

**The Third International School in Astronomy:  
Astroinformatics – Virtual Observatory  
Belgrade, 29.06 – 01.07.2010**

## **Virtual Libraries**

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## Virtual library

"*Virtual reality* (VR) is an environment that is simulated by a computer. Most virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays, but some simulations include additional sensory information, such as sound through speakers or headphones. Some advanced and experimental systems have included limited tactile feedback."

(Wikipedia, 2005b)

Another definition of a virtual library is synonymous with a [digital library](#):

"*Virtual Library* means library without walls. The resources are available in digital format, there is no paper, microforms etc. The resources are locally held or accessed through computer networks."

(Wikipedia, 2005a)

"*The World Wide Web Virtual Library* was the first index of content on the World Wide Web. It was started by Tim Berners-Lee, the creator of HTML and the Web itself, in 1991 at CERN in Geneva."

(Wikipedia, 2005c)

## Virtual libraries in the World

### Project Gutenberg

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## **MIT Theses**    <http://dspace.mit.edu/>

MIT Faculty Open Access Policy On March 18, 2009, the MIT faculty voted unanimously to make their scholarly articles openly available on the web. DSpace@MIT will house articles made available under [the Policy](#)

MIT Thesis Collection Tops 25,000 DSpace@MIT contains selected digital theses and dissertations from all MIT departments dating as far back as the mid-1800s. Since 2004, all new Masters and Ph.D theses have been added to the collection after degrees have been awarded.

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**MIT Theses**    <http://dspace.mit.edu/>

7.4 million downloads in FY2009 Analysis of usage statistics for last fiscal year year indicates that DSpace@MIT content was downloaded directly by end-users over 7.4 million times or, on average, at a rate of over 20,000 files per day.

**arXiv.org**

<http://arxiv.org>

Open access to 612,313 e-prints (scientific articles) in  
Physics, Mathematics, Computer Science, Quantitative  
Biology, Quantitative Finance and Statistics



# Astronomical digital libraries

## ADS Digital Library

NASA [Astrophysics Data System](http://ads.harvard.edu) (ADS) Virtual Library  
<http://ads.harvard.edu/books/>

## [The SAO/NASA Astrophysics Data System](http://adswww.harvard.edu/)

Digital Library for Physics and Astronomy  
<http://adswww.harvard.edu/>

## WWW-VL: Astronomy and Astrophysics & AstroWeb

<http://web.bilkent.edu.tr/vl/astro/astro.html>

# NATIONAL SERBIAN DIGITIZATION PROJECT

The aim of this talk is to present the efforts in the area of digitization and digital preservation of scientific and cultural heritage of a group of Serbian scientists from the Faculty of Mathematics of the University of Belgrade and the Mathematical Institute of the Serbian Academy of Science and Art.

Our starting point was that **digitized scientific works** is one of the most helpful resource and tool for scientific works and fast exchange of scientific information.

## **NATIONAL SERBIAN DIGITIZATION PROJECT**

Also, we understand that every scientific work becomes after some time the part of history and the part of cultural heritage as well. So, our activities are oriented in building of electronic repositories of digitized books, journals and other scientific works. **There are two such subprojects:**

## NATIONAL SERBIAN DIGITIZATION PROJECT

**Virtual Library**, <http://elibrary.matf.bg.ac.rs>, which includes several hundreds of old and rare books in mathematical sciences written by Serbian authors and most of doctoral dissertations in mathematics, astronomy and mechanics written at the Belgrade University. This is the largest Serbian digital library.

It has in its repository about 800 books and about 350 doctoral dissertations in mathematical sciences. Access to the Virtual library is open to the general public.

## NATIONAL SERBIAN DIGITIZATION PROJECT

The second one, **E-Library of Serbian mathematical journals**, <http://elib.mi.sanu.ac.rs>, contains, for example, the complete digitized collection (since 1932 when the journal was founded) of the leading and oldest Serbian mathematical journal *Publications de l'Institut Mathématique*.

Now it includes nine Serbian mathematical and astronomical journals containing 280 volumes and 3700 articles. Access to the both libraries is open via Internet to the general public.

## NATIONAL SERBIAN DIGITIZATION PROJECT

These subprojects are oriented towards **Digital mathematical library**, a World project on which works many World institutions.

The final aim of this project is the fulfillment of a **mathematical dream of a digital archive** containing all peer reviewed mathematical literature ever published, properly linked and validated and verified.

## Virtual Library

**Faculty of Mathematics  
University of Belgrade**

<http://elibrary.matf.bg.ac.rs>

## Virtual Library - Faculty of Mathematics

The overall aim of our digital library is to create a comprehensive and interconnected collection of retro-digitized books and other digital documents.

Objectives of the project include electronic archiving first of all the old manuscripts and their publishing in electronic photo-type form and presentation to the general audience. Our proposal was at the beginning mathematically inclined, but since 2009 we started to include the books from other areas of science and literature. However, the preference will be still given to Serbian authors and works related to South-East European (Balkan) area.



## Virtual Library - Faculty of Mathematics

Some of the books in our library are rather rare and it is known that there are left only few copies of them in the printed form. We think that it is very important to preserve them in some form. Not only as a cultural or scientific heritage important for our local community but also as a part of the World heritage.

We decided to preserve and present them to the wide audience in the electronic - digitized form.

## Virtual Library - Faculty of Mathematics

Beside rare books, the library contains several important collections, for example doctoral dissertations of Serbian mathematicians (more than 350) and collected works of some leading Serbian scientists of the past: Bogdan Gavrilović, Milutin Milanković, Đuro Kurepa and few others.

The library is continuously populated by new copies of digitized books. Papers related to this digital library are published in NCD Review.

