Isaac Newton Institute of Chile in Eastern Europe and Eurasia

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The Isaac Newton Institute, (INI) for astronomical research was founded in 1978 by the undersigned. The main office is located in the eastern outskirts of Santiago. Since 1992, it has expanded into several countries of the former Soviet Union in Eastern Europe and Eurasia.

As of the year 2003 the Institute is composed of fifteen Branches in nine countries. (see figure on following page). These are: Armenia (20), Bulgaria (26), Crimea (29), Kazakhstan (17), Kazan (12), Kiev (11), Moscow (22), Odessa (34), Petersburg (31), Poland (13), Pushchino (23), Special Astrophysical Observatory, ‘‘SAO’’ (49), Tajikistan (9), Uzbekistan (24), and Yugoslavia (22). The quantities in parentheses give the number of scientific staff, the grand total of which is 342 members.

1. RESEARCH IN CHILE

The primary research program of the Institute in Chile continues to be observational studies of globular clusters in the Galaxy and the Magellanic Clouds. In addition, a number of open clusters have been observed. In this field around 200 papers have been published.

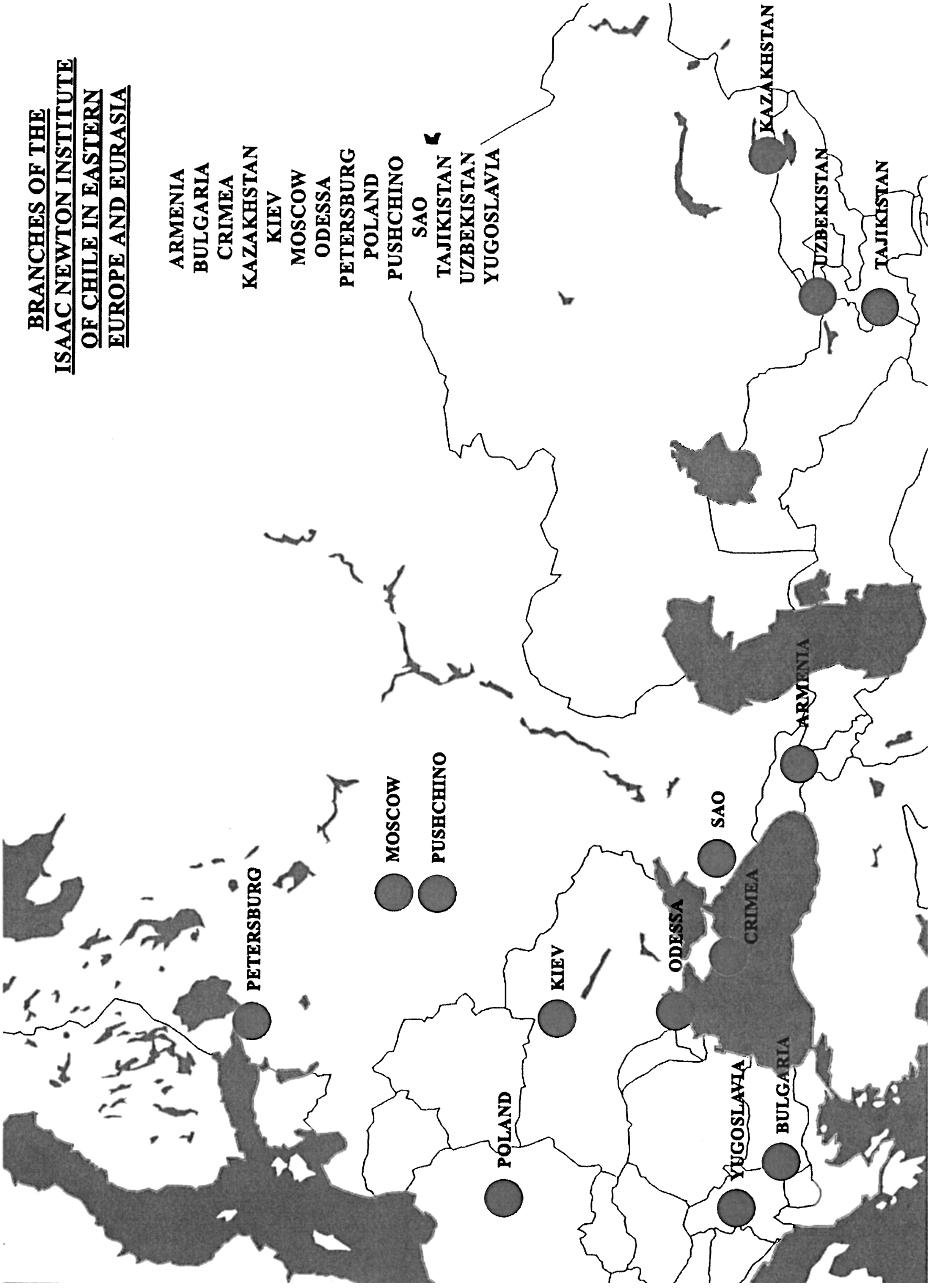
Besides the above named Branches, following the Convention of Scientific Collaboration with the Rome Observatory of February 2000, Gonzalo Alcaino and Franklin Alvarado are involved with Italian astronomers in several research projects using data secured from telescopes in Chile.

With data obtained at VLT (FORS-1) ESO Paranal in a joint study with Gloria Andreuzzi, Vincenzo Testa, Gianni Marconi, and Roberto Buonanno, we analyzed the Galactic Globular Cluster NGC 6397, covering a relatively wide area spanning a radial distance from the cluster center $1' < r < 9.8'$. This work has been submitted to A&A. The CMD has been constructed and the MSLF obtained after correcting for the incompleteness due to the crowding. The radial properties of the LF have been studied as well as the MF after applying mass-luminosity relations from recently published models. The main results can be summarized as follows:
1.- The CMD extends down to $V \sim 26.5$, reaching magnitudes comparable with previous HST - NASA studies;
2.- The two annuli in which the sample has been divided show different degree of completeness with respect to the LF. This comes out from the fact the internal annulus is close to the cluster center and hence its crowding conditions are more critical. This prevents us from bulding the LF fainter than $V = 22.5$. The outer annulus is, instead, complete down to $V \sim 24$. However, comparison with the HST sample of Cool *et al.* (1996), that mostly overlaps the internal annulus shows that our completeness is consistent;
3.- The two annular LF have been fitted with an exponential law obtaining significantly different slopes, down to the last reliable magnitude bin, i.e. where completeness drops below 50%. The slope of the internal annulus is flatter than the outer indicating the presence of different mass distributions at different radial distances. This is a clear mark of mass segregations, as expected in dinamically relaxed systems as GCs;
4.- In order to further clarify the situation, we applied two different mass-luminosity relations from the models of Montalvan *et al.* (2000) and Baraffe *et al.* (1997), for two different metallicities, $[Fe/H] = -1.5$ and $[Fe/H] = -2.0$. The two models, although very similar, give slightly different slopes. Both, however, confirm the difference in slopes between the internal and outer annulus also in the MF. A change in slope at $M \sim 0.3 M_{\odot}$ described in De Marchi *et al.* (2000), could only be studied in the more complete outer annulus, where it has been found consistent with the values given by De Marchi *et al.* (2000);
5.- The main source of uncertainty in deriving the LF is given by the sample incompleteness that for ground based studies, is often a strong effect also when using an instrument like VLT in good seeing conditions. However, part of this effect has been balanced by the much higher statistics provided by the large field of view of FORS1, that overtake the areal coverage of previous HST studies by a factor ~ 9.

CCD photometric analysis has now been completed by Gonzalo Alcaino, Franklin Alvarado, Guiseppe Bono and Gianni Marconi, for the globular clusters NGC 1261, NGC 1851 and NGC 3201.

As from 2002, a systematic programme of CCD data reduction obtained at La Silla and Las Campanas by Gonzalo Alcaino and Franklin Alvarado is ongoing with Jordanka Borissova, Radostin Kurtev and Haralambi Markov, staff members of the INI Bulgarian Branch. Around 50 star clusters will compose the envisaged project in the forthcoming years.

In the course of 2003, we present a new photometric analysis in UBVI, for the SMC globular cluster NGC 458. Comparison with previous photometry of Matteucci *et al.* (BV, 2002) shows good agreement. In this work we reported the first UI magnitudes of the cluster stars. We confirmed the overall color-magnitude morphology of NGC 458 outlined by Ripepi & Brocato (1977) and Matteucci *et al.* (2002). On the basis of the location on the $(U-V, U)$, $(U-B, U)$ and $(B-V, V)$CMDs, we identified three candidates blue straggler stars. We determined reddening $E(B-V) = 0.04 \sim 0.02$. The best fit of the isochrones by Bertelli *et al.* (1994) is for an age of $\sim 140 Myr$, which is in the upper limits of Matteucci *et al.* (2002) age interval. Cross identification of the optical magnitudes of the ‘‘blue-loop’’ stars with near IR photometry available in the 2MASS catalogue allows us to transform the $V-K$ color to the effective temperature and K


BRANCHES OF THE
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magnitudes to the luminosities. The brightest evolved stars in NGC 458 have masses between 4 and 5 $M_\odot$ and are hotter than the model predictions.

We have provided as well moderately deep new UBVI CCD photometry of the SMC star cluster Lindsay 1. This is also the first CCD photometry in U and I filters. The $(U-V,V)$,$(B-V,V)$ and $(V-I,I)$ CMDs, decontaminated of the field stars, was constructed. Applying two methods, we determined the redening $E(B-V)=0.014$. Using a variety of metallicity indicators in the optical and infrared regions we have found a final cluster metallicity $[Fe/H] = -1.05\pm0.14$ and $[M/H]=-0.83\pm0.14$. This value is about 0.3 dex higher than the accepted $[Fe/H]=-1.35$. We have found that Lindsay 1 has an age of 9-10 Gyr which do not differ from other estimations.

2. THE INI ARMENIAN BRANCH

The Isaac Newton Institute opened its Branch in June 2000. The formal Agreement was signed with Prof. Edward Khachikian, Director of the Byurakan Astrophysical Observatory of the Armenian National Academy of Sciences.

The staff of the Isaac Newton Institute Armenian Branch are: Hamlet Abrahamian, Smbat Balayan, Kamo Gigoyan, Armen Gyulbudaghian, Lidia Erastova, Misar Eritsian, Susanna Hakopian, Haik Harutyunian, Rafik Kandalyan, Arthur Karapetian, Edward Khachikian, Tigran Magakian, Norair Melikian, Areg Mickaelian, Tigran Movsessian, Hripsime Navasardyan, Arthur Nikoghossian, Elena Nikogossian, Artashes Petrosian and Norair Yengibargyan. The Resident Director of the INI Armenian Branch is Areg Mickaelian.

The Byurakan Astrophysical Observatory (BAO) is the main astronomical institution in Armenia and one of the most important observatories of the Former Soviet Union. It was founded by the outstanding scientist Victor Ambartsumian in 1946. First studies at BAO related with the instability phenomena taking place in the Universe, and this trend became the main characteristic of the science activity in Byurakan. Discovery of the stellar associations (1947), the hypothesis about activity of galactic nuclei (1958), the famous First and Second Byurakan surveys (FBS, 1965-80, and SBS, 1978-91), discovery and study of many QSOs and Seyfert galaxies, discovery of some 1000 flare stars, dozens of Supernovae, hundreds of Herbig-Haro objects and cometary nebulae, works in the field of radiation transfer theory, are the main scientific achievements of the Byurakan astronomers. Markarian, Arakelian and Kazarian galaxies are known to all astronomers working in the field of extragalactic astronomy. Among the most well-known astronomers who have worked at BAO are V.A. Ambartsumian, B.E. Markarian, G.A. Gurzadian, M.A. Arakelian, L.V. Mirzoyan, E.Ye. Khachikian, V.A. Ambartsumian has been the IAU President (1961-64), IAU Vice-President (1948-55), twice the ICSU President (1968-72), he was the President of the Armenian Academy of Sciences during 1947-1993 and the Director of BAO during 1946-1988.

At present, BAO has some 70 researchers, including 11 Doctors of Science and 38 Candidates of Science (Ph.D.). Many are members of IAU, EAS, EAAS (Euroasian Astron. Soc.), and other international societies and organizations. Since 1999, the Director is Edward Khachikian. There are 3 scientific divisions and 21 small research groups.

The main fields of scientific activity at BAO are: search and multiwavelength studies of AGN and starburst galaxies, infrared and radio galaxies, young stellar objects, variable stars, clusters of galaxies, observational cosmology, theory of compact cosmic objects, and astrophysical applications of mathematical physics. The traditional methods for investigations are surveys, spectroscopic, photometric and polarimetric observations, statistics, direct and inverse theoretical problems. The Byurakan astronomers collaborate with scientists of France, Germany, Italy, UK, Spain, Russia, USA, Mexico, Japan, China, India, Chile, and other countries. Though the funding of science in Armenia is at very low level, however the Byurakan astronomers work actively due to the international collaboration and grants, and valuable contribution in science. The main scientific instruments at BAO are: 2.6m telescope, and the 1m Schmidt telescope.

Galactic Astronomy. Kendall, Mauron, Azzopardi & Gigoyan (A&A 403, 929 2003) have discovered seven hitherto unknown L-dwarfs found as a result of a spectroscopic search for distant AGB stars. Their far-red and near-infrared colors are very similar to known dwarfs of the same spectral type. One new object is among the $\sim$ 30 brightest L-dwarfs, with Ks=12.12, and is nearby, $\sim$ 20 pc. Using the low-resolution spectroscopy from the Danish 1.54m ESO telescope, spectral types in the range L0.5-L5 have been derived. Distances are determined from existing calibrations, and together with measured proper motions, yield kinematics for the seven new dwarfs consistent with that expected for the solar neighborhood disk population.

Docobo, Tamazian, Andrade & Melikian (AJ 126, 1522 2003) studied the bright visual binary WDS 23186 + 6807AB. A revised orbit, with period of 1505 yr, and system mass, 3.65 $\pm$ 0.60 Msolar, have been obtained. The total mass is well in accord with estimates from the literature made on the basis of different methods. The G8 III spectral type of the primary is confirmed. Magakian (A&A 399, 141, 2003) has compiled a Merged Catalogue of Reflection Nebulae. Several catalogues of reflection nebulae are merged to create a uniform catalogue of 913 objects. It contains revised coordinates, cross-identifications of nebulae and stars, as well as identifications with IRAS point sources. The catalogue is available in electronic form at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via http://cdsweb.u-strasbg.fr/cgi-bin/qcat?J/A+A/399/141.

Extragalactic Astronomy. Petrosian *et al.* (AJ 125, 86, 2003) have continued studies of the Second Byurakan Survey (SBS) galaxies. The SBS has been defined using two indicators of activity as observed on objective-prism spectra: the presence of UV excess (UVX) in the continuum, or the presence of emission lines (ELs). A comparative study of 524 UVX SBS galaxies and 340 EL SBS galaxies has been undertaken. The parameters used for the comparison were apparent magnitude, redshift, spectral class, luminosity, morphology, activity type, and close environment.

The main results are as follows: 1) In comparison with the UVX method, the EL method allows the creation of a deeper sample of peculiar galaxies; 2) The UVX method covers a larger range of redshifts than does the EL method; 3) Fifty-four active galactic nuclei (AGNs) have been discovered with the UVX and 11 with the EL techniques. Among the EL sample objects, there are no Seyfert-like galaxies of type 1 or 1.5; 4) Star-forming galaxies with $z<0.1$ and discovered via UVX have median luminosity higher than galaxies discovered via EL; 5) UVX and EL active and star-forming galaxies do not show major differences in their distribution of morphological type (the majority are spirals); 6) The UVX and EL samples are similar in their fractions of mergers or interacting systems, as well as the incidence of close pairs or neighbors within $r<50kpc$; 7) The EL method allows the creation of a sample with lower apparent magnitudes and higher redshifts among the low-luminosity ($M>=-17.0$) galaxies and is more efficient at discovering galaxies with compact or irregular morphology.

Kunth, Leitherer, Mas-Hesse, Ostlin & Petrosian (ApJL 597, 2003, in press) have reported the first results from a deep Ly-alpha imaging program of local starburst galaxies with the HST Advanced Camera for Surveys (ACS). Two galaxies: ESO 350-IG038 and SBS 0335-052 have been observed. The ACS imaging reveals a complex Ly-alpha morphology, with sometimes strong offsets between the emission of Ly-alpha and the location of stellar light, ionized gas traced by H-alpha, and the neutral gas. Overall, more Ly-alpha photons escape from the more metal- and dust-rich galaxy ESO 350-IG038. This is contrary to expectations from models which predict a lower escape fraction from dust-rich gas due to destruction of Ly-alpha photons by dust grains. Rather, the results are in qualitative agreement with models suggesting the kinematic properties of the gas as the dominant Ly-alpha escape regulator.

Veron-Cetty, Balayan, Mickaelian *et al.* (A&A, 2003, in press) have undertaken a project of optical identification of ROSAT FSC sources aimed at construction of a complete X-ray selected AGN sample and discovery and study of new bright Seyfert galaxies. The ROSAT FSC catalogue has been cross-correlated with the USNO catalogue limited to objects brighter than O=16.5 and then with the APS database. Each of the 3,212 coincidences was classified using the slitless Hamburg spectra. 493 objects were found to be extended and 2,719 star-like. Samples of galaxies and star-like objects with $O(APS)<17.0$ have been built up, containing 185 and 144 objects, respectively, highly probable AGN. For 34 galaxies and 91 star-like objects new spectra have been obtained, yielding 42 new AGN and increasing their number in the sample to 83. This confirms that surveys of bright QSOs are still significantly incomplete. On the other hand, it is found that, at the X-ray flux limit of 0.02 count/sec and at $m<17.0$, only 40% of all QSOs are detected by ROSAT.

Kandalyan (A&A 398, 493, 2003) has compiled a sample of 61 Markarian galaxies detected in the CO line. Using available HI, element H2, optical and radio continuum data, the analysis of the gas kinematics and the star formation properties for this sample of galaxies was performed. The main conclusions are: (1) The HI and CO line widths are well correlated. Interaction between galaxies has no influence on the CO line broadening. A rapidly rotating nuclear disk in the galaxy might lead to the CO line broadening with less influence on the HI line; (2) The atomic and molecular gas surface densities are well correlated with the blue, FIR and radio continuum surface brightness; however, the correlation for molecular component is stronger; (3) In general, the galaxies with UV-excess do not differ in their star formation properties from the non-UV galaxies.

Kandalyan (A&A 404, 513 2003) has compiled another sample of 9 OH megamaser galaxies detected in the soft X-ray domain. Using available OH and X-ray data a striking correlation has been found between the X-ray luminosity and the width of the OH line. This correlation may indicate that the X-ray heating of a molecular gas may increase the collisional excitation of the maser emission. However, this result should be considered as a tentative one because of the insufficient number of galaxies. An analysis of the saturation states of compact and diffuse components of OH emission was performed. The results of the analysis support the assumption that both the compact and diffuse OH maser emissions in the megamaser galaxies are saturated. The diffuse component might show unsaturated masing under certain conditions, such as the appropriate relation between the intensities of compact and diffuse components and a relevant number of the IR photons to pump the maser emission.

