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**N. A. Rynin**

# **INTERPLANETARY FLIGHT AND COMMUNICATION**

**Volume I, No. 1**

**Dreams, Legends, and Early Fantasies**

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N.A. Rynin

# INTERPLANETARY FLIGHT AND COMMUNICATION

(Mezhplanetnye soobshcheniya)

Volume I. No. 1

*DREAMS, LEGENDS, AND EARLY FANTASIES*

(Mechty, legendy i pervye fantazii)

Leningrad 1928

Translated from Russian

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## FROM THE AUTHOR

In undertaking this project the author was fully aware of the difficulties involved. The magnitude of this task and the fact that it borders on many of the exact and applied sciences on the one hand, and the history of the development of mankind on the other, render the pursuit beyond the capacity of one man. Therefore, the reader must look upon this work as an initial endeavor to provide an encyclopedia of interplanetary navigation. Although the entire project is ready for publication, material conditions preclude its appearance in toto, and for this reason it will be issued in separate volumes independent of each other but linked by a common title and a common idea.

The present volume is the first. A total of ten is envisaged and will be published when deemed feasible. Readers interested in the idea of interplanetary navigation in general, and in the contents noted by the author in particular, could do yeoman's service for the publication of the remaining volumes by acclaiming this, the first volume, and those to follow.

## CONTENTS

General title: Interplanetary Flight and Communication

Book 1: Interplanetary Navigation in the Fantasies of Novelists

Vol. 1: Dreams, Legends, and Early Fantasies

Vol. 2: Spaceships in Modern Novels

Vol. 3: Radiant Energy

Book 2: Jet Engines — Theory, History, Technology

Vol. 4: The History and Theory of Jet Engines

Vol. 5: Rockets in Interplanetary Space

Book 3: Superaviation and Superartillery

Vol. 5: [sic]: Superaviation and Superartillery

Vol. 6: Atmospheric and Gravitational Envelopes

Book 4: Interplanetary Navigation in Scientific Projects

Vol. 7: K. E. Tsiolkovskii and his Rocket Ship

Vol. 8: The Work of Esnault-Pelterie, Lebedev, Goddard, Oberth, Hohmann, Lorenz, Shershevskii, and others

Vol. 9: Theory of the Flight of Rocket Ships

Vol. 10: Elements of Astronomy in their Application to Interplanetary Navigation. Bibliography and Chronology.

All comments referring to the present first volume, and all requests for the shipment of this and ensuing volumes should be addressed to:

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## Epigraph

One of the most frequently encountered human errors is the idea that the imagination possesses more powerful wings than reason. In order to be persuaded of the opposite, a comparison of the boldest poetic fictions of the starry firmaments of antiquity and what modern science has conceived is sufficient.

Max Nordman

"Journey around the Universe"

## FOREWORD

The aspirations to achieve new discoveries on earth are common to all ages and all peoples. Some are drawn to seek these discoveries by the spirit of adventure and sport, but more often than not it is the desire to enrich the store of human knowledge and to ease and improve people's lives.

When the earth was comparatively unknown, a host of expeditions set forth to explore it. In 1200 B.C. the Phoenicians, though apprehensive of monsters of the sea and evil spirits, sailed to faraway places and discovered new shores in their desire to augment their knowledge and build up their trade. After the Phoenicians came the Norwegian Ericson, the Venetian Marco Polo, Balboa, Walter Raleigh, Cortez and Pizarro, Columbus, Henry Hudson, Baffin, Livingstone, Stanley, and in our time Captain Scott, Nansen, Peary, and Amundsen. These explorers uncovered new lands, blazed new trails, and extended the limit of areas accessible by both land and water.

In past decades man has conquered the atmosphere and large aircraft now permit us a glimpse of places which could not be reached by land or sea.

Flights over the Sahara, the dense African forests, the Siberian taiga, the Indochina swamps, volcanos, the Himalayas, the Arctic icebergs, Amundsen's flight over the North Pole, flights in aircraft over the ocean—all this combined is now accessible to man and will soon satiate his ever-inquiring mind. The earth will soon be congested with men, and their eyes will then focus on the sky, the planets, and the stars. For scores of years they have contemplated this. Long they have been studying the movements and properties of celestial bodies, but it is only recently that bold, scientifically-backed dreams to penetrate the "abode of the gods" have emerged.

The first to enter this abode were the poets and novelists through their imaginary voyages, and then—very slowly, to be sure—the scientists began to consider the possibilities of interplanetary flights, to be joined later by the technicians.

Thus the history of interplanetary navigation, a feat impracticable for the time being, has acquired a respectable past, in addition to masses of material. This is a history of fantasy, of bold, often absurd projects, of exciting deductions and broad anticipations.

To provide an outline of this history, to systematize it by years and even centuries, to sum up work accomplished and on this basis to set future objectives and determine the conditions whereby man could detach himself from earth and be carried into interplanetary space is the goal of our work.

We shall not forget that reality very often surpasses the most vivid imagination—the magic carpets appear like fairy tales for children in comparison with the aerial colossuses of our day, and the sorcerers and witches are mere child's play compared with human power over steam, gas, and electricity.

Epigrah

We will waft away in the brilliance  
of fiery worlds and fly along all the  
trails of interstellar clouds.

N. Morozov

"Zvezdnye pesni," Book 1, p.51

INTRODUCTION

The history of the development of the idea of interplanetary communication comprises two primary trends:

1. The transmission of thought in outer space.
2. The transmission of material bodies in outer space.

The transmission of thought through conventional symbols was envisaged in two ways: light signals and radio transmission.

The first method implies the installation on earth of large-dimensioned signs sharply distinguished on a specific background, visible by day and luminous at night, which could be seen and distinguished from outer space. The second method consists in transmitting powerful radio waves (or possibly others)\* into outer space that could be received by interplanetary vehicles or by inhabitants of other worlds. The transmission of material bodies to planets is possible in two ways: without living beings – people – or with them.

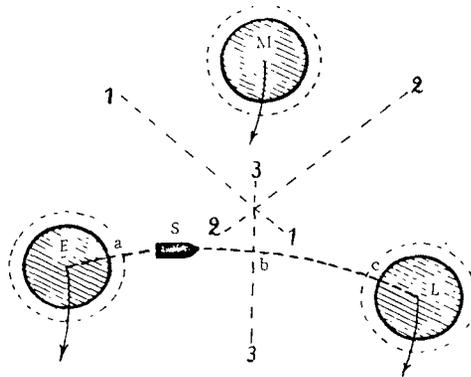


FIGURE 1. Scheme of flight of an interplanetary ship

The flight of a missile or unmanned interplanetary vehicle is easily accomplished since it is possible to impart to such a vehicle greater acceleration at take-off or deceleration during descent, which would be dangerous for man. Rockets and gun-fired projectiles would serve as equipment for such a flight. A basic condition for the realization of their

\* If the Heaviside layer encircling the earth does not let radio waves pass.

flight is a relatively low speed in the dense layers of the atmosphere and a high speed beyond it. In this context, staged rockets or gun-fired projectiles with their own jet-propelled vehicles that commence operation at certain altitudes after launching are suitable.

The flight of a manned vehicle is more complex and requires the fulfillment of a multitude of conditions. Let us look at such a flight (Figure 1) in its most schematic form from earth (E) to planet (L) along trajectory abc, which will be very complex in relation to the form and characteristics of the planets, their movements, solar attraction, vehicle speed, its flight direction, gravity effect of other celestial bodies, M for example. The dotted circles in Figure 1 represent the boundary of planetary atmospheres and the lines 11, 22, 33, the zones where the attraction of the planets is in equilibrium: 11 – between E and M, 22 – between L and M, and 33 – between E and L. At the same time it should be borne in mind that the trajectories of celestial bodies E, M, and L, like that of vehicle S, need not lie in a plane, and the problem may be solved in three-dimensional space as a function of time determining the conditions of motion of all of the bodies.

First, let us examine the flight conditions.

The launching site on earth should be selected with an eye to the purpose of the flight; the site determines the direction of the flight, i.e., in the sense of earth's movement and its rotation, or the opposite.

Flight speed calls for attention. At a low speed there is less struggle with atmospheric resistance (atmospheric envelope), though more with terrestrial gravity (gravitational envelope); on the other hand, the vehicle pierces the envelope of gravity more quickly at high speed but far less so the envelope of air resistance. For this reason an intermediate and appropriate speed must be selected which, after departure from the earth's atmosphere, will increase to the speed indispensable for further free flight (without the work of bursts) in outer space under the effect of gravity and in order to keep the craft from falling back to earth. This maximum speed must be around 9 – 11 km/sec. The gradual acceleration by the vehicle from the most suitable to the maximum speed should not be dangerous for the passengers and could be around 30 – 40 m/sec<sup>2</sup>. The most suitable speed also affects flight direction.

To prevent the vehicle in free flight from deviating from course because of the gravitational effects of asteroids encountered, additional velocities of different directions, which also require energy consumption, must be imparted to the craft en route.

The form of the vehicle depends upon the conditions of its flight. While flying in the atmosphere, its form must present the smallest resistance to movement in the air; this would come through experience (perhaps it should be cigar-shaped). If, in order to obtain the most suitable speed, the vehicle describes a spiral trajectory around the earth gradually drawing away from the surface, perhaps wings and rudders like those of an airplane might be added. When the vehicle leaves the boundary of the atmosphere, its form is unimportant, and since passengers in free flight lose the sensation of gravity and there is no difference between "above" and "below" for them, i.e., they will be floating or flying in the atmosphere within the vehicle, in such a case the vehicle might be of globular form like the terrestrial bodies.

Equipment within the vehicle will be very complex. We will list only the main items required for life and for control of the spacecraft. For life,

people require devices that restore the supplies of oxygen for breathing, absorb and utilize products of excretion of the body, restore products of nutrition, provide the sensation of gravity (for instance, by rotation) until the passengers become acclimatized, coolers for excessive heating on the sunny side of the vehicle and heaters for use when cooling occurs from interplanetary space on the shady side. One must not forget the special coolers and absorbers of acceleration during fast take-off from earth, as well as pressure suits for exit from the vehicle during free flight. It is also necessary to bear in mind the screens or glass protecting the body and organism from the destructive (ultraviolet, for example) rays of space.

Control instruments for the vehicle would be as follows: measuring instruments of speed (tachometers) and acceleration (accelerometers), indicators of distance covered and time, finders of the astronomical position of the vehicle, warning signals of approaching asteroids and meteorites, instruments preventing gyration of the vehicle in space (gyroscopes and fuses), etc. After passing through the neutral zone between the planets, where their gravitational forces are equal, the vehicle starts to fall toward another planet and accelerates its flight; for this reason in descent the flight must be "braked" by counter blasts or by using the resisting force of the atmosphere of this planet; the wings may be pulled out and, gradually describing a spiral around the planet, the vehicle enters the increasingly denser atmospheric layers and, finally, lands on its surface.

Let us proceed now to the main part of the interplanetary vehicle, its engine and the source of energy required for the flight. Three possible cases should be distinguished here:

- 1) the energy source is located on the earth and the energy is transmitted from earth to the vehicle;
- 2) the energy source and its supplies are in the vehicle;
- 3) the vehicle derives the energy from outer space.

