possible so far only by the transit method. Here, we present an overview and first results.

Meetings held in Byurakan

Paris Pismis – 100 seminar, 31 January 2011

Seminar dedicated to Paris Pismis' 100th anniversary; talk on Pismis' life and scientific activity and memories about Paris Pismis.

Youth seminar dedicated to Yuri Gagarin's first flight into Space, 11 April 2011

Organized by the Ministry of Education and Science Republican Centre of Technical Creation Space Club. BAO administration and Daniel Weedman met the guests. Presentation by Avetik Grigoryan.

Scientific Journalism seminar, 16 April 2011

First seminar in Armenia devoted to scientific journalism; talks on BAO, Hot topics of Astronomy, Scientific Journalism, and discussions.

Haik Harutyunian – 60 seminar, 26 April 2011

Seminar dedicated to Haik Harutyunian' 60th anniversary; Report by Haik Harutyunian on his scientific achievements.

Armenian Astronomical School Olympiad, 4-6 May 2011

The final stage of the annual astronomical contest for school pupils and selection of candidates for the International Astronomical Olympiad.

Archaeoastronomy seminar dedicated to Anania Shirakatsi's 1400th anniversary, 13-14 July
Seminar on Archaeoastronomy dedicated to Anania Shirakatsi's 1400th anniversary; talks by astronomers, historians, archaeologists, geologists, linguists, et al.

Vahe Oskanian – 90 and Bagrat Ioannissiani – 100 seminar, 24 October 2011

Seminar dedicated to Vahe Oskanian's 90th and Bagrat Ioannissiani's 100th anniversaries; talk on Vahe Oskanian's life and scientific activity and report on the Meeting dedicated to Bagrat Ioannissiani's 100th anniversary held at SAO, Russia.

ArAS X Annual Meeting, 19 December 2011

ArAS X annual meeting was only an administrative one, without a scientific session. ArAS annual report and discussions were held, as well as a number of prizes and certificates were awarded: ArAS Annual Prize for Young Astronomers (Yervant Terzian Prize), ArAS/OxArm Prizes for Scientific Journalists, and GTTP certificates.

Research grants

International research grants support the research at BAO and are a significant contribution compared to the low level of national funding. In 2011, following projects were active:

ANSEF (2011): *“The differences in the morphology and physical properties in parent galaxies of nearby extragalactic radio sources and other elliptical galaxies of the same luminosities and red shifts from the field”*, PI: **R.R. Andreasyan**; *“Study of the supernova progenitors via their host galaxies from the SDSS DR7”*, PI: **A.A. Hakobyan**; *“Searches of young stellar objects by H-alpha and Call emission”*, PI: **T. Yu. Magakian**; *“Dust obscuration and velocity distribution in narrow line regions of AGN”*, PI: **L.A. Sargsyan**

CNRS-SCS (2010-2011): *“Abundance stratifications and stellar pulsations”*, PIs: **Haik Harutyunian** and **Georges Alecian**; *“Search and monitoring of young stellar objects”*, PIs: **Tigran Magakian** and **Jerome Bouvier**; *“Different type of SNe, stellar populations, and star-formation in galaxies”*, PIs: **Artashes Petrosian** and **Daniel Kunth**

Academic Visits

Altogether, 18 Byurakan scientists had 34 academic visits to astronomical centres of 11 countries (USA, France, Germany, Italy, UK, Spain, Portugal, Hungary, Russia, Kazakhstan and Lebanon) (compared to 33 visits to 13 countries by 17 scientists in 2010 and 17 visits to 6 countries by 11 scientists in 2009). As before, most active collaboration was with French institutions (altogether 12 visits by 9 scientists). Five times Armenian scientists visited Russia, three times Italy and Germany (each), twice – USA, UK, Spain and Kazakhstan (each). Out of the 34 visits, 18 have been accomplished for research work in frame of collaborations (mostly France, Italy, USA and Germany), 11 for participation in meetings (including 3 IAU symposia and the European annual meeting JENAM/EWASS-2011), 3 for participation in summer school and 2 for participation in the international astronomical Olympiad (as the team supervisors).

| | | | | |
|---------------------------|--------------------------|----------|-------------|---------|
| Kamo Gigoyan | Marseille, France | 3 weeks | 16.01-08.02 | work |
| Norair Melikian | Santiago de Comp., Spain | 2 weeks | 03.02-16.02 | work |
| Haik Harutyunian | Pescara, Rome, Italy | 1 week | 18.02-24.02 | meeting |
| Vardan Adibekyan | Porto, Portugal | 3 years | 18.03–2014 | work |
| Gohar Harutyunyan | Strasbourg, France | 1 week | 20.03-26.03 | school |
| Artashes Petrosian | IAP, France | 1 week | 11.04-16.04 | meeting |
| Artur Hakobyan | IAP, France | 1 month | 11.04-09.05 | work |
| Edward Khachikian | SAO, Russia | 1 week | 12.04-19.04 | meeting |
| Artashes Petrosian | StScl, USA | 3 months | 16.04-03.07 | work |
| Lusine Sargsyan | Cornell Univ., USA | 2 month | 01.05-27.06 | work |

