

# **International Symposium**

## **The Astronomer Nicolae Donici – 140 years from his Birth**

### **PROGRAM**

#### **About the Life and Work of Nicolae Donici**

##### **Nicolae Donici, a Great Personality of the World Astronomy**

*Magda Stavinschi*

*Astronomical Institute of the Romanian Academy*

We are celebrating 140 years since the birth of Nicolae Donici. For 45 years his name has been deleted from the Romanian scientific chronicles from both Romania and Moldavia, including from the Pantheon of honorary members of the Romanian Academy. It is time to get to know him better, to discover the cultural legacy that he left behind in astronomy, and to disentangle some of the mysteries that surround him.

In this paper I will try to summarize what we know about him today, based on written testimonials, on research conducted in libraries and archives in Romania and abroad, and on conversations that I had with those who knew him personally.

Perhaps we will never know everything about his life and work, but at least we will pay a well deserved tribute to his memory.

##### **Interview with Mrs. Zoe Donici**

*Anca Filoteanu*

Mrs. Zoe Donici, 92 years old, was married with one of the astronomer's cousins. She is one of the last relatives alive of Nicolae Donici and the last person alive who met him personally. She also is the one who received him in her house on the occasion of his last passage in Romania, before leaving forever to France. Mrs. Zoe Donici tells us about the man Nicolae Donici and his family, as she remembers today, seven decades after their last encounter.

##### **Nicolae Donici: the Dialectics of Life and Creation**

*Veaceslav Ursaki and Ion Tiginyanu*

*Academy of Sciences of Moldova*

This communication presents an analysis of scientific creation of the brilliant Romanian scientist Nicolae Donici, as well as of his life, from the point of view of unity and struggle of opposites in his life and creation. It is shown that the scientific activities of the scientist are at the interface between astronomy and astrophysics, between the fundamental research and engineering, the great fundamental realizations being impossible without putting into operation of the observatory at the motherland of the scientist in Dubăsarii Vechi, Bessarabia. This was a world-class observatory equipped with high performance instruments, including a spectroheliograph developed by Nicolae Donici personally, it being the best performing instrument among the 7 spectroheliographs available at that time in the world. The events in the life of the scientist ranged between misfortunes and challenges from the one hand, and lucky circumstances and achievements on the other hand. Orphaned at an early age of eight years, he was lucky to be with his wealthy aunt Elena Lisakovskaia, who secured him a good education and put a basis for a brilliant scientific career. The confrontations between wealth and poverty, between blows of fate and willingness to confront challenges in the life of the great scientist are also of the dialectic. As the great scientist's life is marked by contrasts and opposites, the attitude towards him also was between the admiration and contempt during the life and between gratitude and oblivion after his death. It is suggested in conclusions that the dramatism of the brilliant scientist's life resembles the one of another great exponent of the nation who was the great

poet Mihai Eminescu. Not incidentally the two asteroids which immortalize their personality and creation travel across the universe alongside under the numbers 9494 and 9495

### **Nicolae Donici - Founder of a Stronghold of Science on Dniester River.**

*Ion Holban, National Council for Accreditation and Attestation of the Republic of Moldova, Information Society Development Institute of the Academy of Sciences of Moldova.*

It reviews the life and work of a Bessarabian astronomer Nicolae Donici, founder of a stronghold of science on a Dniester river. Highlighting this great personality of Romanian and world science and his works on the edge of science, is done in the context of space and time he lived in, of the leading concerns of science of the time, and is seen through the prism of the Donici family, always eager for the light of knowledge from which the perpetuation of the Romanian nation in Bessarabia through language, culture and science has been evermore kindled. Certain new data from the archives have been brought to light, as well as some testimonies of the people who knew him. An attempt has been made to give a real dimension to the scientific and human personality of the world-class astronomer Nicolae Donici, whom the earth of Romanian Bessarabia brought forth.

### **Astronomer Nicolae Donici in Everyday Life**

*Iurie Colesnic*

Nicolae Donici, a man of a special culture, who was in love with music and loved to sing, although he had no musical hearing. Although he had little free time, he was reading very much, gathering a big library at Dubăsarii – Vechi. He had a common sense, because even if he had two cars in the garage, he preferred to come to Chişinău in a horse-drawn carriage. There are many other small oddities that represent him as an accomplished scholar.

