

# ArAS News

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# 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 1400<sup>th</sup> 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 1400<sup>th</sup> 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. Yengibarian, 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 $\alpha$ 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 $\alpha$  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 $\alpha$  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 $\lambda$ 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  $\sim 400$  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  $H_{\beta}$ ) might be caused by the appearance of the anti P Cyg profile, and  $H_{\alpha}$  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  $1 \text{ deg}^2$  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  $\rho$  Ophiuchus star-forming regions.

#### *UWISH2 - the UKIRT Widefield Infrared Survey for H<sub>2</sub>*

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 ( $10^{\circ} < l < 65^{\circ}$ ;  $-1?3 < b < +1?3$ ). 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 $\sigma$  detection limit of point sources of  $K? 18 \text{ mag}$  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<sub>C</sub>-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*

Khazadyan, 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 H<sub>2</sub> 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-wavelength 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. <sup>a</sup> Flux in 10<sup>-18</sup> W m<sup>-2</sup> units and the background 1σ noise estimate is 1.15 × 10<sup>-19</sup> W m<sup>-2</sup> calculated in the 6-arcsec circular aperture.

*A subsample of white dwarfs among the FBS blue stellar objects*

**Sinamyan 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*

**Sinamyan 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.  $^{12}\text{CO}$  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).  $^{12}\text{CO}$  (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*

**Yeghikyan 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  $\alpha$ -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 0.1-1 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., Mickaelian 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  $f_{\text{IR}}$  measured with the Infrared Astronomical Satellite (IRAS), also using AKARI photometry when available. Infrared luminosities and spectral energy distributions (SEDs) from 8  $\mu\text{m}$  to 160  $\mu\text{m}$  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  $42.5 < \log L_{\text{IR}} < 46.8$  ( $\text{erg s}^{-1}$ ) 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  $\log [L_{\text{IR}}/vL_{\nu} (7.7 \mu\text{m})] = 0.74 \pm 0.18$  in starbursts,  $\log [L_{\text{IR}}/vL_{\nu} (7.7 \mu\text{m})] = 0.96 \pm 0.26$  in composite sources (starburst plus AGN),  $\log [L_{\text{IR}}/vL_{\nu} (7.9 \mu\text{m})] = 0.80 \pm 0.25$  in AGNs with silicate absorption, and that  $\log [L_{\text{IR}}/vL_{\nu} (7.9 \mu\text{m})] = 0.51 \pm 0.21$  in AGNs with silicate emission.  $L_{\text{IR}}$  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., Asatryan 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  $\alpha$  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  $0.126 \text{ Mpc}^{-3}$ .

*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  $\text{POSS2-POSS1} \geq 3\sigma$  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 ( $\leq 100$  Myr), nearby ( $\leq 1$  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  $\sim 10$  similar clusters, we can expect to detect  $\sim 10$  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  $\pm 1$  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  $\sim 100$  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' 100<sup>th</sup> 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' 60<sup>th</sup> 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 1400<sup>th</sup> anniversary, 13-14 July**

Seminar on Archaeoastronomy dedicated to Anania Shirakatsi's 1400<sup>th</sup> 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 90<sup>th</sup> and Bagrat Ioannissiani's 100<sup>th</sup> anniversaries; talk on Vahe Oskanian's life and scientific activity and report on the Meeting dedicated to Bagrat Ioannissiani's 100<sup>th</sup> 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).

<b>Kamo Gigoyan</b>	Marseille, France	3 weeks	16.01-08.02	work
<b>Norair Melikian</b>	Santiago de Comp., Spain	2 weeks	03.02-16.02	work
<b>Haik Harutyunian</b>	Pescara, Rome, Italy	1 week	18.02-24.02	meeting
<b>Vardan Adibekyan</b>	Porto, Portugal	3 years	18.03–2014	work
<b>Gohar Harutyunyan</b>	Strasbourg, France	1 week	20.03-26.03	school
<b>Artashes Petrosian</b>	IAP, France	1 week	11.04-16.04	meeting

<b>Artur Hakobyan</b>	IAP, France	1 month	11.04-09.05	work
<b>Edward Khachikian</b>	SAO, Russia	1 week	12.04-19.04	meeting
<b>Artashes Petrosian</b>	StSci, USA	3 months	16.04-03.07	work
<b>Lusine Sargsyan</b>	Cornell Univ., USA	2 month	01.05-27.06	work
<b>Levon Aramyan</b>	Padua, Italy	3 months	28.05-25.08	work
<b>Satenik Ghazaryan</b>	Meudon, France	5 months	07.06-05.11	work
<b>Areg Mickaelian</b>	Tenerife, Spain	1 week	19.06-24.06	meeting
<b>Anahit Samsonyan</b>	Beirut, Lebanon	1 week	19.06-26.06	school
<b>Areg Mickaelian</b>	St. Petersburg, Russia	1 week	03.07-07.07	meeting
<b>Artur Hakobyan</b>	Padua, Italy	1 week	03.07-10.07	meeting
<b>Gohar Harutyunyan</b>	Paris, France	1 week	25.07-15.08	work
<b>Gohar Harutyunyan</b>	Heidelberg, Germany	1 week	01.08-05.08	school
<b>Vazgen Gabrielyan</b>	Moscow, Russia	1 week	14.08-21.08	work
<b>Elena Nikogossian</b>	France	2 weeks	26.08-05.09	work
<b>Tigran Movsessian</b>	France	2 weeks	27.08-10.09	work
<b>Haik Harutyunian</b>	Meudon, France	3 weeks	29.08-19.09	work
<b>Areg Mickaelian</b>	Preston, UK	1 week	04.09-09.09	meeting
<b>Areg Mickaelian</b>	Paris, France	2 weeks	09.09-28.09	work
<b>Areg Mickaelian</b>	Oxford, UK	1 week	18.09-23.09	meeting
<b>Marietta Gyulzadyan</b>	Almaty, Kazakhstan	1 week	22.09-30.09	Olympiad
<b>Tigran Nazaryan</b>	Almaty, Kazakhstan	1 week	22.09-30.09	Olympiad
<b>Artashes Petrosian</b>	IAP, France	2 months	02.10-30.11	work
<b>Edward Khachikian</b>	SAO, Russia	1 week	07.10-14.10	meeting
<b>Tigran Movsessian</b>	SAO, Russia	1 week	07.10-14.10	meeting
<b>Artur Hakobyan</b>	IAP, France	1 month	31.10-28.11	work
<b>Lusine Sargsyan</b>	Hamburg, Germany	3 weeks	03.11-27.11	work
<b>Anahit Samsonyan</b>	Hamburg, Germany	3 weeks	03.11-27.11	work
<b>Norair Melikian</b>	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 Azarquiel 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. Aramyan, A.A. Hakobyan)

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

**6<sup>th</sup> 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)

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

**Bagrat Ioannisiani 100<sup>th</sup> 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 – 1400<sup>th</sup> anniversary**, 13-14 July 2011, Byurakan, Armenia (5 talks)

A.M. Mickaelian: *“Celebration of Anania Shirakatsi’s 1400<sup>th</sup> 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. Harutyunian: *“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 100<sup>th</sup> 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 $\alpha$  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.; Krushevska, 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.; Kitzte, 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.