| | | | | |
|----------------------------|------------------------|----------|-------------|----------|
| Levon Aramyan | Padua, Italy | 3 months | 28.05-25.08 | work |
| Satenik Ghazaryan | Meudon, France | 5 months | 07.06-05.11 | work |
| Areg Mickaelian | Tenerife, Spain | 1 week | 19.06-24.06 | meeting |
| Anahit Samsonyan | Beirut, Lebanon | 1 week | 19.06-26.06 | school |
| Areg Mickaelian | St. Petersburg, Russia | 1 week | 03.07-07.07 | meeting |
| Artur Hakobyan | Padua, Italy | 1 week | 03.07-10.07 | meeting |
| Gohar Harutyunyan | Paris, France | 1 week | 25.07-15.08 | work |
| Gohar Harutyunyan | Heidelberg, Germany | 1 week | 01.08-05.08 | school |
| Vazgen Gabrielyan | Moscow, Russia | 1 week | 14.08-21.08 | work |
| Elena Nikogossian | France | 2 weeks | 26.08-05.09 | work |
| Tigran Movsessian | France | 2 weeks | 27.08-10.09 | work |
| Haik Harutyunian | Meudon, France | 3 weeks | 29.08-19.09 | work |
| Areg Mickaelian | Preston, UK | 1 week | 04.09-09.09 | meeting |
| Areg Mickaelian | Paris, France | 2 weeks | 09.09-28.09 | work |
| Areg Mickaelian | Oxford, UK | 1 week | 18.09-23.09 | meeting |
| Marietta Gyulzadyan | Almaty, Kazakhstan | 1 week | 22.09-30.09 | Olympiad |
| Tigran Nazaryan | Almaty, Kazakhstan | 1 week | 22.09-30.09 | Olympiad |
| Artashes Petrosian | IAP, France | 2 months | 02.10-30.11 | work |
| Edward Khachikian | SAO, Russia | 1 week | 07.10-14.10 | meeting |
| Tigran Movsessian | SAO, Russia | 1 week | 07.10-14.10 | meeting |
| Artur Hakobyan | IAP, France | 1 month | 31.10-28.11 | work |
| Lusine Sargsyan | Hamburg, Germany | 3 weeks | 03.11-27.11 | work |
| Anahit Samsonyan | Hamburg, Germany | 3 weeks | 03.11-27.11 | work |
| Norair Melikian | Budapest, Hungary | 2 weeks | 27.11-12.12 | meeting |

Visits of foreign scientists and other guests

Altogether 10 scientists and other guests from 4 countries visited Byurakan during 2011. Most active were guests from Russia (4), USA (3) and Germany (2). Dan Weedman visited BAO 3 times in 2011.

Daniel Weedman (Cornell University, Ithaca, NY, USA), Jan 1 – Feb 9, 2011, 1 month, collaboration

Daniel Weedman (Cornell University, Ithaca, NY, USA), Mar 15 – Apr 11 2011, 1 month, collaboration

Mikhail Tyurin, cosmonaut (Russia), Apr 2011, guest

George Alecian (Meudon Observatory, France), May 2011, collaboration

Viktor Krivopuskov (Rossotrudnichestvo (“Russian Collaboration”), Russia), June 2011, collaboration

Markus Mugrauer (Jena Observatory, Germany), June 2011, collaboration

Jens Eilenstein (Jena Observatory, Germany), July – Aug 2011, postdoc position

Daniel Weedman (Cornell University, Ithaca, NY, USA), Aug 5 – Oct 5, 2011, 2 months, collaboration

Zhores Alferov, Nobel Prize Winner (Russia), Oct 2011, guest

Alexander Maksimov (SAO, Russia), Nov 2011, collaboration

Participation in Meetings

During 2011, Byurakan astronomers have participated in 22 meetings, including a number of important international ones, such as JENAM/EWASS-2011 in St. Petersburg, Russia, 3 IAU symposia (Nos. 281, 284, 285) in Italy and UK, as well as other meetings in France, Italy, Spain, and

Russia, summers schools in France, Germany and Lebanon, the International Astronomical Olympiad in Kazakhstan, as well as meetings and seminars in Yerevan and Byurakan: Gagarin – 50 and Anania Shirakatsi – 1400 meetings, Young Scientists Conference, ArAS X Annual Meeting, etc.

Paris Pismis – 100 seminar, 31 January 2011, Byurakan, Armenia (BAO staff)

Governing Committee Meeting of the International Centre for Relativistic Astrophysics Network (ICRANet), 21-22 February 2011, Pescara, Italy (H.A. Harutyunian)

European Virtual Observatory (Euro-VO) International Cooperation Empowerment (ICE) school for young astronomers, 21-24 March 2011, Strasbourg, France (G.S. Harutyunyan)

International Conference, 11-15 April 2011, IAP, Paris, France (A.A. Hakobyan, A.R. Petrosian)

Large Telescopes Thematic Committee (KTBT) meeting, 11-15 April 2011, SAO, Russia (E.Ye. Khachikian)

Solemn scientific meeting dedicated to Yuri Gagarin's first flight into Space, 12 April 2011, Yerevan, Armenia (H.A. Harutyunian, T.Yu. Magakian, A.M. Mickaelian, T.H. Movsessian, et al.)