The first case, i.e., when the vehicle is provided with energy from earth, means telecommunication of radiant energy (for example, radio, if the Heaviside layer does not interfere); this theory and its wide practical application already have their place now. But thus far there is only the Yamato project (radioship) for the large scale necessary to move an interplanetary vehicle. Energy obtained in this way may be used for the decomposition of chemical substances on board — water to gases for example — whose explosion will provide the reaction force capable of propelling the vehicle.

The second case presupposes the presence in the vehicle itself of supplies of energy in the form of explosive matter which then renders the vehicle independent. As explosives, for example, liquid hydrogen and oxygen might serve, which would be transformed into gas and produce the detonating gas that will provide the reaction or exhaust during the explosion that is capable of propelling the vehicle into space. Thus in this case the energy of the explosion is transformed into exhaust velocity and the engine will be a jet engine.

The weight of the explosive material will markedly exceed the weight of the passengers, food products, equipment and hull of the ship, depending on the distance and destination of the flight and the type of explosive. Therefore, for the purpose of reducing the dead weight together with the fuel consumed, it will be helpful to jettison the tanks and receptacles in which it was contained.

A task for future technologists would be the invention of an explosive matter which would yield at the smallest weight the greatest energy during explosion. The decomposition of radium atoms or some other atoms would solve the problem if heavy and cumbersome equipment and large quantities of power were not required for their decomposition.

The third case, when the vehicle derives energy from outer space, offers the following possibilities: a) utilization of the force of gravitational attraction, i.e., attraction of celestial bodies when feasible for the direction of the flight of the interplanetary vehicle, b) utilization of radiant energy of the sun, which provides thermal, light, and other rays. Thermal rays could be used for chemical reactions and decomposition of various matter into gas whose explosion yields the required reaction. Light rays could bring radiation pressure to bear on special large screens around the vehicle and impart to it the repulsive force; this is a complex problem and technically difficult to realize; finally, it may be that there are other kinds, still unknown, of radiant energy in outer space that are more powerful and whose discovery may be at hand; then they, too, could be used for interplanetary travel.

We will now indicate the obstacles standing in the way of rocket flights at high altitudes and in outer space.

1. The problem of cooling the working part of the vehicle in which the fuel explosions occur has not been solved. In modern internal-combustion engines, the material of the cylinder walls operates nearly at the limit stresses, transmitting through each square meter of wall 250,000 units of heat per hour at a temperature of 800°C, at a pressure of 1.2 atmospheres and a gas exhaust speed of around 150 m/sec. In a rocket engine we have to deal with a temperature of 2,500°C, pressure of 20 atmospheres and a gas exhaust speed of 5,000 m/sec; heat losses in the rocket come to about 30% of the entire fuel supply if cooling is at all possible with the application of liquid hydrogen and oxygen. The massive quantity of coolers that must be taken on board will markedly lower the payload of the rocket.

2. Another problem as yet unsolved is the more rational arrangement of the combustion chamber of the rocket and the form of the nozzle through which the combustion products escape to the outside, i.e., if the form of the nozzle should be parabolic or based on the Laval nozzle, or any other.

3. The problem of rocket stability in flight must also be solved. Even for artillery shells, whose speed is considerably smaller, this problem is very complicated and not fully solved.

4. Taking into account all losses of power, the current types of fuel, even the most powerful (liquid hydrogen and oxygen, for example), have such a low payload factor that for the rocket ship to transport one man to the moon would call for a rocket of enormous dimensions. Therefore, a new type of fuel must be discovered which for a much smaller weight would produce much more energy.

5. The design of a jet engine and ways and means of storing fuel have yet to be worked out.

6. The problem of the influence of high and prolonged acceleration on man must be examined since it is expedient to increase acceleration of the rocket upon takeoff; the human being cannot well endure an acceleration that exceeds by two to three times the acceleration of terrestrial gravity.

7. Finally, a variety of problems arises on such matters as flight control of the rocket, navigation, cooling in outer space, landing on earth, etc. Scientists and technicians are challenged to find the solutions to these problems; with the joint cooperation of many, an interplanetary vehicle will come into existence and man will detach himself from earth and fly into outer space – in other words, he will be bringing to fruition that which is only dreamt of now by novelists and which scientists have only recently started to investigate.

Epigraph

The human mind cannot devise a non-existent thing; the impossible cannot be born in the mind; every idea, however strange it may appear, exists somewhere, otherwise the mind would be unable to put it into thought.

"Gnev bozhii," part I, p.59 V.Kryzhanovskaya

*Chapter I*

*DREAMS OF CONQUERING OUTER SPACE*

The conquest of outer space will not be achieved in one day. First there will be jet-propelled planes, then instrument-loaded rockets launched at high speeds to a height of several thousand kilometers, and on the return of these the data recorded will have to be studied in order to determine flight conditions at such altitudes.

Subsequently, there will come manned rockets, soaring higher and higher until one day they will succeed in flying around the moon. And then, aided by the reaction resulting from reversed thrust, it will be possible to land on the moon.

After the moon will come flights to the orbits of Venus, Mercury or Mars or its satellites, to circle these planets as their satellite or even to land on their surface. With sufficient supplies of fuel, the return would be made in the same way.



FIGURE 2. A flying rocket station near the moon

A flight to Jupiter calls for an enormous amount of fuel, and a rocket for one passenger plus the necessary equipment would be no smaller than an ocean liner. To descend on Jupiter and then ascend is extremely difficult in view of its huge mass; a speed exceeding 172 times the speed of gas expansion would be required and in that case the ratio of the masses of the full and empty rocket would have to be 4.7 trillion.

The moon could be used as a fueling station for interplanetary flights; here, a plant exploiting solar energy would produce the required material. Since a flight around Jupiter without descending on it would consume one and a half times more fuel than a flight to the moon, it would be possible to fill up on the moon and proceed further.

Finally, an artificial station could be constructed at the boundary of earth and lunar attraction where fuel from the moon would be supplied and where rockets departing from the earth for other planets could stop for refueling (Figure 2).

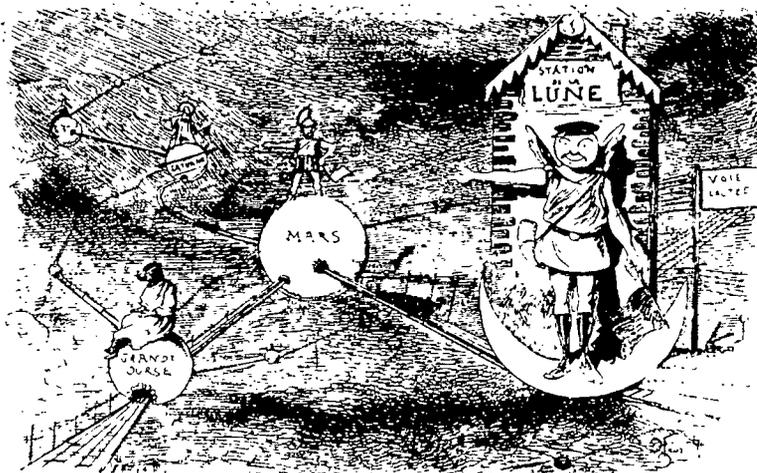


FIGURE 3. Space flight station (French caricature)

Similar voyages from planet to planet (Figure 3) are depicted in humorous form by the French novelists Le Faure and Graffigny in their novel "Aventures extraordinaires d'un savant russe." Actually, this idea is not so inconceivable. Interplanetary rockets to which passengers arriving from earth would transfer would be based at this artificial station. Similar vehicles flying in the sphere of gravity of any of the planets could release small rockets for the passengers to descend onto the planet.

The order in which the moon would be explored would be as follows:

The first passengers would have to try to find ice ( $H_2O$ ). On reporting this to earth, they would receive the necessary equipment to set up a station for the conversion of solar energy and for the decomposition of ice into oxygen and hydrogen which would then liquefy and thus produce the fuel needed for rockets. Simultaneously, in the absence of air on the moon, a hut equipped with artificial air would be set up there. Solar devices would furnish energy for heating and illuminating the hut (Figure 4). With the passing of time, parts of a large interplanetary vehicle would arrive on the moon from the earth for assembling, and from there it could fly on to Mars. A vehicle of this kind could help in setting up a similar station on one of the satellites of Mars. In order to conserve energy, an intermediate rocket station at the boundary of lunar and earth gravity would be in full

time operation. The most feasible spot for this station (according to Waller) is at a distance of about 6 terrestrial radii in order for it to revolve around the earth in the plane of the terrestrial equator with the same period of revolution about the earth as the period of the earth's revolution around its axis.

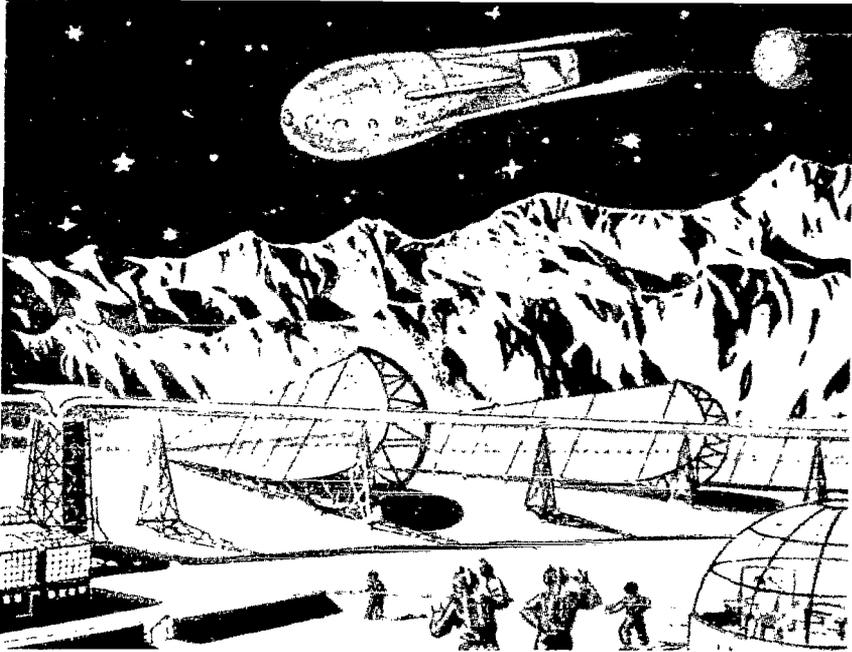


FIGURE 4. Solar engines on the moon

Oberth proposes the use of a parachute during the vehicle's descent onto the earth, and M. Waller suggests gas reaction. In Figure 5, both these methods are shown. Hohmann and Tsander suggest that wings be attached to the rocket for gliding.

According to the degree of development of interplanetary navigation and increase of emigration from earth, it will be possible to set up groups of interplanetary stations in outer space, to rotate around the earth as its satellites.

Later, these stations could be transferred from orbiting the earth to orbiting the sun, thus forming a rocket ring or belt. K. Tsiolkovskii suggests such a swarm of rockets and disposes it at a distance of  $5\frac{1}{2}$  terrestrial radii from its surface.

