ArAS News

N E W S L E T T E R OF THE
ARMENIAN ASTRONOMICAL SOCIETY (A r A S)

No. 64 (June 30, 2013)

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ARMENIAN-GEORGIAN ASTRONOMICAL COLLOQUIUM

A joint **Armenian-Georgian (Byurakan-Abastoumani) Astronomical Colloquium on *"Instability and evolution of stars"*** dedicated to Academician L.V. Mirzoyan's 90th anniversary will take place on August 26-28 in the Byurakan Astrophysical Observatory (BAO). The tradition of such events was put by Viktor Ambarstumian in early 1970s to strengthen Armenia-Georgian friendship and collaboration in astronomy. During such colloquia, scientific sessions, discussions, as well as sports games and friednly meetings are being held. Typically, the Armenian-Georgian colloquia were held every year; once in BAO and once in Abastoumani Astronomical Observatory (AbAO, presently Georgian National Astronomical Observatory – GENAO) and some 15 talks on recent scientific results were presented from each part. However in 1980s, the colloquia were held non-regularly and as a result this year's Colloquium is the 14th. Both Ambartsumian and Mirzoyan had a large contribution in development of the Georgian astronomy, particularly due to them a number of collaborative projects were established, Georgian astronomers had research stays in BAO, Ambartsumian and Mirzoyan have been scientific advisors of a number of them. Also during the recent years there was collaboration between BAO, the Armenian Institute of Informatics and Automation Problems and GENAO on the creation of the Georgian Virtual Observatory. The previous Byurakan-Abastoumani colloquia:

Year	Place	Title and description of the colloquium
1974	BAO	I Joint Colloquium of BAO and AbAO
1976	AbAO	II Joint Colloquium of BAO and AbAO
1977	BAO	III Joint Colloquium of BAO and AbAO
1978	AbAO	IV Joint Colloquium of BAO and AbAO
1979	BAO	V Joint Colloquium of BAO and AbAO
1982	Tbilisi	VI Joint Colloquium of BAO and AbAO
1983	BAO	VII Joint Colloquium of BAO and AbAO
1984	AbAO	VIII Joint Colloquium of BAO and AbAO
1985	BAO	IX Joint Colloquium of BAO and AbAO
1988	BAO	Joint Colloquium of the Department of Astrophysics of the Leningrad State University, the Astronomical Council of the USSR Acad. Sci., BAO and AbAO
1997	AbAO	X Joint Colloquium of BAO and AbAO
1998	BAO	XI Joint Colloquium of BAO and AbAO, deidcated to L.V. Mirzoyan's 75th anniversary
1999	AbAO	XII Joint Colloquium of BAO and AbAO
2003	BAO	XIII Joint Colloquium of BAO and AbAO, dedicated to L.V. Mirzoyan's 80th anniversary
2013	BAO	XIV Joint Colloquium of the BAO and GENAO, dedicated to L.V. Mirzoyan's 90th anniversary

FOURTH BYURAKAN SUMMER SCHOOL and IAU S304 TRAINING

The **Fourth Byurakan Summer School (4BSS) for Yerevan State University (YSU) students** will take place in the Byurakan Astrophysical Observatory (BAO), Armenia from August 19-23, 2013. It is being organized jointly by BAO and the Armenian Astronomical Society (ArAS) and is the 4th one in the series of the Byurakan local schools. The School will be combined with the **IAU Symposium #304 organizational training for YSU and other university students** who are involved in the LOC supporting team. 12 students have been selected for 4BSS from YSU Departments of Physics and Radiophysics and 32 students from YSU Romance and Germanic Philology, International Relations, Journalism and Oriental Studies faculties, from the Yerevan State Linguistic University (YSLU) and from the Armenian Tourism Institute have been selected for the IAU S304 training courses. The participants will stay in the BAO hotel. The students will attend to astronomical lectures and tutorials, and will take IAU 304 training courses. Also observations with small telescopes, astronomical competition, astronomical film screening, sports games and excursions to famous Armenian sightseeing are planned.

Topics and Events

- Lectures about V.A. Ambartsumian, BAO and on various aspects of modern astronomy
- Observations with small telescopes
- Practical courses of astronomy with computers and databases
- Astronomical competition
- Training courses: BAO, astronomy in Armenia, IAU Symposia, IAU S304 organizing teams
- Acquaintance with the Byurakan Observatory and its research: 2.6m telescope, 1m telescope, V.A. Ambartsumian's museum
- Excursions to famous Armenian sightseeing: Tegher Monastery, Amberd fortress, Aragatz lake
- Sports games, competitions, film screening

The IAU Symp. #304 on *"Multiwavelength AGN surveys and studies"* will be held on October 7-11, 2013 in Yerevan with participation of some 145 scientists from 32 countries.