Khazadryan, 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.**, Atsatryan 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 $\alpha$  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. Orio, 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
Nikoghossian 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. Hovhannessian, S.G. Iskudarian, E.Ye. Khachikian,

T.Yu. Magakian, V.H. Malumian, N.D. Melikian, A.M. Mickaelian, T.H. Movsessian, E.H. Nikogossian, E.S. Parsamian, A.R. Petrosian, H.V. Pikichian, A.G. Yeghikian.

**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 8<sup>th</sup> 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.

*Areg Mickaelian*

## BAO DIRECTOR'S ELECTIONS



Recently, **Dr. Haik Harutyunian** was elected the director of the Byurakan Astrophysical Observatory (BAO) for 2 more years (2012-2013). His term was finished at the end of 2011 and new elections were announced by the Armenian National Academy of Sciences (NAS). The elections took place at the Presidium of NAS on February 8, where Harutyunian got an absolute majority of votes.

Harutyunian was born on 25 April 1951 in Noyemberyan, Armenia. He has graduated from the YSU Physics Department in 1973 with a specialization of *Astrophysics* and in the same year started working at BAO. He defended his Ph.D. thesis in 1981. Since 1986 he is a Senior Research Associate, and since 1999, a Leading Research Associate. Harutyunian was the Deputy Director of BAO in 1986-1993 and 1994-2000, he was the acting Director in 1993-1994, and since 2004 he is the Director of BAO. Harutyunian is the ArAS Co-President since 2002, a member of the Board of Directors of the International Centre for Relativistic Astrophysics Network (ICRANet), the Armenian National Liaison of the IAU Commission #46 "*Teaching in Astronomy*". For many years he teaches at the YSU Physics Department. He is a member of IAU, European and Armenian astronomical societies, BAO Scientific and Specialized councils, editorial board member of the journal "*Astrophysics*" and NAS RA published scientific-popular magazine "*In the world of science*". Harutyunian's research relates to radiation transfer theory, alternative cosmology and the problems of connection between the activity of cosmic objects and their evolution. He has 54 publications and beside the scientific papers he has published numerous scientific-popular articles, edited several books.

## TEN YEARS of ArAS WEBPAGE

**ArAS webpage** (<http://www.aras.am>) was created in February 2002 and already 10 years serves as the main source of various information on the Armenian astronomy. There are two main sections of menus; one related to ArAS (Foundation; Goals and Activities; Administration; ArAS Members; Membership Fees; Membership Form; ArAS Newsletters; ArAS Annual Meetings; ArAS Annual Prize; ArAS/BAO Awards) and the other, containing menus Byurakan Observatory; Other Institutions; Famous Astronomers; Armenian Astronomers; V. Ambartsumian Prize; DFBS; Armenian VO; Astronomical Education; Astronomy Schools; IYA-2009; Amateur Astronomy; Archaeoastronomy; ANSEF Grants; Calendar of Events; Mass Media News; and Useful Links.

**Byurakan Observatory.** This gives full information on the main astronomical centre in Armenia, the Byurakan Astrophysical Observatory (BAO): History of BAO, Main Achievements (all important results since BAO's foundation), Scientific instruments and Databases (2.6m, 1m and 0.5m Schmidt telescopes, Photographic Archive, DFBS and ArVO), Research Groups, Research Staff (with links to the personal webpages, current projects and publications), Current Projects (classified by Subjects, PIs, Collaborating countries and institutions, Grants and fellowships, and Publications), Recent Results (2000-2011), International Collaboration (including individual pages for the French-Armenian, German-Armenian and Italian-Armenian ones), Scientific Meetings (data on all 65 meetings held in Byurakan, including individual pages for most of them, as well as Participation of the Armenian astronomers at important international meetings in other countries), and Publications (2000-2011; classified by years, subjects, authors, types of publications, and journals), as well as a link to BAO's main webpage.



**Other Institutions.** Short information and links for other institutions in Armenia where astronomy is active are given: Yerevan State University (YSU), Yerevan Physics Institute (YerPhI), and Isaac Newton Institute (INI) Armenian Branch. The latter gives the history, staff, publications and current works.

**Famous Astronomers.** For the first time, ArAS has created a webpage for a number of famous Armenian astronomers. At present it gives biographies in two languages (English and Armenian) for 18 persons (*Anania Shirakatsi, Victor Ambartsumian, Benyamin Markarian, Gurgen Sahakian, Paris Pishmish, Grigor Gurzadyan, Ludwik Mirzoyan, Agop Terzan, Marat Arakelian, Vahe Petrosian, Yervant Terzian, Tadevos Aghegian, Vahe Oskanian, Zadig Mouradian, Davit Sedrakian, Hrant Tovmassian, Elma Parsamian, Gabriel Kojoyan*), as well as links to short biographies of many others published in ArAS Newsletters on occasion of their anniversaries.

**Armenian Astronomers.** Also for the first time, ArAS has created a database of all Armenian scientists known to work at present in astronomy or related fields. 257 people are listed, including astronomers of Armenian origin working at any institution and country, scientists of any nationality working in Armenian institutions, all ArAS members and astronomers having tight relations to the Armenian astronomy. A separate list of 83 Armenian astronomers, members of international organizations is given (IAU, EAS, AAS, EAAS and ArAS).

**V. Ambartsumian Prize.** A link is given to Viktor Ambartsumian International Prize main webpage at the Armenian National Academy of Sciences.

**DFBS.** A webpage was created for the Digitized First Byurakan Survey (DFBS), where full information is given on Markarian survey (FBS), its digitization project, virtual observatories, and related links. A link is given to the DFBS webpage at Rome University, where the main database is being maintained.

**Armenian VO.** The Armenian Virtual Observatory (ArVO) webpage is also being maintained at ArAS. Information on its project organization, team members, ArVO research group, DFBS, related

funded projects, VO standards and tools, related publications, as well as ArVO Portal and other products at the Institute of Informatics and Automation Problems (IIAP) is given.

**Astronomical Education.** This page contains several sections: Astronomical education in ancient Armenia, Popular astronomy, Astronomy at school, Astronomical Olympiads (including National and International Olympiads, where the Armenian pupils have won many awards), Astronomy at university, Ph.D. studies, Summer Schools for students and for young astronomers (with individual webpages for each of the Byurakan International Summer Schools, BISS, in 2006, 2008 and 2010), Participation of Armenian young astronomers in international schools, and Galileo Teacher Training Program (GTTP).

**Astronomy Schools.** This is a new initiative by ArAS to provide a summarizing table for the most popular astronomy summer and winter schools systematically taking place in different countries. Links are given to their general websites and individual webpages of the forthcoming schools. Students and young astronomers may use this table to select most appropriate schools for themselves by the possibility of funding, period, duration, level of participants, etc.

**IYA-2009.** Though the International Year of Astronomy (IYA) has passed, however its some projects are being continued worldwide. So it is still actual and the IYA-2009 main international webpage is being maintained as well. Here we have created the Armenian IYA-2009 and Beyond-IYA webpages.

**Amateur Astronomy.** ArAS initiated a call to find out amateur astronomers in Armenia, as they haven't yet been organized. A registration form is given as well as one can find the list of all so far registered amateur astronomers.