Current Projects. At present, the INI Armenian Branch members carry out 15 large international projects with participation of scientists from the USA, France, Germany, Italy, UK, Spain, Japan, China, Mexico, Russia, and Jordan. A few other astronomers from the Byurakan Observatory are involved as well. In frame of these projects, mutual visits of scientists have been fulfilled and observations with the Byurakan 2.6m, Russian Special Astrophysical Observatory 6m, Observatoire de Haute-Provence 1.93m telescopes, and the Hubble Space Telescope (HST) have been carried out. Observations with the Space InfraRed Telescope Facility (SIRTF) are planned. These projects are: * Investigation of star formation regions in Our Galaxy (T.Magakian, T. Movsessian & E.Nikogossian, with the Armagh Observatory (UK) and MPIA, Heidelberg (Germany) teams); * Jets and Outflows from Young Stellar Objects (T.Magakian & T. Movsessian, with Observatoire de Marseille (France) and Special Astrophysical Observatory (Russia) teams); * Survey for H-alpha emission line stars in dark clouds (T.Magakian, T.Movsessian & E.Nikogossian, with Kokugakuin University (Japan) team); * Search and study of high galactic latitude carbon stars (K. Gigoyan, with Observatoire de Marseille and Montpellier University (France) teams); * Study of late-type variables (N.Melikian & A.Karapetian, with the University of Santiago de Compostela (Spain) team); * Radiative transfer and Solar activity (A.Nikoghossian, with IAP and Paris-Meudon (France) teams); * Study of Supernovae in nearby galaxies (H.Navasardyan, with the Padova University (Italy) team); * Study of Markarian and SBS galaxies (A.Petrosian, with the STScI (USA) team); * Study of Starburst galaxies with HST (A.Petrosian, with the IAP (France) and STScI (USA) teams); * Study of ROSAT AGN (A. Mickaelian, S. Balayan & S. Hakopian, with Hamburg and MPE, Garching (Germany), Observatoire de Haute-Provence (France), INAOE (Mexico) and Beijing Observatory (China) teams); * Optical identification and study of IRAS galaxies (A. Mickaelian, S. Hakopian & S. Balayan, with the Special Astrophysical Observatory (Russia), Observatoire de Haute-Provence (France) and Cornell University (USA) teams); * Spectroscopic study of bright QSOs and Seyferts (A. Mickaelian, with Observatoire de Haute-Provence (France) team); * The Second Byurakan Survey (SBS) (L.Erastova, with UNAM and INAOE (Mexico) teams); * Radio and IR studies of Markarian and megamaser galaxies (R. Kandalyan, with Al-Bayt University (Jordan) team); * Digitization of the First Byurakan Survey (A.Mickaelian, L.Erastova, S.Balayan & K.Gigoyan, with Universita di Roma ''La Sapienza'' (Italy) and Cornell University (USA) teams).

Participation in International Meetings. A. Mickaelian has participated in the IAU GA XXV, Sydney, Australia: Symposium 216 (contributed talk and poster) and Joint Discussion 05 (contributed talk); in JENAM-2003, Budapest, Hungary: Minisymposium No. 4 (2 contributed talks) and No. 6 (poster); and Workshop on AGN Surveys, INAOE, Puebla, Mexico (contributed talk). A joint Byurakan-Abastoumani (Georgia) Colloquium was organized in Byurakan, where almost all members of the INI Armenian Branch participated, and L. Erastova, A. Gyulbudaghian, H. Harutyunian, A. Mickaelian, T. Movsessian and E.Nikogossian presented contributed talks. S.Balayan, A.Karapetian, and H.Navasardyan are currently working on their Ph.D. theses.

Organizational Affairs. H. Harutyunian and A. Mickaelian are the Co-Presidents of the Armenian Astronomical Society (ArAS). T.Magakian is the ArAS Vice-President, and E.Nikogossian, the Secretary of ArAS. A. Gyulbudaghian, H. Harutyunian, T. Magakian, N. Melikian, A. Nikoghossian, and A. Petrosian are members of the Scientific Council of BAO. A.Mickaelian is a member of the Executive Committee of the Euro-Asian Astronomical Society (EAAS) and T.Magakian is a member of the EAAS Scientific-Technical Committee. T.Movsessian is the Head of the Byurakan 2.6m telescope Laboratory, and S.Balayan and K.Gigoyan are its responsible observers. H.Harutyunian, N.Melikian, A.Mickaelian, E.Nikogossian, and A.Karapetian have organized the Byurakan-Abastoumani Colloquium in June 2003.

3. THE INI BULGARIAN BRANCH

The Isaac Newton Institute of Chile established its Bulgarian Branch in July 2000. The formal Agreement was signed with Prof. Georgi Ivanov, head of the Department of Astronomy and the University Astronomical Observatory at the St. Kliment Okhridski University of Sofia. The staff of the Isaac Newton Institute in Bulgaria includes representatives of all astronomical institutions in Bulgaria. These institutions are: the Department of Astronomy at the St. Kliment Okhridski University of Sofia, the Institute of Astronomy and National Astronomical Observatory at the Bulgarian Academy of Sciences, and the Department of Physics, St. Konstantin Preslavski University of Shumen.

The staff of the Bulgarian Branch of Isaac Newton Institute consists of: Aleksander Antov, Ina Barzova, Jordanka Borissova, Peter Duchlev, Tsvetan Georgiev, Valeri Golev, Ilian Iliev, Ljubomir Iliev, Georgi Ivanov, Dimitar Kolev, Renada Konstantinova-Antova, Radostin Kurtev, Diana Kjurkchieva, Dragomir Marchev, Haralambi Markov, Neviana Markova, Bojko Mihov, Petko Nedjalkov, Georgi Petrov, Tatiana Russeva, Liuba Slavecheva, Ivanka Stateva, Nikolai Tomov, Mima Tomova, Todor Veltchev, and Ivanka Yankulova. The Resident Director of the INI Branch in Bulgaria is Valeri Golev, the head of Department of Astronomy since October 2003.

Founded in 1894, the Astronomical Observatory and Department of Astronomy of St. Kliment Okhridski Sofia University is the oldest astronomical institution in Bulgaria which is the only one responsible for the university education at all three levels (bachelours, masters and doctors) in the field of astronomy and astrophysics in Bulgaria. Having a staff of 10 employers, the scientific activities of the Department cover the fields of stellar content of Local Group galaxies, OB associations, WR stars, AGNs, stellar pulsations and variable stars.

The Institute of Astronomy together with its National Astronomical Observatory at Rozhen, Rodopa Mountain, is the biggest astronomical institution in Bulgaria. The staff of Institute consists of about 70 employers both in Sofia and the Observatory. The Rozhen Observatory is the only major observatory in Bulgaria with its 2m Ritchey-Chretien-coude reflector and three smaller telescopes (60cm Cassegrain, 50/70 Schmidt camera, and a solar instrument). For more than 30 years the Rozhen Observatory was the biggest in South-East Europe yielding precedence to the 2.3m telescope of the Greeck National Observatory since fall of 2003. The main activities of the staff of the Institute of Astronomy are: to carry out fundamental research programs in a broad range of fields in astronomy and astrophysics, and to maintain and secure the observational programs at Rozhen Observatory. The Institute of Astronomy of the Bulgarian Academy of Sciences was established in 1954. Its staff also maintain a smaller observatory around the town of Belogradchik in the Nort-West part of the country where two small telescopes operate.

The St. Konstantin Preslavski University of Shumen was established 40 years ago as a regional university for North-East part of Bulgaria. Since 30 years some essential astronomical courses are offered there by the Department of Physics where two astronomers are employed as a staff members.

So far 12 papers have been published in 2003 by the staff of the Bulgarian Branch of the Isaac Newton Institute of Chile. During the year the staff members of the Bulgarian Branch are actively working in different fields of astrophysics. The scientific highlights of the most significant papers can be summarized in two broad main fields:

1) Astrophysics of the star clusters in our Milky Way and nearby galaxies as well as the astrophysics of the Local Group galaxies. Alcaino *et al.* (A&A 400, 917, 2003) performed a new UBVI photometric study of the SMC star cluster NGC 458. In the subsequent paper the first UI photometric study of the SMC stellar cluster Lindsay 1 was reported (Alcaino *et al.*, A&A 407, 919, 2003). The reddening, the metallicity and the age of the cluster are determined. Ivanov *et al.* (A&A 394, L1, 2002) discovered a new Milky Way star clusters candidate using the 2MASS Point Source Cata-

log. In a second paper of this series (Borissova *et al.*, A&A accepted, 2003) the physical properties of the 2MASS new obscured Milky Way stellar cluster CC 01 were discussed. The first deep J, H, and KS imaging of the cluster is presented. Valdez-Gutierrez *et al.* (AJ 124, 3157, 2002) have unveiled the kinematics and dynamics of the ionized gas in the nearby irregular galaxy NGC 4449. A catalogue of OB associations in the faint irregular Local Group galaxy NGC 1613 was presented by Borissova *et al.* (A&A accepted, 2003). The purpose of the paper, the fourth of IC 16131 series of the authors, is to outline new boundaries of the associations in this galaxy.

2) High-resolution spectroscopy with the coude spectrograph of the 2m RCC telescope of Be-stars, compact binaries, cataclismic variables, symbiotic stars. Duemmler *et al.* (A&A 395, 885, 2002) performed a study of the radial velocities and physical parameters of HD553. In the context of the properties of the OB-stars in our Galaxy Markova *et al.* (A&A accepted, 2003) investigated the mass loss and wind momentum rates of 29 Galactic O-type stars with luminosity classes I, III, and V in the framework of a pure Ha profile analysis accounting for the line-blancketing. Continuing their program, (see A&A 386, 584, 2002) Kjurkchieva and Marchev, the branch members from Shumen University, report the spectroscopic observations of the RS CVn-type star CV Cyg (Kjurkchieva *et al.*, A &A 400, 623, 2003) as well as the spectroscopic and photometric observations of the short-period RS CVn-type star ER Vul (Kjurkchieva *et al.*, A&A 404, 611, 2003). The masses and radii as well as the equatorial velocities of the components of these binaries were determined. Tomov *et al.* (A&A 401, 669, 2003) contributed on properties and nature of mass ejection by the symbiotic binary star Z And during its 2000-2002 outburst. Semkov (A&A 404, 655, 2003) performed a photometric and spectroscopic study of the variable star V 1184 Tau associated with Bok globule CB 34 and considered as a FU Ori object.

4. THE INI CRIMEAN BRANCH

The Isaac Newton Institute opened a Branch in Crimea, in September 1997. The formal Agreement was signed by Gonzalo Alcaino in Nauchny with Prof. Nikolay Steshenko, Director of the Observatory. Thereafter, the agreement, between the Crimean Astrophysical Observatory of Ukraine and the Isaac Newton Institute of Santiago, Chile, was endorsed in an official document signed in Kiev by the Ministry of Sciences and Technology of Ukraine, represented by the Vice-Minister, Y.Dotsenko.

The current staff of the Isaac Newton Institute in Crimea are: Ilya Alekseev, Valery Bochkov, Natalya Bondar, Elena Dmitrienko, Valentina Doroshenko, Vasily Haneychuk, Lyudmila Karachkina, Olesya Kozlova, Valery Kotov, Victor Malanushenko, Nelly Merku- lova, Lubov Metik, Marina Mitskevich, Elena Pavlenko, Sergei Plachinda, Nina Polosukhina, Valentina Prokof'eva-Mikhailovskaja, Iraida Pronik, Vladimir Pronik, Igor Savanov, Sergey Sergeev, Elena Sergeeva, Nikolai Shakhovskoy, Alina Streblyanskaya, Anatoly Tarasov, Taisiya Tarasova, Teodor Tsap, Yuri Tsap and Yuri Yefimov. The Resident Director of the INI Branch is Nelly Merkulova.

The Crimean Observatory was the first major observatory of the former Soviet Union (FSU) to enter the age of astrophysics. The beauty of the observatory site, the telescopes and the instruments together with a rich history and the current scientific activity of the astronomers make the Observatory a quite attractive place. For many years it was unique in combining active scientific research with teaching for students and tutorials in astrophysics. Many astrophysicists of FSU were trained at the Crimean Observatory. Now the Crimean Astrophysical Observatory (CrAO) remains one of the largest scientific centers in the Ukraine and the FSU.

CrAO possesses modern equipment for astrophysical observations over a wide spectral range from gamma-rays to meter radio waves of stars and galaxies as well as the Sun and solar system. The main part of the observatory is located at Nauchny, at an altitude of 600 meters. The instruments in use are: the 2.6-m Shajn telescope, two 1.25-m telescopes, the 1.0-m Solar Tower telescope as well as a few other instruments. There are 350 employees including about 100 scientists.

The members of the Crimean Branch are actively working in different fields of astrophysics. Due to scientific interests, they entered on the 8 scientific projects:

Project 1: ''Compact binaries: Cataclymic variables, black holes, symbiotic stars.'' Investigators: Elena Pavlenko, Elena Dmitrienko, Anatoly Tarasov, and Natalya Bondar'. The aim of this project is to investigate the behaviour of binaries in order to study pecularities of their evolution. Active in photometric, polarimetric and spectroscopic observations using the 2.6-m telescope equipped with a CCD Camera and a 1.25-m telescope equipped with a 5-channel, UBVRI photometer-polarimeter as well as a few other small telescopes.

Project 2: ''Surface anomalies of the chemically peculiar stars.'' Investigators: Victor Malanushenko, Igor Savanov, Marina Mitskevitch, and Nina Polosukhina. The aim of the project is to broaden the knowledge of the pecularities of the atmospheres of the chemically peculiar stars of the upper main sequence, using the coude spectrograph of the 2.6-m telescope.

Project 3: ''Continuum and emission lines variability in active galactic nuclei.'' Investigators: Vladimir Pronik, Sergey Sergeev, and Elena Sergeeva. The objective of this project is to investigate in detail the variability of emission lines in the spectra of active galactic nuclei. The observations are performed on the 2.6-m telescope with a CCD detector.

Project 4: ''Variability of active galactic nuclei in optical and infrared continuum.'' Investigators: Iraida Pronik, Nelly Merkulova, and Lubov Metik. The objective of the project is the detailed investigation of the continuum variability of active galactic nucei in time scales of hours, days, months, and years using tight series of the observations which have been carried out at the Crimean Observatory since 1989 using the 1.25-m telescope equipped with the UBVRI double-image chopping photometer-polarimeter.

Project 5: ''Study of selected blazars structure from photometry and polarimetry.'' Investigators: Yuri Yefimov and Nikolai Shakhovskoy. The main purpose of the project is to study the structure of some bright blazars using prolonged (several years) simultaneous photometric and polarimetric observations in optical regions from ultraviolet to near infrared. The observations are carried out with the 1.25-m telescope equipped with UBVRI double-image chopping photo-polarimeter.

Project 6: ''Seismology of the Sun and stars.'' Investigators: Valery Kotov, Teodor Tsap, and Vasily Haneychuk. The aim of this project is to improve our knowledge about the Solar interior, rotation, magnetic activity and cycle using the observations of the global Solar oscillations and mean magnetic field of the Sun obtained with the Solar Tower telescope.

Project 7: ''Solar and stellar activity.'' Investigators: Sergei Plachinda, Taisiya Tarasova, Ilya Alekseev, Olesya Kozlova, and Yury Tsap. The aim of the project is to study magnetohydrodynamical processes and magnetic activity on the Sun and on the main- and pre-main sequence cool and red stars. Investigations are based on the theoretical researches, numerical simulations, direct measurements of stellar magnetic fields, photometric and spectrophotometric observations, obtained with the use of the 2.6-m Shajn telescope equipped with Stokesmeter, and 1.25-m telescope equipped with a 5-channel, UBVRI photometer-polarimeter.

Project 8: ''Physical researches of Solar system small bodies.'' Investigators: Valentina Prokof'eva-Mikhailovskaja, Lyudmila Karachkina, and Valery Bochkov. The aim of this project is to broaden the knowledge on structures and surface characteristics of asteroids belonged to different spectral types and different asteroid's families. The 0.5 meter meniscus telescope coupled with the high sensitive digital television system is used for photometric and spectrophotometric observations of asteroids.

V.T. Doroshenko, N.I. Merkulova, V.I. Pronik, S.G. Sergeev and E.A. Sergeeva participated in the international program of an intensive 13 year study of variations of the optical continuum and broad H-beta emission line in the Seyfert 1 galaxy NGC 5548 (B.M.Peterson *et al.*, 2002). It was shown that the H-beta variations follow the continuum variations closely, with a typical time delay of about 20 days. A year-by-year analysis shows that the magnitude of emission-line time delay is correlated with the mean continuum flux.

The most full light curve of Mrk 6 in UBV-bands for 1970-2001 obtained in main by the author (V.T. Doroshenko, 2003), shows the amplitudes of variability of about 1.6, 1.1 and 0.8 mag in UBV, respectively. Observed Structure Function is interpreted by the superposition of independent flares model with maximal duration of flares of about 800 days. If these flares are located in the radiation pressure dominated region of the accretion disk, the size of this region is about 70, 330 Rsh, assuming the viscous parameter is 0.1, 0.01, respectively.

The archive spectra of the nucleus of Mrk 6 obtained in 1970-1991 at the 2.6-m telescope of Crimean Astrophysical Observatory in H-alpha and H-beta regions showed that the blue segment of H-beta emission line responds slightly better to the continuum changes than the red one. If the broad profile of H-beta line consists of at least two components with fixed profiles, so one of them is nearly symmetric and has a single peak, while the other has a blue bump and extended red wing. The evolution of the observed H-beta profile is reproduced by changes in the relative strength of the two variable components (V.T.Doroshenko and S.G.Sergeev, 2003).

E.P. Pavlenko and O. Atoniuk participated in an intensive photometric-observation campaign of the recently discovered SU UMa-type dwarf nova, Var73 Dra (D.Nogami *et al.*, 2003). The recurrent cycle of the superoutburst (supercycle) is indicated to be about 60 days. The superhump periods measured during two superoutbursts were 0.104885(93) days, and 0.10623 (16) days, respectively.

A.E. Tarasov (A.E. Tarasov, C. Brocksopp and V.M. Lyuty, 2003) carried out high-resolution H-alpha monitoring of Cyg X-1 (HD 226868) during 1996-2002 and resultant spectra analysed in conjunction with 1.5-12 keV X-ray monitoring. It is demonstrated that H-alpha line-profiles have complex variability on different timescales, controlled in particular by the orbital and the focused wind model of mass loss. It is shown that during the high/soft X-ray state and flaring the effect of photoionization the line-profile and EW of H-alpha increases but is still unable to describe the loose anti-correlation between EW and the low energy X-ray emission.

A.E. Tarasov (J.S. Clark, A.E. Tarasov and E. Panko, 2003) carried out 18 years long high resolution and S/N H-alpha spectroscopy of the Be shell star omicron And obtained between 1985-2002. Analysis of the evolution of the properties of the H-alpha shell profile suggest that the disk kinematics are dominated by rotational motion. It has been shown that disk loss in omicron And occurs ''inside out''; authors find that the disk also appears to be rebuilt in a similar manner, with disk material gradually diffusing to larger radii. That is consistent with the predictions of the viscous decretion disk model for Be star disks.

A.E. Tarasov obtained new light and radial-velocity curves of BD 61 2213, a binary in the open star cluster NGC 7160 (K.Yakut *et al.*, 2003). The solution allowed us to derive the basic physical properties of this massive, short period binary. It was found that the observed light variations consists of a strong ellipticity effect and small contribution from grazing eclipses. A comparison of masses and radii with theoretical evolutionary tracks indicates that both binary components are very close to the zero-age main sequence. Distance to the cluster NGC 7160 was found to be about 760 pc which agrees well with other available estimates.

The quasisimultaneous photometric, polarimetric and spectroscopic observations of the RS CVn type variable MS Ser (I.Alekseev and O.Kozlova, 2003) showed that starspots, chromospheric plages and magnetic regions on this star are concentrated near two active longitudes. Starspots are localized at the middle latitudes. Their areas are up to 21 percents of the stellar surface, and spot umbrae are 1300 K cooler than the quiet photosphere.