4BSS / IAU S304 training webpage: http://www.aras.am/4BSS/

BAO JOINED ICSU WORLD DATA SYSTEM

The Byurakan Astrophysical Observatory (BAO) became an associate member of the ICSU (International Council of Scientific Unions) World Data System (WDS, http://www.icsu-wds.org/). At present a number of sciences and many other spheres of human activities have started actively using data accumulated in all areas and exchanging them. For example, astronomers use data from atomic spectroscopy, communications use meteorological data, space flights need astrometric data, etc. Based on this, there appeared an idea to create a huge database where all data obtained in all sciences will be maintained in special format and will be conveniently available for usage. For this, based on an example of virtual observatories, WDS was created. It is an active database working with special software system. BAO accomplished the first digitization project in Armenia, the Digitized First Byurakan Survey (DFBS) and later based on this created the Armenian Virtual Observatory (ArVO). For these works and for inclusion of all other observational data accumulated in Byurakan, BAO was accepted in ICSU WDS, where some 100 organizations, data centres and databases, research and other institutions are already involved. Due to the integration of data, the accomplishment of scientific, especially interdisciplinary research becomes most easy and available that promotes initiation of new collaboration projects and new directions in science.

MOST PRODUCTIVE SCIENTISTS in ARMENIA

The **Armenian State Committee for Science (SCS)** ***"Most productive scientists"*** **competition** resulted in 97 scientists who are awarded additional funding for 1 year. Scientific publications and citations on them, talks at the meetings, supervision of theses, patents, supervision of research groups, grants and prizes, and scientific-organizational work have been taken into account.

Out of 97 scientists, there are 63 representatives from natural sciences, 13 from engineering and technology, 3 from medical sciences, 3 from agricultural sciences, 1 from social sciences, and 14 from Armenology and humanities. Most representatives are from the Yerevan State University (YSU, 27), Alikhanian Yerevan Physics Insitute (YerPhI, 16), Armenian State Engineering University (5), Institute for Physical Research (5), Byurakan Astrophysical Observatory (BAO, 4), Institute of Molecular Biology (4), and Institute of Archaeology and Ethnography (4).

Among the 97 awarded scientists, 7 are from the field of Astronomy and Astrophysics; 4 from BAO and 3 from other institutions (physicists working on astronomical problems):

Vahagn Gurzadyan (YerPhI; cosmology)
Tigran Magakian (BAO; physics and evolution of stars)
Areg Mickaelian (BAO; extragalactic astronomy)
Tigran Movsessian (BAO; physics and evolution of stars)
Artashes Petrosian (BAO; extragalactic astronomy)
Aram Saharian (YSU Department of Theoretical Physics; cosmology)
Davit Sedrakian (YSU Department of General Physics and Astrophysics; compact objects)

The list of the most productive scientists will be revised every year.

ANSEF-2014 CALL

A.N.S.E.F.

The Armenian National Science & Education Fund

The Armenian National Science & Education Fund (ANSEF) invites grant applications for the 2014 competition. Applicants are to submit their applications through the ANSEF website portal, accessed from the top bar of the ANSEF website (www.ansef.org) or directly through the link ansef.herokuapp.com. The deadline for submissions is August 31, 2013. Competition results will be announced by January 1, 2014. For further questions, contact help@ansef.org.

If you have applied for an ANSEF grant in the past through our portal, you may use your old account to submit new applications. If you have forgotten your password, the portal allows you to reset it and log in with a new password. This allows you to access all your past information in your new proposals. Watch the video tutorials on the portal's login page for more instructions. If you are a new applicant, who have not used the ANSEF portal before, you need to use the portal to first register. You will then receive an email to confirm your new account, and then proceed with logging in. For any technical questions about the ANSEF portal, please contact website@ansef.org.

In the field of astronomy and astrophysics, ANSEF has supported 36 projects (USD 5000 each; projects by 21 Principal Investigators involving more than 70 scientists), including 30 from Byurakan Astrophysical Observatory (BAO) and 6 from Yerevan State University (YSU).

ANANIA SHIRAKATSI MEDAL to AGOP TERZAN

The famous French-Armenian astronomer ***Prof.*** **Agop Terzan** has been awarded **Anania Shirakatsi medal** by the President of Armenia *Mr.* Serzh Sargsyan. The official ceremony will be held in Paris.

Agop Terzan is one of the most important persons of Armenian Diaspora and French astronomy. The stellar clusters revealed by Terzan and named after him are known to all astronomers. With his perennial activity and essential results he has a serious contribution in observational astrophysics.