In his article "Monism of the Universe"\* (Kaluga, 1925), Tsiolkovskii foresees the possibility of flight in outer space and believes in man's mastery of this space in the future. Here are his thoughts in this context: "The technology of the future will provide the possibility of overcoming the earth's gravity

\* "Monizm vseLennoi."

and of journeying through the entire solar system. Of visiting and studying all its planets. Of encircling the sun with artificial dwelling places borrowing material from the asteroids, the planets and their satellites.

"Around the sun, in the vicinity of the asteroids, millions of millions of beings — descendants of emigrants from earth — will grow and advance. A multifarious race of perfect beings will emerge, well adapted for life in various atmospheres, varying gravity, on various planets, in a vacuum or in explosive gas, taking nourishment or surviving without it — living only by the rays of the sun, creatures enduring both the heat and the cold.

"The most predominant and consummate type of organism will be that which lives in the ether and feeds on the power of the sun.

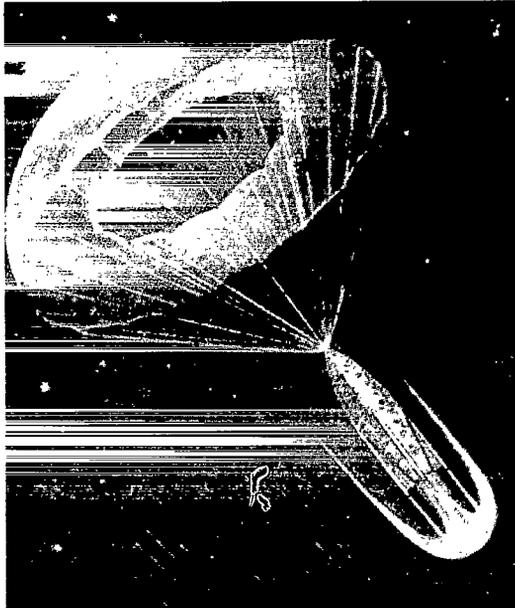


FIGURE 5. Descent of an interplanetary vehicle towards the earth by parachute and gas reaction

"After populating our solar system, other solar systems of our Milky Way will start to be populated. Man is detached from earth with difficulty. It will be far easier to overcome solar attraction by way of free movement in the ether and the enormous quantity of radiant energy of the whole sun, which man can exploit. Earth appears as the point of departure for the settling of perfect beings on the Milky Way.

"What we are privileged to anticipate from our planet holds true vis-à-vis other planets.

"The beginnings of life were discernible at one time on all planets with atmospheres. By force of circumstance life on some of these planets blossomed more luxuriantly, more rapidly, bestowed mental and technical

powers on its creatures and became the source of higher life for the other planets of the universe. These currents encountered each other, without impeding each other they settled our Milky Way, and then others, too. . . "

### Kinderman's dreams of flying to Saturn

In 1748, in his three-volume natural history, Kinderman arrived at the idea that at some time in the future it will be possible to travel to the planet Jupiter to bring back plants in the same manner as bringing back "monkeys and peacocks from Asia" at present.

Jules Verne, in his fascinating novel "De la terre à la lune" speaks of interplanetary travel through the lips of his hero, Michel Ardent, who claims thus: "Some narrow-minded people maintain that man is condemned to remain within the confines of a known closed circle and will never be able to ascend from the earth and become acquainted with other planets. That is not true! I am convinced that we shall reach the moon and neighboring planets and that we will communicate with them as readily as Liverpool now communicates with New York. Moreover, we will even jump from our solar system to a second and from there to a third and so on. In other words, we will be carried along the waves of eternity, along the oceans of ether in precisely the same manner in which we are carried along the oceans of water. Distance is a relative conception. There will come a time when this conception will be incomprehensible because distances will no longer exist."

Captain Ferber, who dedicated his entire life to aviation and became one of its first victims (he was killed on 22 September, 1909), declared that "conquering the air" was but a step in the direction of conquering outer space. Those sharing this opinion were Esnault-Pelterie, Arshdakon, and others.

A. S. Shor, in "Aeronautics in Life"\* (St. Petersburg, 1912, p.124), draws a picture of people from earth settling in outer space and their conditions of life. He describes the development of radio engineering which permits them to communicate with earth from their space vehicles, and foresees the possibility of utilizing the power of solar rays for the renewal of nutritive matter. Further, he dreams of flights to other planets and exploiting them for man's needs. These thoughts are also communicated by K. Tsiolkovskii in his book "Outside Earth."\*\*

Max Waller, in his book "Flight to Outer Space,"† contemplates potential flights to outer space by rocket ships as follows:

"When the moon is conquered with the help of rockets and transformed into an intermediate station, then it will be possible to attain those cosmic velocities required to reach Mercury, Mars, and Venus. Only Jupiter and Saturn will be avoided in view of their enormous masses. But would it not be wonderful indeed to draw near the bewitchingly girdled Saturn, if only to join the dance of its moons?

"Would it not be delightful to sail through outer space chasing after long-tailed comets?

\* "Vozdukhoplavanie v zhizni."

\*\* "Vne zemli."

† "Der Vorstoss in den Weltenraum."

"Those of us who are still bound to earth's surface, who are lacking in the possibilities of breaking away from the atmosphere surrounding the earth, would say that the foregoing is an adequate, a fully adequate reward for our endeavors; no! exclaim those who have already voyaged to the boundary of planetary orbits, it is inadequate, much too inadequate. We want, they say, to penetrate the Milky Way. What do  $4\frac{1}{2}$  billion kilometers separating us from Neptune mean, what do cosmic velocities of 20, 50, or even 100 km/sec needed to reach this giant mean! One would become a grizzled old man before returning from such a journey. This is a snail's pace which could satisfy only the sorry beings of the 20th century.

"If electrons in cathode tubes achieve a speed of 1,000 to 2,000 km/sec and more, why cannot people move at the same speed?

"And finally, why cannot we achieve the speed of light at 300,000 km/sec? Once having achieved this, in 1.5 seconds we would fly past the moon, in 8.5 minutes past the sun, and in 4 hours we would reach Neptune.

"Why should we view as madness the idea that people will be able to move as fast as the speed of light? When this time arrives, they will skim through the universe as fast as a ray of light which up to now has been the only one to bring us tidings of worlds and bodies hovering in the depths of the universe. What would people have achieved if they had then the right to count themselves conquerors of worlds, similar to the gods? Scarcely anything, since we know a few things now that should cool our expectations. Even light takes 4.3 years to penetrate to us from the closest fixed star; from the other suns that we count as our closest satellites in outer space, a ray arrives on earth in 10 to 15 years. Only a handful of stars find themselves close to our planet, while the others soar in far more distant spaces so that to obtain greetings to earth from them, a ray of light must travel for hundreds and thousands of years. What is the advantage of moving through the universe with the speed of light? The traveler would be surrounded by unbounded emptiness in the course of months, years, scores of years. Not only the difference between above and below would lose its meaning but also the conception of time. And there are doubts that people would really be able to see the stars.

"When we approach the source of sound in high-speed travel, the tone increases; when we move away it decreases. The same occurs with light. If we move in the direction of the light source, the waves appear to become more frequent and the light obtains another color which corresponds to shorter oscillations of the light wave. This reduction already becomes noticeable at the speed of a ship's cannon-ball. What if the speed of the motion gradually approaches the speed of light? Then the wavelengths become infinitely small for the stars which we are approaching and infinitely large for the stars we are leaving. In other words, we would be unable to see these celestial bodies! When we leave earth behind at an increasing speed, it becomes red and disappears; the other planets also become red before disappearing. The sun becomes purple before it sets; the stars on the route of our rapidly traveling vehicle become bluer and bluer until finally they turn violet before they die away. Our eyes can no longer perceive them, just as our ears cannot catch the sound of a whistle when it is too high. At full speed equal to the speed of light we do not see a single star in the firmament; behind us there is a frightening emptiness and only sporadically will the stars traversing the direction of our vehicle flare up into blue lights before disappearing.

"In vain would we race through outer space; the heavenly bodies would sparkle only from an infinite distance, as stars scattered along the plane crossing our path, but never permitting us a glance at those bodies close to us and for which we are heading. We would never be able to see them, for the moment we collided with them we would disintegrate into a billion atoms."

Einstein's theory of relativity is reflected in an original manner in three books on interplanetary travel: A. Tolstoi's "Aelita," A. Yaroslavskii's "Argonauts of the Universe,"\* and Sofus Michaelis' "The Ship of Heaven." Here are some excerpts from these books.

In "Aelita" (1923), Tolstoi give his conception of the relative comprehension of time in a conversation between two of the major characters, Los' and Gusev, which takes place on Mars, the second day after arrival there from earth:

"After begging a cigarette, Los' lay down propping his head on his elbow. He blew out puffs of smoke and smiled.

'Aleksei Ivanovich' — he asked — 'do you know how long it is since we last ate?'

'Well, I had a potato before we left last night, Mstislav Sergeevich.

'My good friend, we haven't eaten for 23 to 24 days.'

'How long?'

'Yesterday was August 18 in St. Petersburg, and today it is September 11 down there. Isn't that simply marvelous!'

'For the life of me, Mstislav Sergeevich, I cannot understand what you are saying.'

'I don't understand it too well myself. We left at 7. Now, as you will see, it is 2 o'clock in the afternoon. Nineteen hours ago, we left earth by this watch. And according to the watch I left in my workshop, about a month has passed. Surely you have noticed — you are riding in a train, you are sleeping, the train stops and you either awaken because of an unpleasant sensation or you sleep but are uneasy. This is so because when the train stops, your whole body slows down. You are in a moving train and your heart beats and your watch goes faster than if you were in a stationary train. The difference is elusive because the speeds are very small. Our flight is another matter. For half the journey we flew at nearly the speed of light. Here the difference is already perceptible. The throbbing of the heart, the speed of the watch, the oscillation of particles in the body cells have not changed in relation to each other; while we were flying in a vacuum we blended with the aircraft, moved in the same rhythm. But if the speed of the vehicle exceeds by 500,000 times the normal speed of body movement on earth, then the speed of my heart beat, one throb per second — if we calculate by the clock of the vehicle — has increased by 500,000 times, that is, my heart during flight throbbed 500,000 times per second, reckoned by the watch left behind in St. Petersburg. According to my heartbeat, the movement of the chronometer in my pocket, and the feeling of my whole body, we spent ten hours and forty minutes on our journey, which was in actual fact ten hours and forty minutes, but according to the heartbeat of the inhabitants of St. Petersburg and by the movement of the arrows on the clock atop Petropavlovsk Cathedral, more than three weeks have passed. Eventually it will be possible to construct a large vehicle, store in a half year's supply of food, oxygen, and ultralyddite (explosives necessary for the

\* Argonavty vselenoi,"

motion of an interplanetary vehicle — a rocket) and take off with the speed of light for a half year in outer space. On his return home, the voyager would find a new century on earth, meaning that one hundred years would have passed there. "

In his "Argonauts of the Universe" (Moskva-Leningrad, 1926), A. Yaroslavskii describes the flight of three people in a radium propelled ship (Yamato's conception) from earth to the moon; putting to use Einstein's theory of relativity, he introduces into his Utopian novel the element of reducing the time obtained in rapid interplanetary travel.

