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ANTON DIMITRIJA BILIMOVIČ

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1. Biography

Anton Bilimovich was born on July 20, 1879, in Zhitomir, Ukraine. His father was a military doctor. Anton finished elementary school in Vladimir-on-Klyazmi. In 1896, he finished training at Kiev cadet corps. He passed exams in Latin and Greek languages at Nikolayevsky engineering school in St Petersburg, and then transferred to the Faculty of Physics and Mathematics at the Kiev University, where he graduated in 1903, obtaining the Golden Medal.

He defended his M. A. thesis, entitled "Equations of motion for conservative systems and its application" at the Kiev University in 1903.

From 1905 to 1907, he specialized in Paris and Göttingen. He spent one year in Paris working with Paul Émile Appell, one of the best known scientist working in mechanics of that time. He spent another year in Göttingen with David Hilbert who was one of the authors of functional analysis.

Bilimovich defended his doctoral dissertation, entitled "Contact motion of rigid body, first part: motion with one degree of freedom" in Odessa, in 1907.

Professor Bilimovich worked in Russia and Serbia.

In Russia, he was in service of the Ministry of Education from November 25, 1903 when he was appointed an assistant of the Department for Mechanics, Kiev University, until January 1920, when he left Russia. In 1907, he became private associate professor at the Kiev University, and in 1915, when he was 36 years old, full professor of mechanics, at the Novorossisky University in Odessa. At the same University, he held the position of Rector for two terms.

Anton Bilimovich worked in Serbia from April 20, 1920, to February 15, 1955, when he retired. On April 20, 1920, he was elected professor under contract at the Faculty of Philosophy, Belgrade University. On February 18, 1925, he was elected a corresponding member of the Serbian Academy of Science and Arts. On November 3, 1926, professor Bilimovich was elected full professor of the Faculty of Philosophy, Belgrade University for the subject of rational mechanics and applied mathematics. From 1929 to 1936, Anton Bilimovich held mathematics course in Russian-Serbian gymnasium. On February 17, 1936, he was elected full member

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of the Serbian Academy of Sciences and Arts, in which he held the position of Secretary General of the Department of Natural Sciences and Mathematics, from 1939 to 1940. Besides rational mechanics, he also taught higher mathematics for the students of the Faculty of Natural Sciences and Mathematics in Belgrade. Anton Bilimovich retired on February 15, 1955. During the II World War he was removed from the University, but as the war was finished he was accepted back.

Professor Bilimovich died on September 17, 1970, at the age of 91.

Scientific work of professor Bilimovich, encompassing fifty years of work at the Belgrade University, is enormous and is of the paramount value for domestic and world scientific circles. He published his results in the most acknowledged world journals, journals of many Academies of Sciences, and at the Belgrade University Journal that he set up, and worked especially hard towards acquiring world recognition. Professor Bilimovich published 138 scientific works, 22 scientific papers, 35 books and textbooks, many of them with several editions, 9 texts for popular use, 15 reviews and 15 reports.

The main characteristic of his scientific opus is that he did not address only problems of one narrow scientific field, but Bilimovich also studied the problems of theory of curves and surface, rational mechanics, celestial mechanics and geophysics, nonanalytical functions and vector calculus. Especially in rational mechanics, he was occupied by phenomenological principles, motion of the rigid body around fixed point, dynamics of elastic bodies and equations of motion.

Work of Anton Bilimovich was cited by world scientists and served as an inspiration for a further study for the Serbian scientists. His contribution to the Serbian and world science is a great one, but his influence for the development of mechanics at the Belgrade University is even greater. That positive influence spread all over younger generations that were educated at departments of mechanics and mathematics between 1920 and 1950. Even today at the beginning of the 21-st century, his influence on the scientific thought of mechanics in Serbia is still present.

Due to his contribution to the education of young generations in Serbia, many of his students were successful university professors and Academician Bilimovich was decorated with the Labor Medal of the First Class, in 1955.

Anton Bilimovich was one of the founders of the Department of Technical sciences of the Serbian Academy of Sciences and Arts. He was also a founder of Yugoslav Society for Mechanics.

Professor Bilimovich deserves recognition for dissemination of the Russian school of mechanics in Serbia. He was one of the founders of the Belgrade school of mechanics. His first PhD students at the Belgrade University were Vjačeslav Žardecki, Demčenko, Konstantin Voronjec and Tatomir Andjelić. Many of the papers of his students were published in journals in Serbia, Yugoslavia and at well-known world journals and gave considerable contribution to the development of fundamental problems of contemporary analytical mechanics.