**Archaeoastronomy.** This field of science is being intensively developed in the world, and as Armenia is rich with its archaeoastronomical heritage, we found useful to maintain a page coordinating related matters and giving short information and links to existing webpages on the Armenian rock art (numerous petroglyphs of astronomical content), ruins of ancient observatories (two of them, Karahunge and Metzamor are especially well known; Karahunge is the Armenian twin of the Stonehenge and is considered even older), the ancient Armenian calendar, astronomical terms and names used in Armenian language since II-I millennia B.C., sky maps from Middle Ages, etc.

**ANSEF Grants.** The Armenian National Science and Education Fund (ANSEF) was created in 2000 and since 2001, more than 500 senior and junior scientists and scholars have benefited from the support that ANSEF has provided. In the field of astronomy and astrophysics, ANSEF has supported 33 projects, including 27 from BAO and 6 from YSU. All these projects are listed by years.

**Calendar of Events.** This page was created recently and gives the calendar of astronomical events for 2012. Among the events, there are sky phenomena, International and Armenian astronomy events. This is one of the rare pages so far having its info both in English and in Armenian (see section "*Calendar of Astronomical Events at ArAS webpage*" of this Newsletter).

**Mass Media News.** Since 2009 (IYA-2009), the Armenian astronomers are rather active in public relations; many articles and interviews have been published, press-conferences have been held, and TV and radio programmes have been organized. Since December 2010, ArAS also took the

initiative on Scientific Journalism in Armenia. This page gives a list of mass media interviews, articles and news on astronomical topics with links to them. Most of them are in Armenian, however many have also Russian and English versions.

**Useful Links.** Here many links useful for astronomers are given: astronomical databases, sky atlases, meetings, journals, abstracts, preprints, people in astronomy, Astronomy Picture of the Day, space missions, Virtual Observatories, Astronomical Unions and Societies (IAU, EAS, EAAS, etc.), Armenian scientific organizations and institutes, and science foundations.

The ArAS webpage is being updated at least weekly. Any useful information on the Armenian astronomy or other related matters is welcome for publication at ArAS webpage. The webmaster is Gor Mikayelyan. Questions and comments may be submitted to [gormick@mail.ru](mailto:gormick@mail.ru).

Areg Mickaelian

## TEN YEARS of ArAS NEWSLETTERS

**ArAS Newsletters (ArASNews)** are being published electronically since the beginning of 2002; there were 4 issues yearly in 2002-2008, and then 8 issues yearly in 2009-2011; altogether 52 issues distributed during 10 years (but 3-4 and 7-8 jointly, so far 50 newsletters). ArASNews is available at ArAS webpage at <http://www.aras.am/ArasNews/arasnews.html> (given in the figure), where one can find all released issues and a **Reference list of ArASNews articles** to make easy the search by any subject: International meetings and summer schools held in Armenia; Participation of Armenian astronomers in international meetings and summer schools; IYA-2009; ANSEF grants (*announcements and awards*); ArAS annual prize for young scientists (*announcements and awards*); Announcements, news, and other info; Astronomical Education Matters; Articles about Armenian astronomers and ArAS members; ArAS affairs; and Other articles.

ArASNews is the electronic newsletter of the Armenian Astronomical Society. It was distributed to all ArAS members since the beginning of 2002. 4 times a year, typically at the end of each trimester. Since 2009, 8 issues annually are being released. However, a few handcopies are available in the BAO library, at ArAS secretariat and archives. ArASNews publishes information materials on ArAS, Byurakan Observatory and the Armenian astronomy in general, reports on ArAS Annual Meetings and participation of the Armenian astronomers in important international meetings, articles on occasion of anniversaries of famous Armenian astronomers and ArAS members, acceptance of new ArAS members, achievements of the Armenian astronomers, astronomical education in Armenia, Armenian archaeoastronomy, as well as science articles (reviews) on important studies.

Tigran Magakian was the first editor of ArASNews since the beginning of its publication (2002-2004, issues #1-12). Lusine Sargsyan edited ArASNews in 2005 (issues #13-16), Lilit Hovhannisiyan was the editor in 2006-2007 (issues #17-24), and Areg Mickaelian is the editor since 2008.

ArASNews have published numerous useful articles, which may be accessed through the following [reference list](#).

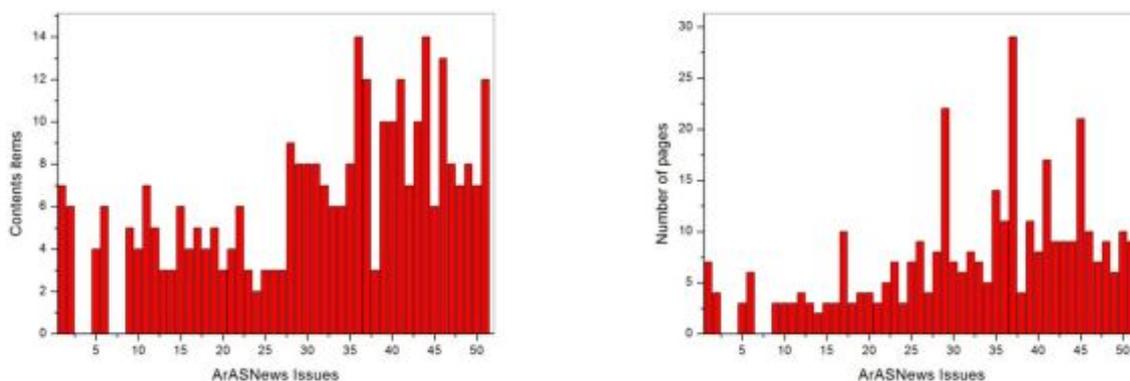
2011	#45, Feb 20	#46, Mar 31	#47, May 15	#48, Jul 09	#49, Aug 20	#50, Oct 8	#51, Nov 16	#52, Dec 31
2010	#37, Feb 15	#38, Mar 31	#39, May 16	#40, Jun 30	#41, Aug 16	#42, Oct 9	#43, Nov 19	#44, Dec 31
2009	#29, Feb 12	#30, Mar 31	#31, May 15	#32, Jun 30	#33, Aug 24	#34, Oct 7	#35, Nov 15	#36, Dec 30
2008	#25, Apr 28	#26, Jul 15	#27, Oct 15	#28, Dec 31				
2007	#21, Mar 30	#22, Jun 21	#23, Nov 1	#24, Jan 5 (2008)				
2006	#17, Mar 29	#18, Jun 25	#19, Sep 29	#20, Dec 29				
2005	#13, Apr 12	#14, Jun 24	#15, Oct 22	#16, Dec 30				
2004	#9, Mar 31	#10, Jun 30	#11, Sep 30	#12, Dec 31				
2003	#5, Apr 25	#6, Aug 28	#7-8, Dec 30					
2002	#1, Mar 1	#2, Jul 1	#3-4, Dec 28					

Contributions for the next issues of ArASNews are welcome!

Altogether during 10 years we have written and distributed 345 articles (content items) that make up 394 pages in total, more or less a book. The table gives the statistics of ArASNews by their issues content items and number of pages during the first 7 years (with fewer releases) and the last 3 years (with 8 releases yearly). So during the last years we distribute some 9-10 articles (some 10-12 pages) in each of 8 issues that typically appear on Feb 15, Mar 31, May 15, June 30, Aug 15, Sep 30, Nov 15 and Dec 31.