Agop Terzan was born on October 31, 1927 in Constantinople (Istanbul). He graduated from the Constantinople University (he got his Bachelor degree on Mathematics in 1945 and Masters on Astronomy in 1949) and worked as a teacher of mathematics at Central Lyceum of Istanbul. In 1956 he moved to France. In 1957-1959 Terzan worked as a teacher of mathematics at technical lyceum and in 1959-1965 as an assistant astronomer, later as a scientist. In 1967-1998 he worked at the Lyon Observatory, in 1982-1983 he was the Deputy Director of that observatory. In 1965 he was awarded a doctorate of mathematical sciences by Lyon University; in 1980 he was awarded a professorship.

Terzan's works mainly refer to variable stars, stellar clusters and problems of physics of stars. Since 1963 he made observations by a number of most significant telescopes of the world. He

discovered 710 variable stars in the immediate vicinity of 14 globular clusters, 11 new globular clusters (named Terzan 1, etc. till Terzan 11), 158 diffuse nebulae, 124 galaxies (from which 25% appeared to be active galaxies of Sy2 type), 4430 red variable stars in direction to the Galactic center (including 458 ones which were later identified with the IRAS infrared sources), 1428 high proper motion stars ($\mu > 0''.1$ per year). 26 planetary nebulae, 122 diffuse galaxies in direction to the center of Our Galaxy. Later it was found out that those galaxies discovered by Terzan formed the cluster of galaxies of Ophiucus constellation, as well as the super-cluster of Sagitterius-Ophiucus, which was essentially discovered due to Terzan. As a result Terzan published more than 100 scientific papers in the most important astronomical journals. Terzan also has a serious contribution in the working out of astronomical devices (devices and photometers for comparing eclipses). He also has a considerable contribution in editorial and administrative works.

Terzan is a member of International Astronomical Union (1967), European Astronomical Society and French National Astronomy Committee. In 1968-1978 he was the Head of Lyon Astronomical Society. He was awarded a Henry Rey prize of the French Astronomical Society (1977), prizes of French Ministry of Education (1979) and a number of medals. He was a Corona Prize winner of the French Academy of Sciences (1988).

SCIENCE in BYURAKAN. RESEARCH by *Dr.* RUBEN ANDREASYAN

Ruben Andreasyan is working in Byurakan Observatory since 1974. His fields of investigation can be divided into two main directions:

1) Study of magnetic field and of electron density in our Galaxy,

2) Investigation of morphological and physical differences in extragalactic radio sources of different Fanaroff-Riley types in frame of the mechanism of their formation and evolution when the magnetic field of parent galaxy has dipole configuration.

In **the first direction** for the study of Galactic magnetic field were used the star light polarization data of 7500 stars and Faraday Rotation Measures (RM) of more than 600 pulsars as well as the RM data for about 1000 extragalactic radio sources. The results of analyses all of these data are in good concordance with together. In result it was suggested a model of two-component large scale magnetic field of the Galaxy. These components are: a) The Plane component of Galactic magnetic field: b) The Halo component of magnetic field.

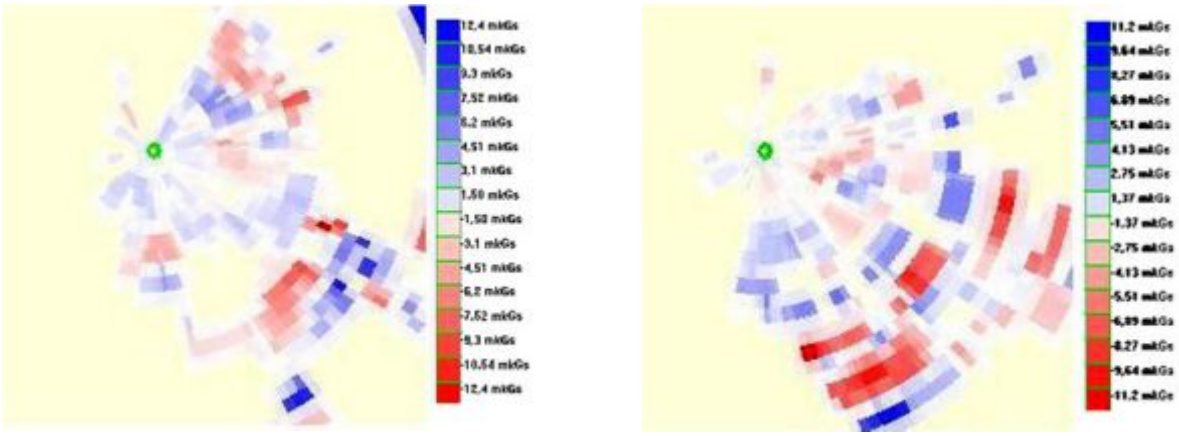
The plane component is the magnetic field of spiral arms of Galaxy, where magnetic fields are directed mainly parallel to the spiral arms. It was found a good reversal of the directions of magnetic field in neighbor arms of Perseus and Sagittarius, moreover the magnetic field in Sagittarius spiral arm is not symmetric to the Galactic plane (it is mainly located in the Northern hemisphere of the Galaxy).

