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Žarko Mijajlović, Nenad Mitić, Saša Malkov
University of Belgrade, Faculty of Mathematics, Serbia

DIGITAL LEGACIES

Abstract: There are important collections of books, photos, documents and other material related to the people from the past who had a key contribution to science or had significant roles in the development of scientific institutions. Instead of holding complete material in museums, it is more usually held in the legacy of these people. We decided to present in digital form the legacies of the most important Serbian people from earlier period that had significant contributions to different areas of mathematics: pure mathematics, mechanics, astronomy, theoretical physics and geosciences.

Keywords: digital legacies, Serbian scientists, national heritage

Introduction

A large number of celebrities left behind great legacies. They show the history of a people, its traditions, arts, science and culture in some historical period. The study of inheritance and the possibility of getting acquainted with it can have a major impact on future generations. Keeping a complete legacy in museums is not always possible and profitable, because of the large space required, and the inability to put the complete material on display to the public for a longer period. Therefore, such material is usually kept as legacy. The advantage of the legacy is their specific identity and relationship with the person to whom a legacy relates. Since legacies often exceed the local significance of the place where they are located, their digitization is the way that their content reaches a wider range of interested people.

Today, digital legacies (in their full or rudimentary form as in [1]) exist for many people. There are a number of problems related to their organization and presentation, most notably relating to copyrights of the material. Information technologies make it possible to create a digital legacy linked to any person [2].

1. Digital legacies of Serbian scientists

There are important collections of books, photos, documents and other material related to people from the past who had an important role in the development of certain institutions, or who have made significant contributions to science. This material is the most important part of the legacy of these people. The Faculty of Mathematics decided to present in digital form legacies of the most Serbian people that in the past gave important contributions to any of the field of the mathematical sciences: pure mathematics, mechanics, astronomy, theoretical physics and geosciences. In the first phase we plan to build digital legacies related to: Bogdan Gavrilović (1864-1948, mathematician, one of the founders of the University of Belgrade), Mihailo Petrović Alas (1868-1943), the founder of Belgrade mathematical school), Milutin Milanković (1879-1958, geophysicist, theoretical mechanist and civil engineer, best known for his theory of ice ages) and Đuro Kurepa (1907-1993, mathematician, known for his important contributions to set theory). A wide range of printed materials related to these

scientists (as well as to some others, see [3]), especially books and scientific papers, has already been collected and partially digitized ([4]).

We have started the project by developing the digital legacy of Milutin Milankovic. We are working on this presentation together with the Society *Milutin Milanković* which owns several thousand digital images of various items related to Milanković's life and work: photos, letters, diplomas, patents, etc. (http://milutinmilankovic.rs/). In cooperation with the Society, problems related to copyrighting of material have been resolved. The first version of legacy was announced at the end of May 2012. (http://codd.matf.bg.ac.rs/milankovic). It currently comprises his biography, pictures, texts and information related to his childhood from [5] (Picture 1.), education and research periods, his functions and recognition that Milanković received.

Picture 1: Childhood and family of M. Milanković

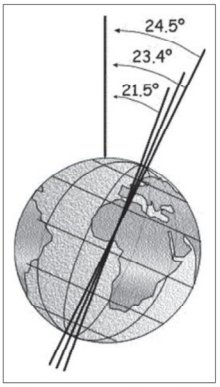
The legacy also includes information about Milanković's scientific work, published articles and books (see Pictures 2. and 3.). We expect that the presentation of Milanković's digital legacy will be fully operational by autumn this year.

Milutin Milanković
Digitalni legat

Matematički fakultet Univerziteta u Beogradu
Udruženje "Milutin Milanković"

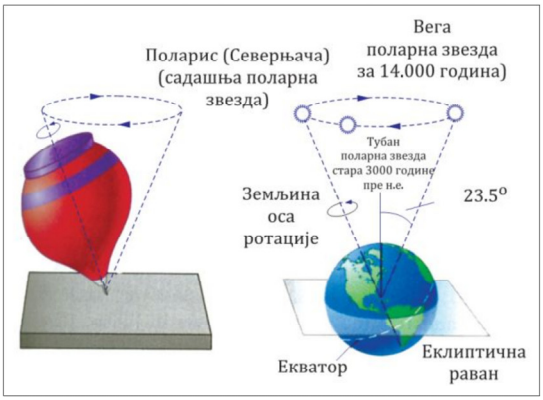
Astronomski deo matematičke teorije klimatskih promena

Kada ne bi bilo uzajamnog gravitacionog dejstva među nebeskim telima, Zemljina osa bi zadržala svoju orijentaciju u prostoru, Zemljina putanja bi bila nepromenljiva, a njene ravnodnevičke i solsticijalne tačke nepomične. Godišnji tok osunčavanja Zemlje ponavljao bi se iz godine u godinu. To, međutim, nije slučaj.