In 1926, Professor Bilimovich initiated and founded the Club of Mathematicians of the Belgrade University, and he was its director. In 1932 professor Bilimovich founded the journal Publications de l'Institut mathématique de l'Académie Serbe des Sciences.

Thanks to the efforts of professor Bilimovich, Institute for Mathematics of the Serbian Academy of Sciences and Arts was founded in 1946. Due to his engagemen, the first post-war journal Publications de l'Institute mathématique de l'Academie Serbe des Sciences and Arts, was published in 1949.

Together with the like-minded persons Milutin Milanković, Jakov Hlitčijev, Konstantin Voronjec and Tatomir Andjelić he founded a study group for mechanics. On the suggestion of professor Hlitčijev the same group was founded at the Faculty of Natural Sciences and Mathematics of the Belgrade University, in 1952. The first professors were above-mentioned founders, and its first Head of the group, until his retirement, was professor Bilimovich.

One part of the life of Academician Anton Bilimovich, the longer and more important one, belongs to Belgrade, Serbian Academy of Sciences and Arts and Belgrade University. In Belgrade he started a new life of university professor and scientist in the new milieu. He was working in Belgrade with the same mental energy as in his motherland Russia. We see that Serbia arduously accepted him. He was highly respected in Serbia. Maybe the best proof is his election for academician in Serbian Academy of Sciences and Arts, the highest scientific institution in Serbia. Professor Bilimovich left colossal and immeasurable commitment to Serbia in science and culture. His commitment and his personal work accomplished a great influence on the Serbian culture in the area of mathematics and mechanics. It is a general opinion that Anton Bilimovich greatly raised the rating of Serbian mechanics.

2. Scientific work

According to the basic scientific methods, theoretical mechanics represents one of the most beautiful and the most developed applications of mathematical scientific opinion. By its results, principles and methods this science was completely developed at the end of the 19th and at the beginning of the 20th century as a scientific discipline.

Academician Bilomovich devoted the biggest part of his scientific work to theoretical mechanics. As many of his famous precursors in theoretical mechanics, he was both an expert in mechanics and mathematician. Beside his work in mechanics, he was active in mathematics, mainly working on basic questions in mathematics.

Anton Bilimovich received his education in Russia, where the idea of theoretical mechanics has strong and productive tradition already off the time of famous mathematician and mechanics expert Leonhard Euler. Bilimovich belongs to that Russian school of mechanics. He was a disciple of Aleksandr Mikhailovich Lyapunov, Gavril Konstantinovich Suslov and Petr Vasiljevich Voronjec.

Scientific work of Bilimovich is enormous and rare for the Serbian milieu. The main part of his work belongs to his 50-year activity at the Belgrade University. He has published the papers in the well-known world journals, such as in the journal of Academy of Science and in journal of Belgrade University. The Journal of Belgrade University is founded by Bilimovich.

During his long life, which was fraught by constant work, Bilimovich contemplated different problems in mechanics and mathematics. His creativity was not

restricted to one limited scientific area. Yet, all problems described by Bilimovich belong to rational mechanics, continuum mechanics, or to mathematics and its applications, mainly from geometry.

Scientific work of Anton Bilimovich is very versatile, but it can be classified in the following areas of mechanics and mathematics:

2.1. Theory of curved lines and surfaces. The earliest papers [1-9] of Bilimovich, from the beginning of the 20th century, are devoted to the theory of curved lines and surfaces. It is interesting that Bilimovich maintained interest in this area until the end of his life.

2.2. Rational mechanics. This includes his work in rational mechanics considering the general problems in mechanics, nonholonomic mechanics, problems of motion of two or more bodies, rigid body dynamics, natural equations of motion for rigid bodies and dynamical systems, as well as the problem of the Earth's rotation. Today, at the beginning of the 21st century, many of his works are used in practice.

2.3. Nonholonomic mechanics. Large number of Bilimovich's papers are devoted to nonholonomic mechanics. In one the papers [10], he considers the first integrals, which are linear with respect to velocities, as nonholonomic constraints. Such idea permitted him to reduce dynamical system with n degrees of freedom to a system with fewer degrees of freedom. At the end of this analysis, using the energy integral, he eliminated time in the differential equations of motion. In another paper [21], he discovered a nonholonomic constraint and called this constraint a nonholonomic pendulum. In the same paper, he gave a method for construction of such a pendulum.