The Plane component of magnetic field is imbedded in the Halo component. The Halo component of magnetic field has opposite directions in the Southern and Northern hemisphere of the Galaxy. It

was suggested that the Halo magnetic field can be a relict of Galactic dipolar magnetic field deformed by the differential rotation.

At the present time the two component magnetic field configuration is accepted by many astronomers for our Galaxy as well as for other spiral galaxies.

In recent studies of Andreasyan it was suggested a method for constructing of two color map of magnetic field in the Galactic plane. Using the integral observational parameters RM and DM, in fact solving an inverse problem, it was found the strength of magnetic field in every point of Galactic plane with coordinates (DM; l), where $DM=\int n_e\, dL$ (instead of the distance from the Sun was used the integral of electron density on the line of sight) and l is the Galactic longitude. Here are examples of such maps of Galactic magnetic field.



-1 < K <20 -20 < K < -1

The distribution of B_L(DM) in the galactic plane (DM;l)

The Sun is marked as a green ring. The Galactic center is in the right side. This method gives a good tool for the study of the magnetic field in different layers of Galaxy. From the pictures it is seen the difference of the field distribution in the Southern and Northern hemispheres of Galaxy.

The second direction of the study of R. Andreasyan concerns to the mechanism of formation and evolution of extragalactic radio sources in framework of the cosmological conception of V. Ambartsumian. The main suggestion is that the magnetic field of the host galaxy or AGN has a dipole configuration, with dipole axes parallel to the rotation axes of host elliptical galaxy. In fact there are many observational evidences that large-scale galactic magnetic fields can have dipolar configuration. The magnetic fields of dipole configuration can be formed and evaluate, for example, in the result of Biermann battery effect. Partly, Andreasyan for the formation and evolution of galactic dipolar magnetic field suggest a model of AGN in agreement with the cosmological conception of V. Ambartsumian. In agreement with this model from the Nucleus of Active galaxy there is a permanent ejection of hot plasma, which expands in the fast rotating gaseous medium of the central part of galaxy (there are a lot of observational data about existence of large amount of fast rotating neutral and ionized gas in the host elliptical galaxies, and about outflows from the central part of Radio galaxies). Because of the large differences between scattering time of expanding electrons and protons with the rotating medium in every point of rotating medium the rotation velocity of expanding electrons and protons will be different. In the result of forming of circular electric currents in the central part of Active galaxies evaluates dipolar magnetic fields.

It was suggested also that the extragalactic radio sources are formed from relativistic plasma clouds, ejected from the central part of the optical galaxy and moving in large-scale dipolar magnetic field of parent galaxy. The behaviors of relativistic plasma clouds that are ejected in the direction of the dipole axis, depends on the ratio Q of the kinetic energy density of the plasma to the magnetic field energy density. In the frame of suggested mechanism the well-known Fanaroff-Riley Dichotomy and many other morphological features finds a very simple physical explanation.

For example it was shown that: a) There are differences in the correlation of radio axis with the optical axis for different FR types of radio galaxies; b) There are differences in the ellipticity of elliptical galaxies identified with the different types of extragalactic radio sources; c) There are differences in the correlation of the radio polarization angle with the radio axes for different FR types of extragalactic radio sources.

At the present time Andreasyan with some yang astronomers is studying the differences in the amount, dynamics and distribution of ionized and neutral hydrogen in different FR types. For this purpose they have done radio and optical observations of some nearby 3C radio galaxies.

R. Andreasyan has collaborations with astronomers from France, Germany, UK, Russia and China. He was leader of the Armenian group in INTAS grant (2002-2004), leader of group in ANSEF grants (2004, 2005, and 2011). His works were presented in seminars of many observatories and many astronomical symposia.

SCIENCE in BYURAKAN. RESEARCH by *Dr.* ARARAT YEGHIKYAN

"Astrobiology, bio-mass-extinctions, and all that", by **Ararat Yeghikyan**.

Introduction. It is generally accepted now that AstroBiology is "a branch of astrophysics on the base of a multidisciplinary study of subjects related to the origin, evolution, distribution and extinction of life as well as to its detection in the universe". The question is how reasonably astrobiology's subjects relate with origin of terrestrial life as we know it because some people from the scientific community like biologists (e.g. Campbell et al. 2010) and geologists cannot make out what is it to astrophysics ? They strongly believe that life on Earth clearly originated in the same way that everything (including complex natural systems) originated, step by step from subunits of only terrestrial origin. But thanks to modern observational and theoretical data we know that it is not the case, a surface of the newborn protoEarth was too hot ($T \sim 800$ K) and a following scenario for the origin of the mentioned subunits should be proposed, establishing a bridge between Astrophysics and Astrobiology (Ehrenfreund et al. 2002).