The voyagers flying from earth to the moon note by their watches that 19 hours 43 minutes 17.01 seconds have elapsed since their departure, while according to earth time 3 months 1 day and 30 minutes have passed from the moment they left earth up to their descent on the moon. The author describes their reaction on learning of this difference via radio from earth.

"So Einstein was right! Our flight is a visual demonstration of the theory of relativity. We have stolen 3 months, 1 day and 30 minutes from Time! . . . That's as it should be: time, as our Lobachevskii, one of Einstein's predecessors, so excellently put it, is only a movement to measure other movements; it is always relative; there is no absolute time the same for all; it depends upon speed: the faster the movement the shorter the time; we rushed through space at an insane speed and three earth months melted into 20 hours. . . . But the most curious thing of all is what we have gone through psychologically and physically in those 20 hours, and the difference lies not only in the chronometer; my cheeks are smooth, do you see? And yet I shaved before we took off; on earth in these three months I would have had a thick beard. . . . In all this time we have slept only once.

"If we had not been in a rocket but in the fantastic core of the French physicist Langevin, a disciple of Einstein, and had been whisked away at a speed of 250,000 km per second, for us it would have meant 2 years while on earth 200 years would have passed."

Similar pronouncements on the relativity of time are put into the mouths of the leading characters of the novel "The Ship of Heaven" by the Danish writer Sofus Michaelis, which was published in Denmark in 1921 and translated into Russian in 1927.

The conversation takes place between two Italians, Avanti (commander) and Ercole Sabene, flying in an interplanetary ship together with other people from earth to Mars.

"Ercole slowly unraveled the knots in his beclouded thoughts:

'Yes' — he said — 'we are shadows squeezed into this fantastic globe, twisted into eternal darkness. Seemingly, we are dead. We no longer breathe. We do not feel the blood coursing through our veins. We will not feel life until we discover a new homeland, a new atmosphere for our lungs, new ground for our legs, and a new time in which to reckon our lives!'

'How right you are' — said Avanti. — 'We find ourselves in a state of transition. We no longer calculate time according to earth. We installed Martian clocks which cannot be used yet. For the first time we find ourselves in the power of timeless eternity. We are partaking of the fourth dimension, imbibing the intoxication of an ecstasy of which we had on earth only a vague, fragmentary premonition. And you perceive, if only for a moment, that time is an earthly conception, non-existent in its way, a planetary hallucination. We are accustomed to count off the morning,

evening, the days, the middle of the year, the new year, to divide up our existence into pitiful compartments using solar years, not considering that time is a subjective delusion, an eternal expansiveness that permits one's whole life to be compressed into one moment or to stretch that moment to eternity. We could drag out time in endless and hellish boredom or cram one second with the feeling of eternity. We thought that we were living in a world with a unique time, that there was a normal measurement of time, that the tempo of the whole universe was one, that there was one common pulse. And, in actual fact, nothing in the universe occurs simultaneously. It would suffice to open a window of our ship into the nocturnal heavens for the stars to tell us that time is only a ticking mechanism in our hearts. All the celestial mechanisms — the planets and the stars — go their several ways and no earthly Emperor Charles V can command them to go one way. All of time outside us is only waves of light running towards us from immeasurable distances; we measure dizzy concepts — light years — by the measure of our solar year and even take years in our conception to reach the stars.'

"Sabene buried his head in his hands and said disconsolately:

'I give up. Thinking about the meaning of time could drive a man out of his mind.'

'Indeed, we know only the subjective moment of the present. The past and future are the basis of the comprehension of space, extension, and the elasticity belonging to it (space); this is something from which we are moving away and which we are approaching. Everything depends upon the point of departure and the distance. That which took place on the planet we left, even though the distance is measured for us in thousands of solar years, can still be observed by our contemporaries, witnesses from another celestial body far, far from earth. Hannibal's march across the Alps, the Lisbon earthquake, the Moscow fire, are still taking place in front of eyes following our planet from appropriate distances. History, which has long since been dead for us, is alive to the distant observers, it is the present or the future. Perhaps all that we call life, the process of development and progress, is only a gigantic tome that is not being written but has everlastingly been written. What the individual understands as his life is the consciousness kindled in his "I" in order for it to run through several pages of the gigantic book of eternity, from the tiny alpha of the moment of the present in which consciousness is kindled to that omega of the moment when it is extinguished. We read our own small destiny in this book and imagine that we are living. This book is unalterable no matter how many times its pages have been illuminated and re-read. Life is merely an illusion, a fragment of an infinite film of eternity, animated when the pictures emerge in the light and are reflected in the eyes of the soul. And the souls of millions being born and dying are only bright patches of tremulous light falling on the pages of the open book of eternity in which each one of us removes one page, another page...''

These dreams of future flights in outer space reveal the work of the human imagination, and they will be fruitful only if they are based on science.

In this context it is interesting to note what Camille Flammarion (Figure 6) has to say on the breadth and limits of man's imagination in his

book "Les habitants de l'autre monde, l'étude où l'on expose les conditions d'habitabilité des terres célestes, discutées au point de vue de l'astronomie et de physiologie" as follows:

"During man's sojourn on earth he draws from this planet the seed, or at least the forms of his true perceptions, the substance of his ideas, the basis of his concepts, the elements of the powers of imagination, but at the same time he appears completely incapable of creating anything new, anything outside the circle of his understanding. He is incapable of ridding himself of earthly notions, of drawing on unknown elements for his strength. Whatever he, captivated by the fervor of the boldest imagination, creates, will always smack purely of earthly derivation. But if he gave free rein to his mettlesome racehorse, this unbridled imagination would dash for the unfathomable, give chase to new creatures, and we would soon see it buried in chaos and yielding chimerical monstrosities scarcely supported by science. This fateful capacity of the human soul, relatively intensified, becomes exceedingly sterile in consequence of the universal propensity of nature to variety. It seems that nature has prescribed herself the law never to produce two completely identical beings, as if she had decided to hold aloft the banner of her inexhaustible wealth and her infinite power."



*Flammarion*

FIGURE 6. Camille Flammarion (1842–1925)

M. Nordman, the French astronomer, expresses himself more cautiously in his fascinating "Journey around The Universe" (Gosizdat, p. 10, 1926). In a passage on a flight to the moon, he writes:

"Thanks to the magnificent photographs taken at the Paris Observatory recently, which even surpass those taken by the larger American observatories, we know the surface of the moon so well that it is as if we had walked its length and breadth with staff in hand.

A journey to the moon which has occupied the minds of so many has now become almost unnecessary. All the better since the voyagers sitting in the vehicle proposed for this journey by Jules Verne would inevitably be flattened into pancakes by the starting speed of 12 km/sec (necessary to overcome terrestrial gravity), obtained in one-thirtieth of a second. Verne lost sight of the fact that all sudden changes in speed are nearly as dangerous for those inside such a vehicle as those outside.

"As for the latest conception of an engine constructed on the principle of a rocket, although it eliminates the above defect, it has other shortcomings, besides which it does not solve the problem of reaching the moon.

"Nevertheless, these projects are not without inventiveness and some scientific sense. They are a huge step forward in comparison with the flippant devices proposed by Cyrano de Bergerac for journeying to the moon. That was the mechanics of poets; can it be expected that they would subordinate themselves to the laws that hang heavy over the Philistines?

"In any event, lacking the opportunity of reaching the moon, the best we can do is to bring it close to us and fix it to the sensitive plates of our astrographs."

The author goes on to tell of a lady donating 100,000 francs to the Paris Academy of Sciences for the first person to establish relations with any of the planets excepting Mars.

Gripped by the enthusiasm evoked by the idea of interplanetary flight and in connection with scientific research on this question, there was formed in Moscow in 1924 the "USSR Society for Interplanetary Communications." The journal "Tekhnika i Zhizn", "\* No. 12, published the following item outlining the Society's objectives (no author given):

"The breakthrough which is now being observed in the matter of interplanetary communications, the result principally of the work of Tsiolkovskii, Oberth and Goddard, and which signifies that interplanetary communication has finally left the realm of fantasy and taken hold of real ground, is a breakthrough that is also being reflected in the USSR. In the middle of April 1924, a Jet Propulsion Section was established at the Military Science Society of the Air Force Academy, which set forth the following aims:

1. The bringing together of all persons working in the USSR on the given question.
2. Procurement of all possible information on work originating in the West.
3. The distribution of regular information on the current situation in interplanetary navigation and, in connection with this, on publications issued.
4. Independent scientific research and, in particular, research into the military use of rockets."

\* [Technics and Life.]



FIGURE 7. The interplanetary communications section of the Air Force Academy in Moscow (Kaporskii, Rezunov and Leiteizen)

The Section was furnished with a series of reports for its members, including those by Professor Vetchinkin and the engineer Tsander; a competition for a small rocket with a range of 100 km was inaugurated; a group for deeper theoretical study of the question was formed; other projects included the organization of a laboratory, opening a book-stall to satisfy the request for literature, the formation of a film group to script films, etc. (Figure 7).



FIGURE 8. Cover of the first Soviet journal dedicated to interplanetary travel

The Section took an active part in organizing the Society for Interplanetary Communications. The Society's first step was the arrangement of a public lecture by M. Ya. Lapirov-Skoblo at the Polytechnical Museum in Moscow.

The first issue of the journal "Raketa,"\* the mouthpiece of the Society (Figure 8), was scheduled to appear on 1 July.

The Society was temporarily located at the former observatory of Tryndin (Moscow, B. Lubyanka, No. 13).

However, there was no further word on the Section in the press. The journal "Raketa" never appeared and the work

of the Section gradually petered out.

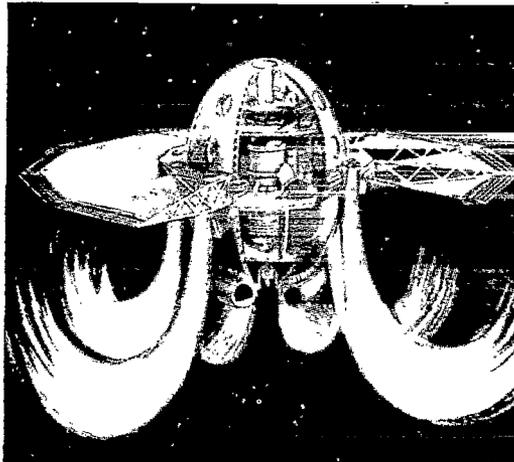
There was some reanimation in 1927 when the Association of Inventors sent the following appeal on 30 January to persons engaged on questions of interplanetary navigation:

\* [Rocket.]