### **In the footsteps of the astronomer Nicolae Donici**

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A documentation travel in some Bessarabian places related to the life and the activity of the reputed Romanian astronomer Nicolae Donici has been performed: Dubăsarii Vechi, Petricani and Chişinău. A photography series was shot, commented, some were compared to the ancient photographs. We tried to find the legacy between the quotidian activities of the population and the astronomical problems which persisted during Nicolae Donici's life. Some precious statements of persons who have known people which have known the astronomer have been recorded. We have seen that the population from nowadays homage the astronomer.

### **On the Research of Nicolae Donici**

#### **Nicolae Donici's researches on zodiacal light**

*Mircea Rusu<sup>(1)</sup>, Marian D. Şuran<sup>(2)</sup>, Oana Stere<sup>(2)(3)</sup>*

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Zodiacal light is a faint, diffuse white glow that appears to extend along the ecliptic. Its origin is the scattering of sunlight produced by the space dust, so its spectrum is the same as the solar spectrum. The zodiacal light decreases in intensity with distance from the Sun. The glow of the zodiacal light was investigated by Giovanni Domenico Cassini in 1683 and he presented the correct explanation of the phenomenon as a faint glow that extends away from the Sun in the ecliptic plane of the sky, caused by dust from interplanetary space. Not too many astronomers made observations on

the zodiacal light. One of them was Nicolae Donici. Starting from 1902 he was interested in observing the high altitude atmospheric luminescence and other such diffuse luminous phenomena seen on the sky. In this presentation we try to follow the Donici's contribution to the understanding of this phenomenon, part of his interests on the luminous phenomena seen on the sky as scattering of light from dust particles or even luminescence caused by high altitude atmospheric dust particles. His observations on zodiacal light started after 1945 and were concerned on the spatial distribution of the light. His observations and measurements are an important part on understandings the dynamics of dust in the planetary systems and why not in a general problematic of the accretion discs dynamics.

Researches on this subject are still of interest because of the instabilities of such kind of discs, under the same forces, gravitation and light. Interesting is to examine zodiacal light images and to find the precise form and extent of the zodiacal disc that are still poorly known. Analysis was carried out on a selection of zodiacal light images and we try to find a way of quantifying the form of the disc.

### **Astronomy and Meteorology – Two Sciences Interconnected in Astrophysicist Nicolae Donici's Life**

Florinela Georgescu, Ancușa Manea  
National Meteorological Administration

Since ancient times people have tried to discover the laws by which the world they live in works. Brilliant minds of humanity have tried to understand both the heavenly events and the earthly phenomena. In time, through continuous efforts of the intellectual elite, distinct sciences such as: Astronomy, Geology, Oceanography, Meteorology, etc. earned distinct shapes. Some of these researchers had the ability to make connections between these sciences, due to a high perception of the fact that elements of the universe are in fact a whole, and that each item's change will affect the others. Scientist Nicolae Donici was one of the first researchers from the Bessarabian space who, due to his intense passion for astronomy, understood the deeper implications that cosmic processes can have on the aspect of the weather (and therefore climate) on planet Earth. Thus, along his career he founded the first point of meteorological observations within his Observatory from Bessarabia in Dubasarii Vechi locality. His concerns about meteorology were not at all superficial, as the scientist understood both the need to distribute weather stations in order to cover all forms of relief so that the meteorological data will be able to describe the climatic regions of the territory, and the endowment requirement of such an observational point with specialized equipment used by the meteorological community. In support of the first assertion is the statement that he made in the "*Report on Dubăsarii Vechi Observatory*" (February 1924) : "I rely on considerations that Dniester river valley where my observatory is located, distinguishes itself in terms of climatic regions from the surroundings and among the resorts that were part of the Romanian meteorological network in this valley there was none." His friendship with the illustrious E. Oteteleșeanu (who at that time was the Director of the Meteorological Institute) will facilitate the endowment of his Observatory with special meteorological equipment. The Nicolae Donici researcher's concerns about the study of weather elements did not stop at simple issues such as daily weather observations. From a social perspective, he managed to popularize the importance of meteorology as science by attracting the interest of teachers in Dubăsarii Vechi town for making meteorological observations. Scientific development of the field has benefited also from his contribution in the observational area of cloudiness and clouds. In 1923, at the initiative of Sir Napier Show (President of International Meteorological Committee and of the International Commission of Clouds respectively), there took place "*La Semaine Internationale des nuages*" (The International Week of Clouds), where Nicolae Donici was invited. One of the results of this international research about clouds is the "*International Cloud Atlas*" which is one of the documents used at present at the meteorological weather stations.