A. Water for terrestrial oceans was delivered by comets and interplanetary dust particles between 4.5-3.8 Gyr ago (D/H is well agreed).
B. The terrestrial primordial atmosphere which was also created by such a way was neutral (CO_2 + N_2).
C. Organics delivered on the Earth by comets and interplanetary dust particles must already have contained heavy hydrocarbons and amino acids including chiral species because molecular symmetry could not be broken under terrestrial conditions.
D. Comets impacting the Earth with grazing trajectories (with $\alpha \leq 5^0$, 2-3 % of all impacts) created first biochemical reactors or „little warm ponds" .
E. Life (on Earth) has originated 3.8 Gyr ago immediately after cessation of the „heavy bombardment" period when over 100 million comets collided with the Earth between 4.5-3.8 Gyr ago.

Comets have originated beyond a so called "snow line" in the protosolar disk consisted of unchanged matter coming from a protosolar cloud. Thus any question concerning to what extent complex organic molecules were presented on the primordial Earths' surface should focus on compounds which were readily synthesized under plausible conditions of star birthplaces that is interstellar molecular clouds (MC) and played an essential role in chemical (and/or prebiotic) evolution as we know it. This is the bridge connecting classical problems of astrophysics with that of origin of life. We have tried to reveal some of them in our study during last 10 years. In this short communication we present some results.

Some results. A basic idea is that complex species are more easily generated in solid state of ice mantles of dust grains inside MC if ultraviolet (UV, 6-13.6 eV) and cosmic ray (CR, > 1 MeV) radiation fields are available.

1. We have theoretically studied the composition of icy mantles deposited in cold dense contracting cores of interstellar MC (Yeghikyan et al., 2001; Yeghikyan, 2003; Keheyan, Cataldo, Yeghikyan, 2004) and have shown that the grain mantle initially was methane-rich but then if about 1 Myr is available for the ice deposition time the methane fraction reduces to around 10-40% (both for the atomic and molecular gas-form initial states), and remains level at this value until late times when its conversion to other species e.g. CH_3OH, should be taken into account. Using experimental results regarding the chemical transformation of carbon-containing molecular solids (CH_4 etc.) to heavy hydrocarbons (alkanes, alkenes and PAH) due to irradiation by energetic ions we have also shown that 1-5 % of the total abundance of the ice mantles may be converted to aliphatic olygomer species containing up to 30 carbon atoms during the total ice processing time of about 1.2 Myr and should dominate over aromatic hydrocarbons in stable cool environments. Last Spitzer Space IR observatory data have confirmed that fact by sensing many predecessors of PAHs molecules with relatively fragile aliphatic bonds in cool and tranquil regions (Sloan, 2007, 2008). Observations regard to circumstellar disks but clearly demonstrate a possibility of aliphatic bonds to survive in the densest cool regions of the clouds. If so, it is worthy to search corresponding lines of solid polyisoprenoid hydrocarbons in the IR spectra of MC and circumstellar disks. It is important from the point of view of prebiotic evolution of matter as it was highlighted earlier (McCarthy, Calvin, 1967) but the question up to now is not investigated. From observational point of view it has to do with vibrational lines of dienic molecules in the range of 3.23-13.7 μm (Sverdlov et al., 1970). Possible identification of such species would localize regions of their formation which in turn would permit putting essential constraints on astrochemical scenarios of their origin. Finally all that would permit to clarify details in the transition from the chemical evolution to the biological one.

2. Space ices containing water, carbon- and nitrogen-rich structures are important in certain chemical and radiation induced processes in interstellar MC dust systems, in cold circumstellar outflow reactions and protosolar nebula chemical processes. Until now there is no detailed investigation on a combined energetic processing of various ices by ions and electrons, modeling the CR irradiation over the whole energy range from eV to GeV, and by UV photons longer than 912 Å. It should be noted that our studies on the proton induced conversion of ices include an examination of the linear energy transfer due to stopping processes by which the input projectile loses its original energy to particles in the target. This deposited energy rate has been calculated under circumsolar radiation field environment for various species (Yeghikyan, 2008). The results can be used to predict a radiation induced chemical conversion rate of simple chemical species to complex ones by means of existing and forthcoming experimental data.