## Virtual Library - Faculty of Mathematics

The project was started in 2007 by several volunteers. Now it has the strong support by the Faculty of Mathematics of the Belgrade University, Mathematical Institute of the Serbian Academy of Science and Art, Serbian Ministry of Science through the project 13017 and the National Center for Digitization.

Since April 2010 the functionality of the library is based on DSpace, the software for building open digital repositories.

**Virtual library** of the Mathematical Faculty of the University of Belgrade is the largest digital depository of digitized texts in Serbia available to the general public. At this moment it contains about 800 digitized books. In the last two years more than 600 digital copies of books were uploaded in the library. There are several important collections, including 360 doctoral dissertations in mathematical sciences most of them obtained at the University of Belgrade. There is also the collection of old Serbian books dating the XVIII and XIX century. Most of these books are rare and some of them are left only in one known printed copy and they are not easily accessible.

In this talk we shall present the collection of Serbian astronomical books in astronomy printed in the XVIII and XIX century for which there are digital copies in the Virtual Library.

## **Astronomical books in Virtual Library**

**In the library there are about 50 books by the following authors**

**Ruđer Bošković** (1711-1787), *Elementorum Universae Matheseos - tomus I-III*, 1757, Venetis.

**Zaharije Orfelin** (1726-1785), *Eternal Calendar*, 1783, Vienna.

**Atanasije Stojković** (1773-1832), *Physics*, 1810, Budapest.

**Đorđe Stanojević** (1858-1921), most of his books, 8 of them are digitized including:  
*The starry sky of independent Serbia.*

**Milan Andonović** (1849-1926), *Cosmography*, 1888, Belgrade.

**Kosta Stojanović** (1867 - 1921), *Atomistics by Ruđer Bošković*, 1892, Niš.

Besides books from the XVIII and XIX century there are also the following astronomical books printed in the XX century:

**Nikolai J. Zinger**, (1842-1918), *Lectures on Astronomy*, 1925, Belgrade (translated by S. P. Bošković, the general and professor of geodesy at the Serbian Military Academy, edition 1899).

**Milutin Milanković** (1879-1958), most of his books, 10 books are digitized, including *Celestial Mechanics*, Belgrade, 1935 and *Kanon Der Erdbestrahlung*, Belgrade, 1941.

**Pavle Vujević** (1881-1966), *Fundamentals of the mathematical and physical geography*, 1924, Belgrade.

**Vojislav Mišković** (1892–1976), most of his books, 10 books are digitized, including *Cosmography*, 1931, Belgrade and *Collection solved problems in general astronomy*, Part I, 1956, Belgrade; Part II, electronic edition, Virtual Library, 2009.

**Tatomir Anđelić** (1903-1993), *Astrodynamics*, 1983, Belgrade.

**Zaharije Brkić** (1910-1979), *General astronomy*, 1971, Belgrade.

**Branislav Ševarlić** ( 1914-2001 ), *General astronomy* , 1971, Belgrade.

**Jovan Simovljević** (1929- 2007), *Collected works*, electronic edition, Virtual Library, 2010.

## **Ruder Bošković (1711-1787)**

Ruder Bošković is the greatest mathematician and astronomer of Dubrovnik, one of the most important scientists of his time, included among 100 the most important Serbs of all time. He was a university professor, founder of the Milan Observatory and director of the French Navy Optical Institute. He was a universal creator: philosopher, mathematician, astronomer, physicist, geologist, architect, archaeologist, designer, an optician, diplomat, writer, professor, poet and polyglot.

He was born on 18 May 1711 as the seventh child of the trader Nikola Bošković (Serb from Orahov Dol near Trebinje in Herzegovina) and mother Paula (of Italian descent, the family of Bar Betere, a famous poet from Dubrovnik). He lived mostly in Italy, where he gained the world fame. He died on 13 February 1787<sup>th</sup>.

He is the creator of the law of the united forces, asserting that there is not only the attracting force (Newton's law), but that there is repulsion as well which changes as the distance between bodies changes. According to him, an elementary dimensionless particle is the source of forces and time and space, unlike in Newton's cosmology, are relative. He is considered as the forerunner of Albert Einstein. Bošković had numerous contributions to astronomy:

- He introduced two geometric methods for determining the elements of solar rotation on the basis of observing the position of the three bodies.
- He determined the size and flatness of the Earth and discovered new comets.
- He first determined (1782) the exact path of Uranus based on the measurement of coordinates of Uranus. At that time it was believed that Uranus is a comet.
- Calculating the path of Uranus, he perfected a method for determining the orbits of comets on the basis of four measured positions, which was one of the most accurate methods at that time.
- He studied the atmosphere of Jupiter and the nature of Aurora.





Ruđer Bošković published numerous papers in mathematics, astronomy and physics. His famous books are *Theoria philosophiae naturalis redakta ad unicam legem virium in natura existentium*, *Opera pertinentia ad opticam et astronomia*, *Elementorum universae matheseos*. In Virtual there are his books:

*Elements of Mathematics* (Elementorum Universal Matheseos - Tomus I-III, 1757, Venetis).

*Diary of the way from Constantinople to Poland* (1762), translated by D. Nedeljeković, 1937, Belgrade.

*A law of continuity and its consequences in relation to the basic elements of matter and their forces*, 1754, translated by E. Stipanić, 1975, Belgrade

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# ELEMENTORUM

UNIVERSÆ MATHESEOS

AUCTORE

P. ROGERIO JOSEPHO

BOSCOVICH

SOCIETATIS JESU

PUBLICO MATHESEOS PROFESSORE

TOMUS I.

CONTI-  
NENS { GEOMETRIAM PLANAM,  
ARITHMETICAM VULGAREM,  
GEOMETRIAM SOLIDORUM,  
TRIGONOMETRIAM PLANAM, & SPHERICAM.