Prvi astronomski parametar koji remeti ovo pretpostavljeno stanje je precesija Zemljine ose rotacije. Ovu pojavu otkrio je, 130-te godine pre nove ere grčki astronom Hiparh. On je, na osnovu podataka astronomskih osmatranja, zapazio da se tačka prolećne ravnodnevice pomera duž prividne Sunčeve putanje na nebu-ekliptike, i to u susret Sunčevom godišnjem kretanju. Njutn je, primenom svog zakona gravitacije otkrio pravi uzrok i čitav mehanizam precesije. U svom delu *„Philosophiae naturalis principia mathematica"* objavljenom 1687. godine, Njutn je istražio neravnomernosti kretanja Meseca i ustanovio da Sunce, kao poremećajno telo, izaziva jednu retrogradnu rotaciju čvorova ravni Mesečeve putanje, zatim je dokazao da spljoštenost Zemlje mora imati za posledicu sličnu pojavu, tj. da čvorovi Zemljine ekvatorske ravni (ekvinocijske tačke) moraju izvoditi jedno slično kretanje suprotno dnevnom obrtanju Zemlje, upravo ono koje je astronomskim posmatranjima uočeno.

Ta pojava pomeranja tačaka ravnodnevica prouzrokovana je time što se, kako Milanković ističe *„naša Zemlja ne vrti kao točak na preslici, nego ona igra kao čigra kojoj se osa zaošijava."* Naime, Zemljina osa nema stalnu orijentaciju u prostoru, nego se ta osa polagano zaokreće oko jedne druge ose koja stoji uspravno na ekliptici. Prodori Zemljine ose sa nebeskim svodom su nebeski polovi, i oni se raspoznaju po tome što se oko njih prividno celo nebo obrće.



Pri razmatranju mehanizma precesije, Milanković je, kao što je i Njutn učinio, uzeo u obzir spljoštenost Zemlje, jer samo u tom slučaju sila kojom Sunce ili Mesec privlače Zemlju ispoljava obrtni moment u odnosu na centar mase Zemlje. Kao posledica permanentnog dejstva obrtnog momenta Sunčevog i Mesečevog privlačenja Zemlje javlja se retrogradno kretanje čvornih (ekvinocijalnih) tačaka, duž Zemljine eliptične putanje, i to u susret Sunčevom godišnjem

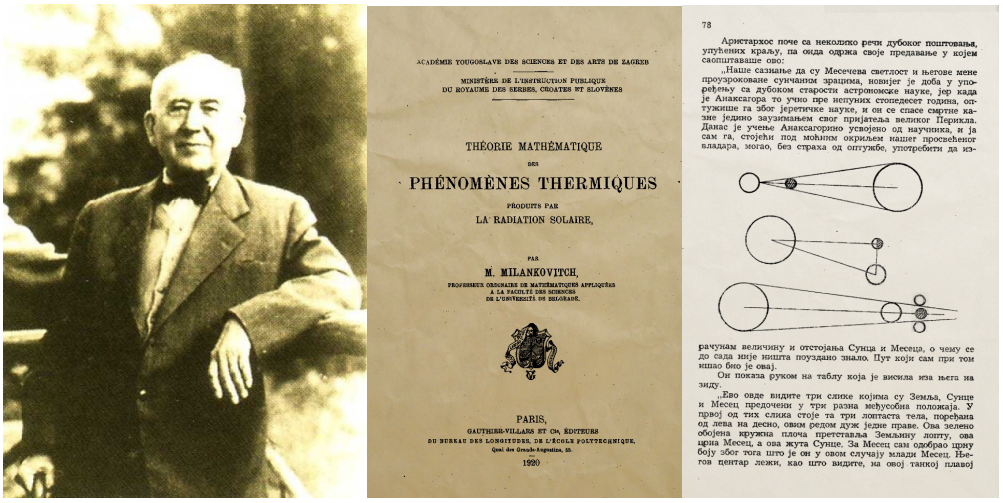
Članci
Predgovor
Biografija, Tatomir Anđelić
Porodica i detinjstvo
Putnik kroz vasionu
Prva naučna rasprava
Prvi srpski doktor tehničkih nauka
Dolazak na Univerzitet u Bgd.
Izbor meteorologije
O Sunčevom sistemu i planeti Zemlji
Polazne osnove istraživanja
Astronomski deo teorije
Fizički deo teorije
Saradnja Milankovića, Kepena i Vegenera
Milankovićeve krive osunčavanja
Sekularno pomeranje polova
Reforma julijanskog kalendara
Novi rezultati astronomske teorije klimatskih promena
Kanon osunčavanja Zemlje
Dokazi i potvrda teorije
Odlikovanja i priznanja
Impressum
Planovi