3. Cosmic ray and UV irradiation doses up to the extinction value A_V = 50 caused respectively by the galactic proton spectrum and the nearby A class star and the average isotropic interstellar radiation field have been also calculated and discussed in our works (Yeghikyan, 2009, 2011a, 2011b). We investigated theoretically the transformation of the energy dependence of the CR proton flux in the MeV to GeV region when penetrating inside molecular clouds (A_V > 3 mag) and have shown that particles with energies less than 1 MeV are being absorbed in outer layers where ices are absent. A cut-off of the CR spectrum inside clouds by their magnetic fields has been phenomenologically also taken into account at the energies 1 MeV – 10 GeV. The computations suggest that energy losses of the CR particles by interaction with the matter of the molecular cloud are principally caused by the inelastic (electronic) interaction potential; the transformed energy distribution of energetic protons is determined mainly by the column density of the absorbing medium. This procedure allows a determination of environment-dependent ionization rates of MC. Mentioned energy sources like UV and CR radiation have caused irradiation doses over experimental threshold values of 0.4 eV/a.m.u. and 1.4 eV/a.m.u., respectively, during clouds lifetime about 10-50 Myr, which is enough to arrange the heavy hydrocarbons and amino acids syntheses from simple and mixture ices.

4. Any MC should collide with intermediate and cold dwarf stars every few kiloyears (Yeghikyan, 2013a). Radiation fluxes caused by moving through MCs A, F, G stars are calculated. It is shown that photons in the spectral range 912 < λ < 2067 Å penetrate deeply into the clouds to such an extent to arrange enough irradiation doses to initiate chemical reactions in icy mantles of dust grains during the stars passage time. A possibility to use these data to interpret known laboratory results from the UV photolysis of realistic ice analogues like $H_2O:CH_3OH:NH_3:CO$ producing heavy hydrocarbons and aminoacids has been discussed (Yeghikyan, 2013a).

5. Anomalous cosmic ray fluxes inside molecular clouds originated during collisions of solar-like GV stars with clouds have been calculated. Charged particles originating in clouds in star's neighbourhood are accelerated at the astrosphere's shock up to energies of a few 100 MeV. It is shown that protons and α-particles in the energy range 1 keV < E < 10 GeV penetrate deeply into the clouds to such a degree to arrange irradiation doses of various ices with a cumulative effect over a threshold value of 0.1-1 eV/a.m.u. during the star passing time through the cloud of 1-5 kiloyears and from 10 to 100 collisions of stars with a given cloud. A possibility to use these data to interpret known laboratory results from the ion processing of realistic ice analogues like $H_2O:CH_3OH:NH_3:CO$ producing potentially important pre-biological complex molecules has been discussed (Yeghikyan, Barsamyan, 2013).

6. The solar system must have passed through interstellar MCs many times in the past. These events would have pushed the heliosphere inward to the region of the terrestrial planets bringing the Earth into immediate contact with the clouds' matter, provided that the number density of that was the order of, or greater than, 10^3 cm^{-3}, and that relative velocities of about 20 km/s prevailed. A simple two-fluids treatment of the incoming flow of the clouds' material is proposed here. We consider flow matter that is ionized only by the solar UV and then assess the amount of neutral hydrogen that is accreted by the Earths' atmosphere during a single passage through a dense cloud. The behavior of the flow variables has been investigated by a 2D-hydrodynamic approach to model the interaction processes, taking into account both the photoionization and the gravity of the Sun. As we have shown, the resulting strongly increased neutral hydrogen fluxes, ranging from 10^9 to 10^{11} atoms·cm^{-2} s^{-1}, cause substantial changes in the terrestrial atmosphere. In that case hydrogen acts as a chemical agent to remove oxygen atoms and to cause ozone concentration reductions above 50 km by a factor of 1.5 at the stratopause, to about a factor of 1000 and more at the mesopause (~100 km). Thus, depending on the specific encounter parameters, the high mixing ratio of hydrogen in the Earths' atmosphere may substantially decrease the ozone concentration in the mesosphere and may trigger an essential climatic change of relatively long duration, probably causing the bio-mass extinction (Yeghikyan, Fahr, 2003, 2004, 2006; Yeghikyan, 2013b).

Conclusion. It was claimed that at least certain stages of the process by which life originated occurred in space, hence there is a strong interest in the range of organics in ice-rich structures in dense MCs that may have contributed the precursors of life. The combination of the astronomical data regarding star-forming regions with published experimental results of energetic particle and UV processing of ices with our theoretical modeling will help estimating the contribution of the CR and UV irradiation to the changes in dust grains in the dense MC. From astrobiology's point of view, an area of rapidly growing interest, it seems important to understand the mechanisms by which large molecules, possibly of pre-biotic interest like heavy hydrocarbons and amino acids could be formed by UV and CR processing of chemically simpler solids in the environment of the clouds. If it turned out that such conversions depended, for example, on star formation efficiency in clouds, stellar masses etc., then these results would have interesting implications for astrochemistry and astrobiology.