"The Interplanetary Section of the Association of Inventors calls your attention to an exhibition which will be held on 10 February, 1927, at the Association of Inventors building, 68 Tverskaya, Moscow. This is the first world exhibition of models and mechanisms of interplanetary vehicles constructed by inventors of different countries. The Association knows of your work on the problem of cosmic flights and believes you will not refuse to participate in our exhibition by submitting copies of manuscripts or published works in addition to sketches, models, diagrams and tables. Many inventors have already sent us material, among them the esteemed K. E. Tsiolkovskii, and from abroad we expect to hear soon from Robert Goddard of the U.S., Esnault-Pelterie of France, Max Waller of Germany, Herman Oberth of Rumania, and Welsh of England. We would appreciate your material well in advance of the opening, but if for some reason this is not possible, please notify us. If you desire copies of the material on display, please let us know."

# Die Rakete

Zeitschrift des Vereins für Raumschifffahrt E.V., Breslau



Breslau 15. September 1927

FIGURE 9. Cover of the German journal "Die Rakete"

Attached to the appeal was a letter written by Academician D. A. Grave which contained greetings to all groups working on the mastery of outer space and in which he wrote of the possibility of using electrons and particles of disintegrated ionized material sent to the earth by the sun.\*

In October 1926, the Society for Research into Outer Space (Gesellschaft

\* For the contents of this letter, see Vol.3 : "Luchistaya Energiya" [Radiant Energy].

für Weltraumforschung) was founded in Vienna with Dr. F. Hoefft as its head. Franz Oskar Leo-Elder von Hoefft was born in Vienna on 5 April, 1882. In Vienna he completed his secondary school education and then in 1900 enrolled for three semesters at the technical college where he studied chemistry. Later followed one semester at the university in Göttingen and six semesters at the University of Vienna. In 1907, he received the title of Doctor of Philosophy. He entered the employment of the Donewitz factory as an engineer and simultaneously held two other positions, one with the Vacuum Oil Company and the other in the Vienna Bureau of Patents. Finally, he performed independent investigations and published his works. During World War I, he served in the Austrian Dragoon Regiment. He had been occupied with the problem of cosmic flights since 1891. Oberth's work on rocket flights in outer space led him to establish a society in Vienna for the purposes of studying the high regions above the earth with the help of vehicles which could also fly over oceans and continents, carrying the mails or photographing the terrain. Hoefft expounded this objective of the society to the natural science congress in Innsbruck in 1924.

In 1927, the Society for Interplanetary Navigation (Der Verein für Raumschiffahrt E. V. Breslau) was founded in Breslau and its journal was called "Die Rakete" (Figure 9). The first meeting of the Society took place on 5 July, 1927. All persons interested in interplanetary navigation may become members of the Society. The membership fee is three marks. Professor Oberth (Mediasch), Max Waller (Munich) and others head the Society. Members receive the monthly journal "Die Rakete" free of charge.

The Society's address is: Johann Winkler (publisher of "Die Rakete"), Hohenzollernstrasse 63/65, Breslau 13.

Epigraph

"Nec soli cedit" (yielding not  
even to the sun).

"Der Flug zur Sonne, "  
Thieme Paul 1926, p.21

## *Chapter II*

### *LEGENDS AND FLIGHTS ON BIRDS*

Man's inclinations and endeavors to climb upward can be traced back deep into antiquity. The beings worshiped by man as deities were endowed in his imagination with wings or symbolically likened to sovereigns of the air: we are familiar with Saturn's wings, Jupiter's eagle, Juno's peacock, Venus' doves, Mercury's wings and those he gave to Perseus for his struggle with Medusa.

The ancient Egyptians depicted the sun making its daily journey across the sky with wings.

In the early legends, narratives and tales, where man assumed the sky and stars to be close to earth, we find naive ways of connecting the sky with the earth. Chinese legends, for instance, have it that the Chinese fell from the moon onto the earth. Peruvian legends relate of Manco Guella, founder of the first Peruvian dynasty, descending from the sky with his wife. The Mayas of ancient Mexico believed that the gods came down to earth on a spider's web (Figure 82 at end of book). However, as man's knowledge increased, he became aware of the remoteness from earth of the sun, planets and stars, and we find this reflected in the legends in terms of new means devised of flying in space.

In the pages that follow there will unfold before the reader a portrayal of imaginary and, we would add, inconceivable methods of reaching the heavenly bodies as visualized by people throughout the ages; sometimes this picture will appear absurd and naive, other times with a semblance of truth – Cyrano de Bergerac, for example – from which there have evolved modern scientific theories and plans to reach outer space. We shall divide these imaginary methods of flight into homogeneous groups of ways of reaching into space.

### *FLIGHTS TO THE SUN, MOON AND STARS IN THE MYTHS OF KALEVALA*

In the Finnish epic poem Kalevala there are tales of flights to the different stars, by people or animals.

The following extracts are from a translation of Kalevala.\*

\* [Russian by L.P. Bel'skii, Stupin Publishers, Moscow 1925; English from the version of the A.K. Johnson Book Concern, Hancock (Michigan), 1950.]

### 1. The honey bee flies to the sky

The bee flew upward on tiny wings along a moonbeam,  
Along the brim of the sun,  
On the shoulder of the North Star,  
On the back of the Seven Stars,  
And into the cellars of Ukko.

### 2. Where was the bear born?

The honey-paw was born near the moon  
In a crack of daylight,  
On the shoulder of the Great Bear  
Beside the maidens of the air.

### 3. The capture of the sun and moon by Louhi (mistress of Pohjola)

The moon stepped out from his home  
To sit upon a crooked birch,  
The sun came out from his castle  
To rest upon a pine bough  
and listen to the kantele.\*  
Louhi, the mistress of Pohjola,  
Snatched them in her hands  
And carried them off to her home in the dark north  
Where she hid them inside a many-colored rock  
With the charm, "Never shall you be free, O Moon,  
To glimmer.  
Never shall you be free to shine, O Sun,  
Until I come to get you."

### 4. Return of the sun and moon

When Ilmarinen and Väinämöinen, heroes of Kalevala, decide to free the sun and moon and tether Louhi to the side of a mountain,

Louhi knew that a day of danger was near  
And with a scream arose into the air  
To fly back to the north,  
At once she hurried to free the moon and the sun  
From the great mountain.

\* A musical instrument played by the hero of the legend, Väinämöinen.



FIGURE 10. Louhi captures the moon

#### THE CAT JOURNEYS TO THE SUN

In his "Tale of the Cat and Vavila"\* (in the journal "Galchenok," No. 24, 1912) A. Roslavlev describes the journey of a cat to the sun.

"The cat, filled with compassion for its master who had fallen through an ice hole in the river, set forth on its journey to the sun:

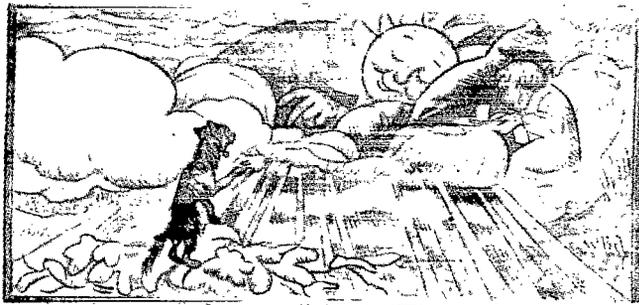


FIGURE 11. The cat sets forth for the sun

\* "Skazka pro kota i Vavilu."

Pity tore at his heart  
He stopped and pondered a while  
And then resolved to entreat the sun  
To melt the river. (Figure 11)  
He remembered a path in the forest  
And near the path a den  
Near that den a pine tree  
Standing higher than a cloud.  
His heart hammered madly  
He tarried not for long  
But ran through the dark forest  
And scampered up the tree.  
Perching himself at the crown  
He glanced below and saw no bigger than a fly  
A waggon filled with hay  
Which a peasant was taking to market.  
How high I am, he said to himself,  
And yet so far away from the sun  
I must wait, it will come close  
When it sinks at that side I will ask.  
In an hour, in two hours,  
The sun commenced to set  
And before him stood a troubled cat  
Begging for his help.  
Reclining in his bed  
Swarms of glaucous flax  
Turning into bright gold  
The sun bellowed fierily:  
"So shall it be: I will cause  
The ice in the river to melt." (Figure 12)



FIGURE 12. The cat talking to the sun

#### THE MONGOLIANS' JOURNEY TO THE SKY

In the book "Legends and Tales of Central Asia," collected by Count A. P. Benningsen (St. Petersburg, 1912, p. 55), there is a Mongolian tale "Origin of the Great Bear," which tells of seven Mongolians, having learned

to fly, ascended from the earth to the sky where they became the seven stars of the Great Bear.

At that time it was very cold as there were six stars in the Pleiades. The Mongolians picked out one star and ever since it has been warmer on earth.

The star they chose is the tiny one near the second star at the tail of the Great Bear.

Before their departure, one of them shot an arrow into the sky and shortly afterward it fell to the earth threaded with stars.

Ancient Greece, too, had its myriad of myths and legends on connections between the earth, moon and sun. According to Diogenes Laertius, Heraclitus maintained that he was acquainted with an inhabitant of the moon who had come down to earth, but refrained from describing him. There is a myth about the Nemean Lion who fell from the moon onto the earth. It is probably under the influence of this myth that the 16th century astronomer Cardan was convinced that he had been visited one evening by two dwellers of the moon. "They were," he remarked, "two old, nearly mute people."

## THE FLIGHT OF ICARUS AND DAEDALUS

One of the most famous myths tells of the wonderful craftsman Daedalus, builder of the great Labyrinth on the island of Crete, who took flight from the island with his son Icarus on wings whose quill feathers were threaded together and held in place by wax. Daedalus flew low over the water cautioning Icarus to follow, but the daring Icarus soared upwards towards the sun. The sun's rays melted the wax and Icarus fell into the sea. Ovid narrates this myth in his "Metamorphoses" (Book 8, Song 2). The myth also serves as the theme of numerous drawings, many of which are described in the article "La leggenda di Dedalo nell'arte moderno," by Giuseppe Boffito, which appeared in the journal "L'ala d'Italia," 1926, p. 299.

Five of these drawings are printed below (Figures 13-17). Figure 17 is a reproduction of the drawing by the Russian artist Zen'kovich, which depicts Icarus before the flight; filled with hope, and in defiance of his father's instructions, he raises his left hand high as he contemplates a flight to the sun. A similar idea is evident in the Italian sculpture (Figure 16) "Daedalus makes wings for Icarus."

## PRECURSORS OF ICARUS AND DAEDALUS

Not many people know that the precursors of Icarus and Daedalus may be found in ancient Indian myths, most particularly in the epic Rāmāyana of the first millennium B.C., which portrays the following event:

Rama, the hero, whose wife Sita has been abducted by the evil Ravana, finds that his fate is bound up with that of the two brothers, Sampati and Eataius. Eataius is slain by Ravana when he tries to prevent the kidnapping of Sita. On learning of the death of his brother, Sampati weeps bitterly. His lamentations are found in the third book of Rāmāyana.



FIGURE 13. The fall of Icarus (from an 18th century engraving)

"Eataius and I competing with each other in our mad ambition and striving for universal glory flew into space.

"Atop Kailaza we wagered, in the presence of a tribunal, that we would fly along the sun to the top of Asta. We left together. Beneath us on earth we saw town after town, which seemed not bigger than cartwheels.