S.I Plachinda and his co-authors (F.Leone *et al.*, 2003) established that beta Lyrae kG-order magnetic field variations with orbital period have changed in sign and strength between 1980 and 2000.

High-resolution spectroscopy of the FUors FU Ori and V1057 Cyg between 1995 and 2002 resulted in discovery of periodic modulations in the wind structure of FU Ori at H-alpha, with a period of 14.8 days, which is believed to be a rotational period of FU Ori. In spectra of both FUors the photospheric lines also vary in shape but with a shorter period. Detailed comparison of the observed spectra with synthetic spectra of accretion disc revealed some critical differences. It is concluded that a rapidly rotating star near the edge of stability may better account for these observations. (G.Herbig, P.Petrov, R.Druemmler, 2003).

P.P. Petrov participated in synoptic study of the photometric and spectroscopic variability of the classical T Tauri star AA Tau on time scales from hours to weeks which provided the first clear evidence for large scale instabilities developing in the magnetosphere of T Tauri star as the magnetic field lines are twisted by differential rotation between the star and the inner accretion disk (J.Bouvier *et al.*, 2003). The interaction between the accretion disk and the stellar magnetosphere thus appears to be highly dynamical and time dependent process. In addition, periodic radial velocity variations of the photospheric spectrum was discovered, which might point to the existence of a $0.02M_\odot$ object orbiting the star at a distance of 0.08 AU.

N. Polosukhina and co-authors (A. Shavrina, N. Polosukhina *et al.*, 2003) carried out a detailed analysis of spectra of the unique roAp star HD 101065 (Przybylski's star) near the resonance doublet LiI 6708 A, using a most complete line list and model calculations. The resulting Li abundance is 3.1 dex (in the scale lg N(H)=12.0), while the isotopic ratio Li-6/Li-7 is near to 0.3.

I. Savanov and S. Hubrig (2003) tested the hypothesis of an anomalous concentration of Cr in the upper layers of the atmospheres of a sample of 10 HgMn stars. All lines used are formed at different depths in the stellar atmosphere. Except for HD 49606, all HgMn stars show an increase in Cr abundance with height in the stellar atmosphere. A similar vertical distribution of Cr, but less pronounced, has been previously found in Am stars.

V.I. Haneychuk, V.A. Kotov and T.T. Tsap (2003) have published the new data on the mean magnetic field of the Sun (MMFS) as a star measured at the Crimean Astrophysical Observatory in 1998-2001. Their analysis of the full 34-year time series of the MMFS (using the similar data from three other observatories, 1968-2001, with the total number of daily MMFS values N = 12428) shows that the primary synodic period of the equatorial rotation of solar magnetic field, 26.929 days, did not vary over the last 34 years, but the average intensity H of the photospheric large-scale fields, by modulus, decreased by about 4.5 percent. The conclusion is made that the longer, 90-year, cycle might be responsible for this potential gradual decrease of H.

Daily values of the mean magnetic field (MMF) of the Sun-as-a-star performed in 1968-2001 by four observatories, were analysed. It is found that the MMF distribution is normal for measurements of the CrAO and Sayan magnetographs, but it deviates substantially from the normal one for the Mount Wilson and Stanford instruments. The physical nature of this abnormity is unknown (V.A.Kotov, 2003).

5. THE INI KAZAKHSTAN BRANCH

The Isaac Newton Institute opened its Branch in April 2000. The formal Agreement has been signed with Prof. Anatoliy Kurchakov, Director of the Fesenkov Astrophysical Institute of Kazakhstan.

The staff of the Isaac Newton Institute in Kazakhstan are: Gauhar Aimanova, Leonid Chechin, Edward Denissyuk, Sergey Efimov, Vladimir Kardopolov, Andrey Kharitonov, Ludmila Knyazeva, Ludmila Kondratyeva, Anatoliy Kurchakov, Tuken Omarov, Chingiz Omarov, Larisa Pavlova, Marina Rud, Lubov Shestakova, Vladimir Tereshchenko, Rashit Valiullin and Emmanuil Vilkoviskij. The Resident Director of the INI Branch is Anatoliy Kurchakov.

The beginning of the history of astronomy in Kazakhstan was connected with the such remarkable event as the Solar eclipse, that has taken place in September 21 of 1941. When the observations of the solar eclipse were completed, some astronomers from Moscow and Leningrad stayed in Alma-Ata and organized The Institute of Astronomy and Physics. Then, in 1950 the Astrophysical Institute was distinguished from as a self-maintained organization.

The actual staff of Institute consists of 122 members, 60 of them are scientific researches. The major activities are: physics of nebulae and star-forming regions, dynamics of gravity systems, absolute spectrophotometry of stars, study of active Galaxies, physics of the Moon and planets, Solar physics, the artificial Earth's satellites.

The Institute manages the following two observatories: (1) The Observatory (Almaty, Kamenskoe Plato) which possesses: - 70 cm telescope (Cassegrain), equipped with spectrograph for study of emission objects, such as galaxies with active nuclei, planetary nebulae, stars with emission spectra. - 60 cm telescope (Cassegrain) of ''Karl Zeiss'' enterprise. It is used for the study of planets. (2) Assy-Turgen Observatory (Zailijskoe Ala-Tau, Assy-Turgen plato) possesses: - 1-m telescope of ''Karl Zeiss'' enterprise, which is in use since 1981; This instrument is equipped with electrophotometer for measurement of polarization of object's radiation, and a spectrograph for a study of nebulae and stars. It has as well a 1.5m telescope.

The main scientific achievements can be summarized as: The atlases of nebulae, which became the world standards;

-The spectrophotometric catalogue contained the data on the energy distribution in the spectra of thousands of stars;

-The spectral Catalogue of some dozens of Planetary Nebulae;

-The discovery of some peculiar objects representing the transient stage between a star with extended atmosphere and a planetary nebula;

-The multicolor photoelectric observations of more than twenty irregular stars;

-The estimation of the formation epoch of the galactic clusters. The new method of structure dynamics based on the corresponding generalization of the Infeld's method in the common relativity;

-Discovery of some moving features in spectra of some Sey-

fert galaxies;
-The revealing of the altitude variations, dividing stratosphere aerosolize into layers, based on monitoring of atmosphere;
-The large cycle of the searches on analysis of the zonal structure of Jupiter's cloudy cover.

In 2003 the study of HAEBE stars was carried out by A. Kurchakov and his colaborators at the Assy-Turgen Observatory. A ST-7 CCD 765×510 , 0.009mkm was used for photometry and a ST8 CCD 1530×1020, 0.009mkm - for the spectral observations. Those stars with bipolar structure of their envelopes are known to show variability of observed parameters. Calculations of values and orientations of the own polarization were done for 21 AeBe Herbig stars. During 2003 the spectral and photometric observations of planetary nebulae were continued by Kondratyeva L. Data for 6 planetaries with the strong [NII] emission lines were analyzed. It was shown that only two of them appeared to be ''N-rich'' objects, but in other planetaries the high [NII]/H(alpha) relation is evidently specified by mechanisms of emission forming; for example, by collisional exciting of hydrogen lines. A possible influence of circumstellar envelopes on observable properties of young low-massive stars was considered by L. Pavlova. On the basis of numerous polarimetric and photometric observations of the young variable stars an analysis of possible evolution tracks for different types of variability was developed by V. Kardopolov and M. Rud. Spectrophotometric observations of 10 stars, which are known to have planetary systems, were carried out by V. Tereshchenko. The distributions of energy in their optical spectra were obtained. Problems of the small bodies thermo-disintegration in process of their approach to the Sun, were considered by L. Shestakova. An analysis of a behavior of a cold gas, which was formed after destroying and evaporating of chain of small bodies, orbiting close to the Sun, was carried out. In 2003 the spectral observations of some Seyfert nuclei were continued (70-cm telescope, spectrograph+ST-8 CCD). NGC 4151, 3516, 5548, Mrk 3, 6, 474, 618, 1095 were studied in order to search for any type of variability in spectra or brightness of these objects (E. Denissyuk, R. Valiullin). A behavior of the wide H(alpha) component in the spectrum of NGC 4151 over long period was analyzed. The theoretical group (E. Vilkoviski and S. Efimov) carried out the research on a problem of a role of radiation pressure in the matter outflows from various high luminosity astrophysical objects: hot stars and active galaxies. In particular, the opportunity is shown, that the separate groups of the ions with the strong resonance lines may be accelerated up to velocities at which nuclear reactions (due to collisions of the ions with protons) become possible. The theory of matter outflow from AGN is created, and the numerical model is worked out, which permits to calculate the absorption spectra of BALQSOs and Seyfert galaxies, both in the UV and X-ray bands. The investigations on stability and dynamical evolution of collisionless gravitating systems has been carried out by T. Omarov and his collaborators. Based on the previous results on the investigation of instability of oscillating gravitating systems, a non-linear analysis of stability of a self-gravitating spheroid was analytically and numerically implemented. An extended approach to the scalar theory of gravitation was suggested and developed, which is based on utilization of space-time tensor of deformation at the initial conditions of symmetry. The method has turned out to be rather effective for the solution of the wide-range of the non-stationary problems of relativistic astrophysics and cosmology. In the field of celestial mechanics the integrated case of non-stationary Hamilton-Jocoby' equation was found, which is a generalized case of Darbu-Demin's integrality. A non-stationary scheme of the restricted photo-gravitating problem of 3-bodies, taking account of influence of the gravitating background of interstellar medium was suggested.

6. THE INI KAZAN BRANCH

The Isaac Newton Institute opened its Kazan Branch in March 2003. The formal agreement has been signed with Prof. Nail Sakhibullin, Director of the Engelgardt Astronomical Observatory and Head of the Astronomy Department of Kazan State University in Russia. The Kazan State University was established in 1804 and it is one of the oldest universities in Russia with high scientific potential. Kazan is one of the biggest and oldest cities in Russia, lying on the river Volga, about 750 km east of Moscow. The staff members belong to both astronomical centers in Kazan and Udmurt State University (Izhevsk city).

The staff of the Isaac Newton Institute in Kazan are: Almaz Galeev, Askar Ibragimov, Ludmila Mashonkina, Vitalij Neustroev, Antonina Nefedjeva, Yuri Nefedjev, Naufal Rizvanov, Nail Sakhibullin, Ramil Shaimukhametov, Valery Suleimanov, Vladislav Shimansky and Nelli Shimanskaya. The Resident Director of the INI Branch is Valery Suleimanov.

The Astronomy Department of Kazan State University is oldest Astronomy Department in Russia. It was established in 1810. One of the first students of the Astronomy Department was Nikolaj Lobachevsky. The staff of the Department includes two professors, eight associated professors, five tutors and seven scientific researchers. The main fields of research are stellar atmospheres, chemical evolution of Galaxy, accretion disks, pre-cataclysmic and cataclysmic variable stars, CCD photometry of variable stars, gravitational lenses and X-ray sources, celestial mechanics, meteors and geodesy.

The Engelgardt Astronomical Observatory of Kazan State University is one of the best known astronomical observatories in Russia. It was opened in 1901 in twenty seven kilometers on west from Kazan. The current staff of the observatory consists of about 10 scientists, including three professors. The research areas are astrometry, selenodesy, meteor astronomy.

The Astronomy Department and Engelgardt Astronomical Observatory have two mountain observational bases.

1. In 1975 the North-Caucasus Astronomical Station was built near 6-m telescope (BTA) of Special Astrophysical Observatory of the Russian Academy of Science. The main telescope is a 40-cm Zeiss astrograph for observations of variable stars, asteroids and comets. A few new asteroids were discovered by using this astrograph.

2. In 1998 a new joint 1.5-m telescope of Kazan University, which is now named RTT150 (Russian-Turkish Telescope), has been installed at the TUBITAK National Observatory (Turkey). This is a joint instrument of Kazan State University, Space Research Institute (Russia), and TUBITAK (Turkey). The Observatory is located near of Antalya (Turkey) at the distance of about 50 km at the altitude of 2500 m above sea level. This telescope is equipped with 2k×2k CCD cameras and will be equipped with spectrometers in a near future. A CCD photometry of a variable stars, gravitational lenses, and gamma-ray/X-ray sources are carried out at the present time. For example, one of the brightest optical afterglow gamma-ray bursts, in March 29, 2003, has been observed during few months.

The researchers incorporated into the Isaac Newton Branch are working in the following three fields of investigations:

Project 1: ''Abundances of chemical elements in stellar atmospheres.'' Researchers: Nail Sakhibullin, Ludmila Mashonkina, Nelli Shimanskaya, Almaz Galeev and Vladislav Shimansky. The aim of the project is the LTE and non LTE analysis of chemical composition of solar-like stars. The high dispersion spectral observations from western observatories, 6-m telescope SAO (Russia) and 2-m telescope of the Ukrainian Terscol Station are used. These investigations give an observational restriction on chemical evolution of Galaxy.

Project 2: ''Accretion disks and related astrophysical objects.'' Researchers: Valery Suleimanov, Askar Ibragimov, Vladislav Shimansky, Nail Sakhibullin, Vitalij Neustroev. The aim of the project is investigations of different types of astrophysical objects with accretion disks, such as cataclysmic variables, supersoft X-ray sources, Galactic black hole candidates and active galactic nuclei. The close binary systems without accretion disks but with strong irradiations of secondary stars are investigated too. These researchers give a better understanding of the physical processes in accretion disks and parameters of accretion disks and close binary systems.

Project 3: ''Astrometry and selenodesy.'' Researchers: Naufal Rizvanov, Antonina Nefedjeva, Yuri Nefedjev and Ramil Shaimukhametov. The aim of this project is investigation of different modern astrometric catalogues accuracy and the border zone of the Moon.

7. THE INI KIEV BRANCH

The Isaac Newton Institute opened its Branch in August 2000. The formal Agreement has been signed with Prof. Peter Berczik, Deputy Director, Main Astronomical Observatory in Kiev of the National Academy of Sciences of Ukraine.

The staff of the Isaac Newton Institute in Kiev are: Peter Berczik, Yurij Fedorov, Victor Khalack, Pavel Korsun, Yurij Kyzyrov, Pavel Malovichko, Sergey Nosov, Yakiv Pavlenko, Boris Shakhov, Leonid Shulman and Boris Zhilyaev. The Resident Director of the INI Branch is Boris Zhilyaev.

The Main Astronomical Observatory (MAO) of the National Academy of Sciences of Ukraine came into being in 1944. The Observatory is situated 12 km from the centre of Kiev, in the Golosiiv forest. Since 1975 MAO is headed by Ya.S. Yatskiv, Member of the NAS of Ukraine. The departments of fundamental astrometry, photographic astrometry, solar physics, and astrophysics were organized in 1958. At present MAO includes the departments of astrometry, physics of stars and galaxies, cosmic geodynamic, cosmic plasma physics, physics of bodies of the solar system, solar physics, the department of experimental astrophysics and atmospheric optics, astrospace information and computing centre. The Observatory offers postgraduate studentship and has a special academic council for conferring candidate's and doctor's degrees in astronomy, astrophysics and engineering sciences. The Observatory Library contains some 66,000 printed books and journals. MAO has a publishing department, experimental designing subdivisions, etc. MAO publishes the journals Kinematics and Physics of Celestial Bodies and Space Science and Technology and the Astronomical Calendar.

In 1970-1991 the Astrophysical Observatory on Peak Terskol in the Northern Caucasus (altitude 3100 m, near mountain Elbrus) was constructed by MAO as its high-altitude observation station. At present this observatory is a joint venture of the NAS of Ukraine and the Russian Academy of Sciences. It forms part of the International Research Centre for Astronomy, Medicine and Ecology. This Centre is headed by Dr. V. Taradii. The equipment of the Terskol Station consists of the 2-meter Ritchey-Chretien telescope, the Zeiss-600 telescope and two solar telescopes. Fedorov, Yu.I. and Shakhov, B.A. reported on a work the propagation of energetic charged particles in a magnetic field with a homogeneous regular component. On the basis of the Boltzmann equation the analytical expressions for particle density and anisotropy are derived under instantaneous isotropic injection of particles into the scattering medium. Starting from the set of equations for spherical harmonics of the distribution function the new transport equation taking into account the second harmonic has been carried out. The solution of this transport equation is reached and comparison with analytical solutions of the kinetic equation is performed. The telegraph equations for particle density and flux are derived and their solutions are analyzed. The transport of energetic particles under multiple small angle scattering is considered.

Khalack, V.R. *et al.* reconstruct the complex magnetic field in the Ap star HD 187474 within the frame of the point field source model, where virtual magnetic charges are distributed in the stellar body. The best-fit model describes sufficiently well the observed nonsinusoidal variability of the mean magnetic field modulus and the sinusoidal behaviour of the mean longitudinal magnetic field with the phase of stellar rotation. The best fit provides discrepancy on the level of chi 2=6.10 for all the analyzed data. We show that in HD 187474 the magnetic dipole is displaced from centre of the star by 0.055 Rstar. The dipole has a size ~0.035 Rstar. The angle between the stellar rotational axis and the magnetic dipole is beta =37degr.

8. THE INI MOSCOW BRANCH

The Isaac Newton Institute opened its Branch in Moscow in June 1992. The formal Agreement was signed with Prof. A.A. Boyarchuk, at that time Director of the Institute of Astronomy of Russian Academy of Sciences and the President of the IAU, and Prof. Anatoly Cherepashchuk, Director of the Sternberg Astronomical Institute of Lomonosov Moscow University.

The Institute of Astronomy was established as the Astronomical Council of the USSR Academy of Sciences on December 20, 1936. Originally, the organization had mainly coordination functions in the Soviet astronomy. After the 2nd World War, it started its own scientific research. Together with the Sternberg Institute, the Astronomical Council participated in the work on the General Catalogue of Variable Stars, on behalf of the IAU. The scientific activity of the Astronomical Council considerably expanded after the launch of the first Sputnik, the Council became responsible for observations of artificial satellites and their use for space geodesy, geodynamics, and geophysics. Besides, it was engaged in basic research in the fields of physics and evolution of stars, solar activity, physics of the Moon, stellar spectroscopy. In 1958, it established an observatory near Zvenigorod (Moscow Region). In December 1990, the Astronomical Council, already being in fact a scientific institute for many years, was formally reorganized into the Institute of Astronomy of the USSR Academy of Sciences (since 1991, the Institute of Astronomy of Russian Academy of Sciences). The Institute's new Director appointed in 2003, Prof. B.M. Shustov, continues providing support to the activities of the Moscow Branch of the Isaac Newton Institute.

The history of Sternberg Astronomical Institute begins as early as in 1831, when the Moscow University established an observatory in Presnya district of Moscow. The present name of the Institute is after P.K. Sternberg, Professor of Moscow University and Director of its observatory, an expert in photographic observations of the sky as well as in geodesy, and also an active participant of the 1917 revolutionary events in Russia. In 1931, three astronomical institutions of Moscow: Research Institute for Astronomy and Geodesy, State Astrophysical Institute, and the University Observatory merged to form Sternberg Astronomical Institute. This research institute is the base for astronomical education in the Moscow University. Its fields of research cover practically all fields of modern astronomy and astrophysics.

The staff of the Isaac Newton Institute Moscow Branch now includes Sergei Antipin, Leonid Berdnikov, Dmitry Bizyaev, Yuri Dumin, Yuri Efremov, Andrew Fokin, Alexander Ipatov, Natalia Katysheva, Alexander Khoperskov, Sergei Lamzin, Oleg Malkov, Alexey Mironov, Vladimir Obridko, Anatoly Piskunov, Sergei Popov, Nikolai Samus, Sergei Shugarov, Vladislav Sidorenko, Olga Silchenko, Gregory Tsarevsky, Boris Yudin, and Alexander Zakharov. The Resident Director of the INI Branch is Nikolai Samus.