In 1914, he published a paper [24] in which he considered a reduction of the Chapligin–Voronjec nonholonomic equations to a canonical form. In addition, he analyzed trajectories of such systems.

Other paper [33] Bilimovich devoted to analyzing the Chapligin–Voronjec and Appell equations of motion for nonholonomic systems. He concluded that Chapligin-Voronjec equations are much more suitable than the Appell equations for solving motion of nonholonomic systems.

In addition, Bilimovich derived a nonholonomic dynamical system, where the constraints are nonlinear. Appell gave the first such problem, and afterwards Bilimovich, Caratheodory and V. Blagonravov analyzed such constraints. Bilimovich described a number of nonholonomic mechanisms, or mechanisms that are moving as a dynamical system with nonholonomic constraints. In this system, an outer body, that belongs to a nonholonomic system, may be either unmovable or movable. If the outer body is unmovable then the dynamical system may have equilibrium positions in any possible state. For a movable outer body the equilibrium position is completely defined.

2.4. Phenomenological principle. In a number of his papers, Bilimovich adapted Pfaff method to the problems of dynamics, disturbances theory and planet's motion [85]. He applied the Pfaff method for angle and action variables in canonical

transformations [97]. In addition, the method is applied to the analysis of differential equations of planet's disturbances [95] and for the study of three body problem [96]. Finally, all of these results are published in the book "About one general phenomenological differential principle", Belgrade 1958. The book is published by Serbian Academy of Sciences and Arts in English. Under influence of Professor Bilmovich, Tatomir Andjelisch, Djordje Musicki and Veljko Vujichisch worked in this area.

2.5. Spherical motion of rigid body. Bilimovich devoted a number of papers to the spherical motion of a body, or the motion of the body with one immovable point. The most important paper [14] was published in repertory of papers devoted to Suslov, one of his teachers in Russia. He derived [109] a connection between vector of ephemeral angle velocity and the main vector of angular momentum. The connection is obtained by Bilimovich deviation center.

2.6. Dynamics of elastic body. In 1932, Bilimovich published [42], first in the world, papers in which he gave a complete dynamical analysis of a material system, which has small variations from the concept of the rigid body. Here he introduces new measures for finite deformations. These results got a great attention in the late forties and fifties of the 20th century.

2.7. Equations of motion. In many papers, Bilimovich considered different forms of the equations of motion. In one paper [31], he gave natural equations of motion for rigid body, and in another paper [38], he did so for a dynamical system. In addition, he gave [112] equations of motion for a dynamical system which are solved with respect to the acceleration vector-versor.

2.8. Celestial mechanics and geophysics. In celestial mechanics, following Voronjec, he found a new integrable case for the problem of n bodies, which corresponds to the attractive force proportional to the third degree of distance, where he considered the system with the same masses. In addition, a very interesting and important is his proof [103] of the Apollonius theorem concerning stagnation of the planets. Professor Bilimovch was mainly theorist in celestial mechanics, but he had a great talent for practical solutions in celestial mechanics. Therefore, he offered [94] an instrument for approximate geometrical solution of the Kepler equation. Concerning Milankovich's theory for movement of the earth pole, Bilimovich studied rotation of the earth around axes and movement of the earth pole. Bilimovich used the model of the earth, which is slightly different from the real shape of the earth [40].

2.9. Nonalalytical functions. He devoted the last years of his scientific work, which coincided with the last years of his life, to the theory of nonanalytical functions. He gave their geometrical interpretation and applied them to fluid mechanics. A procedure for transformation of a nonanalytical function into analytical function, using affine transformations is given in [110]. In the paper [113] Bilimovich gave the the basic pictures for nonanalytic and analytical functions. Vector measure for deviation between nonanalytical and analytical functions is given

in [114]. In addition, Bilimovich analyzed [116] this deviation by a quaternion. The deviation between nonanalytical function and analytical is used by Bilimovich [119] to analyze a few practical problems of fluid mechanics.

2.10. Vector calculus. Just after the appearance of vectors in mathematics, Professor Bilimovich decided to use them in rational mechanics and in problems of curved lines and surfaces. In his bachelor work, which was published in 1906, he applied the vector calculus. Just as he came to Belgrade University, 1920, he used vector calculus in the lectures of rational mechanics. After that, calculus was introduced in many courses at the universities in Serbia. In 1930, he founded the use of diaddas to geometry problems.

At the end, let us mention Bilimovich's paper [70], which maybe best describes how wide an interest he had. In that paper, he defined the coefficient of wideness and used it to analyze a few problems in geography.