Years	Issues		Content Items		Pages	
	Total	##	Total	Average	Total	Average
2002-2008	26	1-28	125	4.8	139	5.3
2009	8	29-36	71	8.9	80	10.0
2010	8	37-44	78	9.8	96	12.0
2011	8	45-52	71	8.9	79	9.9
<b>2002-2011</b>	<b>50</b>	<b>All</b>	<b>345</b>	<b>6.9</b>	<b>394</b>	<b>7.9</b>

The figures give the dynamics of ArASNews content items and number of pages per issue during 2002-2011. The increase in 2009-2011 is obvious and this was connected to the International Year of Astronomy in 2009.



*Dynamics of ArASNews contents items and number of pages per issue*

The editors of ArASNews have been: *Tigran Magakian* (2002-2004; issues #1-12), *Lusine Sargsyan* (2005; issues #13-16), *Lilit Hovhannisyan* (2006-2007; issues #17-24), and *Areg Mickaelian* (2008-2011; issues #25-52). The mailing list consists of 180 addresses; Armenian and many other astronomers, and some organizations.

The main topics of the articles that we publish are: information materials on ArAS, Byurakan Observatory and the Armenian astronomy in general, important international meetings and participation of the Armenian astronomers in them, announcements and reports on ArAS Annual Meetings, announcements and information on ArAS Annual Prize for young astronomers (Yervant Terzian Prize) and other awards and grants, articles on occasion of anniversaries of famous Armenian astronomers and ArAS members, acceptance of new ArAS members, achievements of the Armenian astronomers, astronomical education in Armenia, Armenian archaeoastronomy, as well as scientific and scientific-popular articles (reviews) and info materials on important studies.

Articles for the next ArASNews issues are welcome from all interested astronomers. Please submit your materials to [aregmick@aras.am](mailto:aregmick@aras.am) or [aregmick@yahoo.com](mailto:aregmick@yahoo.com) any time and they will be included in the forthcoming issues. Articles must be in English.

*Areg Mickaelian*

## EAS AFFILIATED SOCIETIES MEETING in SWITZERLAND



The EAS Affiliated Societies meeting took place on Jan 31 – Feb 2 in Rolle, near Geneva, Switzerland, a superb environment facing Lake Geneva. This was the second such meeting; the first one was in 2008 in Leiden, Netherlands. EAS has a policy of activation of its contacts and collaboration with its 24 affiliated societies, as well as to work more intensely to increase the role of the Society in the European astronomy. The EAS Council, presidents or representatives of national astronomical societies, and representatives of other European organizations took part in the meeting. The main goals were to summarize the EAS and national societies' activities during the last 4 years and plan the further affairs. Among the participants, there were: EAS President Thierry Courvoisier (Switzerland), Vice-Presidents Jan Palous (Czech Republic) and Mary Kontizas (Greece), EAS Secretary Elias Brinks (UK), the other members of EAS Council, EAAS Co-Chairman Nikolay Samus (Russia), Chair of the Council of ASTRONET project Ronald Stark (Netherlands) and ASTRONET Coordinator Jean-Marie Hameury (France), the representative of the European Physical Society (EPS) John Dudley (France), et al., altogether 35 scientists from 21 country. ArAS Co-President Areg Mickaelian participated from Armenia; his talk was devoted to ArAS activities in 2008-2011. Talks on the state of astronomy in different countries were presented by presidents of the astronomical societies of Austria, Bulgaria, Czech Republic, Germany, Greece, France, Italy, Latvia, Poland, Portugal, Russia, Serbia, Switzerland, UK, and Ukraine.



The prospective program on the development of the European astronomy suggested by the EAS President was presented and discussed, which involves the enlargement of the scientific collaboration, organization of further annual meetings, etc. Specifically it was decided to increase the budget of JENAM/EWASS meetings from 4000-5000 EUR to 100000 EUR and the participation in them from 400-500 to 1500-2000 scientists starting from 2014. The possible collaboration of EAS with ASTRONET, EPS, ESO, and ESA was also discussed. At present, EAS officially includes national astronomical societies of 24 countries; however among the individual members there are scientists from all European and a number of other countries. ArAS became an EAS Affiliated Society in 2001 and there are 18 individual astronomers from Armenia. ArAS together with EAS organized JENAM-2007 in Armenia, which was the largest ever held scientific meeting in Armenia.

*Areg Mickaelian*

## ICRANet DIRECTOR's BOARD ANNUAL MEETING IN ITALY

Armenia participates in the International Centre for Relativistic Astrophysics Network



The International Centre for Relativistic Astrophysics Network (ICRANet, <http://www.icranet.org/>) held its Directors' Board (Governing Committee) annual meeting in Pescara on February 20, 2012. The results of the last year's activities, the next year's budget and future development trends were discussed. The meeting was attended by representatives of member countries (Italy, Vatican, Armenia and Brazil), as well as Arizona and Stanford universities (USA). From Armenia, the Director of BAO Haik Harutyunian participated. In addition, representatives of the Italian Ministries of Foreign Affairs, Economy and Finances, as well as of the Municipality of Pescara were present, as up to now Italy is the major donor country funding the Centre. The Centre was established in 2002 by Italy and Vatican, Armenia became its member in 2003, and Brazil joined the participating countries in 2011.

At the meeting it was noted that Brazil, despite the fact that it joined the center later, is being very quickly integrated into the activities of the structure. For enough long time being economically and politically self-isolated, Brazil is currently the most active part in economic growth for all the international organizations whose membership it is. It was obviously seen in 2009, when Brazil (Rio de Janeiro) hosted the IAU General Assembly. It was not by chance that this time, beside the ICRANet representative from Brazil, the head of the financial programme of the Brazilian Foreign Ministry international collaboration was also present. The matter is that this country is also trying to become a major player here, and for this purpose, beside the creation of the National Center in Rio de Janeiro, it starts to make serious financial investments in this programme, aiming to bring it up to the Italian investments in the next two years. From this point of view, it was also the fact that the on the following day a reception was organized in Rome by the Brazilian Ambassador to Italy for the participants of ICRANet annual meeting and other related people. And as there is a 13<sup>th</sup> century Armenian "Khach-Qar" (Cross-Stone) only a few hundred metres away from the Brazilian Embassy in Rome donated by the President of Armenia during his visit last December, after the reception, on the suggestion of the Adviser of the Armenian Embassy in Italy Boris Sahakyan, that Khach-Qar visited ICRANet General Director Remo Ruffini, the two American members of the Council, The Brazilian Foreign Ministry representative and the representative of Armenia Haik Harutyunian.

For Armenia, it was important that for the first time in ICRANet annual budget 10,000 EUR were envisaged to purchase equipment for the ICRANet Yerevan office. In general, the presence of such small countries like Armenia in international structures is always important because they receive more from such organizations, rather than invest in them. In this case continues to underline the fact that Armenia, being a country of highly developed science, is also the bearer of European and Christian culture in our region. In addition, the Armenian branch has strategic importance: Armenia is considered as the ICRANet regional centre to tie it to the Middle East and Central Asia countries.