EDITIO PRIMA VENETA,

*Summo labore ac diligentia ab erroribus  
expurgata.*



1757

VENETIIS, MDCCLVII.

APUD ANTONIUM PERLINI:

SUPERIORUM PERMISSU, AC PRIVILEGIIS.

# ELEMENTORUM

UNIVERSÆ MATHESEOS

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P. ROGERIO JOSEPHO

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Societatis JESU

PUBLICO MATHESEOS PROFESSORE

TOMUS II.

CONTINENS

ALGEBRAM FINITAM.

EDITIO PRIMA VENETA

*Summo labore ac diligentia ab erroribus  
expurgata.*



VENETIIS, MDCCLVII.

APUD ANTONIUM PERLINI.

SUPERIORUM PERMISSU, AC PRIVILEGIIS.

**Zechariah Orfelin Stefanović** (1726 - 1785) was a prominent Serbian poet, historian, engraver, baroque educator, calligrapher and writer of textbooks. He was born in a Serbian family in Vukovar (Slavonia) in 1726.

Among his most important works is *Slavenoserbski magazin* printed in Venice in 1768. This is the first South Slavic magazine. Although it was printed just one volume, its importance is great. In the preface he presents the idea of civil enlightenment and also sneaks that science, literature and philosophy should be to leave the narrow circle of educated people and should become available to everyone. In 1768 Zechariah Orfelin introduced into the Serbian literary a language which was a mixture of Church and people's language, having many Russian words. In this way he practically founded Slavoserbian language.

Orfelin is the author of the first Serbian *bukvar* which was used since 1767 in teaching writing and reading many generations of students. He is also the author of the first Latin textbook. His most comprehensive work was *The Life of Peter the Great* (Venice, 1772), which he had seen as the enlightened monarch. He also wrote *Perpetual (eternal) calendar* printed in 1783 in Vienna. This book includes a comprehensive chapter on astronomy.

Because of his artistic works, primarily in the copperplate, he was elected for a member of the Art Academy in Vienna.

**Orfelin's *Perpetual Calendar*** has been printed in Vienna in 1783. The book has 366 pages and 9 astronomical drawings at the end of the book. Its content is mainly on natural sciences and astronomical phenomena and contains as well description of historical events since the creation of the world chronologically presented. Chapters in astronomy bear the names: Space, The Moon and the planets, comets, solar eclipse and Moon eclipse. It includes information on weather cycles, tables with information about the Sun and the Moon (needed for the calculation of the date of Easter according to the Big indicium), tables on the length of day and night, moon phase tables, and more. Therefore *Perpetual calendar* is the first book on astronomy written Slavonic language, how Orfelin says “to the benefit of the people slovenoserbskim”.



**ВѢУНЫИ**  
ТО ЕСТЬ  
Э НАЧАЛА ДА КОНЦА МІРА ТРАЮЩІИ

**КАЛЕНДАРЬ,**  
СОДЕРЖАЩІИ ВЪ СЕБѢ

**СВѢТЦИЛОВЪ И КРАТКАА, ПО**  
БГОСЛОУИИ ЦРКВЕ ИСЧИСЛЕНІЮ, Ш КРЕБѢХЪ  
ГОДОВЫХЪ, И ПРОЧИХЪ ПРИМАДЖИРУХЪ ВІСНІИ  
ИЗМѢНЕНІА; КЪ ТОЛАЪ ФІЗИЧЕСКАА Ш ТЕЛАХЪ МІРА,  
И Ш ВОДАНЫХЪ И ВОЗДУШНЫХЪ ПРИКЛОЧЕНІАХЪ РАЗВѢ  
ЖАЕНІА; СЪ ПРИКЛОЧЕНІАХЪ СІМІИИИ Ш СВѢТЛАА  
ХРОНОЛОГИИ НИИЪ ПІРВЕ НА СЛАВНОСКОЛАЪ ИЗЫКѢ  
КЪ ПОЛЪУ СЛАВНОСКОРІСКИХЪ МАРОВАИЪ.

**НАПІСАИЪ**  
**ЗАХАІЕМЪ ОУФЛАІНОМЪ**  
СІС. КРАА. ВІНСКАА АКАДЕМІИ ХУДОЖЕСТВЪ ЧАИНОЛАЪ.

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СЪ ФІГУРАМИ.

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Напечатана въ Царственомъ Градѣ Вѣникѣ,  
При Искрифѣ Бѣгороданолѣ ш Курчавѣ, Іауручиче-  
колѣ Восточнонѣ Авронолѣ Тѣнографѣ, въ  
лѣто 1783.

Послѣдующія Таблицы показуютъ время Новолунія и Полнолунія съ четвертьми каждаго мѣся чрезъ всѣхъ 19. лѣтъ, по шкончаніи котораго паки начинаеть съ перваго, ѣкже предъчисл.

### Измѣненіе сокращеній.

- В. Л. Видъ ЛѢНЫ.  
 Д. М. Дне мѣсяца.  
 Ч. М. Часы. Минуты.  
 Вр. Время.  
 Пр. Предъ полудне.  
 По. По полудни.  
 ● Нова ЛѢна, или Новолуніе.  
 ☽ Первая Четверть ЛѢНЫ.  
 ☾ Полная ЛѢна, или Полнолуніе.  
 ☾ Послѣдняя Четверть ЛѢНЫ.