"Many times we heard music and wondrous singing. We could see women clad in red robes singing.

"Pursuing the sun we quickly pierced through space. The forests beneath us resembled carpets of tufts.

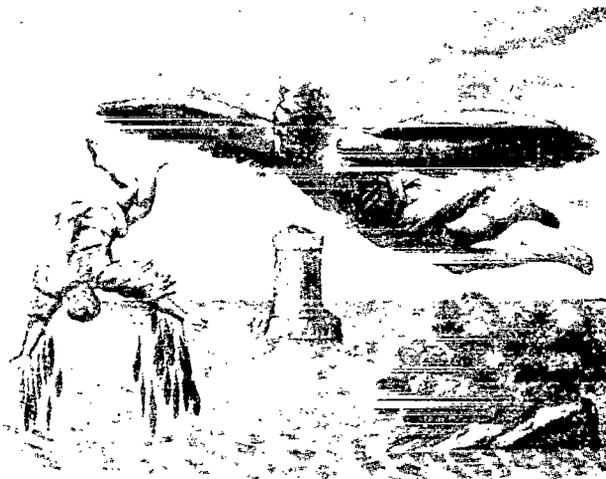


FIGURE 14. The fall of Icarus (Amsterdam, 1670)

"The mountains appeared as if studded with stones and rivers, like a band encircling the earth.

"The gigantic mountains of Himayat, Vindhya – and Meru itself – looked like elephants bogged down in the mud.

"We were covered with cold perspiration, weakened by fatigue and fear, and seized by a terrible weakness and giddiness.

"No longer could we distinguish the kingdoms of Yama, Anga and Varuna. We thought that the whole world had disappeared, had been destroyed by fire as on the Day of Judgment.

The two brothers, finding themselves in this hazardous situation, decide to fly to the morning star which Sampati had seen from a distance. However, here Eataius' strength deserts him and he starts to fall. Sampati hastens to cover him with his wings in order to avoid the deathly rays of the sun.

"Under protection of my wings – Sampati continues – my brother was not burned. But I got burned, thanks to my efforts, and lost my direction.

"I feared for Eataius who had fallen on Yanastana. Being in a deep faint and having had my wings burned, I fell rapidly on Vindhya.

"From me had been taken my kingdom, my brother, my wings, and my strength. As I lay on the mountain I prayed for death."

Sampati lay on the wild mountain and felt death approaching. And then he was found by the pious Rizī, who prophesied that Sampati would render a service to the great hero Rama and as a reward his feathers would grow.

When Angada, king of the apes, was commissioned by Rama to seek Sita, Angada came to Sampati. From atop the mountain, Sampati had seen the abduction of Sita and told Angada that Ravana had carried her off to Lanka.

Thus, as Rizī had prophesied, Sampati rendered a service to Rama and as Rizī had foretold, his wings started to grow again. When Sampati saw himself covered with reddish feathers, his joy was boundless:



FIGURE 15. Daedalus and Icarus (Riderer, 1493, Freiburg)

"Once again" – he said – "I have my wings that were burned by the sun.  
Once again I have the strength of my youth."  
And turning to Angada, he said:  
"Let the return of my feathers serve as an omen that Sita will be returned."



FIGURE 16. Daedalus and Icarus (ancient relief on the Villa Albani in Rome)

Since the days of Plutarch and, in particular, since the time of the first astronomical discoveries by telescope, writers endowed with brilliant although unscientific fantasy have described some 100 journeys to the moon.

Thousands of years have passed since the thought of penetrating the universe was aroused in the minds of men; 2,000 years ago, Lucianus Samosatensis wrote his "Menippus," describing a daring adventure to the moon, but it is unlikely that he was the first.

In "A True Narrative," he describes his journey to the moon in a craft that was lifted to an altitude of 100 leagues by a sandstorm; in seven days he lands on the moon.



FIGURE 17. Icarus and Daedalus by Zen'kovich (N.Rynin collection)

## FLIGHTS ON BIRDS

An ancient Babylonian legend tells of Etana who flies to the sky on an eagle to enlist the assistance of the gods. The following is a more detailed description of the flight.

### ETANA FLIES TO THE SKY ON AN EAGLE

During archaeological excavations in Nineveh, the library of King Assurbanipal was unearthed; it contained 1,000 tablets bearing images and

hieroglyphics of epics, chronicles, magical texts, astronomical and astrological reports, etc. Among them is an epic poem by an unknown poet describing the flight of Etana to the sky.



FIGURE 18. Etana flies to the sky on the back of an eagle

This poem tells of an event which occurred about 3,000 B.C. Etana is a devout man. His wife is barren and he longs for a child. With this in mind he approaches Shamash, God of the Sun. Shamash bids him to seek the eagle who knows where the "grass of fertility" is. At one time the eagle had betrayed a serpent with whom he had been allied, and the latter, with the consent of the gods, had had him thrown into a dungeon and stripped of his feathers. Etana finds the eagle, half starved in the dungeon, and feeds him for eight months. At the end of this period the eagle is freed and emerges from the dungeon as strong as a lion.



FIGURE 19. People and animals watching Etana's flight to the sky

He tells Etana that the "grass of fertility" is to be found in the sky and proposes that Etana be seated on his back and hold tightly to his neck. The eagle and Etana fly to the sky where the god Anu dwells. At the height of one mile, the eagle says: "Look below, my friend. How do the mountains and sea appear to you?" Etana, who is the first to see the earth from the sky, replies: "The mountains look like hills and the sea like a ditch."

Soaring for yet another mile and glancing down once again, Etana likens the earth to a "lot of trees," and looking down for a third time he distinguishes nothing and compares the earth to a "gardener's pit."

On reaching Anu, they find no "grass of fertility." Anu advises them to fly still higher, to Ishtar, mother of the gods.

"Let us then fly, my friend, to the goddess Ishtar," remarks the eagle, and they fly higher.

After flying for a mile, the eagle bids Etana to look below and tell what he sees.

Etana looks and thinks to himself: "What is left of the earth might be compared to a hut and the sea to the yard."

They soar aloft for another mile. The earth now resembles a small loaf of bread and the vast sea a bread basket. It must be stressed that the ancient Assyrians visualized the earth as round, encircled by the sea, and arising from the water like a huge mountain. To Etana this mountain appeared smaller and smaller, like a small loaf of bread in a basket.

After another mile, the eagle says:

"Look below, my friend. The earth has disappeared!" Etana replies: "I look down and perceive that this is so and that the vast sea is no longer visible. My friend, I no longer wish to fly to the sky."

"Very well," says the eagle, "we will descend," and they begin their descent, mile after mile. The story ends here and we are unable to ascertain if Etana arrived safely on earth, if he ever obtained the "grass of fertility," or if the gods ever fulfilled his wish.

Figures 18 and 19 show Etana's flight on the eagle. At the right, a crescent is visible and to the left, the sun. This is an ancient image of man flying to the sky. It is inscribed on the clay cylinders that are to be found in the Berlin State Museum, the Hermitage in Leningrad, and in two British museums.

In addition to the above, the cylinders also depict people and animals observing Etana's flight.

Historical research informs us that Etana was one of the kings of the epoch after the Flood and reigned for 635 years. In the beginning, after the creation of the world, ten kings ruled for a period of 432,000 years. Then came the Flood, after which new kings arose, among them Etana. He was the first and reigned some 3,200 years before the birth of Christ.

Archaeological excavations reveal that Etana had a son, who ruled for 410 years. His name is unknown and the only letters preserved are the beginning - Va-li. Returning to the poem, one would be led to believe that Shamash, the God of the Sun, heard his plea and granted him a son.

There is not one nation in antiquity that did not endow the creations of its religious imagination with the ability to fly over the earth. Both the pagan and Christian heavens were populated throughout with gods, demigods, angels and spirits.

In his "A True Narrative," Lucian writes that on the moon people fly on animals with three heads and wings that are broader than the sails of a ship.

## THE FLIGHT OF KEI KAUS

The Persian poet, Firdusi, in his "Shah-Nama," describes how the Persian Shah Kei Kaus, having conquered the earth and all the spirits on it, is incited by Iblis, head of the evil spirits, to conquer the heavens, sun and moon. For this journey, the Shah commands the construction of a vehicle in the shape of a throne composed of a seat with four columns mounted on four powerful eagles. Kei Kaus seats himself on the throne, and raising a pole to which pieces of meat are attached, he dangles it over the hungry eagles and thus makes them fly in the direction of his choice. Flying high, the Shah releases an arrow into the sky and then descends to the earth (Figure 20).

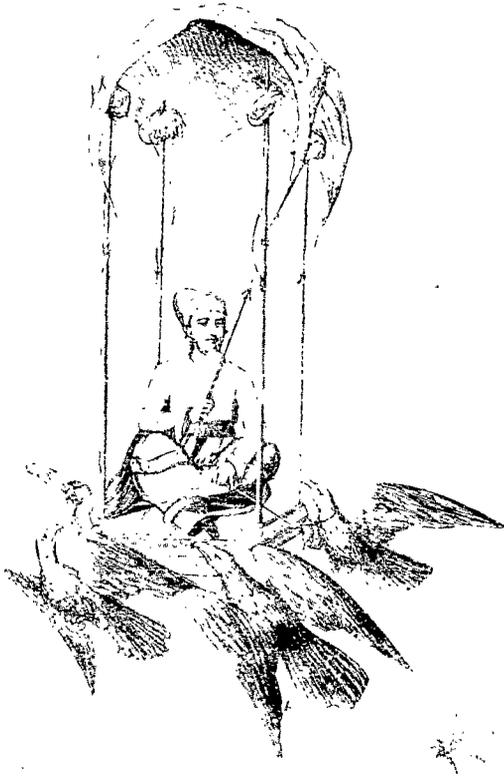


FIGURE 20. The Persian Shah Kei Kaus flies to the sky

A similar theme was also employed by other Persian poets. Further, the Arab historian Tabari tells of a flight by Nimrod on a throne supported by four griffins in order to do battle with God and destroy him. An arrow

cast into the sky is also found among the Hebrews in the twelfth century B. C. (Book of Judges) [sic], who speak of sending an arrow into the sky from atop the Tower of Babel; similarly, the Chinese Emperor Wou-y, who reigned ca. 1198 – 1194 B.C., also shoots an arrow into the sky.

## THE FLIGHT OF ALEXANDER THE GREAT

In Russian myths similar acts are ascribed to King Solomon, and in the Jerusalem Talmud to Alexander the Great, who flew on a throne of eagles and griffins to the sky. This flight was reflected in many works of art describing this event. Here is how it is told in a 3rd century B.C. writing: Alexander ordered four powerful birds, who had not been fed for three days, to be harnessed to the throne. Seating himself on the throne, Alexander raises high two spears from which pieces of meat dangle. In their struggle to seize the food, the birds elevate the throne. At a high altitude, Alexander encounters a bird with the face of a man who orders him back to earth. When he glances downward he sees deep below a colossal serpent coiled in a ring and in the center of the ring a small dais.