Academician Bilimovich worked until the last days of his life. During those days, he finished a paper concerning the behaviors of periodic decimal fractions, but the paper has never been published.

3. Response on scientific work

Professor Bilimovich's papers have been cited numerous times in all over the world and in Serbia. The papers are a great inspiration to many researchers in the world and in Serbia. The presence of Professor Bilimovich in our milieu is unique according to its importance. His contribution to our and world science is enormous, but his influence on the development of mechanics at the Belgrade University and other universities in Serbia is even greater. And now, at the beginning of the 21st century, we understand his great influence on the scientific people in Serbia.

His results from the motion of nonholonomic dynamical systems are cited and used in Encykl. Der math. Wiss. Bd. IV (G. Prange): p. 540 and p. 574. On the page 738 of that book is: Vgl. Auch Bilimovich "Die Bewegungsgleichungen konservativer Systeme mit linearen Bewegungsintegraten", Math. Ann. shows that this paper must have been top-level at that time.

In the book "Handbuch der Physikalischen und Technischen Mechanik", Bd. II, Lieferung 1, in the paper of M. Winkelmann Allgemeine Kinetik, p. 43, six papers of Academician Bilimovich are cited.

The well-known Italian scientist R. Marcolongo, in monograph "Il problema dei tre corpi", p. 52–53, gives a short content of Bilimovich paper "Einige partikuläre Lösungen des Problems der n-Körper", Asr. Nachrichten 189, (1911).

Bilimovich's opinion about the earth axes, which is published in his paper "Über den Begriff der Erdachse Gerlands Beiträge zur Geophysik, Bd. 33 (1931)", is cited in "Anzeiger der Akad. der Wiss. in Wien, math. naturw. Klasse, 10 (1939)" in the paper "R. Schumann Über die realisation der mathematischen Begriffe".

In monograph "О некоторых дифференциальных уравнениях аналитической динамики и их интегрирований", Ташкент, 1958, written by М. Ф. Шульгина, Bilimovich's example of nonholonomic pendlum is cited. Ю. И. Неймарк and

Н. А. Фуфаев in the book "Динамика неголономных систем", Москва, 1967, cite seven papers of Professor Bilimovich.

C. Truesdell and R. Toupin in the book "Handbuch der Physik (S. Flügge), Bd. III/1, 1960 in the part "The classical field theories" on the page 397, cite Bilimovich geometrical construction of space average value of tensor. In the same book, Bilimovich is cited one more time on page 397 and on page 474.

4. Educational-Pedagogic work

Professor Bilimovich arrived in Belgrade in 1920 and found a milieu of a very high scientific theoretical thought and society of Mihail Petrovisch, Milutin Milankovisch and Bogdan Gavrilovisch. In that milieu Professor Bilimovich found himself and started to work with a full heart. His work was divided in three parts: 1) Scientific work; 2) Educational work; 3) General increase of research in theoretical mechanics and mathematics.

During his half century in Belgrade, which started at 1920, Bilimovich executed a considerable and continual influence on the students at Belgrade University between 1920 and fifties of the 20th century.

During this time, Bilimovich wrote a number of scientific papers and a few textbooks on rational mechanics and higher mathematics. He wrote an excellent textbook for rational mechanics in four parts and textbook for higher mathematics for nonmathematical students. Together with Professor Tatomir Andjelisch, he wrote textbook for geometry for first six classes of high school, which is still in use today.

He translated 13 books from Greek Euclid's elements, which are published by the Serbian Academy of Sciences and Arts. This work, which is translated into many languages, and which has almost 2000 editions, he completed with historical and bibliography remarks. With this work, professor Bilimovic gave an antic work to Serbian culture.

Academician Bilimovich was one of the founders of Section of technical sciences at the Serbian Academy of Sciences and Arts. From the origin, he was active in the work of the section.

In addition, he was one the founders of Yugoslav Society for Mechanics.

In 1926, at Bilimovich initiative, Club of mathematicians of Belgrade University was founded. The members were: Mihailo Petrovisch, Milutin Milankovisch, Bogdan Gavrilovisch, Ivan Arnovljevisch, Nikola Saltikov, Anton Bilimovich, Jakov Hlitchiev, Tadija Pejovisch, Vjacheslav Zardecki, Jovan Karamata, Radivoj Kasanin, Milos Radojchisch, Vojislav Miskovisch, and Jelenko Mihailovisch. The Director of the club was Anton Bilimovich. Owing to Professor Bilimovich the club became Mathematical Institute of Serbian Academy of Sciences and Arts in 1946. The first director of the Institute was Bilimovich.