### Крѣгъ ЛѢнѣ І.

Мѣсяцъ	В. Л.				Вр.	Мѣсяцъ	В. Л.				Вр.
	Л	М	Ч.	М.			Л	М	Ч.	М.	
Марта.	●	1	1.	50	пр	Септ.м.	☾	1	4.	44	по
	☾	8	5.	38	пр		●	8	9.	6	пр
	●	16	9.	3	пр		☽	16	7.	38	пр
	☽	23	0.	10	пр		●	23	9.	14	по
Апрѣля.	☽	30	6.	9	по	☾	30	11.	14	по	
	☾	7	9.	47	по	Октяб.	●	8	6.	34	по
	●	14	5.	38	по		☽	15	5.	34	по
	☽	21	10.	22	пр		●	23	10.	30	пр
●	28	7.	42	по	☾		30	6.	9	пр	
Маія.	☾	6	11.	27	по	Нояб.	●	6	11.	14	пр
	●	14	2.	48	пр		☽	14	2.	4	по
	☽	20	5.	28	по		●	21	10.	58	по
	●	28	10.	25	пр		☾	28	3.	16	по
Іюня.	☾	5	1.	29	по	Декаб.	●	6	4.	50	пр
	●	12	10.	13	пр		☽	14	9.	35	пр
	☽	19	6.	51	пр		●	21	10.	27	пр
	●	27	1.	40	пр		☾	28	1.	48	пр
Іюля.	☾	5	0.	35	пр	Іанвар.	●	4	0.	3	пр
	●	11	5.	2	по		☽	13	2.	30	пр
	☽	18	1.	4	по		●	19	9.	1	по
	●	26	4.	47	по		☾	26	3.	51	по
Августа.	☾	3	9.	31	пр	Февр.	●	3	7.	13	по
	●	10	0.	18	пр		☽	11	3.	58	по
	☽	17	3.	50	пр		●	18	7.	1	пр
	●	25	7.	20	пр		☾	25	8.	29	пр

**Atanasije Stojković** was born in 1773. In this city he finished Ascension school (Serbian Grammar school). He went soon to Sopron where in 1794 completed the first six grades of high school and then enrolled in secondary school in Szeged, where in 1796 graduated philosophy. In Vienna, in July 1797<sup>th</sup>, he meets Dositej Obradović and introduces him self with Dositej's enlightenment ideas. In the fall of that year he managed to get the Metropolitan Stratimirovića support for studies in Göttingen, at that time one of the most famous universities. There he obtained PhD degree in philosophy (1799), and began intensive studies in various sciences (physics, mathematics, astronomy, history). After a brief stay in Ruma (1799) he moved to Budapest, where he published his main work *Physics* (1801-1803), written in 3 volumes.

In the Habsburg monarchy it was difficult to obtain civil service, and by call of Severin Osipovič Potocki, the future Minister of Education of Russia, Atanasije accepted the position of full professor of physics at newly established Kharkov University. He soon became the dean of the department of physics and mathematics and in two occasions (1807-1808 and 1811-1813) Rector of the University of Kharkov. He is the founder Kharkov Learned Society and received many honors. He became a member of the Imperial Academy of Sciences, obtained many material privileges, became a national consultant and Tsar Alexander I gave him the Medal of St. Vladimir of the third degree.

In Kharkov, Atanasije Stojković published numerous works written in Russian, mainly intended for students. Particularly interesting is the astronomical book *О воздушних камњахи јих происхожденију* (About meteorites and their origins) printed in 1807. Stojković wrote this book when he got a piece of "air stone", which fell in 1787th near the village of Harkovskoj Žigajlovka Guberniya. This book is the first work on meteorites in the world and its dissemination significantly influenced the development of science on meteorites. In Tunguska area, where on 30 June 1908 the famous large meteorite exploded, there is a hill 150 meters high, which is named after the scientist – Stojković's hill. It is planned a digital copy of this book for the Virtual Library. A hard copy of the book is in the Museum of the Serbian Orthodox church in the Patriarchate in Belgrade.

In addition to these books Stojković also wrote the following two books, both published in 1813:

*Началнија основанија физическој Географији* (Basics of physical geography).  
*Началнија основанија физическој астрономији* (Basics of physical astronomy).





Atanasije Stojković was a worthy and capable man, of wild spirit, very successful and appreciated. He spoke several languages: German, Latin, French, Italian, English, Greek, Hungarian, and almost all Slavic languages. He had interesting and exciting life that next to science was marked by an affair that ended his professorial career. He was also engaged in a secret mission and diplomacy. He died in Kharkov in 1832.

With his versatility, ambition and intelligence, probably under the influence of enlightenment ideas of Dositej Obradović, Stojković was trying to enlighten his people, to improve their science and culture, at a time when barely was foreseen the emergence of a new Serbian state.

**The Stojkvićev's book** *Физика* (Physics) was printed in 3 volumes. The first two volumes have 320 pages while the third was written in 284 pages. The book presents an overview of the knowledge at that time of nature and natural phenomena. At the beginning of the first volume is the chapter on mechanics (the properties and movements of the body). Most of the first volume (the second and the third chapter) is devoted to astronomy. There are described celestial bodies, apparently moving spheres of the sky, stars, solar system, Sun, planets, comets, Moon, eclipses. The third chapter describes our planet Earth. Also, the concepts of celestial equator, horizon, zenith, and nadir are introduced, then the geographical coordinates, the size of Earth, the Earth's movement, the inequality of the day and night on Earth and the Earth's interior. The rest of the book is devoted to the description of geographical notions and meteorological phenomena. .

The book is written in the people's language, without complex mathematical formulas and equations, with the aim to present knowledge about astronomy and nature to ordinary people.

К 2  
АВАНАСІА СТОЙКОВИЧА

Свободныхъ художествъ и Філософіи Доктора  
и Ісикаго естествоиспытательнаго содру-  
жества члена дѣйствительнаго.

Ф У С І К А.

простымъ языкомъ списана за родъ  
Славенно — Сербскій.

*Писана Стойковичъ*  
1812.  
Первая часть.

ВЪ БУДИМЪ

Писмены Кралевскаго Университета

1803.