*Haik Harutyunian*

## CNRS-SCS GRANTS 2012-2013

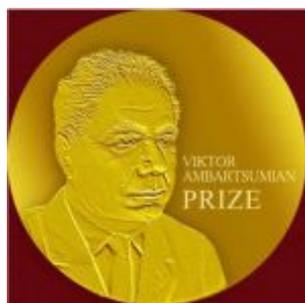


The French National Centre for Scientific Research (Centre National de la Recherche Scientifique, CNRS) and the Armenian State Committee of Science of the Ministry of Education and Science (SCS MES RA) has announced co-sponsored grants for Collaborative Bilateral Research Projects between French and Armenian scientists. Among the winners, there is an astrophysical project of **co-PIs Artashes Petrosian** (Leading Research Associate, BAO, Armenia) and **Daniel Kunth** (IAP, Directeur de Recherche at CNRS, France); **“Supernovae Host Galaxies in the SDSS DR8”**. The research teams consist of: Daniel Kunth, Gary Mamon, Valérie de Lapparent (France) and Artashes Petrosian, Artur Hakobyan, Levon Aramyan (Armenia).

The main aim and motivation of the current project is to study the properties of the galaxies hosts of historical SNe events using data provided by Sloan Digital Sky Survey (SDSS) in connection with SNe phenomena. As a result it is expected to understand the progenitor's nature of different type of SNe and SNe events and its connection with local, integral and environmental properties of the host galaxies.

*Artur Hakobyan*

## CALL for VIKTOR AMBARTSUMIAN INTERNATIONAL PRIZE



Viktor Ambartsumian International Prize is one of the important awards in astronomy/astrophysics and related sciences. It is being awarded to outstanding scientists having significant contribution in physical-mathematical sciences from any country and nationality. The Prize totals USD 500,000 and is being awarded once every two years, starting with 2010.

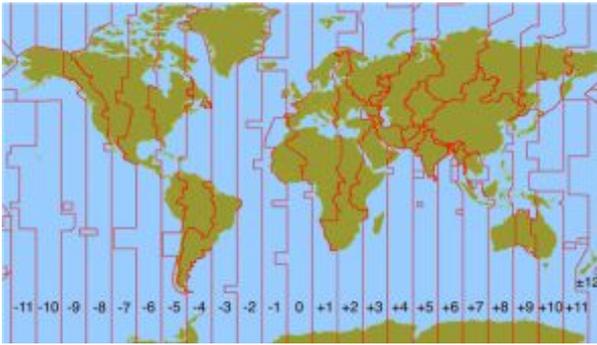
The 2012 call was released in September 2011 and the **deadline for nominations is March 18, 2012**. The winner(s) will be announced on July 18 and the Award Ceremony will take place at the National Academy of Sciences on September 18.

All conditions and eligibility criteria are given at the Prize official webpage at <http://vaprize.sci.am>.

**The documents should be submitted to:** Viktor Ambartsumian Prize International Steering Committee, Presidium, National Academy of Sciences, Marshal Baghramyan ave. 24, Yerevan 0019, Republic of Armenia. Phone: +374-10-525505.

**Contacts:** Dr. Areg M. MICKAELIAN (Scientific Secretary, Viktor Ambartsumian Prize International Steering Committee, phone: +374-91-195914, E-mail: [aregmick@aras.am](mailto:aregmick@aras.am), [aregmick@yahoo.com](mailto:aregmick@yahoo.com)); Gohar S. HARUTYUNYAN (Executive Secretary, Viktor Ambartsumian Prize International Steering Committee, phones: +374-10-525505, +374-77-797090, E-mail: [goharutyunyan@gmail.com](mailto:goharutyunyan@gmail.com), [vaprize@sci.am](mailto:vaprize@sci.am)).

## TIME CHANGE in ARMENIA



Recently an Armenian Government meeting was organized to discuss Time calculation and time zone in Armenia. The RA Prime-Minister Tigran Sargsyan was chairing the meeting. The Minister of Economy Tigran Davtyan and Vice-Minister Garnik Badalyan, the Head of the Government Staff Davit Sargsyan, Head of the Main Administration of the Armenian Civil Aviation Artyom Movsisyan, the Head of the Military-topographical division of the

RA Army General Headquarters Gevorg Manukyan, the Deputy Chair of the RA Government Financial-Economical Administration Ruzanna Vardanyan, the Director of the Armenian National Metrology Institute Vahan Sahakyan, and the Co-President of the Armenian Astronomical Society Areg Mickaelian were present. Because of two matters, the Time Decret introduced in 1930 in the Societ Union and the Summer time change in 1981, Armenia is shifted by 1 (winter) or 2 (summer) time zones from its normal position and appeared as GMT+4 or GMT+5. It was decided that there will not be time change to summer and winter anymore; so Armenia will remain in the same time this spring. And as Armenia is almost exactly located around 45° from Greenwich, gradually, in 1 or 2 years, there will be another shift back so that Armenia appears in its normal geographical time zone, namely GMT+3.

## NEW ArVO SERVER

A new ArVO dedicated server and database has been created at the Institute of Informatics and Automation Problems (IIAP) of NAS RA by Aram Knyazyan and Hrachya Astsatryan in collaboration with the BAO ArVO team. There are the Digitized First Byurakan Survey (DFBS) plate database (<http://arvo.sci.am/main.php>), extraction software for its spectra, and astronomical catalogue cross-matching programme. It is 4 years that IIAP collaborates with BAO, where ArVO project was started in 2005.

A screenshot of the ArVO Database web interface. The page title is "Database" and the URL is "arvo.sci.am/upload/database.php". The table lists file uploads with columns for ID, File Name, File Size, Inserted by, Date, VO, RA, DEC, and Observ Date. The table contains 10 rows of data, all inserted by "admin" on "2012-01-14".

#	ID	File Name	File Size	Inserted by	Date	VO	RA	DEC	Observ Date	View
<input type="checkbox"/>	41	<a href="#">FRS0346_COR.FITS</a>	192147048 MB	admin	2012-01-14	ArVO	186.88	34.91		
<input type="checkbox"/>	42	<a href="#">FRS0347_COR.FITS</a>	192147048 MB	admin	2012-01-14	ArVO	205.92	34.92		
<input type="checkbox"/>	43	<a href="#">FRS0402_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	177.45	34.89		
<input type="checkbox"/>	44	<a href="#">FRS0422_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	248.52	34.97		
<input type="checkbox"/>	45	<a href="#">FRS0435_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	243.65	34.99		
<input type="checkbox"/>	46	<a href="#">FRS0443_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	163.21	34.88		
<input type="checkbox"/>	47	<a href="#">FRS0446_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	172.79	34.9		
<input type="checkbox"/>	48	<a href="#">FRS0451_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	224.87	34.95		
<input type="checkbox"/>	49	<a href="#">FRS0492_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	253.34	35.03		
<input type="checkbox"/>	50	<a href="#">FRS0493_COR.FITS</a>	184383368 MB	admin	2012-01-14	ArVO	253.33	35.05		

As in other VO projects, ArVO is also a collaboration of astronomers and computer scientists, in frame of which corresponding environments are being built to facilitate the joint usage of various astronomical data and the accomplishment of efficient science studies. The International Virtual

