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TIME OF THE COSMIC CIVILIZATION

AND

THE BASIC LAW OF CELESTIAL

MECHANICS

“LUNAR GREENWICH" IS THE ACCOUNTING OF UNIVERSAL, REFERENCE, STANDARD, COORDINATED, ATOMIC, LINEAR LUNAR TIME AND ITS APPLICATION AS A SINGLE TIME OF CIVILIZATION IN FOUR ENVIRONMENTS: ON EARTH, IN THE ATMOSPHERE, ON WATER AND IN SPACE

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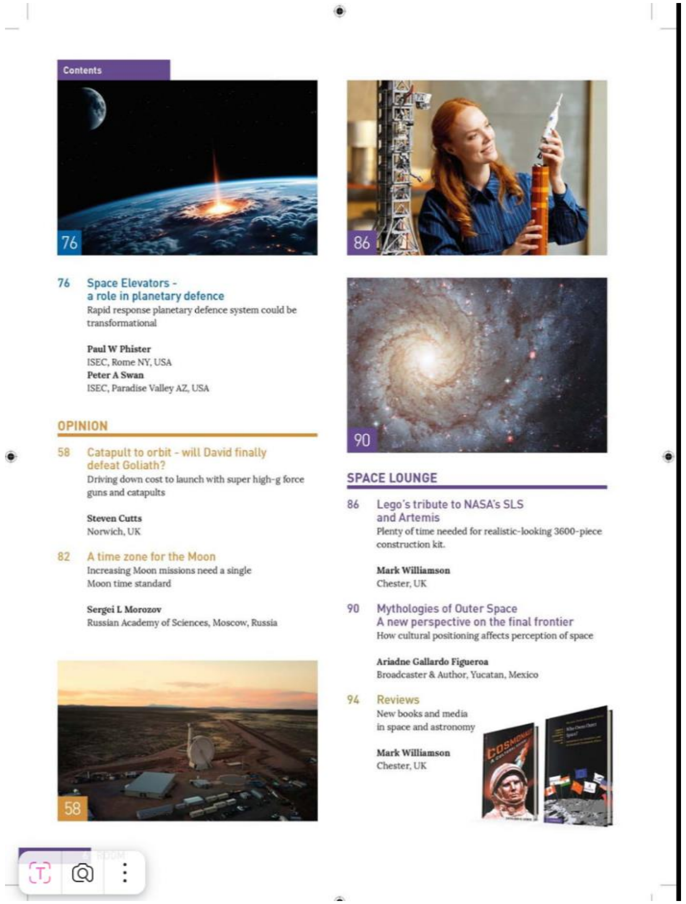
Moscow 2025

MENDELEEV
DMITRY IVANOVICH
1834-1907

- “The calendar needs to be fixed, first of all because it is incorrect. We will not get away from this; it is and will be, no matter what motives are given and obstacles are put forward.
- We can no longer say how Joshua did.: "Stop, Sun, and don't move, Moon!" We are closer to Galileo with his convinced "but still it's moving!"
- Knowing the truth, it is already difficult for us to stay with the old misconception. Here is a categorical imperative and, perhaps, the honor and dignity of Russian science”.
- D.I. Mendeleev [1899].

My article was published in ROOM magazine in March 2025, No. 36, on pages 82-86. Sergei L. Morozov. «A time zone for the Moon» [London, UK]. This is the magazine of the First Space State of Asgardia. Published in London. The first version of the article was planned to be published in No. 35 in June 2024. However, the publication was postponed for a period of one year until the navigation calculations were tested in practice.


Contents

THE NEED TO INTRODUCE THE UNIFIED GLOBAL TRANSPORT TIMETABLE IN ALL FOUR ENVIRONMENTS AT ONCE, AND WHY THE ROSCOSMOS AND NASA CENTER FOR NAVIGATION AND CALENDAR SUPPORT, AS WELL AS THE INTERNATIONAL CALENDAR SPACE SCHOOL, ARE NEEDED.

On April 3, 2024, NASA received a task from the US Government to create a 25th lunar time zone by analogy with the 24 existing time zones on Earth. NASA believes that you need to fly to the Moon at the exact lunar time.

- Currently, in order to prevent accidents in space [6, 44], it has become necessary to compile the single worldwide of rocket transport schedule for the implementation of the Unified global transport link in all four environments at once:
- 1) on Earth,
- 2) in the atmosphere,
- 3) in an aquatic environment and
- 4) in outer space.

- To this end, it is necessary to introduce an additional 25th space lunar time zone and introduce: THE CENTER FOR NAVIGATION AND CALENDAR SUPPORT OF **ROSCOSMOS AND NASA**, AS WELL AS THE **INTERNATIONAL CALENDAR SPACE SCHOOL.**

PROBLEMS OF COLONIZATION OF THE MOON BY THE BIOLOGICAL SPECIES Homo sapiens sapiens

- Of all the objects in the Solar system, the Earth's civilization is particularly interested in the moon today.
- Everything about the Moon is original: its origin, and its appearance in the Earth's gravity zone; and its tidal effect on the Earth; and its unique role in the Earth's geological history; as well as in the history of evolution and the appearance of species on Earth, discovered by Darwin; and its role in the history of the emergence and development of terrestrial civilization, viruses, microbes, fungi, plants, insects, animals, birds, fish and hominids, and their highest species **Homo sapiens sapiens**.

COORDINATED REFERENCE ATOMIC LUNAR TIME [I]

- For the first time, it was proposed to introduce a globally unified space navigation system for all countries based on the **linear unified reference standard of coordinated atomic lunar time** (LTC) [45], which is synchronized with atomic clocks and rigidly linked to coordinated universal time [UTC] of the British Observatory at Greenwich.

- This new Unified universal time scale will be used by the entire human civilization in the coming era of space colonization. [15,16,17,44,45,]

THE "ALPHABETIC SYNTAGMA" OF HIEROMANAC MATTHEW VLASTAR

- **THE BYZANTINE GREEK HIEROMANAK MATTHEW VLASTAR WROTE THE WORLD-FAMOUS ENCYCLOPEDIA "ALPHABETIC SYNTAGMA" IN 1335.**
- **IT HAS BEEN STUDIED IN ALL UNIVERSITIES OF THE WORLD.THIS ENCYCLOPEDIA CONSISTED OF 24 SECTIONS [ACCORDING TO THE NUMBER OF LETTERS OF THE GREEK ALPHABET] IN ALL BRANCHES OF KNOWLEDGE OF THAT TIME.**
- **FOR THE FIRST TIME, THERE WAS A REFERENCE TO THE SYSTEM ERROR OF THE JULIAN CALENDAR IN THE AMOUNT OF ONE DAY FOR EACH CYCLE OF 128 YEARS [1/128].**
- Chapter 13 – about the leap year. Chapter 7 is about Holy Easter. Why does Easter happen after the equinox? Why are there 19 circles of the Moon? Why are there twenty-eight solar circles? Why do the Moon and base circles start in January? Why do the circles of the Sun begin in October? How do I find the circle of the Moon? How to find the base of the Moon? How do I find the circle of the Sun? How do I find an indication? How do I find the day of the Jewish Passover? How do I find the day of the Christian Easter? How to find the meat eater? About the Jewish Passover and the disagreement about the full Moon. That there are four restrictions for Easter. About the vernal equinox. About the three-day Resurrection.