3  
АВАНАСІА СТОЙКОВИЧА

Свободныхъ Художествъ и Філософіи Доктора,  
Кралев. Гетингскаго содружества наукъ Члена  
вышняго соопытствующаго и Ісикаго есте-  
ствоиспытательнаго содружества Члена  
дѣйствующаго

Ф У С І К А

простымъ языкомъ списана за родъ  
Славено = Сербскій.



Трета часть.

ВЪ БУДИМЪ,

Писмены Кралевскаго Университета

1803.

## §. 42.

Движеніе Солнца около собствене свое осе и его воздукохружіе.

Дасе Солнце около свое собствене осе окрестіе, шо легко примѣшпипи можемо, ако пятна (флесе) на Солнцу находящаяся добро посмѣтримо. Находесе сирѣчь на Солнцу нѣка постояна пятна, коя у 27. дней печеніе свое все еднако около Солнца совершаваю. Понеже убо нашлосе есть, да ова пятна на самомъ Солнечномъ тѣлу есу, слѣдуе да Солнце у 27. дней ( выше менше ) кругообращеніе около осе свое совершуе.

Солнце има и свою Атмосферу, како годѣ и наша земля, около себе. Окружность овога воздуха, или какове нибудѣ воздуху подобне матеріе, есть опѣ наше земне Атмосфере безконечно вѣдша.

## §. 43.

## §. 43.

## Д. Планеты.

Понеже древнии звѣдодразумнии между земліомъ нашомъ и неподвижными звѣздами, у различными высинами Солнце, Луну, и другихъ 5. звѣздъ видѣли есу, запосу они 7. планетовѣ числяли: ш: е; кромѣ Солнца, и Луны, Меркуріа, Венеры, Марса, Юпітера, и Сатурнуса. Обаче Солнце планета запо быти и названісе не може, понеже оно собственный свой свѣтѣ има, и темнымъ тѣлесамъ небеснымъ свѣтлоссть и теплоту дае. Новый звѣздонскунии су Солнце убо у число неподвижныхъ звѣздъ положили, и земли нашей мѣсто между планетами дали. Земля наша и у самой вещи есть планета, понеже она тѣло темное есть, кое опѣ Солнца свѣтлоссть и теплоту добыва.

## §. 44.

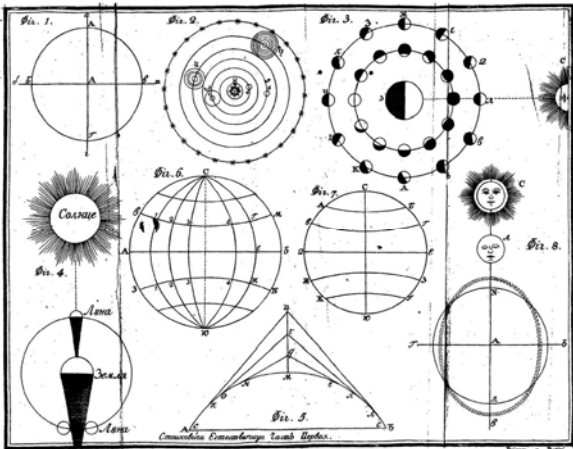


Fig. 1.

Fig. 2.

Fig. 3.



Fig. 4.

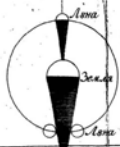


Fig. 6.



Fig. 7.

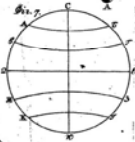


Fig. 5.

Стереометрическо изображение на Луната.

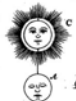


Fig. 8.



**Dorđe Stanojević** (1858-1921) was born in Negotin. He completed the Great School in Belgrade. After that he became the asistent at High School, working with his teacher Alkovića Kosta (1836-1909) and then the professor at the First Belgrade Gymnasium (1883). Having the scholarship of the Ministry of Defense from 1883 to 1887 he studied in the most famous astronomical and meteorological observatories in Europe (Potsdam, Hamburg, Medon, Greenwich, Pulkovo). On behalf of his results he received a call from the Paris Observatory to participate in scientific research expedition to study the Sun and in the Petrovsky where he participated in the study of the full eclipse of the Sun, and two years later and in other scientific-research expedition to study the Sun and the thermal spectrum in Sahara. At that time, and later, he published several research papers in astronomy in the editions of the Paris Academy of Sciences. These are the first scientific work in astronomy among Serbs

Stanojević was a versatile, knowledgeable man with a lot of active interest in many fields of science and technology. His interest in physics was great. Upon his return to Serbia he devoted himself to the study of modern physics. At the same time, he became the lecturer in physics and mechanics at the Military Academy. Also, he taught applied physics and mechanics at the High School and at the Belgrade University after establishing it in 1905. He was responsible for the construction of hydroelectric power plants in Serbia (Vučje, Negotin, Užice, Ivanjica and other places) and for the electrification of Belgrade. This put Belgrade among the first European capitals with full electric lighting. He died in Paris in 1921.

In Negotin there is Square “Đorđe Stanojević” and the museum dedicated to him. In New Belgrade there is the street “Đorđe Stanojević”. Electric Power Industry of Serbia on the occasion of his day, 6th October, gives recognition “Đorđe Stanojević” for contributions to the development of the Serbian electric power industry.

The Virtual Library contains eight digitized books of Đorđe Stanojević:

*The starry sky of independent of Serbia*, 1882, Belgrade

*A walk through the clouds*, 1884, Belgrade

*Cosmic energy of modern physics* (introductory lecture, 22nd September, 1887, Department of Physics at the Military Academy in Belgrade)

*Nikola Tesla and his discovery*, 1894, Belgrade

*Science of light*, 1895, Belgrade

*Central forces in nature*, 1906, Belgrade.