### **Researches in the Areas Approached by Nicolae Donici**

**The Program of Solar Diameter Measurements at Observatorio Nacional do Brasil**  
*Alexandre Andrei*

All along his distinguished scientific carrier Nicolae Donici contributed to solar studies. In fact, half of his works currently cited in the NASA-ADS service are on this subject, plus an also copious contribution on the topic of zodiacal light. Nicolae Donici was a particularly keen observer of solar eclipses, which he used to study the upper solar levels, the photosphere and the chromosphere, and their variations over the main solar cycle. It is quite enlightening, at the present day when astrophysics analysis and astronomy apparatus go hand in hand, to follow both his detailed account of the instrumentation and the conclusions it enabled him to derive. The Solar studies developed at Observatorio Nacional of Brasil since 1997, having Dr. Alexandre Andrei as Principal Investigator, share such need of instrumental improvement to attain scientific result. In this presentation we review this program. We emphasize the development of the Solar Astrolabe and of the Heliometer, as well as the long series of measurements of the variations of the solar diameter, and, as echoing Nicolae Donici own words, what they tell of the minima and maxima of solar activity.

### **A Complete Solar Cycle of Total Solar Eclipses**

*Cătălin Beldea*

*Astrofoto, Știință și Tehnică*

In the memory of our great astronomer, Romanian eclipse lover and eclipse chaser all over the world, I would like to present my personal documentation, photography and experience on “Total Solar Eclipse” phenomenon, throughout a complete solar cycle, between 1999 maximum and 2013 maximum. I will show the audience 7 total solar eclipses witch I observed from all over the Globe:

- 1999 – Romania, Chiselet village
- 2006 – Turkey, Side
- 2008 – Russia, Siberia, Novosibirsk
- 2009 – China, Jinshanwei
- 2010 – Pacific Ocean, French Polynesia, Hao atoll
- 2012 – Australia, Queensland, Mareeba
- 2013 – Kenya, lake Turkana

The presentation will highlight the evolution of the solar corona throughout this entire solar cycle.

In the beginning I will present, briefly, the history of total solar eclipses observations and the eclipses observed by Nicolae Donici with complete maps of those paths of the umbra.

### **Velocity Fields in a Solar Active Region**

*Liliana Dumitru*

*Astronomical Institute of Romanian Academy*

We analyze a solar active region producing multiple flares, using data from SOHO and SDO spacecrafts. Our attention is drawing on the photospheric flows, computed by the Local Correlation Tracking algorithm, in order to compare them for time before and after a flare occurrence. We also extrapolate the coronal magnetic field from the photospheric magnetograms and estimate the force-free-field alpha parameter that expresses the torsion of the magnetic field lines, for both moments. We also compare the coronal loops obtained from computations to those observed by the spacecraft in EUV lines.

The magnetic field is shaped under the form of dipoles, and the dipoles positions are determined from the measured magnetograms registered by satellites. The position of the dipoles in magnetograms is found by the Powell’s method of determining local extremes.

After determining the dipoles the magnetic field lines are drawn in Cartesian coordinates. Estimation of the parameter alpha, as a measure of the torque of the magnetic field lines, is made at different times in the idea of detecting the connections with solar explosive events from the region.

The obtained results show that the alpha parameter has positive peaks when magnetic flux emerges in the studied region and the coronal loops are open, and after the eruptive event producing the alpha parameter becomes negative.

### **Numerical 2.5D Simulation of an Active Region Starting with a Magnetogram as Initial Conditions**

*Cristiana Dumitrache*

*Astronomical Institute of Romanian Academy*

In order to obtain more realistic numerical models of solar phenomena, we performed a 2.5D MHD simulation starting with a real magnetogram as initial condition for the magnetic field values. The MHD equations are solved with Flux Corrector Transport type code on a mesh of 100x100 points, in two dimensions.