In 2002–2003, Olga Silchenko studied properties of stellar populations in nearby galaxies. A single globular cluster discovered earlier in the dwarf spheroidal galaxy DDO 78 belonging to the M 81 group was shown to be an intermediate-metallicity, red-HB globular cluster similar to NGC 362 in our Galaxy. A new long-term project has been started, aimed at studies of star formation histories in the nuclei of central galaxies of the nearby groups. The first results concerning the Leo I group are very promising: in the three brightest galaxies of the group, the E galaxy NGC 3379, the S0 galaxy NGC 3384, and the Sa galaxy NGC 3368, there exist coplanar circumnuclear stellar disks decoupled from the large-scale galactic bodies, and at least in two of them, in NGC 3384 and NGC 3368, these disks were formed simultaneously, $\sim$3 Gyr ago.

Dmitry Bizyaev carried out hydrodynamics modeling of ring galaxy formation, showing that the maximum radial expansion velocity of gas in the first ring (v_{gas}) was invariably below the propagation velocity of the first gas ring itself (v_{ring}). Modeling of the Cartwheel galaxy indicates that the outer ring is currently propagating at $v_{ring} \sim 100$ km/s, while the maximum radial expansion velocity of gas in the outer ring is currently $v_{gas} \sim 65$ km/s. Using observing data, it was demonstrated that the radial Hα surface brightness profiles did peak exterior to those at K and B bands. The angular difference in peak positions implies $v_{ring} = 110$ km/s, which is in agreement with the model predictions.

Leonid Berdnikov continued his observational studies of Cepheids. The variable star T Antliae, sometimes suspected to be a type II pulsator, was demonstrated to be a classical Cepheid in the third crossing of the instability strip. It exhibits a positive period change, with no random fluctuations in pulsation period but with some indications of orbital motion about an unseen companion. Leonid Berdnikov and Nikolai Samus participated in a detailed study of Hipparcos and Cousins photometry for Hipparcos M, S, and C spectral type stars.

Sergei Lamzin studied young variable stars, including very important magnetic phenomena. A weak circular polarization was found in photospheric absorption lines of T Tauri on two occasions, indicating a mean surface longitudinal magnetic field of respectively 160 ± 40 and 140 ± 50 G, much below the values earlier reported by other authors.

Boris Yudin continued his studies of interesting variable stars in the infrared. The results of UBVJHKLM photometry of R CrB spanning the period from 1976 to 2001 were analyzed. In the L band, semi-regular oscillations were revealed. The colors of the warm dust shell were found to be remarkably stable, in contrast to its brightness. This indicates that the inner radius is a constant, time-independent characteristic of the dust shell. The stellar wind of R CrB deviates from spherical symmetry and is variable. The parameters of the dust shell were derived.

Oleg Malkov compared radii of eclipsing binary components and single stars. He found a noticeable difference for B0V-G0V components of eclipsing binaries and single stars of the corresponding spectral types. This difference can be confirmed by a re-analysis of results from other published investigations and, in particular, it can explain the disagreement between published scales of bolometric corrections. The A- and F-type main sequence eclipsing binaries have larger radii and/or higher temperatures than single stars, while B-type eclipsing binaries have smaller radii. It is concluded that the mass-luminosity relation based on empirical data for eclipsing binary components cannot be used to derive the stellar initial mass function. While our current knowledge of the empirical mass-luminosity relation for masses exceeding $1.5 M_{\odot}$ is based exclusively on eclipsing-binary data, accurate observational data for a few hundred visual binaries of intermediate and high masses should be collected. Then the initial mass function for this mass range should be revised.

9. THE INI ODESSA BRANCH

The Isaac Newton Institute opened its Branch in May 2000. The formal Agreement has been signed with Prof. Valentin Karetnikov, Director of the Astronomical Observatory of Odessa National University.

The staff of the Isaac Newton Institute in Odessa are: Sergey Andrievsky, Ivan Andronov, Kirill Antonyuk, Alexej Baklanov, Yuri Beletsky, Stanislav Belik, Vladimir Bezdenezhnyi, Osman Chahrukhanov, Nikolaj Chernykh, Irina Chernyshova, Lidia Chinarova, Nikolay Dorokhov, Tatyana Dorokhova, Irina Egorova, Anastasiya Gamarova, Lyudmila Glazunova, Vera Gopka, Nadiya Gorlova, Alexander Halevin, Sergey Kolesnikov, Sergey Korotin, Valery Kovtyukh, Larisa Kudashkina, Vladislava Marsakova, Tamara Mishenina, David Mkrtichian, Victor Nazarenko, Alexander Pikhun, Vasilij Rumyantsev, Leonid Shakun, Fedor Sirotkin, Sergey Udovichenko, Igor Usenko, and Alexander Yushchenko. The Resident Director of the INI Branch is Valery Kovtyukh.

Odessa is a rather large town (with more than one million citizens) situated on the Black Sea coast. Founded in the end of XVIII century Odessa is full of beautiful sights and cultural traditions. Many famous people lived there. Pushkin, Mendeleev, Mechnikov and Korolev are among them. Moreover Odessa is the hometown of one of the greatest astrophysicists of XX century - George Gamow.

Odessa Astronomical Observatory (OAO) was established on August 3, 1871 as a part of Novorossijsky (nowth-Odessa National) University. It was first headed by Prof. L.F. Berkevich, a distinguished specialist in celestial mechanics. An exceptional instrument was acquired to perform astrometrical observations - meridian circle by famous Repsold’s company. Astrophysical research began in 1881 with the advent of a new director - astrophysicist Prof. A.K. Kononovich. Under his directorship, the OAO was turned into a truly research institution equipped with first-class instruments. A.K. Kononovich was one of the Russian pioneers in astrophysics. He conducted active research of Sun, photometry of Solar system small bodies, etc. Many of his students became well known scientists like A.P. Ganskij, A.S. Vasil’ev, R. Orbinskij, N.N. Donich and others. In 1912 a distiguished astronomer, later academic A.Ya. Orlov, initiated exploring an astro-geophysical direction at OAO: tidal deformations of the Earth and gravimetry. At that same time monitoring of variable stars began (G.A. Lange, V.P. Zesessevitch, V.V. Sharonov). Prof. K.D. Pokrovsky, who came after A.Ya. Orlov, continued to expand the range of scientific research: comets, asteroids, double stars, photometry and spectroscopy of stars of different types were added to the list of activities of Odessa astronomers.

In 1945, a famous astronomer, talented organizer and popularisor of science, Prof. V.P.Zessevitch took the directors’ chair. His primary interest lay in variable stars. He conducted more than 200,000 observations of variable stars of various types, published more than 600 papers and monographs. Just at the end of World War II the number of observatory staff was only 5 people, but steadily grew since 1950. OAO occupied one of the first places in the USSR in variable stars search as well as other fields. V.P.Zessevitch initiated construction of several field observational stations and later - mountain observatories on the Caucasus and Pamire. Systematic observations on the 7-camera astrograph began, and at present OAO possesses a unique collection of sky negatives. Hundreds of papers on variable stars were made using this material. In 1993 the staff of OAO grew up to 150 scientists, considerably increased the spectrum of scientific research: physics and evolution of stars, physics of small bodies of the Solar System, precise stellar photometry, etc.

Contacts with foreign colleagues are largely extended. International conferences are held each year: dedicated to variable stars and Gamow memorial conference. In 1999 an annual summer school for young scientists started to operate. At present OAO is a modern research organization. Being involved in fruitful collaboration with Isaac Newton Institute of Chile Odessa Astronomical Observatory has significantly risen level of its scientific investigations in modern astrophysics.

The investigators incorporated to the Isaac Newton Branch are actively working in the following six fields of research:

Project 1: ‘‘Periodic and Aperiodic processes in stars’’: Investigators: Ivan Andronov, Larisa Kudashkina, Sergey Kolesnikov, Alexander Halevin, Vladislava Marsakova, Lidia Chinarova, and Kirill Antonyuk. The aim of the project is to elaborate additional criteria for classification of variable stars of different types—-cataclysmic (highly magnetized, polars, intermediate polars, weakly magnetic positive and negative superhumpers, nova-likes) based on the polarimetric observations of these stars at a time resolution from seconds to years; long — periodic on time scales from months to decades; to elaborate corresponding mathematical methods. Multisite observational programs of polars. This group uses the observations of artificial satellites.

Project 2: ‘‘Spectral investigations of different type stars’’: Investigators: Sergey Andrievsky, Valery Kovtyukh, Tamara Mishenina, Sergey Korotin, Igor Usenko, Irina Chernyshova, Nadiya Gorlova, Yuri Beletsky, and Irina Egorova. The aim of the project is the investigations of chemical composition of stars of intermediate masses on different stages of evolution: cepheids, nonvariable supergiants and their ancestors, B-stars of the Main Sequence and also metal-poor stars, blue stragglers and lambda Bootis type stars. Methods: high dispersion spectral observations from western observatories and Russian 6 m telescope. LTE and non LTE analysis of chemical composition.

Project 3: ‘‘Astroseismology of single and eclipsing binary stars’’: Investigators: David Mkrtichian and Victor Nazarenko. Studies of pulsating roAp, lambda Boo, delta Scutti and eclipsing binary stars using the asteroseismic and numerical hydrodynamical methods. Asteroseismic methods are based on high-precision multisite photometry and high-resolution spectroscopic observations of roAp, lambda Boo and delta Scutti stars and also for precise determinations of mass transfer rates in eclipsing binaries. Hydrodynamical simulations of mass transfer in different binary systems is being used for quantitive study of morphology of gas streams and its observational manifestations.

Project 4: ''Heavy elements in Stellar Atmospheres'': Investigators: Alexander Yushchenko, Vera Gopka and David Mkrtichian. The main aim of this group are the investigations of abundances of heavy and superheavy elements in the atmospheres of stars of different types. Determinations of evolutionary stages and ages of these stars using cosmochronology. Investigations of chemical evolution of the Galaxy. Investigations of surface inhomogeneities in the atmospheres of B and A stars. Methods: High and superhigh resolution spectroscopy from UV to IR.

Project 5: ''Photometrical Investigations of Variable Stars'': Investigators: Sergey Udovichenko, Nikolay Dorokhov, Tatyana Dorokhova, Vladimir Bezdenezhnyi, and Alexander Yushchenko. The main aim of group is photometrical and spectral investigations of RR Lyraes, delta Scutti and other types of variable stars. Special attention will be devoted to RR Lyraes. Fourier analysis of photometric observations of RR Lyrae on the 15 years time interval perfomed in Odessa Observatory.

Project 6: ''Gravitational Lensing'': Investigators: Alexander Yushchenko, Nikolay Chernyh, Vasilij Rumyantsev, and Osman Chahrukhanov. The main aim of this group are the investigations of lensing properties of globular clusters. We predicted observational tests that can confirm the important role of lensing by globular clusters. It will help us to observe high-redshift objects with middle class telescopes, investigations of weak gravitational lensing by galaxies on the observation of quasi-stellar objects.

Van den Bergh in 1958 was perhaps the first to provide a strong theoretical argument that a metallicity gradient should exist in the Galactic disc. During the following almost fifty years many observational studies were performed with the intent of determining the gradient. Astronomers have analyzed the spectra of B stars, late-type supergiants, old disk giants, and H II regions, frequently producing rather contradictory results. According to some authors, a quite steep present-day metallicity gradient exists in the disc (from -0.05 to -0.10 dex/kpc), but much lower gradient values have also been reported, and even no dependence of the abundances upon the galactocentric distances was found in several surveys.

Cepheids are stars with well-defined distances that can provide radial elemental distributions for chemical elements from carbon to gadolinium. According to these results, the elemental distributions display a complicated structure indicating that a single gradient value may be insufficient to represent the observational data over the large observed range of galactocentric distances. One of the prominent features of the radial distributions is the abrupt discontinuity in metallicity seen at Rg=10 kpc. All 25 stars with galactocentric distances from 10 kpc to 15 kpc are metal deficient with a mean [Fe/H]=-0.20.

These improved data on the metallicity distribution in the Galactic disc over the galactocentric distance range 10-15 kpc support the existence of a discontinuity at Rg=10 kpc. Such a discontinuity could be a consequence of the specific initial conditions of the Galaxy formation (thick and thin disc separation), and might have survived over the long-term period if the mixing process smoothing the metallicity differences was not efficient in this particular region near Rg=10 kpc.

These new observations of metal-poor outer disc Cepheids will also be very useful in an investigation of the metallicity dependence between Cepheid absolute magnitudes and infrared surface brightnesses.

In 2003, S.M. Andrievsky, V.V. Kovtyukh together with co-authors (Luck *et al.*, 2003) continued the investigation of the Galaxy abundance gradient. As a continuation of previous work on the abundance gradient in the outer part of Galactic disc, this paper presents the results on the metallicicty distribution over galactocentric distances up to 15 kpc. The outer disc is clearly separated from the middle part by the existence of a step in the metallicity distribution at about 10 kpc. Taking the region of galactocentric distances from 10 kpc to 15 kpc, one can derive an iron gradient -0.03 ± 0.01 dex/kpc (25 stars). The existence of a discontinuity can be caused by the effective suppression of mixing processes near the corotation resonance where the radial component of the gas velocity should be very small. In the vicinity of this region the mixing processes can be efficiently suppressed by the density gap associated with the corotation resonance. Near the corotation circle the radial component of the gas velocity should be very small (no mixing in radial direction), and this circumstance should in addition favour the preservation of a boundary between the thick and thin disc. The sole Cepheid in our sample clearly beyond 14 kpc, EE Mon, provides some evidence that the metallicity in the Galactic disc might drop further at very large galactocentric distances, but this has to be confirmed by further studies of extremely distant objects in the outer Galactic disc.

V.V. Kovtyukh, S.M. Andrievsky and N.I. Gorlova, together with R.E. Luck (USA) investigated line profiles in a large sample of Cepheid spectra, and found four stars that show unusual (for Cepheids) line profile structure (Kovtyukh *et al.*, 2003). The profiles can be phase dependent but the behavior persists over many cycles. The asymmetries are unlikely to be due to the spectroscopic binarity of these stars or the specific velocity field in their atmospheres caused by shock waves. As a preliminary hypothesis, we suggest that the observed features on the line profiles in the spectra of X Sgr, V1334 Cyg, EV Sct and BG Cru can be caused by the non-radial oscillations. It is possible that these non-radial oscillations are connected to resonances between the radial modes. Another interesting feature of our four Cepheids are anomalously broad spectral lines. One should mention that the line FWHM value in Cepheids depends upon the phase, and reflects the effect of a global compression of the atmosphere, as well as the shock-wave propagation. For the sake of uniformity we have measured and compared the line widths in all available Cepheid spectra at a fixed pulsation phase. The shapes of the lines and their widths vary during the Cepheid pulsation cycle. At the phase of maximum radius the line profiles are highly symmetric due to the absence of systematic atmosphere motions due to pulsation. This makes the maximum radius phase quite suitable for line width measurements. We have measured the Ca I 6717.687 A, line FWHM for 51 Cepheids at the phase of maximum radius (only for those of our Cepheids the spectra near the phase of a maximum radius are available). At present we cannot say whether this is a sign of an anti-correlation between pulsation and line width, since for this group it is still unclear which fraction of the line width is contributed by rotation/macroturbulence.

S.A. Korotin, I. Egorova, S.M. Andrievsky and their co-authors (Thoul *et al.*, 2003) performed seismic modelling of the massive Beta Cep star EN Lacertae. The starting point of the analysis is the spectroscopic mode identification recently performed. To this, they add a new updated photometric mode identification based upon a non-adiabatic description of the eigenfunctions in the outer atmosphere. Both mode identifications agree and this allows to fine-tune the stellar parameters of EN Lacertae with unprecedented precision. This is done by producing a huge amount of stellar models with different parameters and selecting those that fulfill the frequency values and the mode identification. This study is the first one of its kind in which a reconcilation between observed pulsational characteristics and theoretical models can be achieved at a level that allows accurate determination of the basic stellar parameters of a massive oscillator. They derive a mass of 9.62 solar and an age of 15.7 million years if assuming that convective overshooting does not occur.

I. Egorova, S.M. Andrievsky and their co-authors (Lehman *et al.*, 2003) analyse high-resolution spectra of the early A-type stars HD169981 and 2 Lyn. For the spectroscopic and photometric binary HD169981 determined the abundances of certain elements. The derived atmospheric parameters show the star to be an A giant. The abundances of the elements Mg, Si, Ti, Cr and Fe are very close to solar, only C and O show slight underabundances. 2 Lyn has been primarily studied for the occurrence of radial velocity variations. The star is probably a spectroscopic binary with a period of about 3.6 years. Preliminary orbital elements are derived. The search for shorter radial velocity variations gives hints of periods of 69.2, 1.56 and 1.53 days. Both of the last-mentioned periods are in the order of the expected rotation period of the star. The stellar parameters are estimated and for certain elements they determined the abundances.

V. Gopka with co-authors (Yushchenko *et al.*, 2003) present the results of abundance determinations in the atmosphere of mild barium star Zeta Cyg. The spectrum was observed with 2 meter telescope of ICAMER (peak Terskol, Russia). The resolving power R=80000, signal to noise ratio >100 over the spectrum. The atmospheric parameters were found from an investigation of iron lines. They used synthetic spectrum calculated with an inclusion of atomic and molecular lines of Kurucz database and the newest line lists for identification of the spectral lines. For all elements, except iron, spectrum synthesis method was used. The final abundances pattern in the atmosphere of this mild barium star consists of 51 chemical elements. They compared observed abundance pattern with the calculated one and showed that the heavy element overabundances of Zeta Cyg may be explained as a result of accreting the ejecta of its AGB star companion (now white dwarf) through wind accretion.

The determination of accurate effective temperatures is a necessary prerequisite for detailed abundance analysis (Kovtyukh *et al.*, 2003). High precision temperatures of Main Sequence stars might help to resolve two outstanding questions in the extra-solar planetary search. Namely, to get a definite confirmation of the metal richness of the stars that harbor planets, and secondly, perhaps to rule out some low-mass planetary candidates by detecting subtle variations in the host's temperature due to star-spots. Line depth ratios measured on high resolution (R=42000), high S/N echelle spectra are used for the determination of precise effective temperatures of 181 F,G,K Main Sequence stars with about solar metallicity. A set of 105 relations is obtained which rely Teff on ratios of the strengths of lines with high and low excitation potentials, calibrated against previously published precise (one percent) temperature estimates. The application range of the calibrations is 4000–6150 K (F8V–K7V). The internal error of a single calibration is less than 100 K, while the combination of all calibrations for a spectrum of S/N =100 reduces uncertainty to only 5–10 K, and for S/N=200 or higher – to better than 5 K. The zero point of the temperature scale is directly defined from reflection spectra of the Sun with an uncertainty about 1 K. This precision may be enough to detect star spots and Solar-type activity cycles. Of particular interest is the application of this method to testing ambiguous cases of low-mass planet detection, since planets do not cause temperature variations, unlike spots. For the majority of stars we get an error which is smaller than 10 K. The consistency of the results derived from the ratios of lines representing different elements is very reassuring. It shows that our 105 calibrations are essentially independent of micro-turbulence, LTE departures, abundances, rotation and other individual properties of stars. The next step will be the adaptation of this method to a wider range of spectral types and for an automatic pipeline analysis of large spectral databases.

10. THE INI PETERSBURG BRANCH

The Isaac Newton Institute opened its St. Petersburg Branch in September 2000. The formal Agreement has been signed with Prof. Veniamin Vityazev, Director of the Astronomical Institute of St. Petersburg State University in Russia. The staff members belong to all major astronomical centers in St. Petersburg, such as the Pulkovo Observatory and the Institute of Applied Astronomy.