Hieromonk Matthew Vlastar
Alphabetic Syntagma

https://azbyka.ru/otechnik/Matfej_Vlastar/Alfavitnaia_Sintagma/

NAVIGATION PROBLEMS OF THE FIRST TWO LUNAR MISSIONS – RUSSIA'S "MISSION-8" & USA'S "MISSION-9“

https://en.wikipedia.org/wiki/List_of_missions_to_the_Moon

I. **«Mission – 8»** [Russia]: «Luna 1» (E-1 No. 4 "Dream").

Start: **January 2, 1959**. The Soviet Union OKB-1.

Allegedly, due to problems with the guidance of the «Vostok-L» launch vehicle, it was not possible to reach the Moon, and it flew past the Moon in a heliocentric orbit.

The shortest distance to the Moon's surface was 5,995 kilometers (3,725 miles), and it was traveled on **January 4, 1959**. It was the first spacecraft in history to fly past the Moon.

II. «**Mission – 9»** [USA]: «Pioneer 4».

Launch: **March 3, 1959**, United States NASA «Jupiter II» Launch Vehicle.

Allegedly due to the excess power of the second stage of the rocket, «Pioneer 4» flew on **March 4, 1959** at a minimum distance of 58,983 kilometers (36,650 miles) from the lunar surface, i.e. 10 times further from the lunar surface than the Soviet «Luna-1».

The closest approach to the lunar surface occurred at 22:25 UTC on **March 4, 1959**. It was the first American spacecraft to leave Earth orbit.

Conclusion: THE SAME NAVIGATION PROBLEMS IN THE FIRST TWO LUNAR MISSIONS – RUSSIA'S "MISSION-8" & USA'S "MISSION-9" - THE PROBLEMS TURNED OUT TO BE THE SAME

- BOTH THE USA AND THE USSR EQUALLY MISSED THE TARGET OF THE MOON AND FLEW PAST THE MOON.
- THEREFORE, **THE LUNAR TIME ZONE** WAS SUBSEQUENTLY DEVELOPED.;
- **THE "PARADOX" OF THE MOON HAS BEEN EXPLAINED**;
- ANDAN ACCURATE COSMIC CALENDAR WAS CALCULATED WITH THE MOROZOV CALENDAR CONSTANT (31/128), WHICH HAS ZERO ERROR WITH RESPECT TO THE DURATION OF THE KEPLER TROPICAL YEAR [1627], EQUAL TO 365.2421875 DAYS.
- THE NEW AMERICAN LUNAR "**MISSION 139**" WAS DIRECTLY ATTENDED BY THE FIRST SPACE STATE "ASGARDIA", WHICH USED THESE ACHIEVEMENTS.
- ASGARDIA FORMED PART OF THE PAYLOAD OF THE "**MISSION-139**" [WHICH WAS CALLED THE "BLUE GHOST"].

COORDINATED REFERENCE ATOMIC LUNAR TIME [II]

- The successful flight and successful landing on the Moon on **March 2, 2025** of the American "**Mission 139**" called "Blue Ghost" [Blue Ghost] showed the effectiveness of the proposals made by the author.
- At the same time, the same **Falcon-9** rocket that launched «**Mission 139**» [Blue Ghost] into lunar orbit and which successfully landed on the Moon launched the Japanese «**Mission 140**»: [Hakuto-R M-2; **January 15, 2025**].
- The latter was moving along a different calculated trajectory. The Hakuto-R M2 lander of the Japanese company iSpace crashed during an attempt to land on the Moon on **June 6, 2025**.
- This is the second iSpace failure. In 2023, their Hakuto-R M1 «**Mission 129**» module also crashed on the surface of the Moon. The cause of the failure was also recognized at that time as the same software navigation error associated with the lunar surface altitude estimation system.

COORDINATED REFERENCE ATOMIC LUNAR TIME [IV]

- The engineers announced that the "laser altimeter" allegedly "produced data with a delay," which is why the «**Mission 140**» landing module allegedly did not slow down to a safe landing speed and crashed into the surface of the Moon.
- Therefore, Japanese engineers officially announced the "hard landing" on the Moon of «**Mission 140**».
- HISTORY: of the first 26 launches to Mars (USSR, Russia), 25 were unsuccessful.
- Of the first 21 launches to Mars (USA), 17 of the first were unsuccessful.
- ESA's Schiaparelli probe crashed on landing on Mars on **October 19, 2016** for the same reason of "delayed data output".

THE CALCULATIONS WERE VERIFIED IN PRACTICE FOR THE LAUNCH OF TWO NEW LUNAR MISSIONS – «MISSION-132» (RUSSIA) & «MISSION-139» (USA)
https://en.wikipedia.org/wiki/List_of_missions_to_the_Moon

I. Lunar "Mission - 132" – "Luna-25". It launched on August 10 and on August 19, 2023, the spacecraft crashed.

Mission-132 [Luna-25] 10 August 2023 Russia Roscosmos Soyuz-2.1b/Fregat Luna 25 Lander **Spacecraft failure**

- Launched on **10 August 2023**, Orbital insertion on **16 August 2023**, failed orbital maneuver on ***19 August 2023*** set the spacecraft on the crash course with the Moon's surface. Loss of communication was confirmed by Roscosmos ***on 20 August 2023.*** *The impact made Russia the 10th country to impact the lunar surface.*

II. Lunar "Mission 139" - "Blue Ghost" launched on January 15 and successfully landed on March 02, 2025. It was the first fully successful private Moon landing. It was a real triumph of the First Space State of Asgardia.

«Mission-139» [Blue Ghost M1] 15 January 2025 United States Firefly Aerospace Falcon 9 B5 **March 02, 2025 Blue Ghost Lander [Lander full Success]**

- Lunar lander, carrying NASA-sponsored experiments and commercial payloads to **Mare Crisium**. **First fully-successful private lunar landing**.

CALCULATION OF THE SYSTEM ERROR OF THE JULIAN CALENDAR

- Calculation of the duration of the **Julian annual calendar:**

  365 (32/128) days = 365.25 days = 31,557,600 seconds/year

- Calculation of the duration of the **annual Morozov calendar**:

  365 (31/128) days = 365.2421875 days = 31 556 925 seconds/year

- Duration of **Kepler's astronomical tropical year** (1627):

  365.2421875 days = 31 556 925 seconds = 365 (31/128) days/year

- ***Systemic error of the length of the Julian calendar in relation to the length of the astronomical tropical year Kepler is equal to (1 day in 128 years):***

  (1/128) days = 86400 seconds/ 128 years = 675 seconds/year or

  = **1,848 seconds/day**

COORDINATED REFERENCE ATOMIC LUNAR TIME [III]

- The Moon uses a partially decimal time scale, as it was during the Great French Revolution [from July 14, 1789 to November 9, 1799].
- The conditional linear single Lunar day contains **10 lunar chronoses** [xp], which are equal to 24 Earth hours

  [**conversion factor 24 hours (:) 10=2.4**].
- Therefore, **1hr=2.4 hours=60 minutes (x) 2.4 = 144 minutes**.
- Therefore, the conditional single lunar linear days [10 xp] contain the same number of minutes [**1440 min=10x144**] as they are contained in the terrestrial circular days [**24x60=1440 min**].
- Therefore, the Earth's day and the conditional Lunar day contain an equal number of seconds [**86400 sec = 1440 min (x) 60 sec**].