Scientific Journalism seminar, 16 April 2011, Byurakan, Armenia (H.A. Harutyunian, A.M. Mickaelian)

Haik Harutyunian – 60 seminar, 26 April 2011, Byurakan, Armenia (BAO staff)

Armenian Astronomical School Olympiad, 5 May 2011 (Jury members: A.A. Akopian (Chair), A.E. Grigoryan, M.V. Gyulzadian, E.L. Karapetian, A.M. Mickaelian, T. Nazaryan, S.Ye. Nersisyan, A.G. Yeghikian)

Starmus Festival, 20-24 June 2011, Tenerife, Canary Islands, Spain (A.M. Mickaelian)

Second Azarquel School in Astronomy, 19-26 June 2011, Beirut, Lebanon (A.L. Samsonyan, T. Vardanyan)

Joint European and National Astronomical Meeting / European Week of Astronomy and Space Science (JENAM/EWASS-2011), 3-7 July 2011, St. Petersburg, Russia (A.M. Mickaelian)

IAU Symposium #281: *Binary Paths to Type Ia Supernovae Explosions*, 4-8 July 2011, Padua, Italy (L. Aramyán, A.A. Hakobyan)

Archaeoastronomy seminar dedicated to Anania Shirakatsi's 1400th anniversary, 13-14 July 2011, Byurakan, Armenia (BAO staff)

6th International Max-Planck Research School for Astronomy and Cosmic Physics (IMPRS-HD): *Characterizing exoplanets - from formation to atmospheres*, 1-5 August 2011, Heidelberg, Germany (G.S. Harutyunyan)

IAU Symposium #284: *The Spectral Energy Distribution of Galaxies (SED2011)*, 5-9 September 2011, University of Central Lancashire (UCLAN), Preston, UK (A.M. Mickaelian)

IAU Symposium #285: *New Horizons in Time Domain Astronomy*, 19-23 September 2011, Oxford, UK (A.M. Mickaelian)

16th International Astronomical Olympiad (IAO), 22-30 September 2011, Almaty, Kazakhstan, (M.V. Gyulzadian, T. Nazaryan)

Bagrat Ioannisiani 100th anniversary meeting, 7-14 October 2011, SAO, Russia (E.Ye. Khachikian, T.H. Movsessian)

Vahe Oskanian – 90 and Bagrat Ioannisiani – 100 seminar, 24 October 2011, Byurakan, Armenia (BAO staff)

Young Scientists Conference “50 years of Cosmic Era: Real and Virtual Studies of the Sky”, 22-24 November 2011, Yerevan, Armenia (H.V. Abrahamyan, A.S. Amirkhanyan, M.G. Avtandilyan, V.V. Gabrielyan, S. Ghazaryan, K.S. Gigoyan, G.S. Harutyunyan, T.Yu. Magakian, A.M. Mickaelian, T. Nazaryan, G.M. Paronyan, V. Vardanyan)

ArAS X Annual Meeting, 19 December 2011, Byurakan, Armenia (ArAS BAO staff members)

Talks, posters and lectures presented at meetings and schools

During 2011, Byurakan astronomers presented invited, oral and poster contributions at 13 meetings (in Russia, Italy, UK, France, Yerevan and Byurakan) and gave invited lectures at the Young Scientists Conference in Yerevan. Altogether, there were 2 invited talks, 23 contributed talks, 4 posters, 2 lectures, and 3 reports.

Paris Pismis – 100 seminar, 31 Jan 2011, Byurakan, Armenia

A.M. Mickaelian: “*Paris Pismis’ Life and Scientific Activity*” (oral talk)

E.S. Parsamian: “*Memories about Paris Pismis*” (oral talk)

Euro-VO ICE school, 21-24 Mar 2011, Strasbourg, France

G.S. Harutyunyan: “*Multiwavelength Study of Bright Active Galaxies*” (oral talk)

Gagarin’s flight – 50 meeting, 12 Apr 2011, Yerevan, Armenia (3 oral talks)

H.A. Harutyunyan: “*Problems caused by cosmic garbage*” (oral talk)

T.H. Magakian: “*Scientific revolution with the space observatories*” (oral talk)

A.M. Mickaelian: “*MW astrophysics by means of space telescopes: new data on active galaxies*” (oral talk)

Scientific Journalism seminar, 16 Apr 2011, Byurakan, Armenia (3 oral talks)

H.A. Harutyunyan: “*Viktor Ambartsumian and the Byurakan Astrophysical Observatory*” (oral talk)

A.M. Mickaelian: “*Hot topics in Astronomy and Related Fields*” (oral talk)

A.M. Mickaelian: “*Scientific Journalism in the World and in Armenia*” (oral talk)

Haik Harutyunian – 60 seminar, 26 Apr 2011, Byurakan, Armenia

H.A. Harutyunyan: “*A report of scientific activity*” (invited talk)

JENAM/EWASS-2011, 3-7 July 2011, St. Petersburg, Russia (1 invited talk, 1 poster, 1 report)

Special Session 3: *Science with the Virtual Observatory*:

A.M. Mickaelian: “*Large astronomical surveys, archives and databases*” (invited talk)

Special Session 8: *Astronomy Education and Public Outreach in Europe*:

A.M. Mickaelian: “*Scientific Journalism and Astronomy Outreach in Armenia*” (poster)

EAS Business Meeting:

A.M. Mickaelian: “*Report on SREAC activities in 2010-2011*” (report)

IAU Symposium #281, 4-8 July 2011, Padua, Italy

A.A. Hakobyan: “*Five Supernova Survey Galaxies in the Southern Hemisphere: Supernova Ia Rates*” (poster)

Anania Shirakatsi – 1400th anniversary, 13-14 July 2011, Byurakan, Armenia (5 talks)