*Industry of coldness*, 1909, Belgrade

*Inaccurate knowledge of the Resurrection in the Orthodox Church and the reform of the calendar*, 1908, Belgrade



**Stanojević's book *The starry sky of independent Serbia*** is one of the first books on astronomy written in Serbian. The book was issued by Royal-Serbian state printing shop in 1882 in Belgrade. The hard copy of the book is in the University Library of Belgrade, recorded under inventory no. 13006. The book is small in volume but its content is a real pearl of our scientific literature of the nineteenth century. **Đorđa Stanojević** taught schools in European centers and had a good knowledge of foreign languages, so he wrote the book using the then available literature. In the preface Stanojević mentioned two French and one German book.

The book has 70 pages, consists of a preface, ten chapters, a star map and has 22 pictures. The book consists of chapters: Stars in general, Astronomical division of the sky, Number, distance and size distribution of stars, Star maps, Star clusters and their stars, Change of the sky due to precession, Nutation, aberration and refraction, Proper motion of the stars, Variable and new stars double stars, Star clusters and the Milky Way.

Although this book is not large, according to the names of chapters we can conclude that the reader of that time could gain a solid insight into astronomy. Astronomical concepts are explained in a simple and transparent way with the beautiful language and with nice accompanying drawings and illustrations. Stanojević gave special attention to the starry sky, the constellation descriptions, orientation in the sky by use of constellations and usage of star map.

We emphasize the fine writing style and clear exposition of often complex astronomical phenomena. They are described mostly without mathematical expressions using very fine graphics. Therefore, this book has educational aim and is intended mainly for the general readers. We can say, in this regard, Stanojević achieved his goal. It is our great pleasure to bring this precious book out of the darkness of library's storage into the light and made it easily accessible to the readers through the Virtual Library.

# ЗВЕЗДАНО НЕБО

НЕЗАВИСНЕ СРБИЈЕ

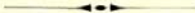
ОД

Ђ. М. СТАНОЈЕВИЋА

*са једном звезданом картом*

и

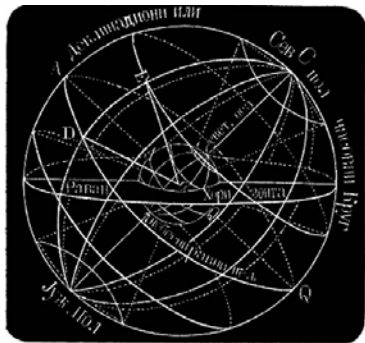
22 слике у тексту



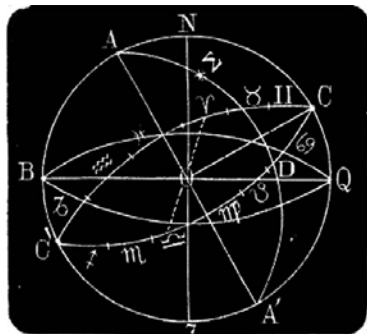
**У БЕОГРАДУ**

КРАЉЕВСКО-СРПСКА ДРЖАВНА ШТАМПАРИЈА

1882



Сл. 3.



Сл. 5.





МИЛАН Ј. АНДОНОВИЋ

**Milan Andonović** (1849-1926) was born in Požarevac where he finished high school. He was educated in Belgrade at the engineering departments of the Great School in Belgrade and at the German Universities in Karlsruhe, Aachen and Munich under supervision of famous professors Ritter, Jordan, and Helmert. There he specialized in mechanics, geodesy and astronomy. Upon his return to Serbia in 1880, he was appointed professor of geodesy at the Great School. He was responsible for the introduction and enforcement of the cadastre in Serbia in the late 19th century. He founded the Geodetic Institute under whose auspices at that time were surveyed many towns in Serbia. In 1907 he founded the Surveying and Building Academy where they trained many Serbian surveyors and builders. Together with John Dragašević, Milan Nedeljković and Djordje Stanojević he is bearing the credit for introducing the teaching of astronomy in Serbian schools and promotion of science in Serbia. He died in Vienna in 1926.

**Andonović** has published a large number of scientific papers, books, and discussions related to surveying, astronomy, shape and size of the Earth, the theory of least squares, survey and cadastre:

*Basics probability and the theory of least squares*, 1886, p. 263.

*The shape and size of the Earth*, 1886, p. 34;

*Cosmography with basic astronomical notes for high school teachers*, 1888, p. 533

*The volume and size of our Earth*, 1889, p. 46

*The Universe*, 1889, p. 30

*Basic geodesy with distinctive view of the cadastral question*, 1890-1897 (1st part 1890, p.368, 2nd part 1897 vol. 1, p. 369-1390; vol. 2, p.1391-1641)

*The cadastre*, 1889, S. 83

He also wrote during the First World War, political discussions and articles (in German and French) in the favor of Serbia.

There are the following digital copies of his books in the Virtual Library:

*Cosmography*, 1888, Belgrade

*The Universe*, 1889, Belgrade

Hard copies of both books are in the Library of Astronomical Observatory of Belgrade. Books are digitized by the courtesy of Vojislava Protić-Benišek.

*Cosmography* was intended for high school students and students of other secondary schools. Probably, it was used as a secondary textbook at the Military Academy and the Grand School, the forerunner of the Belgrade University. In addition to the foreign literature, **Andonović** mentioned in the bibliography two Serbian authors: *Trigonometry* of Dimitrije Nešić and *Cosmometry* from Jovan Dragašević. The book has many illustrations: 141 photos and drawings, 17 tables and a large star map. Most of the items were taken, with permission, from a book of E. Weiss, then the director of the Vienna Observatory.