The staff of the Isaac Newton Institute in St. Petersburg are: Ekaterina Aleshkina, Anisa Bajkova, Yurij Baryshev, Nina Beskrovnaya, Yulia Chernetenko, Ekaterina Evstigneeva, Alexander Gromov, Vladimir Hagen-Thorn, Vladimir Il'in, Vsevolod Ivanov, Tamara Ivanova, Alexander Kholtygin, Denis Konenkov, Iraida Kozlova, Alexei Kritsuk, Valeri Larionov, Dmitrij Nagirner, Leonid Parfinenko, Elena Pitjeva, Mikhail Pogodin, Alexander Potekhin, Vladimir Reshetnikov, Yuriy Rusinov, Elena Skurikhina, Nikolay Sokolov, Michail Sveshnikov, Vadim Urpin, Olga

Vasilkova, Nikolai Voshchinnikov, Eleonora Yagudina and Ruslan Yudin. The Resident Director of the INI Branch is Vladimir Reshetnikov.

The Astronomical Institute of Petersburg State University is one of the best known astronomical organizations in Russia. It was established in 1881 as Astronomical Observatory at the Chair of Astronomy of St. Petersburg University (the Chair was orgzanized in 1819). Since 1999 it is entitled as Sobolev Astronomical Institute. The staff of the Institute include about 60 scientists. The main fields of research are cosmology, observations of active galaxies and variable stars, physics and evolution of stars, solar physics, dynamics of gravity systems, celestial mechanics, astrometry, cosmic hydrodynamics, theory of radiation transfer, light scattering theory, astrospectroscopy and development of special astronomical software.

The Main Astronomical Observatory (Pulkovo Observatory) opened in 1839 was the first astronomical institution in Russia. For a long time, it was the principal observatory in Russia and USSR. The current staff of the observatory consist of 160 scientists. The research areas are radioastronomy, physics of galactic nuclei, X-ray sources and young stars, solar physics, solar-terrestrial relations, celestial mechanics and stellar dynamics, astrometry, geophysics, development of astronomical methods and construction of optical devices. The observatory also develops cosmic projects such as: ‘‘Struve,’’ ‘‘Geobs’’, ‘‘Stereoscope’’.

The Institute of Applied Astronomy was founded in 1987 due to the decree of the Academy of Science of USSR for realization of the biggest national astronomical project-establishment of the very long baseline radio interferometrical network ‘‘QUASAR’’. Over 130 scientists work in the Institute. Main field of research are in radioastronomy, relativistic celestial mechanics, radioastrometry, ephemerides astronomy, cosmic geodesy, geodynamics, development of astronomical software, data processing methods, creation of hardware for radioastronomy.

In 2003 Yu. Baryshev continued his works on two-fluid FLRW cosmological models, which take into account ordinary matter and vacuum/quintessence (dark energy). The magnitude-redshift relation was calculated for special class of models where there is an interaction between matter and dark energy (Teerikorpi *et al.* 2003). Also, Paturel and Baryshev have considered application of the sideral time analysis method for investigation of spatial distribution of graviatational wave sources. It is shown that this method allows to work with data having low signal to noise ratio.

The accretion process onto a magnetized isolated neutron star, which captures material from the interstellar medium, is discussed by N. Ikhsanov (2003). The evolutionary track of such a star can be presented as a sequence of four states: ejector, supersonic propeller, subsonic propeller, and steady accretor. Ikhsanov have shown that subsonic propeller accretor transition does not occur as long as the magnetic field of the star is strong enough to control the accretion flow in the stellar vicinity. During the subsonic propeller state the accretion rate onto the stellar surface is limited to the rate of plasma diffusion into its magnetosphere. The diffusion rate is at least three orders of magnitude smaller than the maximum possible mass capture rate by the star. Therefore, the expected accretion luminosity of magnetized isolated neutron stars is at least three orders of magnitude smaller than that previously evaluated.

S. Covino, V. Larionov *et al.* (2003) have performed optical and near-infrared photometry of the bright afterglow of GRB 020813. A sharp achromatic break is present in the light curve, 14 hours after the trigger. In the framework of jetted fireballs, this break corresponds to a jet half-opening angle of $1.9° \pm 0.2°$, the smallest value ever inferred for a GRB.

G.Valentini, V.Larionov *et al.* (2003) presented optical (UBVRI) and near-infrared (JHK) photometry, along with optical spectra, of the Type Ia supernova SN 2000E in the spiral galaxy NGC 6951. The observations span a time interval of 234 days in the optical and 134 days in the near-infrared. The photometric behavior of SN 2000E is remarkably similar to that of SN 1991T and SN 1992bc, thus being classifiable as a slow-declining Type Ia supernova (SN) and showing the distinctive features of such a class of objects both in the visible and in the near-infrared. Spectroscopically, SN 2000E appears as a ‘‘normal’’ Type Ia SN, like SN 1990N. The reddening $[E(B-V) \sim 0.5 mag]$ and distance $(\sim 32.14 mag)$ are constrained using a number of different methods. The bolometric luminosity curve of SN 2000E, which displays a bump at the epoch of the secondary near-infrared peak, allows a determination of the 56Ni mass, amounting to $0.9 M_\odot$.

J. Clark, V. Larionov *et al.* (2003) presented new photometric and spectroscopic observations of the stellar source AFGL 2298 (= IRAS 18576+0341) that has recently been proposed as a candidate Luminous Blue Variable (LBV). It is confirmed that the star is a highly luminous B supergiant which is both spectroscopically and photometrically variable. Assuming a distance of 10 kpc, comparison of the 2001 June data to synthetic spectra suggest stellar parameters of T=12500K, $log(L/L_\odot)=6.2$ and $\dot{M}=5\times10^5 M_\odot yr^{-1}$. Data obtained in 2002 August indicate an increase in both temperature $(\sim 15000K)$ and mass loss rate $(1.2 \times 10^4 M_\odot yr^{-1})$ at constant bolometric luminosity. These physical parameters place AFGL 2298 at the Humphreys-Davidson limit for the most luminous stars known. The position of AFG 2298 in the HR diagram, the significant variability observed between 1999-2002 and presence of a massive ejection nebula are consistent with a classification of AFGL 2298 as a bona fide LBV.

D.I. Nagirner *et al.* (2003) have obtained an explicit analytical solution for the growth rate of cosmological perturbations in a flat model with non-zero vacuum energy density.

A.Y. Potekhin and G. Chabrier (2003) derived an equation of state and calculated radiative opacities for a strongly magnetized hydrogen plasma at magnetic fields, temperatures, and densities typical for atmospheres of isolated neutron stars. They calculated and tabulated first- and second-order thermodynamic functions, monochromatic radiative opacities, and Rosseland mean opacities, taking account of partial ionization, for the values of the magnetic field and the temperature typical for the ordinary pulsars, and for a wide range of density. They showed that bound-bound and bound-free transitions give an important contribution to the opacities in the outer neutron-star atmosphere layers, which may substantially modify the X-ray spectrum of a typical magnetized neutron star. In addition, they re-evaluated opacities due to free-free transitions, taking into account the motion of both interacting particles, electron and proton, in a strong magnetic field. Compared to the previous neutron-star atmosphere models, the free-free absorption is strongly suppressed at photon frequencies below the proton cyclotron frequency.

Subsequently, A.Y. Potekhin and G. Chabrier (2003) extended their model of the equation of state and radiative opacities of partially ionized hydrogen plasmas to the magnetic field strengths relevant for magnetars. They showed that, as well as in the case of weaker fields, bound-free transitions give an important contribution to the opacities in the outer neutron-star atmosphere layers. However, unlike the case of weaker fields, bound-bound transitions proved to be unimportant. For the whole considered range of magnetic field strength values, the calculated tables of thermodynamic functions and Rosseland mean opacities are made publicly available through the Internet at http://www.ioffe.ru /astro/NSG/Hmagnet/. Using the equation of state and monochromatic opacities calculations, mentioned above, W.C.G. Ho, D. Lai, A.Y. Potekhin, and G. Chabrier (2003) constructed partially ionized hydrogen atmosphere models for magnetized neutron stars in radiative equilibrium with surface fields from 10^{12} to $5\times10^{14}G$ and effective temperatures of a few times 10^5-10^6K. For the models with $B=10^{12}-10^{13}G$, the spectral features due to neutral atoms lie at extreme UV and very soft X-ray energy bands and therefore are difficult to observe. However, the continuum flux proved to be also different from the fully ionized case, especially at lower energies. For the superstrong field models ($B>10^{14}G$), the authors showed that the vacuum polarization effect not only suppresses the proton cyclotron line (as known previously), but also suppresses spectral features due to bound species; therefore spectral lines or features in thermal radiation are more difficult to observe at such superstrong (magnetar) fields.

A.Y. Potekhin, D.G. Yakovlev, G. Chabrier, and O.Y. Gnedin (2003) studied the thermal structure of neutron stars with magnetized envelopes composed of accreted material, using updated thermal conductivities of plasmas in quantizing magnetic fields, as well as the equation of state and radiative opacities for partially ionized hydrogen in strong magnetic fields mentioned above. They calculated the relation between the internal and local surface temperatures and fitted it by an analytic function of the internal temperature, magnetic field strength, angle between the field lines and the normal to the surface, surface gravity, and the mass of the accreted material. The luminosity of a neutron star with a dipole magnetic field has been calculated for various values of the accreted mass, internal temperature, and magnetic field strength. Using these results, the authors numerically simulated cooling of superfluid neutron stars with magnetized accreted envelopes. They considered slow and fast cooling regimes, paying special attention to very slow cooling of low-mass superfluid neutron stars. In the latter case, the cooling is strongly affected by the combined effect of magnetized accreted envelopes and neutron superfluidity in the stellar crust. The obtained results are important for interpretation of observations of isolated neutron stars hottest for their age, such as RX J0822-43 and PSR B1055-52.

V. Reshetnikov *et al.* (2003) studied radial and vertical profiles for a sample of 34 edge-on disk galaxies in the North and South Hubble Deep Fields, selected for their apparent diameter larger than 1.3″ and their unperturbed morphology. The thickness and flatness of their galactic disks are determined and discussed with regard to evolution with redshift. They find that $sub-L$ spiral galaxies with z ~1 have a relative thickness or flatness (characterized by h_z/h the scaleheight to scalelength ratio) globally similar to those in the local Universe. A slight trend is however apparent, with the h_z/h flatness ratio larger by a factor of ~1.5 in distant galaxies if compared to local samples. In absolute value, the disks are smaller than in present-day galaxies. About half of the $z\sim1$ spiral disks show a non-exponential surface brightness distribution.

V. Reshetnikov (2003) presented results of B, V, R surface photometry of three polar-ring galaxies (PRGs) - A0017 +2212, UGC1198, UGC4385. The data were acquired at the 6-m telescope of the Special Astrophysical Observatory of the Russian Academy of Sciences. It was shown that all three galaxies are peculiar late-type spirals in the state of ongoing interaction or merging. He discussed available photometric properties of the PRGs with spiral hosts and determined the Tully-Fisher relation for different types of PRGs. In agreement with Iodice *et al.* (2003), he has shown that true PRGs demonstrate $\sim1/3$ larger maximum rotation velocities than spiral galaxies of the same luminosity. Peculiar objects with forming polar structures satisfy, on average, the Tully-Fisher relation for disk galaxies but with large scatter.

The stability properties of discs rotating with the angular velocity dependent on both the radial and vertical coordinates have been considered by V. Urpin (2003). A vertical dependence of Ω destabilizes the disc at any particular form of this dependence. The growth rate of the vertical shear instability is calculated and compared with that of the magnetic shear instability. We find that the vertical shear instability grows faster for a wide range of parameters.

Young neutron stars formed in core collapse or originating in the merger of a binary neutron star system may possess significant differential rotation. V. Urpin (2003) has considered the stability properties of such hot (non-superfluid) differentially rotating neutron stars. Compared to ordinary stars, the criteria of hydrodynamic instability of neutron stars can be different because generally the thermal diffusivity and viscosity are of the same order of magnitude and are relatively large. For example, the well-known Goldreich-Schubert instability can manifest itself only in rapidly rotating stars and is strongly suppressed if rotation is slow. The rotational instabilities in neutron stars can grow on the thermal or dynamical timescale.

The stability properties of differentially rotating magnetic neutron stars have been considered by Urpin (2003), and the corresponding instability criteria have been obtained. The influence of the magnetic field is twofold: it may stabilize a fluid against some instabilities, on the one hand, and it can lead to new branches of instabilities, on the other hand. It turns out that some of the instability criteria of magnetic neutron stars can be satisfied at smaller departures from the uniform rotation than the criteria of non-magnetic stars. Interaction of hydrodynamic motions caused by instabilities in the core with the neutron star crust can result in small irregularities in the measured spin period of pulsars.

Bonanno, Rezzolla and Urpin (2003) have investigated the turbulent mean-field dynamo action in protoneutron stars that are subject to convective and neutron finger instabilities. While the first one develops mostly in the inner regions of the star, the second one is favoured in the outer regions, where the Rossby number is much smaller and a mean-field dynamo action is more efficient. By solving the mean-field induction equation the authors have computed the critical spin period below which no dynamo action is possible and found it to be ~ 1 s for a wide range of stellar models. Because this critical period is substantially longer than the characteristic spin period of very young pulsars, we expect that a mean-field dynamo will be effective for most protoneutron stars.

O. Vasilkova (2003) studied specific influence of the gravitational field of a very elongated rotating asteroid on the location of zones of the most intensive bombardment by falling particles. A specific model chosen of an Ida-like asteroid was approximated by a triaxial ellipsoid and by a dumb-bell of the same mass. The computations and appropriate figures show that at a rotation period faster than approximately 9.1 hours for the triaxial ellipsoid model and 3.3 hours for the dumb-bell one the leading sides of the asteroid receive a higher flux of impacting particles than the trailing sides while at slower periods the situation is the opposite. The zones of possible erosion are computed depending on the asteroid rotation period and on the ratio of impact and rebound velocities of particles. The contribution of all impacting particles to the angular momentum of the asteroid is computed, which leads to the conclusion that falling out of particles damps the asteroid rotation at any spin period.

R. Yudin *et al.* (2003) presented broadband optical polarimetry, and broadband optical and infrared photometry, of eight RV Tau-type and five R CrB-type stars. For nine of the objets polarimetric data is reported for the first time. They have estimated and subtracted the interstellar component of polarization, allowing them to determine the level of intrinsic polarization. In some cases this is 1%-2% even when the star is in a bright photometric state. They consider this to be evidence for the presence of permanent clumpy non-spherical dust shells around the sellected RV Tau and R CrB-type stars. Yudin et al. (2003) also concluded that for most programme stars neutral extinction must be significant in their circumstellar envelopes.

11. THE INI POLISH BRANCH

The Isaac Newton Institute opened its Branch in Poland in May 2001. The formal Agreement has been signed with Prof. Janusz Gil, Director of the Kepler Astronomical Center of Zielona Gora and Resident Director Prof. Andrzej Maciejewski in charge of inviting a group of selected astronomers from main Polish Astronomical Organizations. Among these centers are the Warsaw University Observatory, Nicolaus Copernicus Astronomical Centre, Turun Centre for Astronomy and Astronomical Units from Universities.

The staff of the Isaac Newton Institute in Poland are: Krzysztof Belczynski, Slawomir Breiter, Janusz Gil, Krzysztof Gozdriewski, Tomasz Kwiatkowski, David Khechinashvili, Jacek Kreiowski, Andrzej Maciejewski, George Melikidze, Maciej Mikolajewski, Michal Ostrowski, Krzysztof Rochowicz and Toma Tomov. The Resident Director of the INI Branch is Andrzej Maciejewski.

This Branch was established following the suggestion of Prof. Andrzej Maciejewski, in his position as Chair of the Department of Astronomy and Astrophysics of Torun Centre of Astronomy. This organization is a part of the Faculty of Physics and Astronomy of the Nicolaus Copernicus University, created in 1997 by a union of Torun Radio Astronomy Observatory and the Institute of Astronomy.

The Nicholas Copernicus University in Torun set up in 1945, is the biggest university in Northern Poland and outstanding in terms of scientific potential. Torun is one of the oldest and, in the past, one of the richest cities in Poland, lying on the river Vistula, about 200 km north-west of Warzaw.

12. THE INI PUSHCHINO BRANCH

The Isaac Newton Institute opened its Branch in Pushchino in May 2002. The formal Agreement was signed with Prof. R. D.Dagkesamanskii, Director of the Pushchino Radio Astronomy Observatory, Astro Space Center of the Lebedev Physical Institute of the Russian Academy of Sciences.

Pushchino Radio Astronomy Observatory was established as the Radio Astronomy Station in 1956 and became one of the greatest radio astronomical centers in the world. Three radio telescopes operate here up to now. The first of them RT-22, the parabolic reflector with its main dish of 22 m in diameter, was constructed in 1959 for investigations of the interstellar medium, planets, and discrete radio sources in the centimeter and millimeter ranges. The first line of excited hydrogen H90-alpha was discovered with this telescope in 1964. The second instrument DKR-1000, the meridian telescope consisting of 2 arms (East-West and North-South), began to operate in 1964. The main problems for this telescope were spectra of discrete sources and dynamics of the interplanetary plasma.Since 1968 many pulsars were observed by using DKR-1000. The third radio telescope BSA, the phased array comprising 16384 dipoles, was constructed in 1974 and was intended for investigations of pulsars at frequency 102.5 MHz. Since 1999 BSA operates at 111 MHz. This reconstruction was caused by strong interferences at 102 MHz. Several new pulsars were discovered with BSA, and more than 300 known pulsars were investigated by using this antenna. Moreover it gives the possibility to study the interplanetary and interstellar media, many distant galaxies and quasars and the structure of the Universe. BSA is the most sensitive telescope in the world in the meter wave range up to now.

The staff of the Isaac Newton Institute Pushchino Branch includes now Vadim Artyukh, Igor Chashey, Alexander Ershov, Valeriy Frolov, Alexander Glushak, Vera Izvekova, Sergei Kutuzov, Arkady Kuzmin, Boris Losovsky, Valerij Malofeev, Igor Malov, Oleg Malov, Vladimir Potapov, Alexey Pynzar', Alexander Rodin, Vladimir Shishov, Vladimir Shoutenkov, Grigori Smirnov, Tatiana Smirnova, Svetlana Souleimanova, Alexander Ysivilev, and Sergei Tyulbashev. The Resident Director of the INI Branch is Igor Malov.

Results of 6 years timing observations of the fastest millisecond pulsar PSR 1937+21 at Kalyazin Radio Astronomy Observatory (Kalyazin, Russia) and Kashima Research Space Center (Kashima, Japan) were analyzed. Using of two far-separated frequencies of observations (about 0.6 at Kalyazin and 2.15 GHz at Kashima) gave the possibility to improve the accuracy of pulsar parameters definition by removal of the effect of dispersion measure (DM) variations. The fractional instability was found about 2×10^{-14} that limited the energy density of the primordial gravitational waves background (GWB) by 10^{-6} in units of closure density of Universe at frequency about 10^{-8} Hz. The most interesting result for this pulsar was found in DM variation which showed secular decreasing of the DM from 1985 to 2003 with the average rate about $0.0012pccm^{-3}$ per year (Potapov V., Rodin A.).

Analysis of the 6 years pulsar observations data for 5 binary millisecond pulsars at Kalyazin was made to improve their timing parameters (spin, astrometric and binary). New timing solutions for PSRs J0613-02, J1640+22, J1643-12, J1713+07 and J2145-07 were obtained. Analysis of pulsar fractional instability was made and J1640+22 was found as the most stable pulsar in given set with minimum of the third order polynomial variation of 10^{-13} in 3 years. PSR J1640+22 timing data was used to estimate the relative density of GWB at ultra-low frequency down to $10^{-11}Hz$. The upper limit of GWB was less than 8.5×10^{-4} in units of closure density of Universe (Potapov V., Rodin A.).