A.M. Mickaelian: “*Celebration of Anania Shirakatsi’s 1400th anniversary in 2012-2013*” (oral talk)

G.H. Brutian: “*The structure of Shirakatsi’s chronology*” (oral talk)

A.M. Mickaelian: “*Coordination of the historical-astronomical matters in Armenia*” (oral talk)

H.A. Harutyunyan: “*Ancient Armenian astronomical names*” (oral talk)

A.M. Mickaelian: “*On the Armenian names of constellations*” (oral talk)

IAU Symposium #284, 5-9 Sep 2011, Preston, UK

A.M. Mickaelian: *"Spectral Energy Distribution and classification of bright active galaxies"* (poster)

IAU Symposium #285, 19-23 Sep 2011, Oxford, UK

A.M. Mickaelian: *"Variability analysis based on POSS1 and POSS2 photometry"* (poster)

Vahe Oskanian – 90 and Bagrat Ioannissiani – 100 seminar, 24 Oct 2011, Byurakan, Armenia

Ara V. Oskanian: *"Vahe Oskanian's Life and Scientific Activity"* (oral talk)

T.H. Movsessian: *"Report on Bagrat Ioannissiani's 100th anniversary meeting held at SAO, Russia"* (report)

Young Scientists Conference, 22-24 Nov 2011, Yerevan, Armenia (2 lectures and 8 talks)

A.M. Mickaelian: *"Large Astronomical Surveys and Catalogs"* (invited lecture)

A.M. Mickaelian: *"Astronomical Databases, Archives and Virtual Observatories"* (invited lecture)

H.V. Abrahamyan: *"Joint catalogue of IRAS PSC/FSC"* (oral talk)

M.G. Avtandilyan: *"Revised classification of the SBS carbon star candidates including the discovery of a new emission line dwarf carbon star"* (oral talk)

V.V. Gabrielyan: *"Designing a New Control System for the Schmidt Telescope"* (oral talk)

S. Ghazaryan: *"Analysis of CoRoT N2-light curves corrected with a new quasi-automatic procedure"* (oral talk)

G.S. Harutyunyan: *"Study and classification of SDSS spectra for Byurakan-IRAS Galaxies"* (oral talk)

T. Nazaryan: *"Comparative Study of the Neighbors of the First and Second Byurakan surveys galaxies"* (oral talk)

G.M. Paronyan: *"Multiwavelength investigation of X-ray active galactic nuclei (AGN)"* (oral talk)

V. Vardanyan: *"Python Programming for Astronomical Data Analysis"* (oral talk)

ArAS X Annual Meeting, 19 December 2011, Byurakan, Armenia

A.M. Mickaelian: *"ArAS annual report 2010-2011"* (annual report)

Seminars

31.01, Byurakan

Areg Mickaelian: *"Paris Pismis – 100"*.

31.01, Byurakan

Elma Parsamian: *Memories about Paris Pismis.*

21.02, Byurakan

Gabriel Ohanian: *"The origin and evolution of galaxies: two different approaches"*.

26.04, Byurakan

Haik Harutyunyan: *A report of scientific activity.*

16.05, Byurakan

Tigran Movsessian: *"The nature of the HL Tau star's Herbig-Haro jet"*.

06.06, Byurakan

Elena Nikogossian: *"The new HH objects and Ha emission stars in the vicinity of GM 2-41 nebula"*.

11.07, Byurakan

Abraham Mahtesyan: *"The galaxies' luminosity function in the different environments"*.

18.07, Byurakan

Areg Mickaelian: *Report on JENAM 2011 held in St. Petersburg.*

22.08, Byurakan

Haik Harutyunyan: *"Hubble Expansion of the Universe and Formation of Cosmic Objects. I"*.

25.08, Byurakan

Haik Harutyunyan: *"Hubble Expansion of the Universe and Formation of Cosmic Objects. II"*.

05.09, Byurakan

Abraham Mahtessian: *"The statistic study of the groups of galaxies"*.

24.10, Byurakan

Ara Oskanian: *"Vahe Oskanian – 90"*.

24.10, Byurakan

Tigran Movsessian: *Report on Meeting dedicated to Bagrat Ioannissiani – 100 held at SAO, Russia.*

21.11, Byurakan

Susanna Hakopian: *"SBS1202+583. Detection and study of HII-regions by the results of integral-field spectroscopy"*.

Publications

During 2011, Byurakan astronomers published 32 papers in refereed journals (including 21 in *Astrophysics*, 4 in *MNRAS*, and 1 – *ApJ*, *AJ*, *A&A*, *Astronomische Nachrichten*, *Astronomy Letters*, *Inter. S.R.N. Astronomy & Astrophysics*, *Classical & Quantum Gravity* each), 4 in proceedings of 2

meetings, 1 electronic catalog in Vizier, 2 booklets, and 2 preprints. Numerous information materials and popular articles were published as well. Compared to 2010, there is an increase in refereed papers but decrease in other publications.

Refereed journal papers

Sargsyan, L.; Weedman, D.; Lebouteiller, V.; Houck, J.; Barry, D.; Hovhannisyan, A.; **Mickaelian, A.** – Infrared Spectra and Spectral Energy Distributions for Dusty Starbursts and Active Galactic Nuclei // *Astrophysical Journal*, Vol. 730, No. 1, p. 19-, Mar 2011.