Time on the Moon is unique, **reference, standard, absolute and linear**. It does not depend on the specific time zone of the Earth.

Therefore, for the date and time of the Blue Ghost landing on the surface of the Moon, we always have the single combination of ***"Space Data & Space Time":*** **Aries, 5; 2025, 3 chronos and 082 minutes**.

The single **13-month** cosmic calendar with the Morozov calendar constant [31/128] (with zero annual error) was applied for the Earth and the Moon in relation to the duration of **the tropical year [1627] Kepler [365.2421875 days].**

Universal:

1) **"Space Time"** digital lunar coordinated time [**LTC**] and

2) The universal space date **["Space Data"]** - is unique and absolutely unchangeable.

This is the same unambiguous cosmic digital expression of date and time for each and **every circular 24-hour zone on Earth.**

COORDINATED REFERENCE ATOMIC LUNAR TIME [V]

- Asgardia successfully delivered its **Coat of Arms, Flag and Constitution** to the Moon in the **Sea of Crises** as part of the American "**Mission 139**“ on the spaceship "Blue Ghost"

- March 2, 2025, 8:34 UTC [UTC standard time]

Aries, 5; 2025. 3.0 chronos and 082 minutes Lunar Coordinated Time (LTC)

THE TRIUMPH OF ASGARDIA'S FIRST SPACE STATE ON THE MOON

Asgardia
successfully delivered its Coat of Arms, Flag, and Constitution to the Moon in a Sea of Crises as part of the American "**139 Mission**“
aboard the «Blue Ghost» spacecraft

March 2, 2025, 8:34 (UTC)

Aries, 5; 2025. 3 chronos and 082 minutes (LTC)

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TIME NAVIGATION CHARACTERISTICS OF THE LAUNCH AND LANDING OF THE BLUE GHOST M1 IN COORDINATED TIME, BOTH IN THE TERRESTRIAL VERSION [UTC] AND IN THE LUNAR VERSION [LTC]

Запуск **Launch**	15 января 2025, 6:11 UTC **January 15, 2025, 6:11 A.M. (UTC)** **[Aquarius 15, 2025; 2 kh. 083 min (LTC)]**
Выход на орбиту через 30 дней 4 часов, 16 минут (UTC), **[30 дней 1 хроносов, 112 минут (LTC)],** **Entering orbit after 30 days, 4 hours, 16 minutes (UTC),** **[30 days, 1 khronos, 112 minutes (LTC)],**	14 февраля 2025, 1:55 UTC **February 14, 2025, 1:55 (UTC)** **[Pisces 17, 2025; 0 kh. 115 min. (LTC)]**
Посадка на небесное тело **Landing on a celestial body**	Море Кризисов; 2 марта 2025, 8:34 (UTC), **Sea of Crises; March 2, 2025, 8:34 (UTC)** **[Aries 5, 2025; 3 kh. 082 min. (LTC)]**
Длительность полёта **Flight duration**	45 дней 21 часов, 37 минут (UTC), **[45 дней 9 хроносов, 1 минута (LTC)]** **45 days, 21 hours, 37 minutes (UTC),** **[45 days, 9 chronos, 1 minutes (LTC)]**
COSPAR ID NSSDCA ID SCN **Стоимость [Cost]**	2025-010A BLUEGHOST 62716 **93,3 млн долларов [$93,3 mln dollars]**

THE SYMBOLS OF ASGARDIA WERE LOCATED IN THE "PYRAMID" OF THE LIFESHIP PAYLOAD. THEY HAVE NOW BEEN ON THE SURFACE OF THE MOON SINCE MARCH 2, 2025 IN THE AREA OF THE LUNAR SEA OF CRISES. THUS, ASGARDIA HAS, THEORETICALLY, "STAKED OUT" ITS OWN TERRITORY ON THE MOON.

THE COAT OF ARMS, FLAG AND CONSTITUTION OF THE FIRST SPACE STATE OF ASGARDIA WERE SUCCESSFULLY DELIVERED TO THE MOON.

THEORETICALLY, STARTING FROM MARCH 2, 2025, ASGARDIA HAS THE OPPORTUNITY TO OFFICIALLY REPRESENT ITS FIRST SPACE STATE IN THE WORLD AND IN THE HISTORY OF CIVILIZATION AT THE UNITED NATIONS. [ARIES, 5; 2025.3 CHRONOS AND 082 MINUTES (LTC)]

ASGARDIA'S TERRITORIAL WEALTH ON THE MOON [ASGARDIA WILL "STAKE OUT" ITS TERRITORY]

https://asgardia.space/en/news/Asgardias-Legacy-Lands-on-the-Moon

SOLVING THE PROBLEM OF THE REFERENCE STANDARD OF LUNAR TIME AND THE "PARADOX" OF THE MOON

ON MY WEBSITE TODAY: https://calendar-morozov.space

THE ENTIRE PROPOSED BRICS SPACE COUNCIL HAS GATHERED

- **10,631 VISITORS FROM ≈ 45 UN COUNTRIES**
- **[AUGUST 07, 2025]**
- Sweden, Finland, Thailand, Poland, Vietnam, Great Britain, Belarus, Kazakhstan, Georgia, Singapore, Japan, Brazil, Netherlands, France, Canada, Germany, China, USA, Russia, Tunisia, Mexico, Australia, India, Belgium, Israel, Greece, Turkey. Switzerland, Italy, Romania, Azerbaijan, Ireland, Greece, etc.

THE DISTANCE FROM THE EARTH TO THE MOON AND THE ORIENTATION OF THE MOON'S ORBIT

- The orientation of the Moon's orbit **is not fixed** in the space around the Earth. There is an **orbital precession – "apsidal precession**". The semimajor axis, which connects the apogee and perigee (the long diameter of the Moon's orbit), makes a complete revolution in 8.85 Earth years (in 3232.60 days) in the direction of the direct movement of the Moon itself (processes for every 8.85 years in a period of 360˚ degrees).

Perigee is the minimum distance from the Earth to the Moon (on average) **363 104 km.**

[from 356,400 to 370,400]

Apogee is the maximum distance from the Earth to the Moon (on average) **405,696 km.**

[from 404,000 to 406,700]

The average distance from the Earth to the Moon is **384,400 ÷ (384,403) km.;**

The semimajor axis of the Moon's rotation ellipse is **384,400 km [Newton]**

The minor semimajor axis of the Moon's rotation ellipse is **383,800 km [Newton]**
The average value of both semi-axes, taken for theoretical calculations as the radius of rotation in a circular orbit– 384 100 km ≈ **384 000** km.