*Cosmography* is extensive (533 pages) and quite comprehensive book. Thus, it describes celestial sphere, constellations, the shape and size of the Earth, the Earth's rotation and revolution, the apparent movement of the Sun, coordinate systems, time, calendars, Solar system, stars, tides, precession, Cosmogony and among other things, Kant-Laplace's theory about the origin of the World (i.e. the Solar system). Besides all this, there are twenty fully solved problems with detailed explanations.

The book is written in very beautiful style, almost as a literary work, and is worth reading also from that point of view. There we find many forgotten words and terms whose meaning has changed today. For example, cluster (serb. *zvezdano jato*) there means constellation, stardust (serb. *ozvezdina*) - meteorite, comet star (serb. *zvezda repatica*)- comet, the inflow and outflow (serb. *priliv i odliv*)- tide. Also, for each constellation he introduces *alinjman* – having the meaning similar to asterism. For example *alinjman* Big Bear (in Serbian also called *Velika kola* - Big Chariot) has four stars – the asterism trapeze of the constellation Big Bear, while the *alinjman* North Star is the line that passes through the rear wheels of the Big Chariot toward to the North Star..

# КОСМОГРАФИЈА

СА

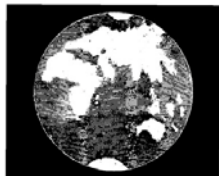
ОСНОВНИМ АСТРОНОМСКИМ НАПОМЕНАМА

ЗА

ВИШЕ РАЗРЕДЕ СРЕДЊИХ И УЧИТЕЉСКИХ ШКОЛА

ОД

М. Ј. АНДОНОВИТА  
ПРОФЕСОРА ВЕЛИКЕ ШКОЛЕ



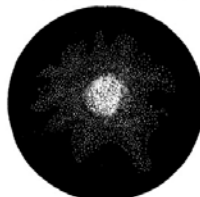
СА 141. СЛИКОМ У ТЕМНОТУ ИЛИ 20 ТАБЕЛИЦА

У БЕОГРАДУ

КРАЈАКЕ И ШТАМПА КРАЉЕВСКО-СРПСКЕ ДРЖАВНЕ ШТАМПАРИЈЕ  
1939.

— 277 —

је око средине збијена. Близо до ове маглине налазе се и неколико прилично светлих звезда.



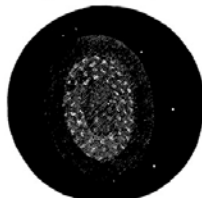
Звездана гомила у Херкулу.  
Са. 59.



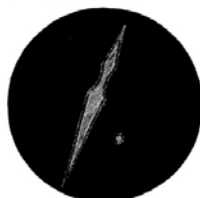
Маглина у Гронува.  
Са. 60.

Слика 61. показује прстенасту Маглину у јату Лире, између звезда  $\beta$  и  $\gamma$ . Близо до ове Маглине стоје две звезде врло слабо светле.

Слика 62. показује Маглину у Еридану, која се састоји из једне подуже маглине, која је у средини и ка



Маглина у Лире.  
Са. 61.



Маглина у Еридану.  
Са. 62.

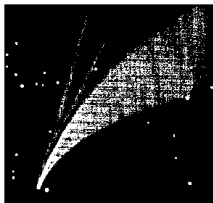
крајевима прилично збијена, а осем тога има поред себе и једну малу округлу маглину.

# О КОСМОСУ

ЈАВНО ПРЕДАВАЊЕ

Милица Ј. Андрић  
ПРОФ. ВКА. ШКОЛЕ

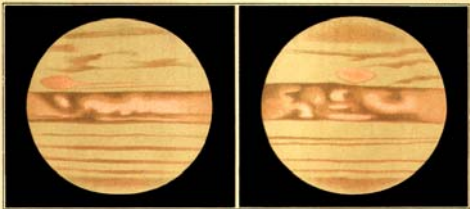
ДРЖАНО У ДВОРАНИ ВЕЛИКЕ ШКОЛЕ



У БЕОГРАДУ

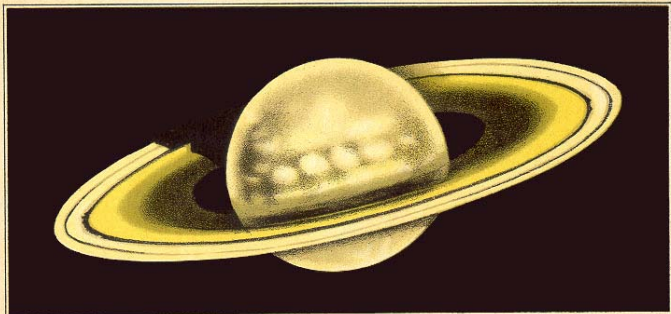
ИШТАМВАНО У ЕРАЛДСКО-СРПСКОЈ ДРЖАВНОЈ ИШТАМПАРНИ

1889



Планета Юпитер.  
сѣна  
1900. Сентября 4.

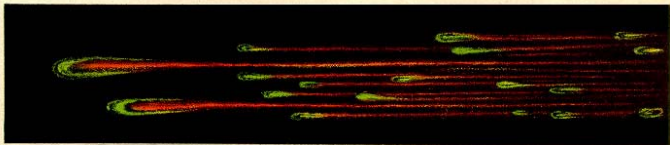
Планета Юпитер.  
сѣна  
1901. Сентября 1.



Планета Сатурн  
како се поназивала 1874. у Децембру.