Gyulzadyan M., McLean B., **Adibekyan V.Zh.**, Allen R.J., Kunth D., **Petrosian A.**, Stepanian J.A. – The Second Byurakan Survey galaxies. I. The optical database // *Astrophysics*, Vol. 54, No. 1, p. 15-25, Mar 2011.

Khachikian E.Ye., **Asatrian N.S.**, Burenkov A.N. – On the variability of emission spectrum of the Sy2 galaxy Mark 6 // *Astrophysics*, Vol. 54, No. 1, p. 26-35, Mar 2011.

Yeghikyan A.G. – Irradiation of dust in molecular clouds. II. Doses produced by cosmic rays // *Astrophysics*, Vol. 54, No. 1, p. 87-99, Mar 2011.

Nikoghossian A.G. – Group-theoretical description of radiative transfer in one-dimensional media // *Astrophysics*, Vol. 54, No. 1, p. 126-138, Mar 2011.

Gigoyan K.S., Russeil D., Sarkissian A., **Avtandilyan M.** – Two New N-Type Carbon Stars Found In The DFBS // *Astrophysics*, Vol. 54, No. 1, p. 139-142, Mar 2011.

Erastova L.K. – The Variable Star SBS 0150+339 // *Astrophysics*, Vol. 54, No. 1, p. 143-145, Mar 2011.

Ter-Kazarian, G.T. – Two-step spacetime deformation-induced dynamical torsion // *Classical and Quantum Gravity*, Vol. 28, No. 5, 055003, Mar 2011.

Aspin, C.; Beck, T.L.; Davis, C.J.; Froebrich, D.; Khanzadyan, T.; **Magakian, T.Yu.**; Moriarty-Schieven, G.H.; **Movsessian, T.A.**; Mitchison, S.; **Nikogossian, E.G.**; Pyo, T.-S.; Smith, M.D. – CSO Bolocam 1.1 mm Continuum Mapping of the Braid Nebula Star Formation Region in Cygnus OB7 // *Astronomical Journal*, Vol. 141, No. 4, p. 139-, Apr 2011.

Froebrich, D.; Davis, C.J.; Ioannidis, G.; Gledhill, T.M.; Takami, M.; Chrysostomou, A.; Drew, J.; Eisloffel, J.; Gosling, A.; Gredel, R.; Hatchell, J.; Hodapp, K.W.; Kumar, M.S.N.; Lucas, P.W.; Matthews, H.; Rawlings, M.G.; Smith, M.D.; Stecklum, B.; Varricatt, W.P.; Lee, H.T.; Teixeira, P.S.; Aspin, C.; Khanzadyan, T.; Karr, J.; Kim, H.-J.; Koo, B.-C.; Lee, J.J.; Lee, Y.-H.; **Magakian, T.Y.**; **Movsessian, T.A.**; **Nikogossian, E.H.**; Pyo, T.S.; Stanke, T. – UWISH2 - the UKIRT Widefield Infrared Survey for H₂ // *Monthly Notices of the Royal Astronomical Society*, Vol. 413, No. 1, p. 480-492, May 2011.

Hovhannisyan A., **Sargsyan L.A.**, **Mickaelian A.M.**, Weedman D.W. – Multiwavelength study of 230 IRAS FSC galaxies // *Astrophysics*, Vol. 54, No. 2, p. 147-154, June 2011.

Mahtessian A.P. – Luminosity function of the field galaxies // *Astrophysics*, Vol. 54, No. 2, p. 162-176, June 2011.

Andreasyan R.R., **Balayan S.K.**, **Movsesyan V.H.** – Structure of the magnetic field near the galactic plane // *Astrophysics*, Vol. 54, No. 2, p. 177-183, June 2011.

Melikyan N.D., Tamazyan V.S., **Karapetyan A.A.**, **Samsonyan A.A.**, **Kostandyan G.R.** – New H α stars. NGC 6910 region. II // *Astrophysics*, Vol. 54, No. 2, p. 203-213, June 2011.

Nikoghossian A.G. – Bilinear integrals of the radiative transfer equation // *Astrophysics*, Vol. 54, No. 2, p. 242-249, June 2011.

Harutyunian H.A. – Hubble expansion of the universe and structural features of atomic nuclei // *Astrophysics*, Vol. 54, No. 2, p. 290-299, June 2011.

Kun, M.; Szegedi-Elek, E.; Moor, A.; Kospal, A.; Abraham, P.; Apai, D.; Kiss, Z.T.; Klagyivik, P.; **Magakian, T.Yu.**; Mezo, Gy.; **Movsessian, T.A.**; Pal, A.; Racz, M.; Rogers, J. – Inner disc rearrangement revealed by dramatic brightness variations in the young star PV Cep // *Monthly Notices of the Royal Astronomical Society*, Vol. 413, No. 4, p. 2689-2695, June 2011.