Professor Bilimovich has great merit for progress and extension of Russian school of mechanics of Suslov and Voronjec in Serbia. We can say that Bilimovic founded his school of analytical mechanics in Serbia. That school gave a number of well known scientists: Tatomir P. Andjelisch (1901–1996), Rastko D. Stojanovisch (1926–1970), Veljko A. Vujichisch (1929), Bozidar D. Vujanovisch (1930)

and Djordje S. Djukisch (1943). These scientists published many papers in Journals in Serbia, Yugoslavia and in the best world journals.

When the World War II was finished, Professor Bilimovich was very eager to find possibility for work in the pre-war "Club of Mathematicians".

Due to the fact that Bilimovich educated many generations at the Belgrade University, today's opinions are that he has been one of the best pedagogues at the Belgrade University. He was a great example of how to become a good teacher and a good man. From his students he always required hard work and a deep understanding of the studied material. He did not like students whose hard work was consisting just of mental learning. He started and finished lessons exactly at a scheduled time, sign of a prepared. When once he was late for the lesson, he apologized and formulated the following theorem: "Even when professor is late, there always will be a student who arrives later". Just then one student entered the classroom. Professor Bilimovich said to students: "Nu, the theorem is proved.

Professor Bilimovich disliked administration. According to an anecdote, when Bilimovich was retired, the members of his Department inherited just one document. It was the Foundation Act for the Department of Mechanics. The act had been all the time in the pocket of Bilimovich's jacket.

Scientific papers of Professor Bilimovich

1903

1. *Элементарное построеніе Штейнеровскаго эллипса*, Унив. Изв. Кіевъ. Годъ. 43, № 6; 1–5, 1903.

1904

2. *О Гауссовой кривизны*, Унив. Изв. Кіевъ. Годъ. 44, № 10; 53–58, 1904.

1905

3. *Средняя кривизны*, Унив. Изв. Кіевъ. Годъ. 45, № 11; 121–124, 1905.
4. *Теоремы Якоби и Сильвестра*, Унив. Изв. Кіевъ. Годъ. 45, № 10; 63–72, 1905.

1907

5. *Геометрическіе дифференціалы въ теоріи поверхностей*, Унив. Изв. Кіевъ. Годъ. 47, № 10; 1–13, 1907.
6. *Приложеніе геометрическихъ производныхъ къ теоріи кривыхъ и поверхностей*, Унив. Изв. Кіевъ. Годъ. 47, № 3, 5, 7, 8; 1–30, 31–46, 47–88, 89–108, 1907.

1908

7. *Къ вопросу о разложеніи e въ непериывную дробь. Библиографическая замытка*, Унив. Изв. Кіевъ. Годъ. 48, № 9; 9–10, 1908.

1910

8. *Приемъ приближеннаго спрямленія круговой дуги*, Унив. Изв. Годъ. 50, № 2, 1910. Проток. Засед. Физ. Мат. Общ. Кіевъ за 1908, 101–102.
9. *Уравненыя движенія для консервативныхъ системъ съ линейными интералами*, Унив. Изв. Годъ. 50. № 2, 1910. Проток. Засед. Физ. Мат. Общ., Кіевъ за 1909, 23–43.
10. *Die Bewegungsleichungen konservativer Systeme mit linearen Bewegungsintegralen*, Math. Annln. Leipzig, Bd. 69, 1910, 581–591.

1911

11. *Две модели*, Вестн. Опит. Физ. Элемент. Мат., Одесса, 1911.
12. *Einige partikulare Lösungen des Problems der n Korper*, Astr. Nachr. Kiel. Bd. 189, Hft. 10, N. 4522, 1911, 181–186.

1912

13. *Некоторыя частныя решенія задачи объ N телахъ*, Унив. Изв. Годъ. 52, № 6, 1912. Проток. Засед. Физ. Мат. Общ., Кіевъ за 1911, 1–6.
14. *Уравненія движенія для консервативныхъ системъ и ихъ приложенія*, Кіевъ. Тип Императорскаго Университета Св. Владимира, 1912, Стр. 8+160, Магистарска дисертација.
15. *Уравненія движенія тяжелаго тела около неподвижной точкию*, Унив. Изв. Годъ. 52, № 9, 1912. Проток. Засед. Физ. Мат. Общ., Кіевъ за 1910, 1–51.