The speed of light is **299,792,458** meters per second; therefore, the comparative distance from the Earth to the Moon in light seconds is:

384,400,000 meters / 299,792,458 meters per second = 1.282220 light seconds **≈ 1.282 light seconds.**

384,000,000 meters / 299,792,458 meters per second = 1.280,886 light seconds **≈ 1,281 light seconds**

PHASES OF THE MOON – FROM THE POINT OF VIEW OF AN OBSERVER FROM EARTH

- The plane of the Moon's orbit is located almost exactly **in the plane of the Sun's equator** (**ecliptic**). The deviation from it is minimal and equal to only **5.1**° degrees of inclination [from 4°59' to 5°19'] to the ecliptic plane (to the equatorial plane of the Sun, as with all planets of the solar system). Is the moon an "**irregular**" gravitational acquisition of the Earth?
- The Moon is not located in the equatorial plane of the Earth, as befits "regular" real terrestrial satellites (the equatorial plane of the Earth is inclined to the equatorial plane of the Sun – or to the plane of the ecliptic - by **23.4**°degrees).
- Rotation of the plane of the lunar orbit: its nodes (points of intersection of the orbit with the ecliptic) shift to the west, making **a complete revolution in 18.6 years [precession cycle ≈ 19 years («Meton» cycle)]**.
- In the "**new Moon**" phase, the Moon is in *syzygy* (that is, on the same line) of "connection" with the Sun [***phase "zero" –* «0»** - or **phase** "**0.0**" or **single phase** "**1.0**"];
- In the "**full Moon**" phase, the Moon is *in the syzygy* of "confrontation" with the Sun [**phase 180°** - or **phase "0.5"];**
- In the "**first quarter**" phase [**phase 90°** - or "**phase 0.25"]** and
- In the phase of the "**first and last quarter**" [**270° phase** - or **"0.75" phase**] – the Moon is "in quadrature" (that is, across the «syzygy» line).

THE PERIOD OF THE MOON'S ORBIT AROUND THE EARTH [THREE POSSIBLE REFERENCE POINTS]

- I. The sidereal (stellar) cycle **for an observer on the Moon behind the star Spica** in the constellation Virgo is on average: 27.32166 days or 27 days 7 hours 43 minutes 11.5 seconds.
- II. The Synodic average biblical Jewish cycle *between any two identical phases of the Moon* (molad interval) **for an observer on Earth behind the Moon** is: 29.530588 average solar days or 29 days of 12 hours 44 minutes and 1/18 minutes {1/18 minutes = 3(⅓) seconds = 3.3333 seconds}.
- **The "Molad Interval"** itself has its own range of fluctuations **[from 29.25 days** (29 days 6 hours) **up to 29.83 days** (29 days, 19 hours, 55 minutes, 12 seconds)**],** that is, with an oscillation range **of 13 hours, 55 minutes, and 12 seconds.**
- **Precession of the earth's axis** relative to the star Spicus in the constellation Virgo (with a 360°- degree rotation cycle for **25,776 years, that is, with a shift of 1° (degree) for every 71.6 years)**

III. The solar light cycle or calendar **13-month cycle**

(for an ***observer on the Sun behind the Moon***) is equal to:

14 Earth days are the **light cycle** (140 chronoses = 336 hours);

14 Earth days are the **dark cycle** (140 chronoses = 336 hours).

The **monthly total cycle** is **28 Earth days** (280 chronoses = 672 hours).

THE ASTROPHYSICAL "PARADOX" OF THE MOON'S EXISTENCE AS A SATELLITE OF THE EARTH IS *MATERIAL THAT WILL PROBABLY BE INCLUDED IN ALL TEXTBOOKS.*

- THE CONTRADICTION OF THE MOMENT:
- CIVILIZATION TODAY, ON THE ONE HAND, IS TRYING TO COLONIZE THE MOON, BUT STILL CANNOT EXPLAIN THE REASON –
- **WHY DOES THE MOON NOT FALL ON THE SUN**?
- OR WHY IS THE MOON NOT AN INDEPENDENT PLANET OF THE SOLAR SYSTEM?
- AND WHY DOES THE MOON FLY IN TANDEM WITH THE EARTH, FORMING A STABLE DOUBLE PLANET AND AN "IRREGULAR" GRAVITATIONAL ORBIT?

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ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ УЧРЕЖДЕНИЕ НАУКИ
ИНСТИТУТ КОСМИЧЕСКИХ ИССЛЕДОВАНИЙ РОССИЙСКОЙ АКАДЕМИИ НАУК (ИКИ РАН)

Б. Ц. БАХШИЯН, К. С. ФЕДЯЕВ

ОСНОВЫ КОСМИЧЕСКОЙ БАЛЛИСТИКИ И НАВИГАЦИИ

КУРС ЛЕКЦИЙ

Серия **«МЕХАНИКА, УПРАВЛЕНИЕ И ИНФОРМАТИКА»**

МОСКВА
2013

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Бахшиян Б. Ц., Федяев *К. С.* Основы космической баллистики и навигации : Курс лекций. М.: ИКИ РАН, 2013. 119 с. (Серия «Механика, управление и информатика»).

ISBN 978-5-9903101-4-8

Данный курс лекций представляет собой введение в космическую баллистику — теорию полета искусственных небесных тел. Приведены законы невозмущенного движения спутников, излагаются методы оценивания и коррекции их параметров. Приводятся примеры решения некоторых типовых задач.

Для студентов, аспирантов и преподавателей факультетов прикладной математики технических вузов, может быть полезно специалистам по небесной механике и астродинамике.

Ключевые слова: невозмущенное движение, законы Кеплера, элементы орбиты, возмущенное движение, теория оценивания, гарантирующее оценивание, линейное программирование, планирование эксперимента, коррекция движения, линейная импульсная коррекция.

Bakhshiyan B. Ts., *Fedyaev K. C.* Fundamentals of Space Ballistics and Navigation. M.: IKI RAN, 2013. 119 p. (Series “Mechanics, Control, Informatics”).

ISBN 978-5-9903101-4-8

The book contains lectures on the theory of space ballistics (satellite motion theory). Basic concepts of unperturbed satellite motion as well as its parameters determination and correction methods are discussed.

This book may be of interest to students, graduates and lecturers of applied mathematics departments of technical universities. Also it can be useful to specialists in celestial mechanics and astrodynamics.

Keywords: unperturbed motion, Kepler’s laws, orbital elements, perturbed motion, estimation theory, guaranteed estimation, linear programming, design of experiment, motion correction, linear impulse correction.

Редактор: *Корниленко В. С.*
Дизайн обложки: *Захаров А. Н.*
Компьютерная верстка: *Комарова Н. Ю.*

Bakhshiyan B.Ts., Fedyaev K.C. Fundamentals of Space Ballistics and Navigation. M.: IKI RAN, 2013. 119 p. (Series “Mechanics, Control, Informatics”)[8], - ***in general, this issue of the "Moon paradox" is not covered in any way.***

- The essence of the paradox of Newton's formula of the astrophysical Law of Universal Attraction for the Moon is that according to this formula, the Sun attracts **the Moon more than 2 times more strongly than the Earth attracts it**, but at the same time the Moon does not seem to "unnaturally" fall on the Sun.
- This conclusion raises many well-founded questions. Why doesn't the moon fall on the Sun in this case? [This fact is called the "**Moon paradox**."]
- Therefore, a natural question arises with suspicion of the alleged imperfection of the Law of Universal Gravitation (gravity) itself Newton's law [2]? **Are there any problems with space navigation?**

Keywords: centripetal force; centrifugal force; gravitational focus; Huygens formula; Newton formula. Calculation of the orbital velocity of a space object. The main task of celestial mechanics. The linear absolute Time of the Universe on the Moon. The Coat of Arms, Flag and Constitution of Asgardia have been delivered to the Moon.