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ANNIVERSARIES. LYUDVIK MIRZOYAN – 90

This year one of the representatives of the first brilliant generation of Armenian astronomers who founded the Byurakan Astrophysical Observatory and the Byurakan direction in astronomy, Academician of the Academy of Sciences of Armenia, first Armenian member of the French Academy of Astronautics, ***Prof.*** **Lyudvik Mirzoyan (1923-1999)** would be 90 years old.

Lyudvik Mirzoyan has devoted his whole life to Armenian science, actually following his teacher's, Viktor Ambartsumian's advice, who had said: "If one strives for science he has to devote himself completely to it. Science does not tolerate those who share their love with other admires". Professor Mirzoyan was born on May 1, 1923 in Yerevan. Showing great interest towards learning from early childhood finishing school with best results he had entered Yerevan State University (YSU), faculty of physics and mathematics. Unfortunately because of the Second World War he was obliged to interrupt his studies and to join the army. After the war he had graduated the university with honours in two and half years instead of five and was noticed by Academician Viktor Ambartsumian who was looking for talented young people for the newly founded Byurakan Observatory. In 1951 Lyudvik Mirzoyan had defended his scientific thesis under the joint guidance of Viktor Ambartsumian and Oleg Melnikov from Pulkovo Observatory.

In 1953 Mirzoyan was appointed Scientific Secretary and in 1959 Deputy Director of the Byurakan Observatory and for 30 years he worked fruitfully as Deputy of Viktor Ambartsumian. Since 1965

Mirzoyan was heading the department of Physics of Stars and Nebulae which was engaged in observation of young unstable stars and stellar objects.

This was the time of rapid development of the Byurakan Observatory when it became the symbol of Armenian science and the visiting card of Armenia. Lyudvik Mirzoyan was one of the first students of Viktor Ambartsumian later becoming the teacher of the next generations of Armenian astronomers giving lectures in YSU for almost half a century. Many of his foreign post graduate students today work in many observatories and scientific centers of the world and remember with gratitude their dear teacher.

The aim of Mirzoyan's fundamental and consistent scientific activity was to develop and prove the revolutionary ideas put forward by Viktor Ambartsumian and the Byurakan school. He had a huge input in the establishment of modern perception of birth of stars becoming the leader of Armenian observational astrophysics in this field. Academician Mirzoyan is the author of a number of scientific monographs, more than 200 scientific papers and many scientific-popular articles and books.

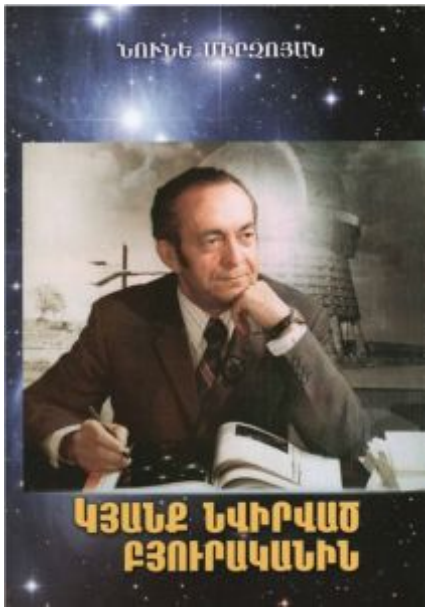
His editorial work has a special place in his scientific activity. In 1965 the Academy of Sciences started publication of "Astrophysics" journal, which was an all-union journal and later got international status and was published also in English language in the USA. From the day of its establishment Mirzoyan was the Deputy Editor. Since 1988 he was the Editor-in-Chief until the end of his life.

Lyudvik Mirzoyan was an active participant in the development of international relations between the scientists of the Byurakan Observatory and famous observatories and scientific centers of the world. A big number of mutual visits and long term business trips were taking place between them, which highly favored the upgrading of the Armenian science and the image of the scientists.

Academician Mirzoyan is remembered as a distinguished scientist devoted to his work, a talented organizer of science, a man of immense charm, an honest leader and man of principle.

Ara Mirzoyan

PUBLICATION of BOOKS. "A LIFE DEVOTED to BYURAKAN"

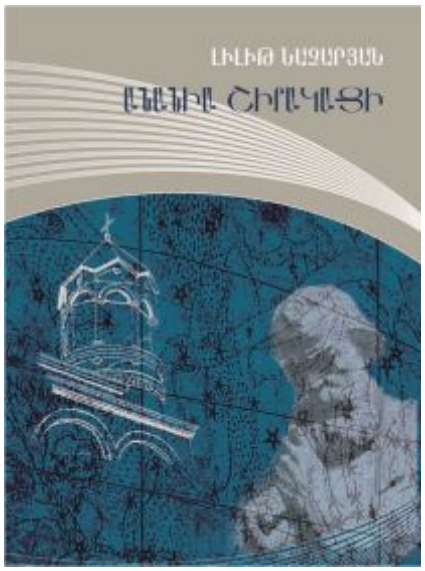


Recently a book was published on the occasion of the 90th anniversary of prominent Armenian astronomer, academician of the Academy of Sciences of Armenia, first Armenian member of the International Academy of Astronautics, Professor **Lyudvik Mirzoyan (1923-1999)**, written by his daughter Noone Mirzoyan.