Neuhauser, R.; Errmann, R.; Berndt, A.; Maciejewski, G.; Takahashi, H.; Chen, W.P.; Dimitrov, D.P.; Pribulla, T.; **Nikogossian, E.H.**; Jensen, E.L.N.; Marschall, L.; Wu, Z.-Y.; Kellerer, A.; Walter, F.M.; Briceno, C.; Chini, R.; Fernandez, M.; Raetz, St.; Torres, G.; Latham, D.W.; Quinn, S.N.; Niedzielski, A.; Bukowiecki, L.; Nowak, G.; Tomov, T.; Tachihara, K.; Hu, S.C.-L.; Hung, L.W.; Kjurkchieva, D.P.; Radeva, V.S.; Mihov, B.M.; Slavcheva-Mihova, L.; Bozhinova, I.N.; Budaj, J.; Vanko, M.; Kundra, E.; Hambalek, L.; Krushevskaya, V.; **Movsessian, T.**; **Harutyunyan, H.**; Downes, J.J.; Hernandez, J.; Hoffmeister, V.H.; Cohen, D.H.; Abel, I.; Ahmad, R.; Chapman, S.; Eckert, S.; Goodman, J.; Guerard, A.; Kim, H.M.; Koontharana, A.; Sokol, J.; Trinh, J.; Wang, Y.; Zhou, X.; Redmer, R.; Kramm, U.; Nettelmann, N.; Mugrauer, M.; Schmidt, J.; Moualla, M.; Ginski, C.; Marka, C.; Adam, C.; Seeliger, M.; Baar, S.; Roell, T.; Schmidt, T.O.B.; Trepl, L.; Eisenbeiß, T.; Fiedler, S.; Tetzlaff, N.; Schmidt, E.; Hohle, M.M.; Kitzke, M.; Chakrova, N.; Grafe, C.; Schreyer, K.; Hambaryan, V.V.; Broeg, C.H.; Koppenhoefer, J.; Pandey, A.K. – The Young Exoplanet Transit Initiative (YETI) // *Astronomische Nachrichten*, Vol. 332, No. 6, p. 547-, July 2011.

Mahtessian, A.P.; **Movsessian, V.G.**; Mahtessian, L.A. – Markarian galaxies and their environment // *Astronomy Letters*, Vol. 37, No. 7, p. 448-455, July 2011.

Rossi, C.; **Gigoyan, K.S.**; **Avtandilyan, M.G.**; Sclavi, S. – Revised classification of the SBS carbon star candidates including the discovery of a new emission line dwarf carbon star // *Astronomy & Astrophysics*, Vol. 532, No. , p. 69-, Aug 2011.

Mickaelian, A.M.; Mikayelyan, G.A.; **Sinamyanyan, P.K.** – Accurate photometry and variability of First Byurakan Survey blue stellar objects // *Monthly Notices of the Royal Astronomical Society*, Vol. 415, No. 2, p. 1061-1073, Aug 2011.

Hakobyan A.A., **Petrosian A.R.**, Mamon G.A., McLean B., Kunth D., Turatto M., Cappellaro E., Mannucci F., Allen R.J., Panagia N., Della Valle M. – Five supernova survey galaxies in the southern hemisphere. II. The supernova rates // *Astrophysics*, Vol. 54, No. 3, p. 301-314, Sep 2011.

Melikyan N.D., Tamazyan V.S., **Karapetyan A.A.**, **Samsonyan A.A.** – Emission stars in Cyg OB7. New flare stars. III // *Astrophysics*, Vol. 54, No. 3, p. 377-383, Sep 2011.

Gyulbudaghian A.L. – The compact nebulae cn1 and cn2, coupled to infrared stellar clusters // *Astrophysics*, Vol. 54, No. 3, p. 384-391, Sep 2011.

Sinamyanyan P.K., **Mickaelian A.M.** – A subsample of white dwarfs among the FBS blue stellar objects // *Astrophysics*, Vol. 54, No. 3, p. 403-412, Sep 2011.

Sinamyanyan P.K. – Temperature and surface gravitation of white dwarfs in the FBS survey from the SDSS // *Astrophysics*, Vol. 54, No. 3, p. 413-420, Sep 2011.

Melikyan N.D., Tamazyan V.S., **Samsonyan A.A.** – Variation in the Flare Activity of the Star UV Ceti // *Astrophysics*, Vol. 54, No. 4, p. 469-475, Nov 2011.

Gyulbudaghian A.L. – Two star-formation regions in Auriga // *Astrophysics*, Vol. 54, No. 4, p. 476-482, Nov 2011.

Nikoghosyan E.H., **Magakian T.Yu.**, **Movsessian T.A.** – Search of HH Objects and Emission-Line Stars in the Star Forming Regions. VII. Herbig-Haro Objects in the Vicinity of GM 2-41 Nebula // *Astrophysics*, Vol. 54, No. 4, p. 496-506, Nov 2011.

Nikoghossian A.G. – Solution of linear radiative transport problems in plane-parallel atmospheres. I // *Astrophysics*, Vol. 54, No. 4, p. 553-567, Nov 2011.

Khanzadyan, T.; **Movsessian, T.A.**; Davis, C.J.; **Magakian, T.Yu.**; Gredel, R.; **Nikogossian, E.H.** – GM 2-4: a signpost for low- and intermediate-mass star formation // *Monthly Notices of the Royal Astronomical Society*, Vol. 418, No. 3, p. 1994-2003, Dec 2011.