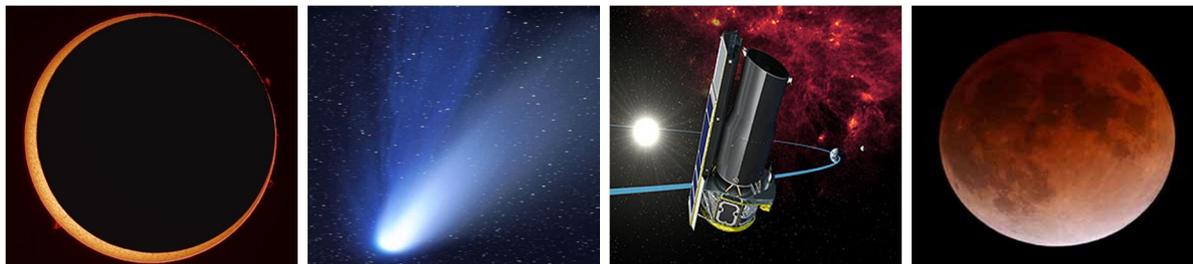
Observatories Alliance (IVOA) was created in 2002, which at present unifies 17 national and 2 European projects. ArVO became its member in 2005.

On ArVO new server, a new programme for cross-correlation of catalogues is being operated, which is better than similar programmes by its work principles and precision (specifically, each of the coordinate errors is being taken into account when comparing objects from catalogs). Already research projects are being accomplished based on this software, e.g. by the BAO ArVO group. The architecture of the database is such that it offers possibility to dynamically increase the quantity of maintained data, adding new images, spectra and catalogs, which are being continuously obtained from new observations. Also there aren't any limitations on the added data volume, as a new large memory element has been implemented, which is connected to the server with a high-speed channel thus creating a structure corresponding to Grid technologies. The cross-matching software has been implemented at the webpage in the ArVO environment (<http://arvo.sci.am/crosscorrelation/crosscor.html>), which allows astronomers to utilize this efficient cross-matching approach in online regime.

ArVO portal is available at <http://www.aras.am/Arvo/arvo.htm> and also gives access to world main VO standards and tools for data discovery, spectral analysis, data visualization and handling, etc. ArVO was created as a result of digitization of the Markarian survey (DFBS), which was the first ever digitization project in Armenia (2002-2005). It was recently included in UNESCO "Memory of the World" International Register.

*Areg Mickaelian*

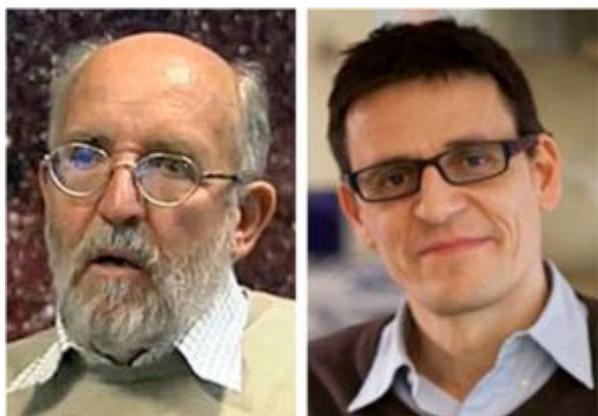
## CALENDAR of ASTRONOMICAL EVENTS at ArAS WEBPAGE



For the first time Calendar of Astronomical Events has been created at ArAS webpage. All major astronomical events of 2012 are presented known to this moment, including as sky phenomena, so as events planned in international and Armenian astronomy. The first group involves Solar and Lunar eclipses (two of each in 2012), all major meteor showers (20), Lunar phases, planetary oppositions and junctions, approach of the most dangerous near-Earth asteroids and meteorites and a rather rare phenomenon expected in 2012 – transit of Venus over the Solar disc (June 5-6). Among the events of the second group, most important affairs of BAO and ArAS, international and local symposia, conferences, summer schools and astronomical Olympiads, and anniversaries of Armenian astronomers. Particularly, this year in August, the IAU General Assembly will take place in Beijing, China, which is the most important event in the world astronomy and is being organized once per three years, and the EAS general meeting, EWASS (European Week of Astronomy and Space Science) will take place in July in Rome, Italy. The Armenian astronomers will actively take part in the events dedicated to 1400<sup>th</sup> anniversary of Anania Shirakatsi, which will be organized together with the historians and archaeologists.

The webpage is available at <http://www.aras.am/Calendar/calendar.htm>.

## MICHEL MAYOR and DIDIER QUELOZ WON BBVA AWARD



The **BBVA Foundation Frontiers of Knowledge Awards** seek to recognize and encourage world-class research and artistic creation, prizing contributions of lasting impact for their originality, theoretical significance and ability to push back the frontiers of the known world. These international awards span eight categories: Basic Sciences (Physics, Chemistry, Mathematics), Biomedicine, Ecology and Conservation Biology, Information and Communication Technologies, Economics, Finance and Management, Contemporary Music, Climate

Change and Development Cooperation.

The BBVA Award 2011 in the Basic Sciences category has gone to Swiss astrophysicists **Michel Mayor** and **Didier Queloz** *“for their pathbreaking development of new astronomical instruments and experimental techniques that led to the observation of planets outside the solar system”*, in the words of the jury’s citation. This contribution facilitated *“their discovery, in 1995, of a giant planet orbiting another star, spawning a revolution in astronomy. Today, more than five hundred exoplanets are known and the first direct measurements of some of their atmospheres have been obtained”*, the citation continues.

There can be no doubt that Mayor and Queloz’s breakthrough has expanded the frontiers of knowledge. When they first started looking for planets around sun-like stars, few astrophysicists believed it was feasible to detect a small, dark object moving close to another – its star – of enormous size and brilliance. But the two men invented and developed a technique known as radial velocity, based on the Doppler effect, to detect such objects by indirect means. It works by examining the star’s light for tell-tale signs of changes in its movement caused by the gravitational pull between it and the unseen planet.

It is with this method that science has found most of the extrasolar planets catalogued to date. In addition, Mayor and Queloz were instrumental in developing HARPS, the most productive search tool based on their technique or, as the jury refers to it, *“the world’s leading planet discovery machine”*. And they have also been involved in the emerging *“transit method”*, in which planets are identified by the slight dimming of a star’s light as the orbiting body crosses its disk. This method has already yielded the first detection of a rocky extrasolar planet.

*“I feel extremely grateful and honored to have this prize”*, said Michel Mayor, who heard the news during a workshop at the famed radio telescope in Arecibo, Puerto Rico. Queloz, his doctorate student when they discovered the first signal of a planet orbiting the star 51 Pegasi, returned to Geneva from Paris after getting the jury’s call: *“I feel very proud. For me, it’s a recognition of the work Michel and I have been doing for almost 20 years, which has been a game changer in astrophysics”*.