The bird tells Alexander that the serpent is a sea and the dais the earth encompassed by the sea. At the bird's command, Alexander releases the spears and the throne is flown back safely to earth, but so far from the original site that it is with great difficulty that Alexander finally makes his way to his army.

Alexander's flight is described at various times in history and in various art forms. Figure 21 is a miniature from a Munich manuscript of the 14th century (Enikels "Weltchronik"). Figure 22 is also a miniature of the year 1320. Figure 23 is a relief on the Romanesque gates of the church in Remagen on the Rhine. Figure 24 is a relief in the basilica of St. Mark's Cathedral in Venice, and Figure 25 is an embroidery on semisilk material which was made in Regensburg in the 13th century (Krefeld Museum).



FIGURE 21. Alexander of Macedonia's flight to the sky on birds

## GONZALES' FLIGHT

In 1638, "The Man in the Moon or a Discourse of a Voyage Thither by Domingo Gonzales, the Speedy Messenger," by Francis Godwin (1562 – 1633), was published posthumously in England. The book was subsequently translated into French (1648) and Dutch. It tells of a Sevillian nobleman, Domingo Gonzales, who tamed wild swans and taught them to carry heavy burdens in the air, including himself. Aided by the swans Gonzales flew from a ship which had been wrecked to the Peak of Tenerife and from the Peak higher... higher... (Figure 26).

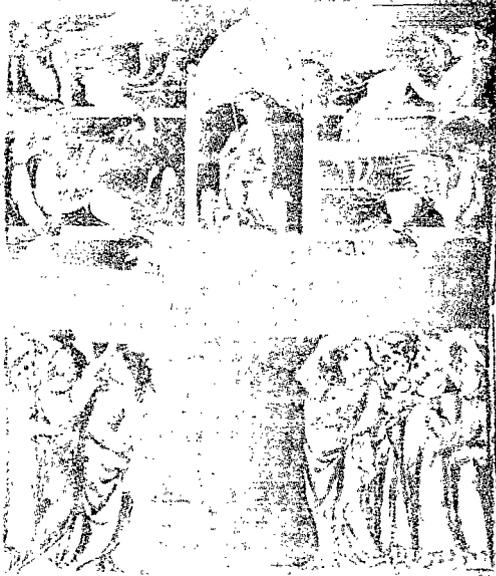


FIGURE 26. Alexander of Macedonia flies to the sky on birds. Engraving, 13.0.

The first thing Gonzales learned during his aerial voyage was that at a given altitude the body becomes weightless. The swans flew at a terrifying speed and the only thing which kept Gonzales from dropping dead of fear was his Spanish courage. He flew for eleven days and from the very first day was surrounded by evil spirits striking enormous fear in the hearts of the swans. However, Gonzales soon came to terms with them. During his flight he took neither food nor drink. At last the swans reached the moon's atmosphere. One might ask how the voyager, sitting on his staff with legs dangling below and rope in hand – as he is shown in the engraving dedicated to this adventure – could maintain this position for eleven days and eleven nights. Gonzales' reply is that he was just as comfortable in this position as he would have been in a feather bed.

Domingo Gonzales' flight was the subject of many pictures. For example, Figure 27 – Flier of Fortune (Glücksflieger) – is the work of Hans Thoma.

Further, Figure 28 shows a similar illustration to the Horatian ode 1, III. 38 on the theme "Caelum ipsum petimus stultitia."

Journey to the moon on a flying chariot. — The Englishman Wilkins in his "A discourse, concerning a new World and another Planet" (in two books, by Wilkins. London), which was published in 1640, notes that one might construct a flying chariot based on the same principles as advocated by Archytas of Tarentum for making a wooden dove fly, and by Regiomontanus for an eagle. Besides this, for a flight of this kind one might sit on the back of the large birds which they say are found in Madagascar.



FIGURE 23. Alexander of Macedonia's flight (relief on the Roman gates of the church) in Remagen on the Rhine

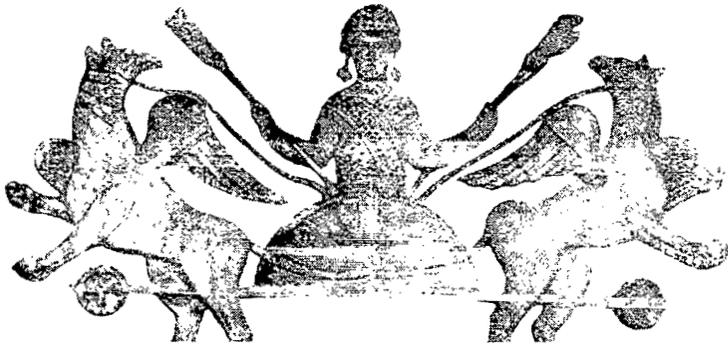


FIGURE 24. Alexander of Macedonia's flight (relief in the basilica of St. Mark's Cathedral in Venice)

Note 1. The philosopher Archytas of Tarentum, who lived in the 4th century B.C., built a mechanical dove of wood which, preserving its equilibrium in the air through the weight suspended from it, was put into motion by the gas contained in it.



FIGURE 25. Alexander of Macedonia's flight (embroidery in the Krefeld Museum)

Note 2. Johann Müller, better known as Regiomontanus, was a German mathematician who lived in the 15th century A. D. He built a fly of metal and an eagle of iron which supposedly flew 500 steps forward and backward before Emperor Frederick IV in Nuremberg.

Flight to the moon on an eagle. — In 1865, Alexandre Dumas, in his "Journey to the Moon," has his hero Moke fly to the moon on an eagle.

## TWO CHILDREN FLY TO THE SKY ON A COSMIC BIRD

In 1927, there appeared the Russian translation of the German "Journey on a Cosmic Bird" by Fritz Pferdenges. In this adventure for children, the author tells of two children who dreamed that they had flown on a wondrous white cosmic bird to the planets of the solar system and farther in the stellar world. The cosmic bird flies through the universe following the movement of the stars and puts those back which have swerved from their courses. The children are seated on its back. From its body there stream the vital substances which it had drawn from outer space when it cut through the universe with one mighty swoop. From its feathers there appears a small white cloud which floats over its back; this makes it

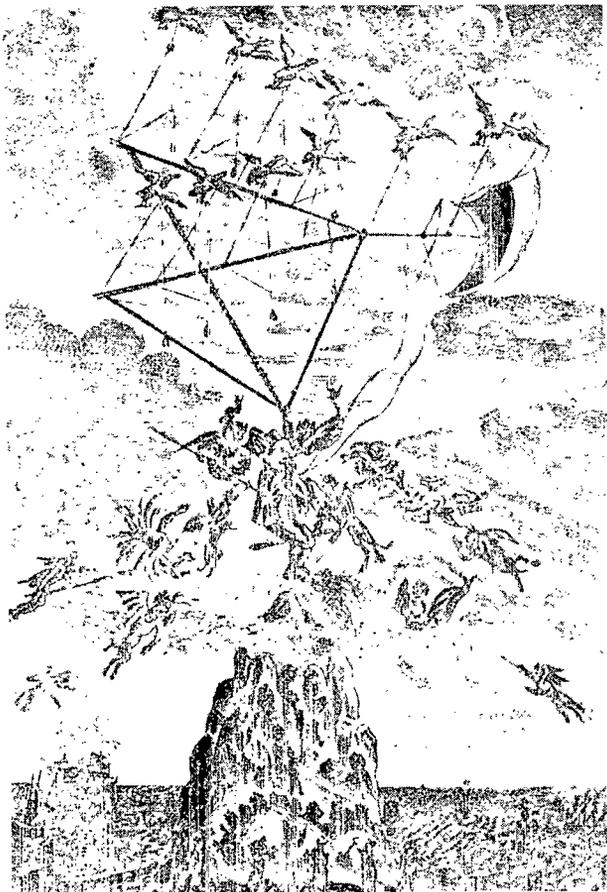


FIGURE 26. Domingo Gonzales flying on his swans to the moon

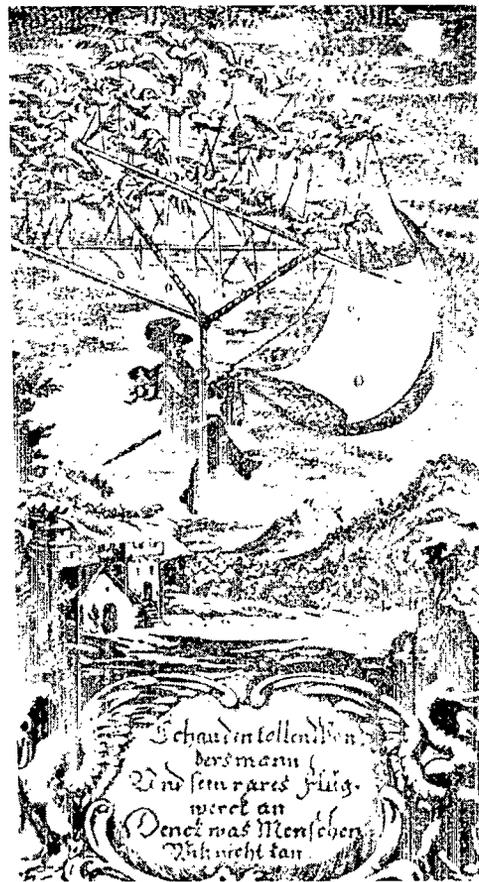


FIGURE 27. "Flier of Fortune"

possible for the children to breathe. The heat exuding from the body of the bird keep the children warm (Figure 29).



FIGURE 28. Through stupidity we reach heaven itself (Horatian ode)

The journey starts from earth and the children are carried by the Moon, Sun, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, the comets and thus to the boundary of our universe where another cosmic bird flies. This attractively drawn up book for children tells about the sky and celestial bodies.



FIGURE 29. The children fly to the stars on the cosmic bird

Epigraph

The earth bored me; my endeavor  
Was directed to the far away sky  
There I saw the sun and moon approach  
There I now see the gods

Cyrano de Bergerac

*Chapter III*

**CYRANO DE BERGERAC'S FLIGHTS TO  
THE MOON AND SUN**

Savinien de Cyrano de Bergerac (Figure 30), born in 1619 in the town of Bergerac near Périgueux (France) and best known as Cyrano de Bergerac, was a man of very comprehensive education and reading. In addition, he was distinguished by great courage, was a poet, writer, musician and physicist. The French poet Edmond Rostand sings praises to the life and deeds of de Bergerac in a heroic comedy.

In two of his works, "Voyage dans la Lune," 1649, and "Histoire comique des Etats et Empires du Soleil," 1652, he tells of an imaginary voyage to the moon and sun and describes eight ways of flying to the moon and four to the sun. (Translated into English in 1659, 1687, and 1753.)

In the following we present his ways of reaching the moon and sun, availing ourselves of the interpretation of these schemes found in C. Flammarion's "Inhabitants of the Celestial Universe," J. Lecornu's "La navigation aerienne" and E. Rostand's "Cyrano de Bergerac."