Annotation. The Moon is attracted to the Sun twice as much as to the Earth. However, the Moon does not fall on the Sun. This effect is called the "Moon paradox." We have applied Newton's Third Law in the dynamics of rotation to solve this problem. The main problem of celestial mechanics is the problem of "n" bodies. The limited problem of two Newtonian bodies moving conditionally in circular orbits. The linear absolute Time of the Universe on the Moon is the basis of modern astrogation on Earth and in Space. Asgardia successfully delivered its Coat of Arms, Flag, and Constitution to the Moon in a Sea of Crises; March 2, 2025, 8:34 a.m. (UTC) [Aries, 5; 2025. 3 chronos and 082 minutes (LTC)] on the USA «Mission 139» Blue Ghost spacecraft.

Fig. 1. The Earth and the Moon.
A typical model of force interaction between two bodies.
sciencelearn.org.nz

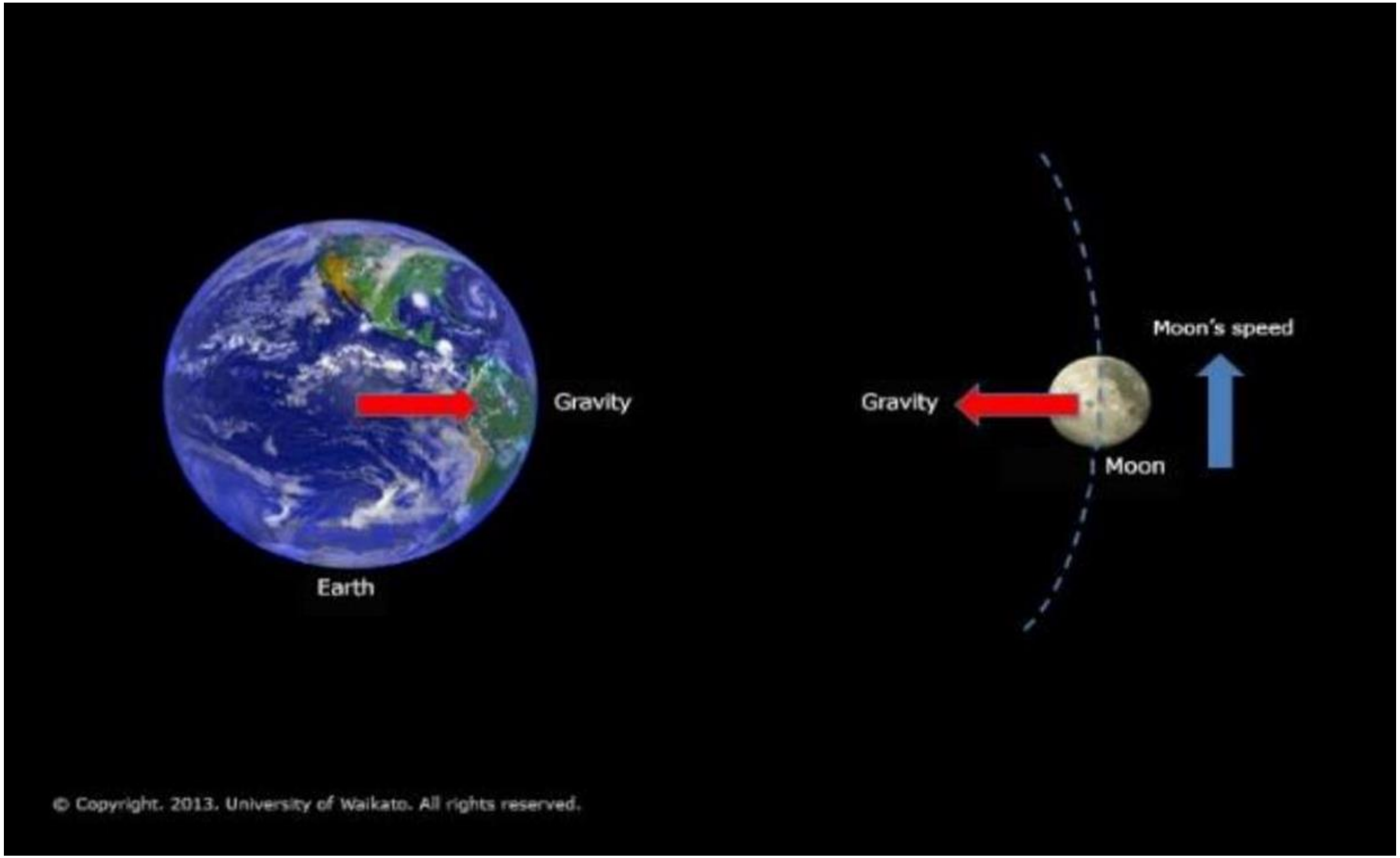
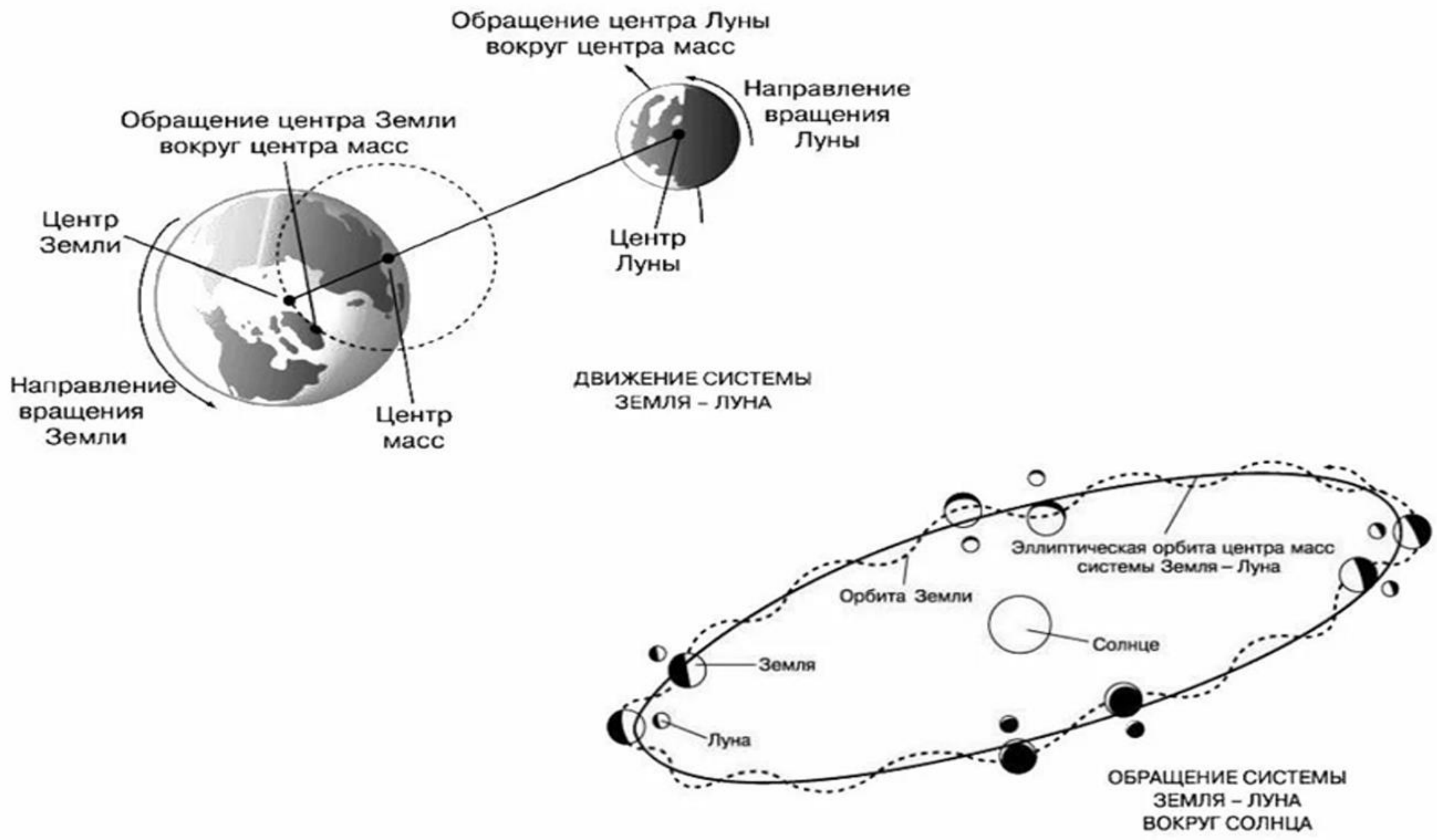