*α, 1865. године 1. Ноембра*



*β, 1863. године Октобра*



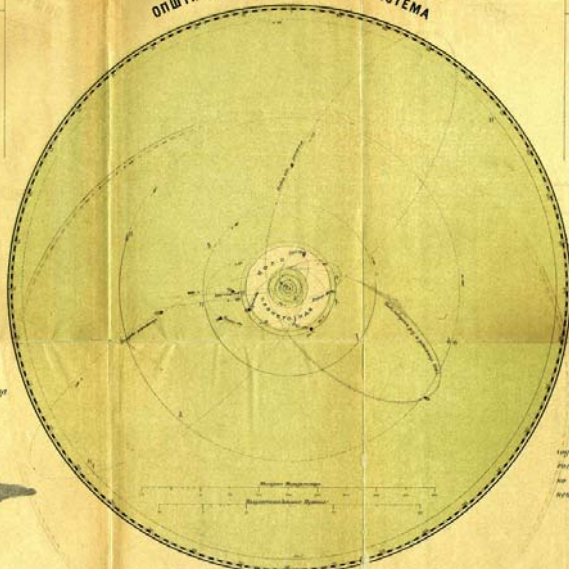
*γ, 1860. године у Јулу*

**Метеорити**

## ОПШТИ ПРЕГЛЕД СУНЧАНОГА СИСТЕМА

Планета	Полупречник орбите у Милјонима километара	Полупречник од Сунца у Милјонима километара
Меркур	○ 37.3	
Венера	○ 69.3	
Земља	○ 108.2	
Марс	○ 150.3	
Јупитер	○ 772.8	
Сатурн	○ 917.8	
Уран	○ 1925.1	
Нептун	○ 3007.4	

Планета	Полупречник орбите	Величина пресека:	
		у Елипсоиду	у Великом кругу
Меркур	○ 3.08	0.28	
Венера	○ 1182.9	0.39	
Земља	○ 149.6	1.00	
Марс	○ 227.9	0.33	
Јупитер	○ 778.3	0.47	
Сатурн	○ 917.8	0.33	
Уран	○ 1925.1	1.48	
Нептун	○ 3007.4	4.32	



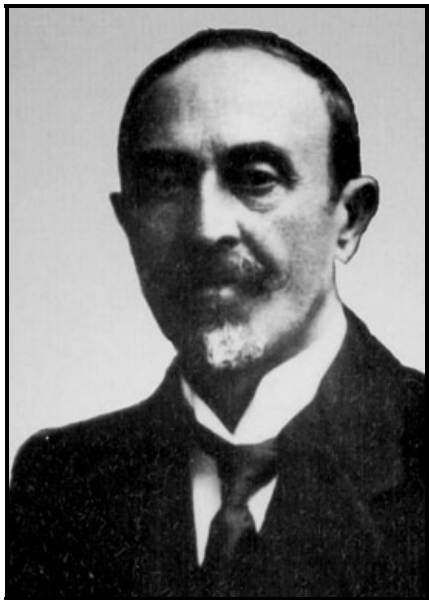
Систем звезда некретница  
клетног пута  
и планетај Сунца  
по W. Herschel у



Број планетојуда  
у сунчаном систему.

До последње нестаре Маја 1688  
сунчане планете је у сунчаном  
систему 5795 планетојуда, по што  
до сунца има неки главни плането  
и 219 планетојуда.

КОПЕРНИКОВ СИСТЕМ СВЕТА



**Kosta Stojanović** (1867-1921) was born in Aleksinac. There he finished elementary school and lower secondary school, while the high school he completed in Niš. He graduated in mathematical sciences at the Grand School in Belgrade. For some time he was working as a high school teacher in Niš and Belgrade. He went to Paris in 1893 where he taught mathematics, astronomy, mechanics and physics under supervision of famous professors Poincaré, Picard and Appel. There he became a member of the Historical Society of France and the French Astronomical Society. In Leipzig he went 1897 where he entered doctoral studies in mathematics. Unfortunately, he returned to Serbia after three months because of illness.



**Kosta Stojanović** besides the university had a very rich political career. At the beginning of 1900th he became a deputy as a representative of the Niš district. Since the 1903rd he taught applied mathematics at the Grand School and at the Belgrade University after it was established in 1905. Whereupon he abruptly interrupted academic career and 1906 he became Minister of Commerce, at the time of the custom war between Belgrade and Vienna.

Around that time, **Kosta Stojanović** wrote the book *Fundamentals of economy value*. This book is a work in mathematical economics and Stojanović there used very advanced mathematical apparatus, for example, the theory of partial differential equations to describe economic models. Even today there is an interest for this book, not only in Serbia but also in other parts of former Yugoslavia. This is probably the most advanced book in economics ever printed in Serbia due to the mathematical tools that were used in it.

The government of Nikola Pasic he was the Minister of Agriculture (1919-1920) and Minister of Finance in 1921. A few days after the appointment as the minister of finance, he suddenly died.

**Kosta Stojanovic** also published the following books:

*Atomistics* (of Ruđer Bošković), 1891, Niš

*Mechanics*, 1912, Belgrade

*Treatises on science and philosophy* (posthumously), 1922, Belgrade

All these three books are in the Virtual Library.

КОСТА СТОЈАНОВИЋ

ПРЕДАВАЊА НА УНИВЕРЗИТЕТУ  
ИЗ  
ПРИМЕЋЕНЕ МАТЕМАТИКЕ

# МЕХАНИКА



БЕОГРАД

ШТАМПАНО У ДРЖАВНОЈ ШТАМПАРИЈИ КРАЉЕВИНЕ СРБИЈЕ  
1912.

The book *Mechanics* is actually a university textbook in applied mathematics. Let us mention that in this time, under the term applied mathematics it was assumed mechanics, mathematical physics and celestial mechanics. Most of the books were related to the vector calculus, then the kinematics, static, dynamic, analytical mechanics and the theory of differential equations. Chapter Ten of this book is dedicated to astronomy. Here he gave the basics of celestial mechanics, then the differential equations of motion of planets, comets and satellites are presented. Also, the theory of elliptical movement, the method of variation of constants and parabolic motion of comets are given.