Fizički deo teorije
U početku su njegova istraživanja dobro napredovala. *„Ali nastojeći da dublje proniknem u sam problem, naišao na brojne teškoće i ne mogah dalje."*
otvori članak...

Dokazi i potvrda teorije
U početku, sve je išlo polako, zatim je sve više činjenica ukazivalo na tačnost Milankovićevih proračuna. Poredi brojnih eksperimenata u svetu, grupa istraživača utvrdila je, istraživanjem karakteristika lesnog profila Čot u Starom Slankamenu u Srbiji, prisustvo Milankovićevih ciklusa.
otvori članak...

Saradnja Milankovića, Kepena i Vegenera
Kao što je Kepen naslutio, Milankovićeva teorija pokazala se kao neprocenjiva alatka pri istraživanju prastarih klima. Kada su te ideje uvršćene u monografiju Kepena i Vegenera *„Klime geološke prošlosti"*, koja je objavljena 1924. godine, Milanković je doživeo svojevrsno priznanje.
otvori članak...

Picture 2: Astronomical part of the mathematical theory of climate change



ACADÉMIE YOUGOSLAVE DES SCIENCES ET DES ARTS DE ZAGREB

MINISTÈRE DE L'INSTRUCTION PUBLIQUE DU ROYAUME DES SERBES, CROATES ET SLOVÈNES

THÉORIE MATHÉMATIQUE DES

PHÉNOMÈNES THERMIQUES

PRODUITS PAR LA RADIATION SOLAIRE,

PAR

M. MILANKOVITCH,

PROFESSEUR ORDINAIRE DE MATHÉMATIQUES APPLIQUÉES A LA FACULTÉ DES SCIENCES DE L'UNIVERSITÉ DE BELGRADE.

PARIS,
GAUTHIER-VILLARS ET Cie, ÉDITEURS
DU BUREAU DES LONGITUDES, DE L'ÉCOLE POLYTECHNIQUE,
Quai des Grands-Augustins, 55.
1920

78

Аристархос поче са неколико речи дубоког поштовања, упућених краљу, па онда одржа своје предавање у којем саопштаваше ово:

„Наше сазнање да су Месечева светлост и његове мене проузроковане сунчаним зрацима, новијег је доба у упоређењу са дубоком старости астрономске науке, јер када је Анаксагора то учио пре непуних стопедесет година, оптужише га због јеретичке науке, и он се спасе смртне казне једино заузимањем свог пријатеља великог Перикла. Данас је учење Анаксагорино усвојено од научника, и ја сам га, стојећи под моћним окрилем нашег просвећеног владара, могао, без страха од оптужбе, употребити да из-

рачунам величину и отстојања Сунца и Месеца, о чему се до сада није ништа поуздано знало. Пут који сам при том ишао био је овај.

Он показа руком на таблу која је висила иза њега на зиду.

„Ево овде видите три слике којима су Земља, Сунце и Месец предочени у три разна међусобна положаја. У праву од тих слика стоје та три лоптаста тела, поређана од лева на десно, овако редом дуж једне праве. Ова зелено обојена кружна плоча претставља Земљину лопту, ова црна Месец, а ова жута Сунце. За Месец сам одобрао црну боју због тога што је он у овом случају млади Месец. Његов центар лежи, као што видите, на овој танкој плавој

Picture 3: Milanković's scientific work

ТЕОРИЈА

ДЕТЕРМИНАНАТА

Др. БОГДАН ГАВРИЛОВИЋ

У БЕОГРАДУ

БОГДАН ГАВРИЛОВИЋ.