Fig.2. Model of the annual cycle of the Earth-Moon system's rotation [around the Sun] around the common center of mass



As we can see in the presented models, the Moon simultaneously participates in two rotations at once: 1) firstly, around the Earth [Fig. 1], and 2) secondly, together with the Earth around the Sun [Fig.2]. The Moon has a common single "**gravitational focus**" with the Earth [that is, a common center of mass or barycenter], and forms **the single binary planet** with the Earth, rather than the classical system of a small satellite and its large planet.

The Earth revolves around the Moon in the same way that the Moon revolves around the Earth.

- Both of them, like the **giant dumbbell**, rotate around the Sun in the same general elliptical orbit of their "gravitational focus" [center of mass], located at a distance of **4,671 km** from the center of the Earth. The average radius of the Earth is: **Re = 6371 km.** They both have the single common circular centrifugal acceleration [**Ach**] of the "gravitational focus", which is traditionally calculated using the Huygens formula, which is given below.

I. Consider the options for astrodynamics of rotation:
1) Moons around the Earth;
2) The Moon and the Earth, as the unified system, around the Sun.

- Any celestial body that rotates around another celestial body is affected by **Newton's Third Law in a dynamic form**: the action of the static centripetal force vector [**Fcn**] directed towards the center of rotation must necessarily be balanced by an adequate counteraction of the dynamic circular centrifugal force vector [**Fch**] directed, conversely, from the center of rotation:

$$\mathbf{Fcn = Fch}$$

The initial conditions for calculating Newton's centripetal force [Fcn] and Huygens' centrifugal force of rotation [Fch] are as follows:

- The mass of the Sun [Ms] is 1.9891*10^30 kg;
- The mass of the Earth [Me] is 5.9737*10^24 kg;
- the mass of the Moon [Mm] is 7.3477*10^22 kg
- average distance between the Earth and the Moon:

  r = 384,000,000 m = 384,000 km [4];
- the average distance between, on the one hand, the "gravitational focus"

of a system of two planets [Moon and Earth, conditionally, as a whole] and, on the other hand, with the Sun:

Re = 149,600,000,000 m≈150,000,000,000 m = "1 Astronomical Unit" =

= 1 AE ≈ 150,000,000 km = 15*10^7 km.

- «T» is the time of the complete annual revolution of one cosmic body around another [period of annual revolution], where T= Te is the annual period of the Earth's revolution.

II. The force of centripetal gravity [Fcn], as the formula of Newton's law of universal gravitation [2-body problem]

- This ratio is usually represented in the form of the formula

  of **Newton's Law of Universal Gravitation**:

  Fcn = G * m * [M / R^2] = μ [M / R^2] .

- Between two bodies having masses (m) and (M), there is a static force of centripetal attraction (**Fcn**), which is directly proportional to the product of these masses ("m" and "M") and inversely proportional to the square of the distance (R) between them;
- Were: [G] is the "**gravitational constant**", determined experimentally, equal to: G = 6.6725x10^-11 m^3/(kg·sec^2).
- μ = - G * m is the "**gravitational parameter**" of the mass "m", for example, for the Earth [m=Me], which is equal to: μ = 3.986*10^5 km^3/sec^2 ;

III. The Huygens centrifugal dynamic force [Fch] has a different physical nature than the static centripetal force of gravity Newton's Law [Fcn].

- The centrifugal force of rotation [Fch] is equal to [according to the Huygens formula] – the product of body mass [**m**] and its centrifugal acceleration [**Ach**]:

Fch = m* [Ach] = m*[V^2/R],

where the centrifugal acceleration is: **Ach = V^2/R.**

- The Huygens centrifugal acceleration [**Ach**] directly depends on the conditions of rotation of the celestial body itself in orbit (on its velocity, more precisely on the square of the orbit velocity [**V^2**]) and inversely depends on the radius of its rotation [**R**].

BASIC MATHEMATICAL RELATIONS AND INDICATORS OF ROTATION OF CELESTIAL BODIES [BASIC LAW [FORMULA] OF CELESTIAL MECHANICS]

In the solar system, this calculation of the orbital speed of rotation of any space object [**m**] around the Sun [**Ms**] is based on the equality: **Fcn = Fch**

G * m * [**Ms** / Rm^2] = m*[**Vm**^2/Rm]

Vm^2 = G * Ms / Rm =μ/Rm   или   Vm = G^½ * Ms^½ / Rm^½ = μ^½/Rm^½

Calculation of the **orbital rotation velocity** of a space object [specifically the Earth - Ve] around the Sun [m=Ms]: G * Me * [Ms / Re^2] = Me*[Ve^2/Re], from where we have :

Ve = [*G^½ * Ms^½]* / Re^½ = μ^½/Re^½ =

[6,6725x10^-11] ^½ * [1,9891*10^30] ^½ /[15*10^10] ^ ½ =

29 745,89019 m/sec ≈ 30 km/sec,

were: μ =   [G * Ms] - the "gravitational parameter" of the Sun.