Yegikian A.G. – On the Cosmic Ray-Induced Ionization Rate in Molecular Clouds // *Inter.S.R.N. Astronomy and Astrophysics, Vol. 2011, p. 6-, 2011.*

Proceedings papers

Tamazian, V.S.; Docobo, J.A.; Balega, Yu.Yu.; **Melikian, N.D.**; Malogolovets, E.A. – EMCCD Speckle Measurements, Differential Photometry and Dynamical Masses of Visual Binary Stars // *International Workshop on Double and Multiple Stars: Dynamics, Physics, and Instrumentation. AIP Conference Proceedings, Vol. 1346, p. 36-41, July 2011.*

Melikian, N.D.; Tamazian, V.S.; Docobo, J.A.; **Karapetian, A.A.**; **Kostandyan, G.S.**; **Samsonyan, A.L.** – Spectral Observations of the Eclipsing Binary RY Sct // *International Workshop on Double and Multiple Stars: Dynamics, Physics, and Instrumentation. AIP Conference Proc., Vol. 1346, p. 96-100, July 2011.*

Melikian, N.D.; Tamazian, V.S.; Docobo, J.A.; **Karapetian, A.A.**; **Kostandyan, G.S.** – A New Deep Low State of TT Ari? // *International Workshop on Double and Multiple Stars: Dynamics, Physics, and Instrumentation. AIP Conference Proceedings, Vol. 1346, p. 101-106, July 2011.*

Knyazyan A., **Mickaelian A.**, Astsatryan H. – Astronomical Catalogs Cross-correlation Objectives and Illustration of a New Correlation Algorithm // *Computer Science and Information Technologies (CSIT-2011), Sep 2011.*

Electronic catalogs

Parsamian, E.S.; Chavira, E. – H α emission stars in the Orion Nebula // *VizieR Catalog II/309, Nov 2011.*

Other papers

Ter-Kazarian, G.T. – Probing the origin of inertia behind spacetime deformation // *eprint arXiv:1105.5932, eprint 1105.5932, May 2011.*

Hakobyan, A.A.; **Petrosian, A.R.**; Mamon, G.A.; McLean, B.; Kunth, D.; Turatto, M.; Cappellaro, E.; Mannucci, F.; Allen, R.J.; Panagia, N.; Della Valle, M.; Petrosyan, G.V. – Five Supernova Survey Galaxies in the Southern Hemisphere: Supernova Ia Rates // *eprint arXiv:1107.3044; to be published in the Proc. IAU Symp. #281: "Binary Paths to type Ia Supernovae Explosions", eds. R. Di Stefano & M. Orlo, July 2011.*

Mickaelian, A.M. – Byurakan Observatory // *Edit Print Publishing House, 64 p., Oct 2011.*

Harutyunian H.A.; **Mickaelian, A.M.** – Viktor Ambartsumian: most important scientific results // *Edit Print Publishing House, 32 p., Oct 2011.*

Most productive authors have been (3 and more refereed papers):

| Authors | Ref. papers | Proc. papers | Other publ.-s | All publ.-s |
|------------------|-------------|--------------|---------------|-------------|
| Magakian T.Yu. | 5 | - | - | 5 |
| Melikian N.D. | 3 | 3 | - | 6 |
| Mickaelian A.M. | 4 | 1 | 2 | 7 |
| Movsessian T.H. | 6 | - | - | 6 |
| Nikoghosian A.G. | 3 | - | - | 3 |
| Nikogossian E.H. | 5 | - | - | 5 |
| Samsonyan A.L. | 3 | 1 | - | 4 |
| Sinamyanyan P.K. | 3 | - | - | 3 |

Publications by research groups:

| Head of the group | Ref. papers | Proc. papers | Other publ.-s | All publ.-s |
|-------------------|-------------|--------------|---------------|-------------|
| Harutyunian H.A. | 2 | - | 1 | 3 |
| Khachikian E.Ye. | 4 | - | - | 4 |

| | | | | |
|-------------------|---|---|---|----|
| Magakian T.Yu. | 6 | - | - | 6 |
| Melikian N.D. | 3 | 3 | - | 6 |
| Mickaelian A.M. | 8 | 1 | 2 | 11 |
| Nikoghossian A.G. | 3 | - | - | 3 |
| Parsamian E.S. | 4 | - | 1 | 5 |
| Petrosian A.R. | 2 | - | 1 | 3 |
| Ter-Kazarian G.T. | 1 | - | 1 | 2 |

Isaac Newton Institute (INI) Armenian Branch

The President of the Isaac Newton Institute of Chile **Dr. Gonzalo Alcaino** established the INI Armenian Branch in 2000. **Dr. A.M. Mickaelian** is its Resident Director. Altogether in 2011, 7 papers were published in AJ, ApJ, A&A, and MNRAS, including 3 in frame of INI (listed in “*Publications*”). The research staff (24): H.V. Abrahamian, T.G. Arshakian, M.G. Avtandilyan, S.K. Balayan, L.K. Erastova, K.S. Gigoyan, A.L. Gyulbudaghian, A.A. Hakobyan, S.A. Hakopian, H.A. Harutyunian, L.R. Hovhannisyanyan, R.A. Kandalyan, A.A. Karapetian, T.Yu. Magakian, N.D. Melikian, A.M. Mickaelian, G.A. Mikayelyan, H.Kh. Navasardian, A.G. Nikoghossian, E.H. Nikoghossian, A.R. Petrosian, L.A. Sargsyan, P.K. Sinamyanyan, A.A. Sinanian.

Teaching, supervision of students

Following Byurakan scientists teach astrophysical subjects at the YSU Department of Physics, Chair of General Physics and Astrophysics: V.Zh. Adibekyan, A.A. Akopian, A.A. Hakobyan, H.A. Harutyunian, V.H. Malumian, T.H. Movsessian, A.G. Nikoghossian, A.G. Yeghikyan. **Prof. Davit Sedrakian** is the head of the Chair of General Physics and Astrophysics.