We performed two series of simulations, for each plan in the Cartesian coordinates that extends in the solar corona: (a)  $\underline{B} = (B_x, B_z)$ ; (b)  $\underline{B} = (B_y, B_z)$ .

The initial coronal magnetic field configuration is  $\underline{B}_t = (B_x, B_y, B_z)$  and its components are extrapolated from a photospheric magnetogram registered by the instrument MDI onboard of SOHO spacecraft, using an IDL code.

### **Analysis of two successive CMEs hitting the Earth in August 2000**

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The studied event is that of the geomagnetic storm on 12 August 2000, associated with two coronal mass ejections (CMEs) coming from the Sun. The first coronal mass ejection was observed on 8 August 2000, partial halo type (PH), with a solar source associated with a prominence at the western edge of the solar disk. The second coronal mass ejection was a full halo (FH) observed on 9 August 2000, the source being a solar eruption of XF type. Analysis of these events lies in finding the real speed of propagation using the sphere model which assumes that a CME is a sphere which extends self-similar in the interplanetary space (Fig. 1). The model takes into account as input data the source location, projection speed in the sky plane and the expansion rate from the image analysis recorded by SOHO / LASCO C2.

Thus we shall estimate the arrival time at the ACE space mission and we can delineate the boundaries of the interplanetary event (front shock front, plasma density, back shock). For a more detailed analysis of these two events, we'll compute and compare the solar magnetic source helicity with the one of the interplanetary event.

### **Analysis of the Interplanetary Events Observed by Ulysses between 5 May 2002 and 11 May 2002**

*Nedelia Popescu, Cristiana Dumitrache*

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The boundaries and the morphology of the interplanetary events registered by the Ulysses spacecraft between 5 May 2002 and 11 May 2002 are studied in this paper. The presence of a magnetic cloud (MC), followed by an interplanetary coronal mass ejection (ICME), and a spectacular stream interaction region (SIR) is underlined by a sum of signatures regarding the magnetic field, velocity, temperature and density of plasma.

### **Near-infrared Spectroscopic Observations of Asteroids**

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The study of asteroids and comets is crucial in the understanding of Solar System formation.

As the only remnants of the planetary system formation phase, the minor bodies of the Solar System have recorded the original physical and chemical conditions of the primordial solar nebula. For the recovery of this record we have to employ methods addressing both the physical and dynamical properties of asteroids. The main tool employed today to study the surfaces of the Solar System bodies is the visible and near-infrared (VNIR) spectroscopy. The solar light reflected from the asteroids contains essential information regarding the optical properties of the materials found at the asteroids surface. Comparison of asteroids telescopic spectra with those of minerals or mineral assemblages obtained in laboratory - the comparative planetology - allow us to infer the most probable mineralogical constituents of the asteroid hence its taxonomic type.

In this work we present near-infrared spectra (0.8 - 2.5 microns) of asteroids obtained with the NASA IRTF telescope from Mauna Kea, Hawaii. The components of their surfaces, taxonomic types and the probable source regions are inferred from mineralogical analysis.

### **Inexhaustible Energy**

*Julia Malcoci*

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This paper analyzes the energy of the Earth and the entire Universe. The central idea is to argue that the Universe is like a perpetuum mobile that continually generates energy sources. Energy resources such as oil, coal, natural gas, considered non-renewable, in fact, are as inexhaustible as wind energy, sun, flowing water, tides etc. Inexhaustible energy is derived based on both the side of the fission reactors, as well as at the fusion reactions. The conclusion emphasizes the vital importance of human civilization rational use of all resources available in the universe, without causing ecological disasters comparable to that in 1986 nuclear power reactor near Chernobyl.

### **Mobile Platform for New Astro-Geodetic Determinations**

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Geoid determination as physical figure of the Earth and reference equipotential surface represents one of the major tasks of geodesy, integrated in the present efforts of understanding the Earth as a system. Beginning with the December 2013, as a collaboration between Technical University of Civil Engineering Bucharest (TUCEB) Faculty of Geodesy (FG), Astronomical Institute of the Romanian Academy (AIRA) and Geogis Project s.r.l. as private co-financer, was started a project for new astro-geodetic determinations, in the actual context of technological development, mainly for geoid determination or geoid validation. The main scope of the project is to improve the precision and feasibility of positional astronomical observations by using adequate instruments and improved mathematical algorithms.