Calculation of the **time of one annual orbital revolution** of the Earth [Te] according to Kepler [1627]: **Te** = 2πRe/ **Ve** ≈ 31 556 925 sec = 365.2421875 days

Traditionally, the equation of motion of a satellite is used in the simplest limited two-body problem [Bakhshiyan B.Ts., Fedyaev, p. 47]. It is completely equivalent to the above calculation of the satellite's velocity on the model of the simplest circular orbit using the same formula, but without using Huygens' centrifugal force formula in the derivation – hence all the "paradoxes" of the Moon?

- Traditionally, the same **speed of the Earth's motion** [29,745,89,019 m/s ≈ 30 km/s] as a satellite of the Sun is calculated according to the circular orbit model of radius "r" using the formula of the "**basic law of celestial mechanics**":

$$\upsilon = \upsilon_{\text{кр}}(r) = \sqrt{\frac{\mu}{r}},$$

were: the "**gravitational parameter**" of the Sun is:

μ(S) = G*Ms = (6,6725x10^-11)*(1,9891*10^30)=132,722*10^18 km^3/sec^2;

the radius of the Earth's rotation around the Sun is: r = 15*10^7 km

THE MODEL OF THE SOLAR SYSTEM

THE ORBITAL ROTATIONAL VELOCITIES OF THE PLANETS OF THE SOLAR SYSTEM – THE FIRST COSMIC VELOCITIES OF THE PLANETS IN RELATION TO THE SUN - BASED ON CALCULATIONS ACCORDING TO THE BASIC FORMULA [LAW] OF CELESTIAL MECHANICS

Орбитальные скорости планет солнечной системы

Планета (карликовая планета)	Орбитальная скорость, км/с
Меркурий	47,87
Венера	35,02
Земля	29,78
Марс	24,13
Церера	17,88
Юпитер	13,07
Сатурн	9,69
Уран	6,81
Нептун	5,43
Плутон	4,67
Хаумеа	4,48
Макемаке	4,41
Эрида	3,44

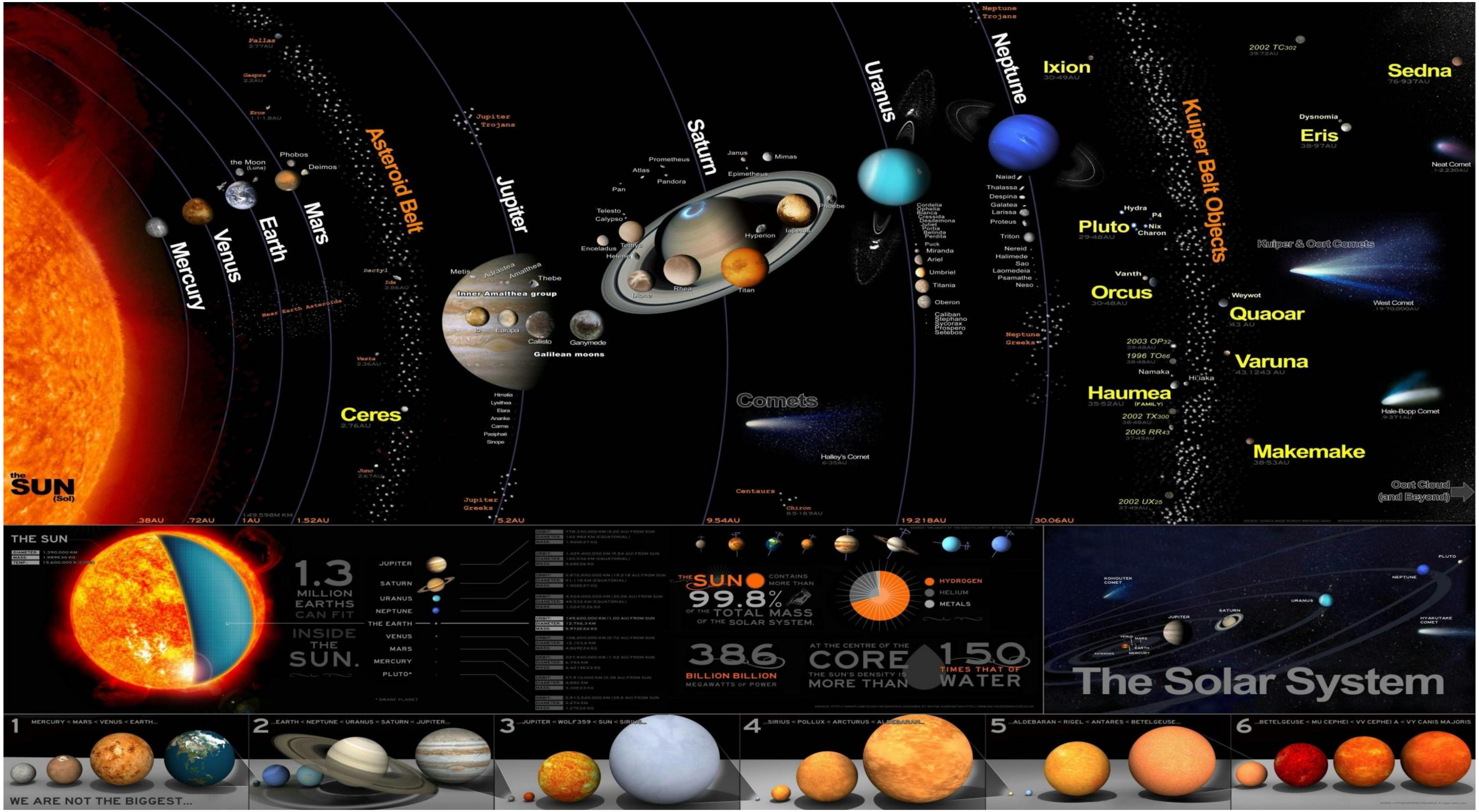
THE CALCULATION OF ANY SATELLITE SYSTEM OF ANY PLANET AND ANY STAR IS CARRIED OUT ACCORDING TO THE "BASIC LAW (FORMULA) CELESTIAL MECHANICS."

First, the individual "gravitational parameter" of a given planet or star is calculated **[μ(x) = G * M(x)],** similar to how we calculated the gravitational parameter of the Earth [which has 1 natural satellite] and the Sun [8 natural satellites] above.

The gravitational parameters of Mars [2 satellites], Venus, Mercury, Jupiter [95 satellites], Saturn [274 satellites], Uranus [28 satellites] and Neptune [16 satellites] are calculated in the same way.

After that, the radii [«r»] of rotation of the natural (or artificial) satellites of these planets are substituted into the formula and the sizes of their orbital velocities are obtained, which, as we see, do not depend in any way on the masses of these satellites themselves.