### **The discovery that came “too soon”**

Both remember the announcement of their finding as just one in a chain of remarkable events. As Queloz describes it: *“At that time there were very few people doing this, it was a kind of bizarre,*

*weird project. We had built this really precise machine and thought it was going to take years to detect a planet, then suddenly after a couple of months, there was the first signal. However, what we were observing didn't fit with any known planet in the solar system. At first I thought I was mistaken. But Michel has the kind of mind that is ready for the unexpected, and that was essential to our success”.*

Even so, Mayor decided it was best to wait until the star could be observed again, one year later. *“In July 95 we repeated our measurements and got exactly the same signal. It was then we knew that we had really a planet”*, he recalls.

Their initial wariness had to do with the type of planet detected; with a mass similar to Jupiter but, unlike the gas giants of our solar system, circling just a short distance from its star. 51 Pegasi b – as they baptized it – has an orbit of just four days. As it turns out, this is true of the vast majority of planets detected since, but at that time, as Mayor relates, *“it was a huge surprise, we were saying ‘what is this?’”*.

With their measurements confirmed, the men sent their findings to Nature. Two of the three astrophysicists whom the magazine asked to review the paper recommended it for publication. The date set was November 23, 1995, but in October Mayor and Queloz announced their results at a congress in Florence: the story was seized on by the press and, from that moment on, extrasolar planets have rarely been out of the headlines. *“The media attention was entirely unexpected”*, explains Mayor. *“It was only then we realized how important our work was for the general public”*.

In his view, *“One pending scientific goal is to understand the physics of the formation of these planets”*. Though in the long term, *“what really matters, the big, big challenge is to understand if life is a common feature in the universe. I don't know when we might know whether a given planet sustains life, because these are very difficult measurements that can probably only be done from space. But we also know that life affects the chemical composition of a planet's atmosphere. I am sure space agencies will make this a priority objective”*.

**Michel Mayor** was born in Lausanne (Switzerland) in 1942. After completing an MSc in physics at his home-town university, he moved to the University of Geneva in 1966 to specialize in astrophysics. He would remain with this institution for the rest of his career, obtaining his PhD in 1971 and continuing there firstly as a research associate, then as Associate Professor, Professor and, since 2007, Professor Emeritus. Between 1998 and 2004 he combined his university posts with the directorship of Geneva Observatory. Mayor has more than 700 scientific papers to his name, the fruit of a research career that has earned him seven honorary doctorates and a score of other accolades, including the Albert Einstein Medal (2004), Knight of the French Legion d'Honneur (2004), the Shaw Prize for Astronomy (2005), Viktor Ambartsumian International Prize (2010). He is ArAS member since 2010.

**Didier Queloz** (1966) has also spent most of his career at the University of Geneva. A physicist by training, he took his PhD with Michel Mayor in 1995; the doctorate studies that would lead to his discovery of the first exoplanet. From 1997 to 1999 he was Distinguished Visiting Scientist at the Jet Propulsion Lab (California, USA), before returning to his alma mater where he took up a professorship in 2008.

## CHEMICAL CLUES on FORMATION of PLANETARY SYSTEMS: EARTH 'SIBLINGS' CAN BE DIFFERENT

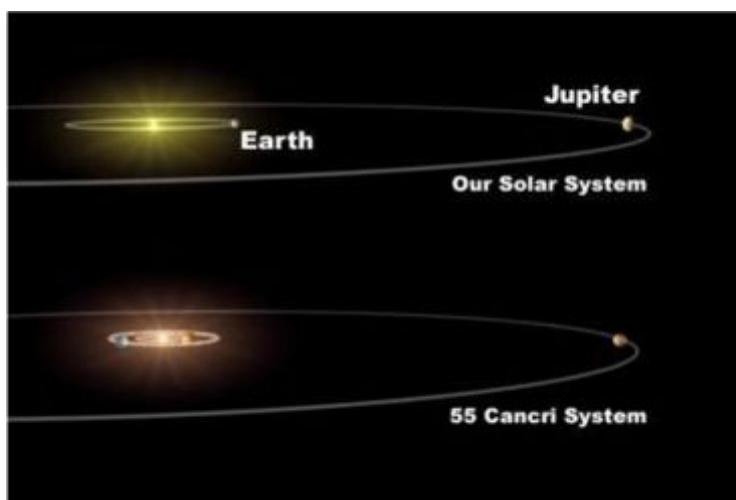


An international team of researchers, with the participation of IAC astronomers, has discovered that the chemical structure of Earth-like planets can be very different from the bulk composition of Earth. This may have a dramatic effect on the existence and formation of the biospheres and life on Earth-like planets.

The study of the photospheric stellar abundances of the planet-host stars is the key to understanding how protoplanets form, as well as which protoplanetary clouds evolve planets and which do not. These studies, which have important implications for models of giant planet formation and evolution, also help us to investigate the internal and atmospheric structure and composition of extrasolar planets.

Theoretical studies suggest that C/O and Mg/Si, are the most important elemental ratios in determining the mineralogy of terrestrial planets, and they can give us information about the composition of these planets. The C/O ratio controls the distribution of Si among carbide and oxide species, while Mg/Si gives information on the silicate mineralogy. In 2010 Bond et al. carried out the first numerical simulations of planet formation in which the chemical composition of the protoplanetary cloud was taken as an input parameter. Terrestrial planets were found to form in all the simulations with a wide variety of chemical compositions so these planets might be very different from Earth.

Delgado Mena et al. (2010) have carried out the first detailed and uniform study of C, O, Mg and Si abundances for 61 stars with detected planets and 270 stars without detected planets from the homogeneous high-quality unbiased HARPS GTO sample. They found mineralogical ratios quite different from those in the Sun, showing that there is a wide variety of planetary systems which are unlike the Solar System. Many planetary-host stars present a Mg/Si value lower than 1, so their planets will have a high Si content to form species such as  $\text{MgSiO}_3$ . This type of composition can have important implications for planetary processes like plate tectonics, atmospheric composition and volcanism.



'There could be billions of Earth-like planets in the Universe but a great majority of them may have a totally different internal and atmospheric structure. Building planets in chemically non-solar environments (which are very common in the Universe) may lead to the formation of strange worlds, very different from the Earth! The amount of radioactive and some refractory elements (especially Si) may have drastic implications for planetary processes such as plate tectonics and volcanic activity,' concludes Garik Israelian.

The latest numerical simulations have shown that a wide range of extrasolar terrestrial planet bulk compositions are likely to exist. Planets simulated as forming around stars with Mg/Si ratios less than 1 are found to be Mg-depleted (compared to Earth), consisting of silicate species such as pyroxene and various types of feldspars. Planetary carbon abundances also vary in accordance with the host stars' C/O ratio. The predicted abundances are in keeping with observations of polluted white dwarfs (expected to have accreted their inner planets during their previous red giant stage).

'The observed variations in the key C/O and Mg/Si ratios for known planetary host stars implies that a wide variety of extrasolar terrestrial planet compositions are likely to exist, ranging from relatively "Earth-like" planets to those that are dominated by C, such as graphite and carbide phases (e.g. SiC, TiC),' Delgado Mena stresses.

The results of Delgado Mena et al. (2010) were used in this study as they are the first to determine the abundance of all of the required elements in a completely internally consistent manner, using high quality spectra and an identical approach for all stars and elements, for a large sample of both host and non-host stars.