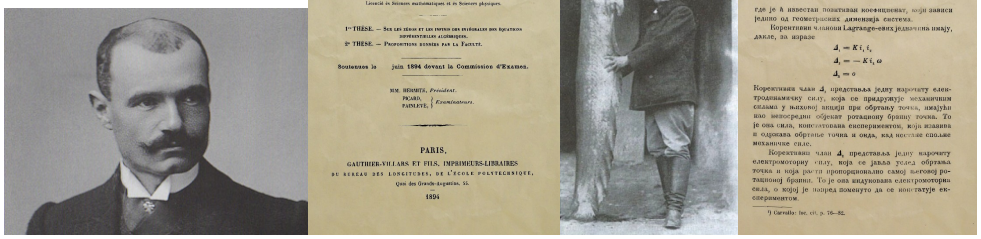
ЦИВИЛИЗАЦИЈА И НАУКА.

(Реферисан говор на овогодишњој свечаности краљевог у Универзитету).

БЕОГРАД

НОВА ШТАМПАРИЈА „ДАВИДОВИЋ", ДЕЧАНСКА УЛ. БР. 14.

1911.



THÈSES

PRÉSENTÉES

A LA FACULTÉ DES SCIENCES DE PARIS

POUR OBTENIR

LE GRADE DE DOCTEUR ÈS SCIENCES MATHÉMATIQUES,

PAR M. MICHEL PETROWITCH.

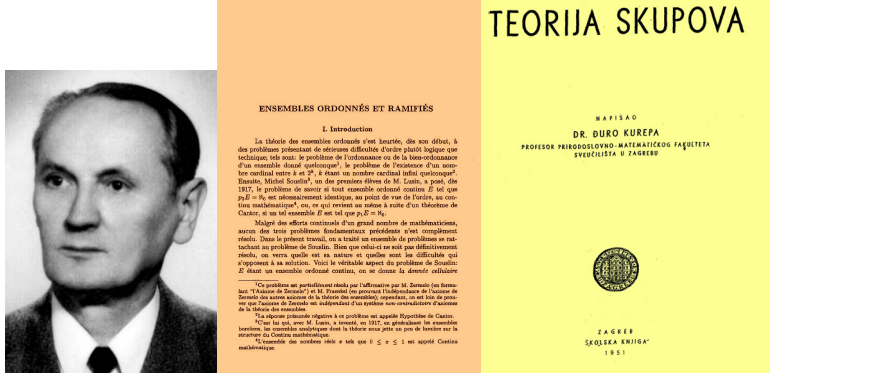
PARIS,

GAUTHIER-VILLARS ET FILS, IMPRIMEURS-LIBRAIRES

DU BUREAU DES LONGITUDES, DE L'ÉCOLE POLYTECHNIQUE,

Quai des Grands-Augustins, 55.

1894



ENSEMBLES ORDONNÉS ET RAMIFIÉS

I. Introduction

TEORIJA SKUPOVA

NAPISAO

DR. DURO KUREPA

PROFESOR PRIRODOSLOVNO-MATEMATIČKOG FAKULTETA SVEUČILIŠTA U ZAGREBU

ZAGREB

ŠKOLSKA KNJIGA

1951

Picture 4: Some material for Bogdanović, Petrović and Kurepa

Works related to other legacies (Bogdan Gavrilović, Mihailo Petrović Alas and Đuro Kurepa) are in their early stage. The material has been collected; it mostly refers to their scientific papers and is available in the virtual library. In addition, some pictures have been collected. When activities on Milanković's legacy are completed, works on legacies of other scientists will be intensified.

2. Implementation and used technologies

The implementation of displaying the legacy contents should support the storage, processing and display of different types of materials (texts, images, photographs, and in the perspective of sound and other multimedia material). The implementation had to be flexible, and should always support adding of the new material and changing of the page content. These requirements have been met by using a functional programming language WAFL [6]. The data are located either in files or in tables of related database management system DB2. Web pages are formed dynamically, in accordance with the choice of appropriate options and parameters.

3. Conclusion

We believe that digital legacies will help to better understand not only the work and life of the important people but the time and circumstance in which they lived as well. Availability of legacy on the Internet will enable faster and more efficient access to the general public and scientists. We hope that already digitized heritage, as well as legacies to be digitized in the future, will incite the interest of scientists working in the field of fundamental science and mathematics.

Acknowledgments

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zarkom@matf.bg.ac.rs
nenad@matf.bg.ac.rs
smalkov@matf.bg.ac.rs