The confusion probability distribution in interferometer observations is derived. It is shown that the form of the distribution depends on the correlation between fringe visibilities V and flux densities S of radio sources. This correlation depends on the Universe model, the evolution of radio source dimensions, and the evolution of radioluminosity function. So, the statistical VLBI observations give a new cosmological test to analyse Universe models and evolution models. It is shown that the confusion variance in VLBI observations is much less than in observations with a single radio telescope (Artyukh V.).

Interplanetary scintillating (IPS) radio sources from the Pushchino Survey (PS) in the area 0f 0.11 sr have been cross-identified with objects from the 7C and FIRST catalogues. The data on sizes and morphology provided by the FIRST catalogue have shown that more than 50% of IPS radio sources are single and compact ($<3''$) at 1400 MHz, about 15% of them are single partially resolved FIRST objects (sizes of $3''$-$9''$) and 11% are double radio sources with compact components. The remaining sources have larger sizes and a more complex structure. We believe that a significant part of the Pushchino Survey objects are very probable candidates for steep spectrum quasars (Artyukh V., Kopylov A., Kopylova F.).

Giant pulses from the pulsar PRS B0031-07 were detected. A pulse with the intensity that is a factor of 50 or more higher than the intensity of average pulse is encounterd approximately once in 300 observed pulses. The peak flux density of the strongest pulse is about 500 Jy. This value is a factor 120 higher than the peak flux density of the average pulse. The giant pulses are narrower than the average profile by a factor of 20 and they cluster in the center of the average profile (Kuzmin A., Ershov A., Losovsky B.). Interstellar scintillation multi-frequency observations of PSR 0329+54 in the frequency range from 102 MHz to 5 GHz were analyzed to estimate the spectrum of interstellar plasma inhomogeneities in the direction to this pulsar. Based on the theory of diffractive scintillation the composite structure function of phase fluctuations covering a large range of turbulence scales was constructed. It was found that the spectrum is well described by a power law with n=3D 3.5 for scales from 106 to 109 m, which differs from the value known for a Kolmogorov spectrum. However within the accuracy of these data it is impossible to excluded a Kolmogorov spectrum. It became also clear that the angular refraction of emission must be taken into account to fit the data points at all observing frequencies. The size of the irregularities responsible for the angular refraction is estimated to be about $3\times1013m$. They can be identified with clouds of neutral hydrogen which can be considered as holes of electron density (Shishov V., Smirnova T., Malofeev V., Potapov V.).

Multi-frequency observations of PSR 1642-03 interstellar scintillation in the frequency range from 103 MHz to 5 GHz were analyzed to estimate the spectrum of interstellar plasma inhomogeneities in the direction to this pulsar. The composite structure function of phase fluctuations covering the wide range of turbulence scales was constructed. It was shown that interstellar plasma spectrum in the direction to this pulsar has a piecewise power law. The spectrum is well described by a power law with n =3D 3.7 for scales from 10^7 to $10^{13}m$ (Kolmogorov spectrum) and n =3D 3 for scales less than 107 m. It is possible that unusual behavior of the spectrum is caused by passing of the line of sight through the North polar spur with unknown interstellar plasma properties (Smirnova T., Shishov V., Malofeev V., Potapov V., Tyulbashev S.).

Results of the first run of the Ori A HII region mapping based on Hydrogen (H), Helium (He) and Carbon (C) Radio Recombination lines (RRL) are presented. Observations have been done with the same angular resolution (2 arcmin) using both the 32 m VLBI dish of Medicina (Italy, 22.4 GHz) and the Pushchino (Russia, 36.5 GHz). The obtained ionized helium abundance $y^+N(He^+)/N(H^+)$ and the behaviour with the distance from the center confirm that He^+ zone size is smaller than of the H^+ one. Such behaviour is different for the core and for the envelope, as well as for different directions from the center. The helium abundance, $N(He)/N(H)10.2(\pm0.8)\%$, is measured. Derived radial velocities of the lines, their widths and y^+ data support the well known idea about the ''blister type'' structure of this HII region, LTE electron temperatures (7700-9300K) are measured; and the effective temperature ($T_ef\sim37500K$) of ionizing star has been estimated (Tsivilev A.).

The frequency fluctuation data obtained in the solar wind radiooccultation experiments with GALILEO and ULYSSES spacecraft were analyzed. It was shown that the density turbulence spectrum in the inner solar wind at the scales $>10^8 cm$ has the power law shape with the power exponent changing from 1.0 at small heliocentric distances to 1.6-1.7 in the range of formed flow. The transit from the flat turbulence power spectra to more steep ones takes place at heliocentric distances 10-30 Rs (Rs is the Sun's radius). Transition region in the period of solar activity minimum is located at greater heliocentric distances for fast high latitude solar wind than for the slow wind in the near equatorial region. The tendency of the fractional density fluctuation increase with increasing heliocentric distance is found for the slow solar wind. The interpretation of the observational results on radial turbulence evolution is carried out in the frame of the model with local generation of density fluctuations by the low frequency Alfven waves propagating away from the Sun (Chashey I.). Interplanetary scintillation observations of 47 compact flat spectrum radio sources have been carried out at 111 MHz on the Large Phased Array (Pushchino, Russia). The estimations of flux densities or upper limits were made for all sources. The number of sources have cut-offs in spectra of compact components (Tuyl'bashev S.). The formula for calculating the X-ray luminosity L of radio pulsars was derived in the framework of the synchrotron model. It is shown that L depends strongly on the parameter $\dot{P}/P^{3.5}$, where P is the pulsar period and $\dot{P}$ is its derivative. The known data confirm this dependence. It gives the possibility to predict the detection of X-ray emission from more than a hundred known radio pulsars. In particular, almost all of the millisecond pulsars must emit X-ray synchrotron radiation. This conclusion differs from predictions of other models and can be used to test the theory under consideration (Malov I.).

Pulsed radio emission from the recently discovered X-ray pulsar J0205+6449 in the supernova remnant 3C 58 was registered by radio telescopes of the Pushchino Radio Astronomy Observatory at 111 and 88 MHz. Estimates of its parameters (P, $\dot{P}$, spectral index, widths of profiles, dispersion measure) were obtained. The synchrotron mechanism for the radio and X-ray emission was proposed to explain the lower radio and X-ray luminosity of this new pulsar compared to the Crab pulsar which is similar to it in many ways. Optical emission with luminosity 10^{31} erg/sec and gamma-ray emission $\sim 7\times 10^{35}$ ersg/sec are predicted (Malofeev V., Malov I., Malov O., Glushak A.). A new model is put forward to explain the observed features of Anomalous X-Ray Pulsars (AXPs) and Soft Gamma-Ray Repeaters (SGRs). It is shown that drift waves can be excited in the magnetosphere of a neutron star with a rotational period of $P \sim 0.1 sec$, surface magnetic field $B\sim 10^{12} G$, and the angle between the rotation axis and magnetic moment less than 10 degrees. These waves lead to the formation of radiation pulses with a period of order 10 sec. The rate of loss of rotational energy by such a star ($10^{37} erg/sec$) is sufficient to produce the observed increase in the period $\dot{P} \sim 10^{-10}$), the X-ray luminosities ($\sim 10^{34} - 10^{36} erg/sec$), and the injection of relativistic particles intj the surrounded supernova remnant (Malov I., Malofeev V.).

13. THE INI SAO BRANCH

The Isaac Newton Institute opened its Branch in May 2000. The formal Agreement has been signed with Prof. Yuri Balega, Director of the Special Astrophysical Observatory (SAO) in Russia.

The staff of the Isaac Newton Institute in SAO are: Irina Acharova, Mashhoor Al-wardat, Yuri Balega, Gregory Beskin, Tatyana Borkova, Alexander Burenkov, Victor Bychkov, Eugene Chentsov, Sergei Ermakov, Sergei Fabrika, Timur Fatkhullin, Gazinur Galazutdinov, Olga Galazutdinova, Yuri Glagolevskij, Sergey Karpov, Valentina Klochkova, Alexei Kniazev, Victoria Komarova, Alexander Kopylov, Flera Kopylova, Vladimir Korchagin, Dimitry Makarov, Lidia Makarova, Vladimir Marsakov, Yuri Mishurov, Sofia Mitronova, Faig Musaev, Igor Naselsky, Natalia Orlova, Vladimir Panchuk, Alexander Panferov, Inna Panferova, Vladimir Plokhotnichenko, Eugene Pluzhnik, Alexander Pramsky, Simon Pustilnik, Iosif Romanyuk, Abid Rzayev, Alla Shapovalova, Margarita Sharina, Yuri Shchekinov, Zalikha Shkhagosheva, Olga Sholukhova, Vladimir Sokolov, Nikolai Tikhonov, Andrei Ugryumov, Gennady Valyavin, Eduard Vorobyov and Maksim Yushkin. The Resident Director of the INI Branch is Zalikha Shkhagosheva.

The Special Astrophysical Observatory (SAO) was established in June 1966 as a research institute of the Department of General Physics and Astronomy of the USSR Academy of Science. The principal instruments of the Observatory are the optical telescope BTA (Big Telescope Azimuthal) with the 6 meter main mirror and the radio telescope RATAN-600 (Radio Telescope of the Academy of Science) with the ring multi-element antenna 600 meter in diameter. The observatory performs telescope observations under programs approved by the Allocation Committee and carries out its own fundamental research in the field of astrophysics.

At present SAO is the only Russian center for ground-based observations of the Universe. In Russia the observatory furnishes 80 percent of observational data in the field of optical and radio astronomy. The telescopes BTA and RATAN-600 have the common use status allowing a broad integration with the world astronomical community. Research activity in SAO is conducted by 110 researchers in 15 groups. The investigators incorporated to the Isaac Newton Branch are working in the following fields:

The Laboratory ''Structure'' performs the CCD photometry and the spectroscopic study of Blue Compact Galaxies (BCG) from the First Byurakan Survey. The main goal of the project is the investigation of the spatial distribution of low-mass galaxies and modeling of the formation of the large scale structure of the Universe. Many new emission-line and blue compact galaxies were discovered with the 6-m telescope.

The Stellar Spectroscopy Laboratory studies the chemical composition and the evolution of the stellar population in our Galaxy. The main attention is devoted to objects on the latest stages of stellar evolution.

The Gamma Burst Study Group performs the CCD photometry of optical afterglows of gamma ray bursts and their host galaxies using the standart Johnson photometric system. From the comparison of the spectral energy distribution in nearby galaxies and the observed afterglows photometry the researchers define probable types of parent galaxies.

Main aims of the Laboratory of Relativistic Astrophysics are focused on studying the energy transformation mechanisms taking place in strong gravitational and magnetic fields. These fields are assosiated with nonstationary processes in black holes, pulsars, white dwarfs and flashing stars.

The Laboratory of Large Scale Structure is mainly concentrated on the CCD photometry of nearby dwarf galaxies. From the study of their distances, kinematics and structure, the main characteristics of the Local Group of galaxies are derived.

The Laboratory of High Angular Resolution Methods performs the speckle interferometric study of binary and multiple stars with the diffraction-limited resolution of the 6-m telescope in the visible and in the infrared spectral region. Stellar fundamental parameters are derived for different types of stars from computed speckle interferometric orbits and magnitude differences. The main attention is given to stars at the lower end of the main sequence.

Chentsov E., Ermakov S., Klochkova V., Panchuk V. (SAO RAS, Russia, and INI SAO Branch) and Bjorkman K.S., Miroshnichenko A.S. (Ritter Observatory, Toledo, USA) made an atlas of spectra of 5 emission-line stars: the low-luminosity luminous blue variables (LBVs) HD168625 and HD160529, the white hypergiants (and LBV candidates) HD168607 and AS314, and the supergiant HD183143. They described specific spectral features of the objects. The atlas is useful as it presents the spectra at certain epochs. Additionally they have found some new features of the objects. In particular, the spectra presented suggest that HD168625 ($B6Ia^+$) and HD183143 (B7Ia) could be considered as candidate objects showing ‘‘blueward migrating DACs’’. A new explanation for the complicated shape of the absorption line profiles in the spectrum of AS314 was proposed: apparently their splitting is due to superposition of narrow emission peaks which are formed in the extended envelope of the star (A&A, 2003, 397, 1035).

Makarov D., Burenkov A. and colleague Karachentsev I.D. presented radial velocities for nearby dwarf galaxy candidates found by Karachentseva & Karachentsev on the POSS-II films. Out of 118 observed objects, 88 were detected in the Hα line. The objects median radial velocity is 1750 km/s. A quarter of the galaxies belong to the Local Volume, having corrected radial velocities $V_{LG} <$500 km/s. Some of them are members of the nearby groups around Maffei/IC342, M81, and NGC6946 (A&A, 2003, 405, 951).

Makarov D., Sharina M. *et al.* presented Hubble Space Telescope/WFPC2 images of sixteen dwarf galaxies as part of their snapshot survey of nearby galaxy candidates. They derived their distances from the luminosity of the tip of the red giant branch stars with a typical accuracy of 12%. Based on distances and radial velocities of 156 nearby galaxies, they plot the local velocity-distance relation, which has a slope of H0=73km/s/Mpc and a radial velocity dispersion of 85 km/s. They showed that the local Hubble flow within 5 Mpc exhibits a significant anisotropy, with two infall peculiar velocity regions directed towards the Supergalactic poles (A&A, 2003, 398, 479).

Makarov D. *et al.* studied the phenomenon of the very local (<3 Mpc) Hubble flow on the basis of the data of recent precision observations. A set of computer simulations was performed to trace the trajectories of the flow galaxies back in time to the epoch of the formation of the Local Group. It was found that the initial conditions of the flow are drastically different from the linear velocity-distance relation. The simulations enabled also to recognize the major trends of the flow evolution and identify the dynamical role of universal antigravity produced by cosmic vacuum (A&A, 2003, in press).

Sharina M. presented an analysis of Hubble Space Telescope/WFPC images of six nearby galaxies in the projected vicinity of IC 342, nine nearby galaxies in Sculptor, eighteen galaxies in the Canes Venatici I cloud, eighteen galaxies situated in the vicinity of the Local Group. She derived accurate distances to these galaxies from the magnitude of the tip of the red giant branch. Structural and dynamical characteristics of the nearby groups were also studied based on the velocity-distance data (A&A, 2003, 408, 111; A&A, 2003, 404, 93, A&A, 2003, 398, 467, A&A, 2003, 398, 479).

Kniazev A., Pramsky A., Pustilnik S., and Ugryumov A. continued to work on the detailed studies of extremely metal-deficient (XMD, Z < 1/20 Zo) blue compact galaxies (BCGs). In particular, the results of the deep multiband photometry of the galaxy SBS 0335-052 E (Z = 1/42 Zo) evidence for the ages of its oldest stars of less than 500 Myr (A&A, 2003, in press). For HS 0822+3542 (Z = 1/30 Zo), situated deeply in a nearby void, they discovered and studied a dwarf companion, triggered it current (probably the first) star formation episode (A&A, 2003,v.409, 917). For a luminous XMD BCG HS 0837+4717 (Z = 1/20Zo) they discovered very large nitrogen excess, and argued that this phenomenon, like in a few other luminous BCGs, is related to their recent merger nature (A&A, 2003, submitted). Besides, they prepared, based on the SDSS DR1 database, a catalog of about 600 HII galaxies with the measured by the classic T_e method oxygen abundances (AJ, 2003, submitted).

Acharova I. and Mishurov Yu. with collegue Lepine J. R. D. considered the effects of the corotation resonance of the Galactic spiral structure on the stellar orbits. It was shown that because of resonant interaction with the spiral gravitation field, stars can wander in the radial direction over a large part of the Galactic disk. This influences the Galactic distribution of heavy elements (AphJ, 2003, 589, 210). Vorobyov E. and Bizyaev D. performed a numerical hydrodynamics modeling of ring galaxy formation. Their computational results were in agreement with data on HI kinematics and Hα emission (A&A, 2003. 400, 81).

Vorobyov E. showed that the gas hydrodynamics modeling of the Cartwheel ring galaxy is performed with the purpose to reproduce the measured intensity and radial distribution of Hα emission in the Cartwheel's disk. Numerical simulations indicate that a large shear near/at the position of the inner ring can raise the gas threshold for star formation and suppress MSF in the Cartwheel's inner regions. Hence, the Schmidt law has to be supplemented with a shear criterion for star formation in order to reproduce the observed radial distribution of Ha surface brightness in the Cartwheel's inner regions (A&A, 2003, 407, 913).

Vorobyov E. in collaboration with Klein U., Shchekinov Yu., and Ott J. performed numerical hydrodynamical modelling of supernova-driven shell formation with a purpose to reproduce a giant HI ring (diameter 1.7 kpc) in the dwarf irregular galaxy Holmberg I(Ho I) (A&A, in press).

Borkova T. and Marsakov V. revealed abrupt changes of the stellar spatial and kinematical characteristics when their peculiar velocities relative to the local standard of rest cross the threshold value, $V_{pec} \approx 280$ km/sec, evidencing that the general population of metal-poor RR Lyrae stars is not homogeneous but rather consists of two spherical subsystems occupying different volumes in the Galaxy (A&A, 2003, 398, 133).

Borkova T. with collegues presented barium, europium and magnesium abundances for the new sample of stars. They confirmed the overabundance of Eu relative to Mg in halo stars. They estimated that the thick disk stellar population formed on a timescale between 1.1 to 1.6 Gyr from the beginning of the protogalactic collapse. In the halo stars the [Eu/Ba] values are found mostly between 0.40 and 0.67, which suggests a duration of the halo formation of about 1.5 Gyr (A&A, 2003, 397, 275).

Korchagin V., Borkova T., *et al.* have re-estimated the surface density of the Galactic disk in the solar neighborhood within $\pm$ 0.4 kpc of the Sun using parallaxes and proper motions of a kinematically and spatially unbiased sample of 1476 old bright red giant stars from the Hipparcos catalog with measured radial velocities from Barbier-Brossat & Figon (2000). They determined the vertical distribution of the red giants as well as the vertical velocity dispersion of the sample, (14.4 $\pm$ 0.3 km/sec), and combined these to derive the surface density of gravitating matter in the Galactic disk as a function of the Galactic coordinate z(AJ, 2003, in press).

Korchagin V., in cooperation with Tsuchiya T., Dinescu D. explored an accretion origin for Omega Cen by N-body modeling of the orbital decay and distruption of a Milky-Way dwarf satellite. They found that a capture scenario can produce an Omega Cen-like object with the current low-energy orbit of the cluster. Their best model was a nucleated dwarf galaxy with an Hernquist density profile that has a mass of $8\times10^9 M_\odot$, and a half-mass radius of 1.4 kpc (ApJL, 2003, 589, L29).

Tikhonov N. and Galazutdinova O. with Aparicio A. reported V-band and I-band CCD stellar and surface photometry of the galaxy NGC 404 , taken with HST WFPC2 and the 2.5 m Nordic telescope. The colour-magnitude diagram for the stars in this galaxy is typical of that of spheroidal systems (i.e. it lacks luminous, young stars but contains a large number of Asymptotic Giant Branch (AGB) and Red Giant Branch (RGB) stars). The disk of the galaxy is mostly dominated by red giant stars while its bulge consists of both the AGB and RGB population. Using the distance indicator technique, based on the tip of the red giant branch (TRGB), they find a distance of 3.42 ± 0.25 Mpc for this galaxy. The integral colour of the galaxy changes slightly along the radius, and its mean value is (V-I) = 1.1. On the HST images situated at $9'$ from the galaxy center there are many red giants. This means that the size of the disk of NGC 404 exceeds 20 kpc. The value of the mean metallicity of the red giants in the disk is [Fe/H] = -1.11 (A&A, 2003, 401, 863).