Everything We Know in Our Solar System



The ratio of the mass of the Sun and the total mass of the planets of the Solar system

- The mass of the Sun is at least 99.86% of the mass of the entire Solar system. When viewed from space, the solar system is actually the Sun star itself and a bit of "conditional space debris" [0.14% of the Sun's mass] around it in the form of the Solar planetary system, 90% of which is made up of the combined masses of only two gas giant planets Jupiter and Saturn. The mass of the Earth, together with our entire **"divine civilization" and the entire Vernadsky noosphere**, is 318 times less than the mass of Jupiter: *[≈0.003=10^-3]*.
- The mass of all objects of the "conditional space debris" of the Solar system [from the mass of the Sun] is no more than 0.14% [7/50≈1/7].
- The mass of the planet Jupiter is 1000 times less than [10^3] the mass of the Sun. It's probably a broken–off piece of the Sun itself, like all the other gas planets- it's probably just pieces of the Sun itself, too.
- The mass of Jupiter is 2.47 times the mass of all other (other) objects in the Solar system combined.
- The total mass of all the satellites of Jupiter is about **5*10^3 times** less than the mass of Jupiter itself.
- Saturn's mass is [5.6846 × 10^26 kg] and it is greater than the total mass of its two largest satellites Elena&Titanium [2*(1.4×10^23 kg)=2.8×10^23 kg], **2.030*10^3 times**.
- The combined mass of both moons of Mars, Phobos and Deimos, is ≈**60*10^6 times** less than the mass of Mars. [6.4185*10^23 kg/ (1.072*10^16 kg) = 5.98740*10^7]
- The mass of the Moon is significant in relation to the mass of the Earth. It is **1/88.3** of the Earth's mass [more ≈0.01=10^-2≈**1.0%**]. That is why the "Moon paradox" arose?

"THE MOON PARADOX" – A SOLUTION TO THE GRAVITATIONAL PROBLEM OF THREE BODIES:
MOON, EARTH, AND SUN

APPLICATION OF NEWTON'S THIRD LAW IN ITS DYNAMIC FORM

IV. The first calculation

of Newton's centripetal static gravitational forces for the Earth and the Sun in relation to the Moon:

"The paradox of Newton's formula for the Moon."

Conclusion 1.

The Newtonian force of the Moon's static centripetal attraction to the Sun [***F2***] is more than twice as strong as the Newtonian force of the Moon's static centripetal attraction to the Earth [**F1**]:

***F2*≈ 2F1**

F2/F1 = [***4.35746*10^20 H***] / [1.98619*10^20 H] = **2.1938787326 times**

This is the "Moon Paradox": The Moon supposedly "unnaturally" does not fall on the Sun. [46]

https://ru.m.wikipedia.org/wiki/Луна

Why [2]?

V. The second calculation
of the dynamic centrifugal and centripetal forces of rotation in the Earth-Sun system

Conclusion 2.

Huygens' centrifugal dynamic force of rotation (***F3***) exactly corresponds to Newton's centripetal static force of gravity (**F4**) inside the Earth-Sun system:

F3 **= F4**

- There is an almost complete coincidence of the results within the acceptable error of the calculations themselves.:

3.523758 *10^22 H **≈3.58422*10^22 H**.

VI. The third calculation

of the parameters of the centripetal and centrifugal forces of dynamic rotation in the Moon-Earth system

Conclusion 3.

Huygens' centrifugal dynamic force of rotation (***F5***) exactly corresponds to Newton's centripetal static force of gravity (**F6**) inside the Moon-Earth system:

***F5* = F6.**

There is an almost complete coincidence of the results within the acceptable error of the calculations themselves:

***2.0021*10^20 H*≈1.98619*10^20 H**

VII. The fourth calculation

of the parameters of the astrodynamic rotation of the Moon around the Sun (the Moon-Sun system)

Conclusion 4.

There is a complete gravitational balance in the Moon-Sun system between Newton's static centripetal force [**F2≈2F1**] with respect to the Moon and Huygens' centrifugal astrodynamic rotational force [***F7***] with respect to the Moon:

$$F7 \approx [\mathbf{F2 \approx 2F1}]$$

$$4.40862*10^{20}\ H \approx \mathbf{4.33425139*10^{20}\ H}$$

- **Thus, therefore, due to the dynamic centrifugal force of Huygens [*F7*], the Moon does not fall on the Sun.**
- **Newton's third law for the dynamic circular motion of a body in orbit is observed simultaneously, both in relation to the pair "Earth-Moon", and in relation to the pair "Sun-Moon", as well as in relation to the pair "Sun-Earth". There is a stable dynamic gravitational balance in the system of three bodies: the Moon, the Earth and the Sun.**

WHAT SHOULD HUMANITY DO [THE BEGINNING]?

- Spontaneous volcanic activity, which is not yet scientifically predictable, poses a critical danger to the biological world on Earth. But it defines such a phenomenon as periodically occurring glacial periods, which are detrimental to all living things.
- Today, human civilization is objectively located between the fifth and sixth ice ages. She must manage to build caravans from fleets of spacecraft, colonize the "inner" solar system, that is, the Moon and Mars, as well as the satellites of gas planets in the "far" space of the Solar system.
- To realize the idea of saving civilization in space, humanity needs the "sixth socio-economic formation" of K.E. Tsiolkovsky, which will develop on the basis of the traditional values of the leading sciences of civilization.

WHAT SHOULD HUMANITY DO [CONTINUED «1»]?

- Such sciences include, in particular, Mendel-Vavilov genetics, Wiener-Glushko-von Neumann cybernetics, Planck-Einstein-Lemaitre Universe astrophysics, Kantorovich economic theory, Tsiolkovsky-Mendeleev cosmonautics.
- The most important direction is the development of Vernadsky's ideas of the noosphere, as well as Lemaitre's modern theological theory, which combines faith, religion and science.
- Max Planck believed that new revolutionary ideas win only when the opponents of these new revolutionary ideas physically die out.
- And Igor Ashurbeyli is right about this with his progressive idea of the First Space state of "Asgardia" [2016].

WHAT SHOULD HUMANITY DO [CONTINUED «2»]?

- "Stupidity" does not get smarter, even if it is repeated many times over the millennia. And the "truth" doesn't get any sillier, even if everyone keeps quiet about it. "Stupidity" lives exactly until it destroys itself and until the truth takes its place simply by itself, and this is always facilitated by the "fools" themselves, who always claim that they have always told everyone only the "truth." And it's really true. It is the "fools" who have always been the biggest "truth-tellers" in history. And over time, they necessarily turned any "truth" into their opposite, into another "lie", since they always told the "truth" and "only the truth", but "not the whole truth».
- And, in the end, even the newest and biggest "truth" will always be turned by "fools" into its opposite, and therefore, over time, it will become the next biggest "lie". The logic of any scientific idea develops along the "Hegelian spiral" of Kant's Critique of Pure Reason: thesis-antithesis-synthesis. Nevertheless, Galileo did not say for nothing after the unjust trial of him in 1633 in the Vatican: "The Earth revolves around the Sun anyway, and not the other way around." Wasn't he right? "Follow your own path, and let people say whatever they want," Dante Alighieri wrote in the «Divine Comedy» as early as 1321, and as early as 1335, Hieromonk Matthew Vlastar confirmed this truth in his «Alphabetical Syntagma». "Nothing is new under the Moon," wrote King Solomon, the smartest of the wise men who lived on Earth (970-930 B.C.).
- King Solomon built the First Temple in Jerusalem in 950 B.C. and under him the first solar-lunar calendar, which still exists in Israel, became the state calendar. The lunar synodic Hebrew "molad interval" between two identical the phases of the Moon was first correctly astronomically calculated during the reign of King Solomon.

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