The chemical and dynamical simulations were combined by assuming that each embryo retains the composition of its formation location and contributes the same composition to the simulated terrestrial planet. The innermost terrestrial planets (located within ~0.5 AU from the host star) contain a significant amount of the refractory elements Al and Ca (~47% of the planetary mass). Planets forming beyond ~0.5 AU from the host star contain steadily less Al and Ca with increasing distance. One planetary system, 55 Cnc, has a C/O ratio above 1 (C/O = 1.12). This system produced carbon-enriched "Earth-like" planets. All of the terrestrial planets considered in this work have compositions dominated by O, Fe, Mg and Si, most of these elements being delivered in the form of silicates or metals (in the case of iron). However, important differences between those planets forming in systems with C/O < 0.8 (HD17051, HD19994) and those with C/O > 0.8 (55Cnc) have been found.

'We are working hard to decrease abundance measurement errors and make the results of theoretical models and numerical simulations more reliable,' comments González Hernández, 'There is much work to be done'.

**Reference:** Jade C. Carter-Bond, David P. O'Brien, Elisa Delgado Mena, Garik Israelian, Nuno C. Santos, Jonay I. González Hernández. Low Mg/Si Planetary Host Stars and their Mg-Depleted Terrestrial Planets. *The Astrophysical Journal*, 2012; 747 (1): L2.

## VLADIMIR AIRAPETIAN'S ASTRONOMY TEXTBOOK



Former BAO associate and ArAS member Vladimir Airapetian has written and published in the USA an online Astronomy textbook "*Rocking Stories of the Universe*". This textbook is intended for non-science as well as for science majors. The book can be tailored for one-semester or two-semester course. The distinctive property of this textbook in its presentation of the most recent (as of November 2011) and "rocking" stories of astronomy in a systematic, highly visualized and interactive way. Specifically, every single concept of physics and astronomy introduced and discussed in the book is illustrated by an animation created by NASA and/or ESA science teams as well as complemented by recent animated

realistic computer simulations of astronomical phenomena performed by leading astronomical groups (over 250 animations and simulations as well as over 500 recent images taken from radio to gamma-ray bands). The book heavily utilizes (>90%) the NASA recent science discoveries derived by HST, Spitzer, Chandra, Herschel, Fermi, WMAP, COBE, Kepler etc.

In addition, the book actively utilizes online interactive applets that provide a direct way to understand the underlying physical processes of astronomical phenomena. Elementary formulas are presented whenever the book explains the relationship between the most critical physical parameters and presents the quantitative description of the basic processes in the Universe. Another distinctive feature of the book is a systematic use of interactive links to science mission Web sites to allow the student to obtain first-hand experience about the Universe from the mission itself. Finally, each chapter of the textbook emphasizes not only what we already know about the subject of study, but also the open questions and problems in each astronomy field that are still awaiting their resolution.

The book comes with the web site that incorporates self test quizzes, ppt slides, online multi-threaded discussion forums and online grade book. This is a "living and evolving" textbook with updates available every 6 months. The electronic book is available at webpage: <http://webcom8.grtxle.com/rockingstories>. The book is published only by Kendal Hunt Publishing House / Great River Technologies.

Vladimir Airapetian (b. 1960) has graduated from the Yerevan State University (YSU) Department of Physics, Chair of Astrophysics in 1982 and has worked in 1982-1994 at the Byurakan Astrophysical Observatory (BAO). In 1989 he defended his Ph.D. thesis. Then he moved to work at the scientific centres of several countries and at present works in Washington; at NASA GSFC and George Mason University (Virginia). His research is devoted to theoretical astrophysics and Solar System.

## ANNIVERSARIES



**Ara (Ralph) KRIKORIAN – 70.** On January 2 the French Armenian astrophysicist Ara (Ralph) Krikorian celebrated his 70<sup>th</sup> anniversary. He works at the Institut d'Astrophysique de Paris. Krikorian's research is devoted to various topics of theoretical astrophysics: stellar chromospheres, stellar flares, radiation transfer, relativistic dynamics, stellar rotation theory, pulsar electrodynamics, etc. He has published some 60 research papers. Krikorian is an IAU member (Div. IV: Stars, Com. 36: Theory of Stellar Atmospheres).

*Ara Krikorian (on the right) at the IAU Symposium #137 held in Byurakan in 1989 together with another French-Armenian astrophysicist Zadig Mouradian and Armenian physicist Rudolf Muradian.*



**Artashes PETROSIAN – 60.** Dr. Artashes Petrosian celebrated recently his 60<sup>th</sup> anniversary. Born on 16.02.1952 in Yerevan, he graduated from the Yerevan State University (YSU), Department of Astrophysics in 1974 and since the same year works at BAO. He took his Ph.D. degree in 1981. Since 1986 Petrosian is Head of a Research Group, since 1999, he is a Leading Research Associate. Petrosian was the Director of BAO in 1994-1999, and simultaneously the Minister of Education and Science of Armenia in 1996-1998. He has been a lecturer at the Department of Astrophysics at YSU. He

has headed a number of international projects as well as, M.Sc. and Ph.D. theses on astrophysics. Petrosian has worked in the astronomical centres of the USA, France, Italy, and some other countries, has accomplished observing programmes at BAO, Russian, French, USA, Indian and other telescopes, as well as space telescopes. He was the Coordinator of the French-Armenian collaboration in astronomy (PICS and Jumelage) in 1994-2000. He is a well-known specialist in different fields of extragalactic astronomy: AGNs, starburst (SB) galaxies, blue compact dwarf galaxies (BCDGs), extragalactic supernovae, etc., he has studied Markarian and Second Byurakan Survey (SBS) galaxies. Petrosian is an author of some 180 papers on these topics in highly-ranked international journals and several electronic catalogs. He is a member of IAU, EAS, EAAS, and ArAS (2002).



**Anahit YEGHIAZARYAN – 60.** Dr. Anahit Yeghiazaryan celebrated recently her 60<sup>th</sup> anniversary. She was born on 18.01.1952 in Leninakan (Gyumri), Armenia. She graduated from the Yerevan State University (YSU), Department of Astrophysics in 1974 and since the same year works at BAO. She took her Ph.D. degree in 1987. Since 1988 she is a Research associate at BAO. Yeghiazaryan works in the field of extragalactic astronomy: Markarian galaxies, AGN, starbursts. She has some 20 publications on these topics. Yeghiazaryan is a member of ArAS since 2001.

## ArAS MEMBERSHIP FEES

We would like to invite you to pay **ArAS membership fees 2012**. Those members who haven't yet paid for 2011 (or more), please do this asap. Our new treasurer **Marietta Gyulzadyan** ([mgyluz@yahoo.com](mailto:mgyluz@yahoo.com)) is in charge of arrangement for the payments (or you can contact the Co-President Areg Mickaelian, [aregmick@aras.am](mailto:aregmick@aras.am), [aregmick@yahoo.com](mailto:aregmick@yahoo.com)). The table gives the membership fees depending on the country of residence and the age of the members:

<b>Countries</b>	<b>Membership fees</b>	
	<b><i>Full member</i></b>	<b><i>Junior member</i></b> (30 years or younger)
Armenia	<b>AMD 5000</b>	<b>AMD 2500</b>
Western Europe, USA & Canada	<b>USD 50</b>	<b>USD 25</b>
Other countries	<b>USD 30</b>	<b>USD 15</b>