The book is devoted to the life and fruitful activities of the distinguished scientist, prominent teacher of several generations of Armenian and foreign astronomers, perfect editor, author of a number of books and more than 200 scientific papers and a man of immense charm and intelligence. World famous astronomer was among the founders of Byurakan observatory and together with his teacher Viktor Ambartsumian was efficiently guiding the observatory for 30 years. Hence the title of the book: ***"A Life Devoted to Byurakan"***.

The author has tried to describe the picture and the atmosphere in which Professor Mirzoyan had lived and worked, publishing for the first time the memories, written by her father, his archive materials, as well as the memories of his collegues, friends and students. The book is foreseen for a large frame of audience.

PUBLICATION of BOOKS. “ANANIA SHIRAKATSI”



Recently a book by Lilit Nazaryan ***“Anania Shirakatsi”*** was published by Anania Shirakatsi College (Yerevan, 242 pages).

Anania Shirakatsi (612-685) is one of the greatest scientists who made an important contribution to the field of exact sciences in Armenia, a brilliant scientist and philosopher of the 7th century; actually the founder of exact sciences in Armenian reality. Unfortunately, out of Shirakatsi’s rich heritage only some fragments of his works in the fields of Mathematics, Cosmography, Calendarology, Metrology, which are of great value for the history of exact sciences, got to us. There is a valuable source about Anania Shirakatsi’s life and work; the author has left his autobiography. Out of Shirakatsi’s works got to us the most valuable and unique one is the textbook in Arithmetic which, unfortunately, has got in fragments. Shirakatsi’s arithmetic work is the oldest one among the textbooks of Arithmetic known by us and it contains the oldest tables for arithmetic, which have got to us. Shirakatsi also left a rich heritage on Calendars. Among Shirakatsi’s works the most important one is considered “Knnikon”, which contains “Easter Speech”, “Christmas Speech” and “Chronicle” including synchronized spatial tables of changeable and fixed calendars for 532 years. Shirakatsi formed a large number of tables and calendar cycles. Shirakatsi’s works on Cosmography are of great value. The basic questions on Exact Sciences are included in it. These works give us an opportunity to learn about his views on Exact Sciences.

The book “Anania Shirakatsi” is devoted to Anania Shirakatsi’s 1400th anniversary and is in fact the 2nd updated and revised edition of the previously published book in 2006. UNESCO included Shirakatsi’s 1400th anniversary in the list of important dates in 2012 and the Armenian Government decided to celebrate this anniversary in 2012-2013 with a number of events.

PUBLICATION of BOOKS. “From the DEEP of AGES to the UNIVERSE”

Former BAO researcher **Avetik Grigoryan** has published popular science book ***“From the Deep of Ages to the Universe”*** written by him in Armenian. 20 years of experience in educating astronomy and related scientific and technical disciplines (aeronautics, aviation and astronautics, as well as the fundamentals of physics, chemistry, biology, informatics, technology) for secondary school students resulted in writing this book, which required five years of hard work and persistent efforts. The author has passed through it as a real enthusiast and patriot, even having no hope for funding the publication of the book.

It presents a fascinating popular science story about the cognizing race of mankind in aeronautics, aviation, astronomy and astronautics starting from ancient ages to our time, as well as about the man-kind’s space future. Under the attraction of

extraordinary phenomena and mysteries of the outer space this book leads the reader from simplest and ordinary notions to deep and encyclopedic knowledge in natural science and technology, awakes inquisitiveness, develops ability and tendency to creative research and investigation, as well as gives a comprehensive conception of Universe and the history of its study.

The book has serious methodological advantages against the existing text-books and encyclopedias. It's even hard to recall such a comprehensive and valuable popular science book, written by an Armenian author. The contribution of the Armenian nation and its famous scientists to the described areas is specifically presented in the historical context of development of science and technology in the world.

The book is very interesting, inspiring and useful for a wide range of readers (especially secondary and high school students, teachers of natural sciences, amateur astronomers, and generally any inquisitive person). It will surely have an appreciable success and will contribute to popularization and education of the mentioned areas in Armenia. By this it will promote particularly the future development of astronomy in Armenia.

The presentation of the book ***"From the Deep of Ages to the Universe"*** will be held in the Armenian National Academy of Sciences on July 4, 2013.