Byurakan scientists have also been supervisors of B.Sc. and M.Sc. Diploma theses at the YSU. At present BAO has two Ph.D. students. **Satenik Ghazaryan** (supervisor: H.A. Harutyunian) is involved in the joint French-Armenian post-graduate fellowship sponsored by the French Embassy in Armenia. Her second (French) supervisor is Georges Alecian. The second Ph.D. student is **Tigran Nazaryan** (supervisor: A.R. Petrosian). In addition, a few other Byurakan fellows are in the stage of preparation of their Ph.D. theses: N.S. Asatrian, A.G. Eghikian, M.V. Gyulzadian, A.A. Karapetian, P.K. Sinamyanyan, H.V. Abrahamyan and G.M. Paronyan. No theses have been defended at BAO Special Council during 2011.

The International Astronomical Olympiad was held in 2011 in Almaty, Kazakhstan, where the Armenian pupils won one First-rank and three Third-rank Diploma (teachers: Marietta Gyulzadian and Tigran Nazaryan).

Membership

International Astronomical Union (IAU, 16 members): K.S. Gigoyan, A.L. Gyulbudaghian, H.A. Harutyunian, R.Kh. Hovhannessian, A.T. Kaloghlian, E.Ye. Khachikian, T.Yu. Magakian, A.P. Mahtessian, V.H. Malumian, N.D. Melikian, A.M. Mickaelian, A.G. Nikoghossian, E.S. Parsamian, A.R. Petrosian, H.V. Pikichian, R.K. Shahbazian (retired).

European Astronomical Society (EAS, 18 members): A.S. Amirkhanian, R.R. Andreasyan, K.S. Gigoyan, A.A. Hakobyan, H.A. Harutyunian, M.A. Hovhannissian, S.G. Iskudarian, E.Ye. Khachikian, T.Yu. Magakian, V.H. Malumian, N.D. Melikian, A.M. Mickaelian, T.H. Movsessian, E.H. Nikoghossian, E.S. Parsamian, A.R. Petrosian, H.V. Pikichian, A.G. Yeghikyan.

Euro-Asian Astronomical Society (EAAS, 7 members): T.Yu. Magakian, N.D. Melikian, A.M. Mickaelian, A.G. Nikoghossian, G.B. Ohanian, E.S. Parsamian, A.R. Petrosian.

American Astronomical Society (AAS, 1 member): A.M. Mickaelian.

Armenian Astronomical Society (ArAS): 40 members from BAO.

International Committees and Working Groups (WG)

EAAS Executive Council: A.M. Mickaelian

EAAS Scientific-Technical Committee: T.Yu. Magakian

EAAS International Bureau: A.M. Mickaelian

IAU Commission 5 WG on Astronomical Data (WGAD): A.M. Mickaelian

IAU Commission 5 WG on Preservation and Digitization of Photographic Plates (PDPP):
A.M. Mickaelian

IAU Commission 41 WG on Astronomy and World Heritage (WGAWH): A.M. Mickaelian

IAU Commission 46 “Astronomy Education & Development”: H.A. Harutyunian (Liaison in Armenia)

International Centre for Relativistic Astrophysics (ICRANet) Director’s Council: H.A. Harutyunian

International Virtual Observatory Alliance (IVOA) Executive Committee: A.M. Mickaelian

Large Telescopes Thematic Committee (KTBT): E.Ye. Khachikian

Sub-Regional European Astronomical Committee (SREAC): A.M. Mickaelian

Journal *Astrofizika*/Astrophysics

The journal *Astrofizika* (English translation: *Astrophysics*) is being published by the Armenian NAS. Five Byurakan astronomers are involved in the Editorial Board of *Astrofizika* (Editor-in-Chief: *Prof. Davit Sedrakian* from the YSU): **E.Ye. Khachikian** (*Deputy Editor-in-Chief*), **A.T. Kalloghlian** (*Secretary-in-Chief*), **H.A. Harutyunian**, **A.G. Nikoghossian**, and **E.S. Parsamian**. Four issues of Vol. 54 were published in 2011 with 56 papers, including 21 (37.5%) from BAO (compared to 20 (35%) out of 57 in 2010). Other papers were from the YSU (7), Russia, Ukraine, Georgia, Serbia, China, Mexico, and Iran.

Armenian Astronomical Society (ArAS)

ArAS was created in 1999-2001 and at present is an active organization supporting astronomy/astrophysics and science in general in Armenia. Co-Presidents: **H.A. Harutyunian**, **A.M. Mickaelian**, **Ye.Terzian** (Cornell Univ, USA), Vice-President: **T.Yu. Magakian**, Secretary: **E.H. Nikoghossian**, Treasurer: **M.V. Gyulzadyan**, Webmaster: **G.A. Mikayelyan**. ArAS has **93 members from 21 countries**, including 56 from Armenia. During 2011, the **ArAS webpage** was updated, eight issues (Nos. 45-52) of the **ArAS Newsletter (ArASNews)** were released, **ArAS X meeting** was held on December 19, **ArAS Annual prize for Young Astronomers** was awarded for the 8th time (2011 winner: Marine Avtandilyan), **ArAS/OxArm Prizes** were awarded to scientific journalists, **7 new ArAS members** were accepted. During 2011, in frame of the **scientific journalism**, ArAS prepared and circulated 117 press-releases to Armenian mass media with information on sky events, international and local astronomical news that resulted in more than 1000 publications.