1913

16. *О каноническомъ преобразованіи*, Унив. Изв. Кіевъ. Годъ. 53, № 8; 1–16, 1913.
17. *Sur les équations du mouvement des systémes conservatifs non holonomes*, C. r. hebd. Séanc. Acad. Sci., Paris, 156:5, 1913, 381–384.
18. *Sur les systémes conservatifs non holonomes avec des liasons dépendantes du temps*, C. r. hebd. Séanc. Acad. Sci., Paris, T. 156, N. 16, 1913, 1216–1218.
19. *Sur les transformations canoniques spéciales*, C. r. hebd. Séanc. Acad. Sci., Paris, 157:23, 1913, 1133–1135
20. *Уравненія движенія для консервативныхъ системъ и ихъ приложенія*, Унив. Изв. Кіевъ. Годъ. 53, № 3; 4, 1913, 1–80.

1914

21. *Неголомный маятникъ*, Мат. Сб. Москва, Т. 29, Вып. 2, 1914, 234–240.
22. *Sur les transformations canoniques des équations du mouvement d'un systéme non holonome*, C. r. hebd. Séanc. Acad. Sci., Paris, T. 158, N. 15, 1913, 1064–1068.

1915

23. *Приборы для интегрированія как звенья неголономнаго механзма*, Унив. Изв. Кіевъ. 1915.

1916

24. *Къ ученію траекторіи неголономной системы*, Зап. Имп. Новоросс. Унив. Одесса, вып. 10, 1916, 1–57.
25. *Къ вопросу объ основахъ механики*, Русск. Мысль. Годъ тридцать седмой. Кн. 5, 1916, 68–82.

1919

26. *Соприкасательныя движенія твердого тела, част первая: движеніе съ одной степенья свободы*, Одесса, тип. "Техникь"Д. И. Крохмаля, литогр. № Т. Корчака.

1920

27. *Sur les équations intrinséques du mouvement d'un corps solide*, C. r. hebd. Séanc. Acad. Sci., Paris, T. 171, N. 14, 1920, 616–618.

1922

28. *Des lignes d'inertie sur une surface*, C. r. hebd. Séanc. Acad. Sci., Paris, T. 175, N. 16, 1922, 609–611.
29. *Природне једначине кретања чврстог тела*, Глас Срп. краљ. Акад. 94, Први Разр. 42, Београд, 1922, 45–67.

1923

30. *О линијама инерције на површи*, Глас Срп. краљ. Акад. 109, Први Разр. 48, Београд, 1923, 31–52.

1927

31. *Једначине кретања чврстог тела у новој векторској форми*, Глас Срп. краљ. Акад. 127, Први Разр. 58, Београд, 1927, 19–43.
32. *Једначине кретања материјалног система ако су осе потпуно произвољне*, Глас Срп. краљ. Акад. 128, Први Разр. 59, Београд, 1927, 115–137.

33. *О једначинама кретања нехолономног система*, Глас Срп. краљ. Акад. 128, Први Разр. 59, Београд, 1927, 93–114.
34. *О неким специјалним случајевима проблема n тела*, Глас Срп. краљ. Акад. 128, Први Разр. 59, Београд, 1927, 17–43.

1929

35. *О хеликоидалним случајевима проблема n тела*, Глас Срп. краљ. Акад. 134, Први Разр. 63, Београд, 1929, 1–17.
36. *Приложеніе абсолютной геометріи къ классической механике*, Труды 4-ого Създа Русскихъ Академическихъ организацій за границей, въ Белграде 16–23 сентября 1928. Белградъ, изд. Русскаго Начнаго Института. 1929, Ч. 2, 1–4.

1930

37. *Объ уравненіяхъ механики по отношенію къ главнымъ осямъ*, Зап. Русск. науч. Инст. Белградъ, Вып. 2, 1930, 129–135.

1931

38. *Природне једначине кретања материјалног система*, Глас Срп. краљ. Акад. 143, Први Разр. 70, Београд, 1931, 169–192.
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40. *Über den Begriff der Erdachse*, Beitr. Geophys. Leipzig, Bd. 33 (Köppen Bd. 2), 1931, 181–185.
41. *Fondements géométriques de la théorie des diades et des affineurs*, Verhandlungen der 3. Internationalen Kongresses für technische Mechanik, Stockholm 24–29 august 1930, Stockholm, Kungl. Boktryckeriet, P. A. Norsted & S?ner, 1931, Vol. II, 442–443.

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