Bychkov V. *et al.* presented the catalogue and the method of determination of averaged quadratic effective magnetic fields $\langle$Be$\rangle$ for 596 main sequence and giant stars. The catalogue is based on measurements of the stellar effective (or mean longitudinal) magnetic field strengths Be, which were compiled from the existing literature (A&A, 2003, 407, 631).

Mitronova S. *et al.* reported the results of applying the 2MASS Tully-Fisher (TF) relations to study galaxy bulk flows. For 1141 all-sky distributed flat RFGC galaxies they construct J, H, Ks TF relations and find that Kron J_{fe} magnitudes show the smallest dispersion on the TF diagram. For the sample of 971 RFGC galaxies with $V_{3K} <$ 18 000 km/s they find a dispersion $\sigma_{TF}=0.42^m$ and an amplitude of bulk flow V= 199 ± 61 km/s, directed towards $l=301°\pm18°$, $b=-2°\pm15°$. Their determination of low-amplitude coherent flow is in good agreement with a set of recent data derived from EFAR, PSCz and SCI/SCII samples. The resultant two-dimensional smoothed peculiar velocity field traces well the large-scale density variations in the galaxy distributions. The regions of large positive peculiar velocities lie in the direction of the Great Attractor and Shapley concentration. A significant negative peculiar velocity is seen in the direction of Bootes and in the direction of the Local void. A small positive peculiar velocity (100-150 km/s) is seen towards the Pisces-Perseus supercluster, as well as the Hercules-Coma-Corona Borealis supercluster regions (A&A, 2003, 407, 889).

248 interplanetary scintillating (IPS) radio sources from the Pushchino Survey at 102 MHz in the area of 0.11 star has been cross-identified with objects from the 7C and FIRST catalogues by Kopylov A., Kopylova F. and Artyukh V. (Pushchino). Improved positions of IPS radio sources has been obtained, which are necessary for their optical identification. More than 50% of IPS radio sources belong to the class of compact steep spectrum radio sources. A significant part of them are probable candidates for steep spectrum quasars (A&A, 2003, 403, 555).

Galazutdinov G., Galazutdinova O. and Grinin V. report a detection of weak diffuse interstellar bands (DIBs) in the close vicinity of 6 Herbig Ae/Be pre-main sequence stars. A common feature of these objects is the presence of a dusty shell where DIB carriers are apparently formed/destroyed. The possible influence of ultraviolet flux on carriers of diffuse interstellar bands is discussed as well as DIB to DIB intensity ratios in the spectra of the program stars and in the general interstellar medium (A&A, 2003, 407, 705).

14. THE INI TAJIKISTAN BRANCH

The Isaac Newton Institute opened its Branch in July 2000. The formal Agreement has been signed with Prof. Pulat Babadzhanov, Director of the Institute of Astrophysics of the Academy of Sciences of Tajikistan.

The staff of the INI Tajikistan Branch are: Obid Alimov, Pulat Babadzhanov, Khursand Ibadinov, Subhon Ibadov, Gulchehra Kokhirova, Natalia Konovalova, Nasridin Minikulov, Firouz Sakhibov and Fanisa Tupiyeva. The Resident Director of the INI Branch is Pulat Babadzhanov.

The modern astronomy in Tajikistan began in 1932 after the end of the work of Tajik-Pamir complex expedition (1928-1932) which appreciated rather favorable astroclimatic conditions and advantageous geographical location of Tajikistan. In 1932 a Tajik Astronomical Observatory (TAO) was organized in the outskirts of Dushanbe. The principal directions of scientific research for the Observatory, namely, meteors, comets, and variable stars, were chosen taking into account the geographical location and climatic conditions of Tajikistan. These directions, alongside with others, remain as the main to this day.

In 1958 on the base of the observatory, the Institute of Astrophysics of the Tajik Academy of Sciences was created. It consisted of three departments: Department of meteor astronomy, Deparment of comets, Department of variable stars. Afterwards the Department of theoretical astrophysics (1962), Laboratory of experimental astrophysics (1972), and Department of astrometry (1975) were created. The following three modern observation bases were built during the 30 years after the creation of the Institute.

1. In 1963-1971 the Gissar astronomical observatory (GissAO) was built at a distance 14 km south-west from Dushanbe. Its dome houses: a 70-cm reflector supplied with electron-optical, electrophotometric and polarimetric receiving apparatus, intended for observations of variable stars and comets and a 40-cm Zeiss astrograph for observations of asteroids, comets and variable stars.

2. Sanglokh observatory, the construction of which was completed in 1980, is located in a south-east of Dushanbe at a distance of about 90 km. It was built at the top of Sanglokh Mountain, the astroclimatic conditions of which have been widely recognized, with a Ritchey-Chretien 1-m telescope.

3. Pamir high-mountain observatory, the so-called ''Solar ground-based astronomical complex 'Pamir''' (situated at an altitude of 4350 m above sea level and enjoying 250 clear nights per year). It is located in the Murgab district (East Pamir) of the Gorno-Badakhshan Autonomous Region of Tajikistan. A 70-cm telescope RT 700 (with Cassegrain optical system) and solar telescope are installed there. Pamir observatory, with its unique astroclimate, is an excellent long-term site for astronomical submillimeter, IR and optical observations.

Nature of meteoroids and phenomena accompanying flight of these bodies in the Earth atmosphere, atmospheric trajectories, meteor radiation and ionization, heliocentric orbit of meteoroids, distribution of meteor matter in the near-Earth space and, at last, origin and evolution of meteoroid streams and meteor showers — all of these problems are the area of scientific interest of scientists of the Institute of Astrophysics of the Tajik Academy of sciences.

Physics of comets is the other important direction of scientific research at the Institute of Astrophysics, Tajik Academy of Sciences. This research covers all sections of cometary physics and an extensive observational and experimental material on comets is obtained there.

Observations of variable stars in Tajikistan began from the earliest days of the formation of the Astronomical Observatory in Dushanbe. A unique photo-archives, a ''Sky Survey,'' consisting of almost 70,000 sky negatives is preserved. Based on this archive several novae and more than 100 variables were discovered in T-associations, than Features of light curves, variability of period of variables of different types, and the oscillations in brightness of novae have been studied.

Theoretical investigations of the dynamical phenomenon of the collective gravitational interactions of stars in galaxies have been widely developed at the Institute. Investigation of star formation in galaxies have shown that spiral waves of density in galaxies counted not only in the features of motion of stars and interstellar gas, but also in peculiarity of late star-formation processes. In 2003 members of the INI Tajikistan Branch continued investigating the physics and dynamics of Near-Earth Objects (NEOs), namely, asteroids, comets, meteoroid streams and meteoroids.

Pulat Babadzhanov and Natalia Konovalova investigated the photometric light curves of bright flickering Geminids. Analysis of the instantaneous images of bright Geminids shows that these meteors have wakes of 90 to 350 metres of length. Formation of meteor wakes is connected with the separation of matter from the surface of meteoroids. Meteor wakes peculiar to Geminids as well as the obtained values of the ablation energy suggest that the large Geminid meteoroids deeply penetrating into the Earth's atmosphere were disrupted by the melting and cyclic detachment of the surface-layer of meteoroid matter with the period corresponding to the observed period of the flickering.

P.B. Babadzhanov and G.I. Kokhirova carried out a quantitative analysis of 8 meteor spectra and determined the concentration of calcium ions and that of free electrons in meteor coma. Also determined was the exitation temperature along meteor trajectory.

P.B. Babadzhanov (A&A, 397, 319, 2003) investigated the orbital evolution of the near-Earth asteroid (2001) Adonis under gravitational action of six planets (Mercury-Saturn) and determined the theoretical geocentric coordinates and velocities of four meteor showers associated with this asteroid. Theoretically predicted showers were identified with the observed showers, namely, night-time Sigma Capricornids and Khi Sagittariids, and day-time Khi Capricornids and Capricornids-Sagittariids. The existence of meteor showers associated with Adonis provides evidence supporting the conjecture that this asteroid may be of a cometary origin. It was also shown that the small 50-meter near-Earth asteroid 1995 CS, according to its orbital elements and geocentric radiant and velocity, probably is a large fragment of Adonis, and is moving along the orbit of the Khi Capricornid meteor shower.

N.A. Konovalova (A&A, 404, 1145, 2003) investigated the luminosity peculiarities of bright Taurids which break up into individual fragments due to the aerodynamic pressure (into the range of 0.51 to 1.76 Mdyn/cm^3) in the Earths atmosphere. Comparing the resulting values with the known strength properties of various materials it was concluded that Taurid meteoroids could be considered structurally fragile bodies that split along fissure lines into large pieces due to aerodynamic pressure of the incoming stream of air. The taurid meteoroids have densities of 2.3 to 2.8 g/cm^3, and can be characterized as carbonaceous chondrites.

F.A. Tupieva (A&A, 408, 379, 2003) presented the results of UBV photometry of the asteroid 44 Nysa. The color curves of Nysa connected with the rotation and phase angle were obtained from observations carried out in 1982 in the Hissar observatory of the Institute of Astrophysics, Tajik Academy of Sciences. The color curves show the U-B change with rotation and the value of this change was equal to 0.2 mag. It is concluded that these color variations may be connected with the extended color spot on the surface of 44 Nysa.

15. THE INI UZBEKISTAN BRANCH

The Isaac Newton opened its Branch in August 2000. The formal Agreement has been signed with Prof. Shukhrat Ehgamberdiev, Director of the Ulugh Beg Astronomical Institute of the Uzbekistan Academy of Sciences.

At present the staff of the Isaac Newton Institute in Uzbekistan are: Bobomurat Ahmedov, Abdikul Ashurov, Venera Batirshinova, Otabek Burkhonov, Shukhrat Ehgamberdiev, Manzura Eshankulova, Olga Ezhkova, Evelina Gaynulina, Konstantin Grankin, Alisher Hojaev, Mansur Ibrahimov, Sabit Ilyasov, Shukur Kholikov, Oleg Ladenkov, Stanislav Melnikov, Karomat Mirtadjieva, Muydinjon Muminov, Salakhutdin Nuritdinov, Israil Sattarov, Aleksander Serebryanskiy, Fazliddin Shamshiev, Chori Sherdanov, Yusuf Tillaev and Mamnun Zakirov. The Resident Director of the INI Branch is Salakhutdin Nuritdinov.

Ulugh Beg Astronomical Institute of the Uzbekistan Academy of Sciences (UBAI) is one of the oldest astronomical institutions of the Former Soviet Union. It was founded in 1873. The Central Asian area where Uzbekistan lies has absolute maximum of clear sky time for the whole Euroasian continent. This makes the area particularly important for optical astronomical observations. As a result of the site testing expeditions organized by UBAI and Sternberg Astronomical Institute (Moscow) at the early 70s Maidanak mountain (2700m) located 120 km south of the famous historical city of Samarkand was selected for an observatory. In August 1996 a seeing monitoring at Mt. Maidanak was started with Differential Image Motion Monitor of ESO, designed by M. Sarazin and used for Paranal and La Silla sites testing. After one year the results of the seeing measurements showed very high quality seeing conditions at Mt. Maidanak.

Starting this year all scientific projects in Uzbekistan have been converted to the competitive grant system. The current seven main research topics have been selected by the Center of Science and Technology of the Republic of Uzbekistan for the budget funding. They are related to the theoretical and observational research in galaxies, photometric observation of eclipsing binaries, observational studies of young stars, the study of solar activities, etc.:

Project 1: ‘‘Gravitational lenses and collapsing galaxies’’: Investigators: Salakhutdin Nuritdinov, Karomat Mirtadjieva, Evelina Gaynulina, Otabek Burkhonov and a number of postgraduate students. This group studies early evolution stages of spiral and other disk galaxies and gravitationally lensed quasars. Observations of gravitationally lensed quasars are carried out with the 1.5 m telescope at the Maidanak Observatory using modern CCD-camera.

Project 2: ‘‘The study of solar activities’’: Investigators: Shukhat Ehgamberdiev, Israil Sattarov, Shukur Kholikov, Aleksander Serebryanskiy, Oleg Ladenkov, Chori Sherdanov, and Yusuf Tillaev. This group carries out observations in helioseismology in the frame of a number of International research programs and studies mechanisms of the solar activity. Besides interior structure of the Sun is also the aim of this group.

Project 3: ‘‘Observational tests of the origin theory and early stages of young stars’’: Investigators: Konstantin Grankin, Olga Ezhkova, Stanislav Melnikov, Manzura Eshankulova, and a number of postgraduate students. The main aim of this group is observation of young stars in our Galaxy. The group created the most multicolor data base.

Project 4: ‘‘Development of complex program of near open clusters’’: Investigators: Muydinjon Muminov and a number of young scientists. The group has first epoch of near 50 open star clusters photographed 20-25 years ago. Today they are photographing the second epoch as well as planning photometric observations.

Project 5: ‘‘Young stars and structure formation around them’’: Investigators: Alisher Hojaev and a number of postgraduate students. They observe and research young stars in open star clusters and associations.

Project 6: ‘‘Dynamics of gravitating systems and electromagnetic fields around compact objects’’: Investigators: Abdikul Ashurov, Bobomurat Ahmedov and a number of students. The group is studying encounters in galaxies with black hole and electromagnetic fields and waves around magnetized neutron stars.

Project 7: ‘‘Nature of cores of galaxies and quasars’’: Investigators: Mansur Ibrahimov, Venera Batirshinova, Sabit Ilyasov, and a number of young scientists. The group carries out the CCD observations of some quasars and active galactic nuclei.

Several members of the Branch deliver lectures in the Astronomy Department of the National University of Uzbekistan. The University was founded in 1918. The Astronomy Department of the University trains Bachelors, Masters, Post-graduates and Post-doctoral students. The scientific activity of the Department members are in the fields of : Formation and Evolution of Elliptical galaxies, Physics of Globular Clusters, Dynamics of Galaxy Clusters, Physics of Quasars, and Close Binary Systems. In particular Mamnun Zakirov studies the influence of the third star on close binary system.

Scientific Highlights 2003 of the INI Uzbekistan Branch Menard, F., Bouvier, J., Dougados, C., Mel’nikov, S. Y., Grankin, K. N. (Constraints on the disk geometry of the T Tauri star AA Tau from linear polarimetry. Astronomy and Astrophysics, 409, p.163-167, 2003) have simultaneously monitored the photometric and polarimetric variations of the Classical T Tauri star AA Tau during the fall of 2002. They combined these data with previously published polarimetric data covering two earlier epochs. The phase coverage is complete, although not contiguous. AA Tau clearly shows cyclic variations coupled with the rotation of the system. The star-disk system produces a repeatable polarisation curve where the polarisation increases with decreasing brightness. The data fit well with the model put forward by Bouvier *et al.* (1999) where AA Tau is viewed almost edge-on and its disk is actively dumping material onto the central star via magnetospheric accretion. The inner edge of the disk is deformed by its interaction with the tilted magnetosphere, producing ''eclipses'' as it rotates and occults the photosphere periodically. From the shape of the polarisation curve in the QU-plane they confirmed that the accretion disk is seen at a large inclination, almost edge-on, and predict that its position angle is $PA \sim 90°$, i.e., that the disk's major axis is oriented in the East-West direction. Based on observations collected with the STERENN Polarimeter at the 2 m Bernard-Lyot telescope (TBL) operated by INSU/CNRS and Pic-du-Midi Observatory (CNRS USR 5026), France.

Raiteri, C. M., Villata, M., Tosti, G., Nesci, R., Massaro, E., Aller, M. F., Aller, H. D., Terasranta, H., Kurtanidze, O. M., Nikolashvili, M. G., Ibrahimov, M. A. *et al.* (Optical and radio behaviour of the BL Lacertae object 0716+714. Astronomy & Astrophysics, vol. 402, 151, 2003) studied observations of the BL Lac object 0716+714 in the last years: 4854 data points have been collected in the UBVRI bands since 1994, while radio light curves extend back to 1978. Many of these data, which all together constitute the widest optical and radio database available on this object, are presented there for the first time. Four major optical outbursts were observed at the beginning of 1995, in late 1997, at the end of 2000, and in fall 2001. In particular, an exceptional brightening of 2.3 mag in 9 days was detected in the R band just before the BeppoSAX pointing of October 30, 2000. A big radio outburst lasted from early 1998 to the end of 1999. The long-term trend shown by the optical light curves seems to vary with a characteristic time scale of about 3.3 years, while a longer period of 5.5-6 years seems to characterize the radio long-term variations. In general, optical colour indices are only weakly correlated with brightness; a clear spectral steepening trend was observed during at least one long-lasting dimming phase. Moreover, the optical spectrum became steeper after JD 2,451,000, the change occurring in the decaying phase of the late-1997 outburst. The radio flux behaviour at different frequencies is similar, but the flux variation amplitude decreases with increasing wavelength. The radio spectral index varies with brightness (harder when brighter), but the radio fluxes seem to be the sum of two different-spectrum contributions: a steady base level and a harder-spectrum variable component. Once the base level is removed, the radio variations appear as essentially achromatic, similarly to the optical behaviour. Flux variations at the higher radio frequencies lead the lower-frequency ones with week-month time scales. The behaviour of the optical and radio light curves is quite different, the broad radio outbursts not corresponding in time to the faster optical ones and the cross-correlation analysis indicating only weak correlation with long time lags. However, minor radio flux enhancements simultaneous with the major optical flares can be recognized, which may imply that the mechanism producing the strong flux increases in the optical band also marginally affects the radio one. On the contrary, the process responsible for the big radio outbursts does not seem to affect the optical emission.

16. THE INI YUGOSLAVIA BRANCH

The Isaac Newton Institute opened its Branch in Yugoslavia in April 2002. The formal agreement has been signed with Prof. Milan S. Dimitrijevic Director of the Belgrade Astronomical Observatory.

The staff of the Isaac Newton Institute in Belgrade are: Edi Bon, Srdjan Z. Bukvic, Zorica Cvetkovic, Miodrag Dacic, Milan S. Dimitrijevic, Stevan I. Djenize, Gojko R. Djurasevic, Sanja R. Erkapic, Ljubinko M. Ignjatovic, Predrag Jovanovic, Aleksandar Dj. Kubi- cela, Anatolij A. Mihajlov, Vladimir Milosavljevic, Nenad Milovanovic, Slobodan Ninkovic, Dragomir Olevic, Luka Ch. Popovic, Srdjan S. Samurovic, Zoran Simic, Aleksandar Sreckovic, Natasa M. Stanic and Dragana Tankosic. The staff of the INI Branch in Yugoslavia includes representatives of Belgrade Astronomical Observatory, Faculty of Physics of the Belgrade University and Institute of Physics. The Resident Director of the Branch is Milan S. Dimitrijevic.

The principal astronomical institution in Serbia is the Belgrade Astronomical Observatory, one of the oldest scientific organizations and the unique autonomous astronomical institute in Yugoslavia. Its past development forms an important part of the history of science and culture in these regions. The decree of its founding conjointly with the Meteorological Observatory was signed on 20 March (7 April) 1887 by the Minister of Education and Church Affaires of Kingdom of Serbia Milan Kujundzic on the initiative of Milan Nedeljkovic (Belgrade 27. Sept. 1857 - Belgarde 27 Dec. 1950), a professor of the Grand School (Belgarde University). Nedeljkovic was appointed first director of the newly founded Observatory. He governed Observatory until 1924, with a small break when 1899-1900 Director was Djordje Stanojevic (Negotin, 7 April 1858 - Paris 24 Dec. 1921), the first Serbian astrophysicist, later on the rector of Belgrade University. Dj. Stanojevic was a great popularizer of astronomy and science in general; he was the driving force in the introduction of electrical light in Belgrade and other cities in Serbia, the builder of the first hydro-electric power station in Serbia, a pioneer of industry of refrigerating appliances, the initiator of setting up a committee for cooling problems and of forming an international organization for cooling technique in Paris in 1903. He was also the pioneer of the color photogaphy in Serbia.

Apart from its importance for astronomy and meteorology, the Belgrade Astronomical Observatory was a cradle of the seismic and geomagnetic researches in Serbia. The instruments procured by Nedeljkovic from the Great war reparations, constitute still practically the only observing basis of the Observatory. Currently mounted in appropriate pavilions are the following instruments: 1. Large Refractor - ZEISS 650/10550 mm equatorial; 2. Solar spectrograph (monochromatic) LITTROW, 9000 mm/100.000 developed by adapting to the ZEISS 200/3020 mm equatorial two astrocameras TESSAR and PETZVAL 160/800 mm; 3. Large Transit Instrument ASKANIA 190/2578 mm; 4. Large Vertical Circle

ASKANIA 190/2578 mm; 5. Astrograph ZEISS 160/800 mm; 6. Photovisual Refractor ZEISS 135/1000 mm and 125/1000 mm; 7. Transit Instrument BAMBERG 100/1000 mm and 8. Zenith-telescope ASKANIA 110/1287 mm.

At present, there are 42 employees at the Observatory 32 of them are astronomers. The Observatory is divided in Department of Astrophysics, Department for Dynamical Astronomy, Department for Astrometry, and Time keeping and geographic coordinates determination service. Scientific activity on Observatory is organized in 9 projects:

1. Influence of collisional processes on astrophysical plasma lineshapes (principal invesigator Milan S. Dimitrijevic);

2. Solar spectral irradiance variability (Istvan Vince);

3. Inverse problems in astrophysics: Doppler tomography (Slobodan Jankov);

4. Stellar physics (Gojko Djurasevic);

5. Astrophysical spectroscopy of extragalactic objects (Luka Ch. Popovic);

6. Position and motion of minor bodies of the Solar system (Zoran Knezevic);

7. Investigations of double and multiple stars (Georgije Popovic);

8. Structure, kinematics and dynamics of the Milky Way (Slobodan Ninkovic);

9. History of astronomy among Serbs (Slobodan Ninkovic)

Serbian Astronomical Journal publishing by the Belgrade Astronomical Observatory and Department of Astronomy of the Faculty of Mathematics of the Belgrade University is available on www through the Astrophysical Data System (ADS), thanks to the courtesy of the System's holders. The www address is: *http://adswww.harvard.edu.BOBeo*. During 1999, the web site of the Belgrade astronomical observatory has been made and the corresponding www address is: *http://www.aob.bg.ac.yu*. Moreover the database BELDATA has started to develop and it is available through internet with the address: *http://www.aob.bg.ac.yu/BELDATA*. The INI Yugoslavia Branch has as well the internet address: *http://www.aob.bg.ac.yu*

In the course of its history the Belgrade Astronomical Observatory grew to an institution of great importance in the history of science and culture of the Serbian people, not only in the field of astronomy but also in meteorology, seismology and geomagnetics. Linked to this institution are the names of the famous personalities in the history of science who contributed to the Observatory, and the scientific achievements of Serbian astronomers in general, having earned esteem in the international scientific community as well as to the young having a good perspective, in our country too, in engaging in this beautiful and challenging science, in an ambience enabling them to achieve results of the highest value. In 2003 Luka C. Popovic and P. Jovanovic studied the influence of gravitational microlensing on the AGN Fe K alpha line confirming that unexpected enhancements recently detected in the iron line of some AGNs can be produced by this effect. They use a ray tracing method to study the influence of microlensing in the emission coming from a compact accretion disc considering both geometries, Schwarzschild and Kerr. Thanks to the small dimensions of the region producing the AGN Fe K alpha line, the Einstein Ring Radii associated to even very small compact objects have size comparable to the accretion disc hence producing noticeable changes in the line profiles. Asymmetrical enhancements contributing differently to the peaks or to the core of the line are produced by a microlens, off-centered with respect to the accretion disc. In the standard configuration of microlensing by a compact object in an intervening galaxy, they found that the effects on the iron line are two orders of magnitude larger than those expected in the optical or UV emission lines. In particular, microlensing can satisfactorily explain the excess in the iron line emission found very recently in two gravitational lens systems, H1413+117 and MG J0414+0534. Exploring other physical scenario for microlensing, they found that compact objects (of the order of one $M_{\odot}$) which belong to the bulge or the halo of the host galaxy can also produce significant changes in the Fe K alpha line profile of an AGN. However, the optical depth estimated for this type of microlensing is very small (tau 0.001), even in a favorable case.

Using a well known method for laboratory plasma diagnostic, the Boltzmann-plot, Luka C. Popovic in 2003 discussed the physical properties in Broad Line Region (BLR) of Active Galactic Nuclei (AGN). He applied the Boltzmann-plot method to Balmer lines on a sample of 14 AGN, finding that it may indicate the existence of ''Case B'' recombination or Partial Local Thermodynamical Equilibrium (PLTE). For BLR of AGN, where PLTE exists, he estimated the electron temperature and density of BLR. The estimated electron temperatures (T 13000 - 37000) are in good agreement with previous estimates. The estimated electron densities depend on opacity of the emitting plasma in BLR. Luka C. Popovic, Edi Bon, Natasa Stanic and Aleksandar Kubicela have studied the Ly alpha, H beta, H alpha and Mg II 2798 line profiles of Seyfert 1 III Zw 2. The shapes of these broad emission lines show evidence of a multicomponent origin and also features which could be identified as the peaks due to a rotating disk. They have proposed a two-component Broad Line Region (BLR) model consisting of an inner Keplerian relativistic disk and an outer structure surrounding the disk. The results of the fitting of the four Broad Emission Lines (BELs) here considered, are highly consistent in both the inner and outer component parameters. Adopting a mass of $2\times10(+8M)_{\odot}$ for the central object, they found that the outer radius of the disk is approximately equal for the four considered lines (0.01 pc). However, the inner radius of the disk is not the same: 0.0018 pc for Ly alpha, 0.0027 pc for Mg II, and 0.0038 pc for the Balmer lines. This, as well as the relatively broad component present in the blue wings of the narrow [OIII] lines indicate stratification in the emission-line region. Using long-term H beta observations (1972-1990, 1998) they found a moderate flux variation of BEL with respect to the [OIII] lines. The variation is higher in the low-velocity component of BLR which corresponds to the outer structure surrounding the disk.

Characteristics of the astrophysically important Stark broadened 447.15 nm, 587.56 nm and 667.82 nm He I spectral line profiles have been measured in 2003 by Vladimir Milosavljevic and Stevan Djenize at electron densities between 0.3×10(+22) and 8.2×10(+22) m(-3) and electron temperatures between 8000 and 33 000 K. Investigated plasmas were created in five various discharge conditions using a linear, low-pressure, pulsed arc as an optically thin plasma source operated in a helium-nitrogen-oxygen gas mixture. On the basis of the observed asymmetry of the line profiles they have obtained ion broadening parameters (A) caused by influence of the ion microfield on the line broadening mechanism and also the influence of the ion dynamic effect (D) on the line shape. They have found stronger influence of the ion contribution to these He I line profiles than the semiclassical theoretical approximation provides. This can be important for some astrophysical plasma modeling or diagnostics.

On the basis of the observed asymmetry of the measured spectral line profiles Vladimir Milosavljevic and Stevan Djenize obtained the ion contribution to the Ne I (26 lines), Ar I (19 lines) and Kr I (20 lines) spectral line broadening due to the quasi-static ion approximation and ion-dynamical effects. The ion broadening parameters (A) and the ion dynamic coefficients (D) have been obtained directly by the use of their line deconvolution procedure which allows the determination of the basic physical properties that characterize the line profile and also the relevant plasma parameters. They have found clear evidence of the quasi-static ion and ion-dynamical effects on the investigated line shapes, much more important than the approaches based on semiclassical theory give, especially in the case of the Ne I spectral lines. This is of importance for astrophysical plasma modeling and diagnostics. On the basis of five accurately recorded neutral argon (Ar I) line shapes (in the 4s-5p transition) Vladimir Milosavljevic and Stevan Djenize have recovered the basic plasma parameters i.e. electron temperature (T) and electron density (N) using their new line deconvolution procedure in the case of three different plasmas created in a linear, low-pressure, pulsed arc discharge. The mentioned plasma parameters have also been measured using independent experimental diagnostic techniques. An excellent agreement has been found among the two sets of obtained parameters. This recommends their deconvolution procedure for plasma diagnostic purposes, not only for laboratory but also for astrophysical; plasmas where direct measurements of the main plasma parameters (T and N) are not possible. The separate electron (We) and ion (Wi) contributions to the total Stark width, which have not been measured so far, have also been obtained.

Anatolij A. Mihajlov, Milan S. Dimitrijevic and Ljubinko M. Ignjatovic studied the influence of a group of chemi-ionization and chemi-recombination processes on the populations of higher states of Hydrogen in the layers of a stellar atmosphere. This group of processes includes the ionization: $H^*(n)+H(1s)-H(2)^{+}+e$, $H^*(n)+H(1s)-H(1s)+H^{+}+e$, and inverse recombination: $H(2)^{+}+e-H^*(n)+H(1s)$, $H(1s)+H^{+}+e-H^*(n)+H(1s)$, where $H^*(n)$ is the hydrogen atom in a state with the principal quantum number n much larger than 1, and $H(2)^{+}$ is the hydrogen molecular ion in a weakly bound rho-vibrational state of the ground state. These processes have been treated within the frame of the semi-classical approximation, developed in several previous papers, and have been included in the general stellar atmosphere code PHOENIX. They present results for an M dwarf atmosphere, with effective temperature equal to 3800 K and find that the inclusion of chemi-ionization and chemi-recombination processes is significant in the low temperature parts of the atmosphere. The influence of symmetrical chemi-ionization and chemi-recombination processes on the helium atom Rydberg states' population in weakly ionized layers of helium rich DB white dwarfs has been investigated in 2003 by Anatolij A. Mihajlov, Ljubinko M. Ignjatovic and Milan S. Dimitrijevic. The ionization processes in $He^*(n)+He(1s(2))$ collisions and their inverse recombination processes $He(2)^{+}+e$ and $He(1s(2))+He^{+}+e$ have been considered in domains of principal quantum numbers n greater or equal 3 and effective temperatures from 12000 K up to 20000 K. These processes have been treated within the frame of the semi classical theory developed earlier. Their contributions to the Rydberg state populations have been compared with electron - electron - ion recombination, electron - excited atom ionization and electron - ion photorecombination processes. Results showed that these processes can be dominant ionization/recombination mechanisms in helium rich DB white dwarf atmosphere layers for log g = 7 and 8 and effective temperatures up to 20 000 K, and have to be implemented in relevant models of weakly ionized helium plasmas.

The interest for atomic data on as much as possible larger numbers of emmiters/absorbers, increased considerably last years, since with space born spectrographs, one obtains stellar spectra with such resolution that a large number of different spectral lines may be indentified. As an example, in the spectrum of Przybylski's star Cowley *et al.* indentified in 2000, lines belonging to 75 various atom/ion species. Consequently, data on the Stark broadening of neutral germanium spectral lines are of interest not only for laboratory but also for astrophysical plasma research as e.g. for germanium abundance determination and opacity calculations. Moreover, germanium is commonly associated with slow-neutron-capture nucleosynthesis in stellar interiors. Also germanium lines are present in Solar spectrum and with the help of Goddard High Resolution Spectrograph (GHRS) on Hubble Space Teloscope (HST) presence of germanium is confirmed e.g. for Chi Lupi binary star. The primary component of this system has T(eff) = 10 650 K and log g = 3.8 and the secondary T(eff) = 9200 K and log g = 4.2. Since around T = 10 000 K hydrogen is mainly ionized, Stark broadening is the principal pressure broadening mechanism for such plasma conditions. It is interesting to note as well that beginning with germanium (Z = 32) and extending to heavier elements, there is a ''dramatic increase in the magnitude of overabundances'' in chemically peculiar (CP) star spectra. Stark broadening of the 11 Ge I transitions, within the 4p(2) - 4p5s transition array has been analyzed within the frame of the semiclassical perturbation method during 2003 by Milan S. Dimitrijevic, Predrag Jovanovic and Zoran Simic. Obtained results have been compared with available experimental and theoretical data. The importance of the electron-impact broadening in the case of the 4226.562 A line for A star atmospheres has been tested.

In hot star atmospheres, the Stark broadening is the main pressure broadening mechanism. An interesting application where such a mechanism is of interest is the modeling and investigation of hot star spectra, stellar atmospheres and subphotospheric layers. Consequently, for the investigation and modeling of the Hg-Mn star and oder type of hot star atmospheres, the Stark broadening parameters for Co III spectral lines may be of interest. Dragana Tankosic, Luka C. Popovic and Milan S. Dimitrijevic determined during 2003, Stark broadening parameters for 20 Co III spectral lines as a function of temperature, within the semi-empirical approach. The importance of the electron-impact effect in the case of the Co III 194.98 nm line for several stellar atmosphere models has been tested. Stark widths and shifts of astrophysically important ten doubly ionized sulfur (S III) spectral lines (within the 3d-4p and 4s-4p transitions) have been measured by Aleksandar Sreckovic, Milan S. Dimitrijevic, Stevan Djenize and Srdjan Bukvic in a SF(6) plasma created in the linear, low-pressure, pulsed arc discharge at about 35 000 K electron temperature and about $2.8\times10^{+23}m^{-3}$ electron density. The widths and shifts have been calculated using the semiclassical perturbation formalism, taking into account the impurity of energy levels, i.e. that the atomic energy levels are expressed as a mix of different configurations due to the configuration interaction, modified semi-empirical method, simplified semiclassical theory and its modification, taking into account new energy level values. Calculations have been performed for electron temperatures between 10 000 K and 150 000 K for electrons, protons and helium ions - the main perturber particles in stellar atmospheres. Stark shifts of nine doubly charged (Si III) and six triply charged (Si IV) silicon spectral lines have been measured in a linear, low-pressure, pulsed arc operated in O2 and SF6 discharges. Si III Stark shift values have been also calculated using the semiclassical perturbation formalism for electrons, protons and helium ions as perturbers. Transition probabilities of spontaneous emission (Einstein's A values) of nine Si III transitions have been obtained using the relative line intensity ratio method, and also calculated using the Coulomb approximation method. Using a semiclassical perturbation method, Milan S. Dimitrijevic, Miodrag Dacic and Zorica Cvetkovic have calculated in 2003 electron-, proton-, and ionized helium-impact line widths and shifts for 52 Be III multiplets as a function of temperature and perturber density. The electron temperatures are 10,000 K; 20,000 K; 50,000 K; 100,000 K 200,000K and 300,000 K and perturber densities are from $10^{+11}cm^{-3}$ up to $10^{+21}cm^{-3}$. The obtained results have been used for discussion of regularities and systematic trends along spectral series.

Milan S. Dimitrijevic and Luka C. Popovic have studied the influence of Stark broadening and stratification effects on Si I, lines in the rapidly oscillating (roAp) star 10 Aql, where the Si I, 6142.48 A and 6155.13 A lines are asymmetrical and shifted. First we have calculated Stark broadening parameters using the semiclassical perturbation method for three Si I, lines: 5950.2 A, 6142.48 A and 6155.13 A. We revised the synthetic spectrum calculation code taking into account both Stark width and shift for these lines. From the comparison of our calculations with the observations we found that Stark broadening + the stratification effect can explain asymmetry of the Si I, 6142.48 A and 6155.13 A lines in the atmospere of roAp star 10 Aql.

Gojko Djurasevic and Sanja Erkapic with collaborators have studied the gravity-darkening exponents in semi-detached binary systems. From the light curve analysis of several semi-detached close binary systems, the exponent of the gravity-darkening for the Roche lobe filling components has been empirically estimated. The analysis, based on Roche geometry, has been made using the latest improved version of their computer programme. The present method of the light-curve analysis enables a simultaneous estimation of the parameters of the system and gravity-darkening exponents. The reliability of the method has been confirmed by its application to the artificial light curves obtained with a priori known parameters. Further tests with real observations have shown that in the case of well defined light curves the parameters of the system and the value of the gravity-darkening exponent can be reliably estimated. This first part of their analysis presents the results for 9 of the examined systems, that could briefly summarised as follows: 1) For four of the systems, namely: ZZ Cru, RZ Dra, XZ Sgr and W UMi, there is a very good agreement between empirically estimated and theoretically predicted values for radiative and convective envelopes. 2) For the rest five, namely: TT Aur, V Pup, TV Cas, LT Her, and VV UMa, the estimated values of the gravity-darkening exponents were deduced to be larger than theory expects for purely radiative or convective envelopes, respectively. Moreover, it is worthwhile to mention that these values —although greater than theoretical predictions— are: a) smaller compared to those found by others b) in two cases, (TV Cas and LT Her), they are normal if some kind of solar type activity (i.e. by employing the Roche model involving a spotted area on the surface of the secondary star) is assumed. 3) The large values derived for the two early-type systems TT Aur and V Pup are very possibly connected with the effects of rotation laws, and in some degree with the large contribution of the radiative pressure in the total potential, leading by that to considerable deviations of the stellar surfaces from the assumed classical Roche geometry. 4) Finally, in the VV UMa case, the estimated value of the gravity-darkening exponent-although almost double than the expected for the stars with convective envelopes— still it is low in comparison with that estimated by others who have analysed the same data. But, since for this particular binary the anomalous GDE is not supported by recent simultaneous uvby obesrvations the estimated higher value may be due to the old observational material used.

In the paper ‘‘Long-term photometric behaviour of the RS CVn binary RT Lacertae’’ Gojko Djurasevic and Sanja Erkapic with co-authors have analysed a sequence of the seasonal light curves of RT Lac, covering the period 1978-2000, in the frame work of the starspots hypothesis to define the spot distribution, based on the interpretation of the B-band observations. The analysis of the corresponding light curves is made using Djurasevic's inverse-problem method. To explain the light-curve variations the binary is modelled using a Roche model that involved regions containing spots on both components. Satisfactory fits were obtained assuming spots on both components. The more massive G5 primary appears to be the most active star in the system and its spotted areas mainly responsible for the light-curve distortions. Spots are concentrated around longitudes 45-170 degrees and at high latitudes (above 45 degrees). The analysis indicates two spots with diameters of approximately 10-50 degrees on both hemispheres of the primary. However, the less-massive cool component seems to have only one spot which covers a relatively small area. Total spotted area of the more-massive primary component indicates clear evidence for a short-term activity cycle with a period of 8.4 yr, and a possible long-term cycle with a period of 33.5 yr. The G9IV secondary does not show any evidence for an activity cycle, its spot coverage appearing rather constant at about 10% of its surface. The variation of the orbital period seems to be correlated with the total activity level of the system. In particular, the decrement of the orbital period appears to be associated with the minimum spottedness and sizeable changes of the surface spot pattern distribution on the surface of each star. This result, if confirmed by the future observations, can provide further support for recently proposed models for connection between the magnetic activity and orbital period variations.

Gojko Djurasevic has published in 2003 the analysis of new BVR light curves for the active star SV Cam. The Roche model with spotted areas on the hotter primary component fits satisfactorily all filter observations yielding two spots in intermediate latitudes and covering about 1.5% each of the stellar surface. Both are about 1000K cooler than surrounding photosphere. The comparison with an earlier season (January/February 2000) suggests that the spots probably evolved in area longitude and latitude but basic and preferred orientation from previous season are confirmed.

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