BERGERAC'S EIGHT METHODS OF FLYING TO THE MOON

1. The principle of flight of a body  
lighter than air

As for instance – Having stripped myself  
Bare as a wax candle, adorn my form  
With crystal vials filled with morning dew  
And so be drawn aloft, as the sun rises  
Drinking the mist of dawn! (Rostand)

2. An aeroplane with a spring motor

"I built a machine capable of raising me wherever I wished. I seated myself inside, and launched myself from the top of a mountain into space. But because I had neglected to take certain measures, I fell downward." Further, he goes on to say that the machine had wings operated by a spring.

Again, I might construct a rocket, in the form  
Of a huge locust driven by impulses...

(Rostand)



FIGURE 30. Cyrano de Bergerac (1619–1655)

"The earth bored me; my endeavor  
Was directed to the far away sky  
There I saw the sun and moon approach  
There I now see the gods."

[Rendered slightly differently in the Russian translation, as some other extracts].

### 3. The rocket principle

The soldiers who picked up the machine, which had fallen in the valley, thought it was a flying dragon and in order to stop it from flying were about to set fire to it. At this time (Cyrano):

"Filled with grief that the labor of my hands found itself in such danger, I rushed forward, seized the hand of the soldier carrying the fire, snatched the match away from him, and jumped into the machine. But I was too late: the rockets burst into flames and the machine with me in it lifted into space: however, the rockets did not burn up simultaneously but one by one: they were disposed in different stages, six in each, and the last stage burst into flame after the preceding had burnt up. It was due to this that I escaped the danger of being destroyed by all rockets exploding at once" (Figure 31).



FIGURE 31. Cyrano de Bergerac flies to the moon with the help of rockets

Of villainous saltpetre from the rear,  
Upward by leaps and bounds.

(Rostand)

#### 4. Attraction of the moon through bulls' marrow

After falling on the earth and bruising himself (see Scheme 2), Cyrano had treated his wounds by anointing himself with the marrow of bulls. Raised to an enormous height by the rockets (Scheme 3), he notes that all



FIGURE 32. Cyrano de Bergerac's flight to the moon by attracting it with the bulls marrow

the rockets have burned out and that the machine is starting to fall. However, he continues to rise higher and higher... Accustomed to sucking bulls' marrow, the moon has now been sucking the marrow with which Cyrano had covered himself the night before; the moon draws closer and closer. Suddenly he falls onto the moon, legs upward, but the impact of the fall prevents him from remembering how it all had happened.

Or since Diana, as old fables tell,  
Draws forth to fill her crescent horn,  
the marrow  
Of bulls and goats — to anoint  
myself therewith. (Rostand)

#### 5. Montgolfier's principle with a parachute

He filled with smoke two metallic, hermetically sealed globes that were attached to wings. The smoke, having no way of escaping through the metal, lifted the globes together with Cyrano. When he was near the moon, he opened

the globes attached to his shoulders together with wings, and when the distance between him and the moon was not more than 4 toise [1.949 m] he freed himself completely of the globes. However, he was still high enough to be hurt on falling, but luckily his clothing, swelled by the wind, lessened the velocity of the latter and he landed safely on his feet.

Or again,  
Smoke having a natural tendency to rise,  
Blow in a globe to raise me. (Rostand)

#### 6. Ascent with the aid of a magnet

This scheme consisted of hurling a large spherical natural magnet into the air, which drew the light iron machine in which the voyager found himself. This operation continued until the machine reached the sphere of the moon's attraction.

Finally — seated on an iron plate  
To hurl a magnet in the air — the iron  
Follows — I catch the magnet — throw again —  
And so proceed indefinitely. (Rostand)

### 7. Attraction of the moon (ocean tides)

The ocean!  
What hour its rising tide seeks the full moon,  
I laid me on the strand, fresh from the spray,  
My head fronting the moonbeams, since the hair  
Retains moisture, — and so I slowly rose  
As upon angels' wings, effortlessly,  
Upward — then suddenly I felt a shock! —  
and then... (Rostand)



FIGURE 33. Cyrano de Bergerac leaving the moon on the devil's back

8. Cyrano de Bergerac flies from the moon to earth on a devil

On his return from the moon to earth Cyrano flew with a moon dweller — a giant — aided by the devil. When the latter was flying over earth and past Italy, Cyrano pronounced the name of God and suddenly separated from the devil and landed safely on earth (Figure 33).

BERGERAC'S FOUR WAYS OF FLYING TO THE SUN

9. Flight after the manner of clouds

One fine day Cyrano wound around himself numerous vials (Figure 34) filled with dew on which the sun had been pouring its rays with such force that the heat, attracting the vials in the same manner as it attracted the largest clouds, lifted Cyrano so high that he soon found himself above the middle region of space. But he flew too fast, and instead of approaching the moon as he had hoped he moved away, since it appeared to be smaller than when he had taken off. And therefore he broke several of the vials; his weight now exceeded the force of the sun's attraction and he landed on earth.



FIGURE 34. Cyrano de Bergerac flies like the clouds

10. The principle of rarefied air within a body

Cyrano set to work again to build a new machine. This was a large, very light chest, hermetically sealed in case it was necessary, 6 feet high and 3 to 4 feet wide. There was a hole in the lower part, and an aperture in the upper part allowed for access to a crystal globe whose neck, made in the form of an icosahedron, reached into the crystal chest; the globe possessed the properties of burning glass (Figure 35).

One morning Cyrano was seated in his machine on the terrace of his house. The sun lit up the transparent icosahedron; its rays penetrated the chest, producing magical effects of coloration when suddenly Cyrano started, as if being hoisted on a pulley. What happened! The vacuum created in the icosahedron by the sun's rays had attracted air which had penetrated the machine through the lower aperture and raised the machine. This occurred so rapidly that the voyager, who had recovered from his initial shock, and in an effort to orient himself had attempted to lift the sails

of the icosahedron with a rope, was already so high in the air that the town appeared like a scarcely visible dot; Cyrano set off towards the sun, flying close past the moon and leaving Mercury and Venus to the right. After a four months' journey he arrived at one of the sun's spots, which is actually a small world revolving around the morning star.

Or, sealing up the air in a cedar chest,  
Rarefy it by means of mirrors, placed  
In a icosahedron.

(Rostand)

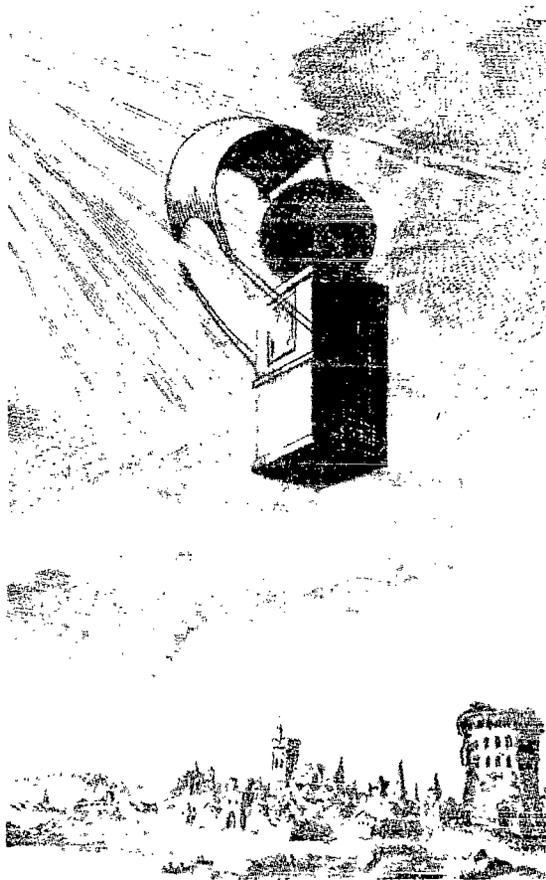


FIGURE 35. Cyrano de Bergerac flies to the sun with the help of rarefied air within a body

## 11. Flight by will power

As Cyrano flew rather close to the sun he observed that the walls of his icosahedron were unusually transparent. When he extended his hand too vigorously the crystal icosahedron unexpectedly smashed into smithereens,

and he hung in infinite space, turning upon the sun his mournful face and thoughts. But as it turned out, this was a better way of achieving the goal of the voyage: his will power reached such proportions that twenty-two months after his departure he arrived at the spacious dominion of the morning star.

12. Cyrano accomplished one of his voyages to the sun with four gigantic eagles who seized him by the arms and legs and carried him off to the sun (Figure 36).



FIGURE 36. Cyrano de Bergerac flies to the sun on eagles

#### CONCLUSIONS ON CYRANO DE BERGERAC'S SCHEMES

Of all the twelve schemes of de Bergerac, 1, 2, 5, 9 and 10 are worth consideration in relation to space flights in general, and 3 and 7 are notable in relation to planetary flights. Schemes, 1, 5 and 9 contain a grain of truth in themselves, anticipating ascent in Mongolfier balloons by nearly 100 years.

REACTION TO CYRANO'S IDEAS IN THE  
CONTEMPORARY PRESS

M. Laurent-Einac organizes a flight  
to the moon

An article bearing the above title, which appeared in the French journal "L'aerosport," No. 386, 1925, describes in a humorous tone how M. Laurent-Einac, head of the French Air Force up to 1926, meets with the famous Savinien de Cyrano de Bergerac, author of "Voyage dans la lune." In the fictitious conversation between them, the French Air Force chief tells of his desire to launch a spacecraft with 40 passengers to the moon.

Epigraph

With a heart of furious fancies,  
Whereof I am commander,  
With a burning spear and a horse of air,  
To the wilderness I wander.

Tom O'Bedlam's song  
Edgar Allan Poe, "The Unparalleled  
Adventures of One Hans Pfaall "

*Chapter IV*

*FLYING HORSES*

The legends and myths of flying horses in the celestial sphere are numerous.

Flying in Arabian fairy tales

Arabian fairy tales are filled with diverse means of flying. People are borne aloft on magic objects or supernatural creatures. In "Alladin and the Magic Lamp," Alladin and his palace are conveyed from Africa to China by powerful genies, who also bear aloft a bed containing the Emperor of China's daughter.

In another tale, "The Emperor's Son Ahmed and the Beautiful Fairy Pari-Panu," Ahmed and his two brothers fly from one country to another on a magic carpet. Other stories tell of people flying on angels, genies, etc. However, all these flights take place just above the earth in only two tales does fantasy take them higher).

In "The History of Sinbad the Sailor" (seventh journey), Sinbad on his seventh and last journey falls among people who grow wings each spring and thus are able to fly. In his desire to experience the sensation of flying, Sinbad asks one of the inhabitants to take him on one of the latter's journeys. Here is how Sinbad tells of the experience: "I grasped him around his waist and he carried me off broadly flapping his wings (Figure 37).

"For quite a long time we flew in a straight line, and ascended so high into the remote parts of the azure skies that I could hear the angels singing under the canopy of heaven."

However, this flight ended in disaster. Enraptured with the singing, Sinbad pronounced the name of Allah and his bearer, who was a demon, abruptly descended to a high mountain, and there flung Sinbad off.

In another tale, "The Magical History of the Horse of Ebony Wood," the son of the Emperor of Persia mounts a wooden horse, presses a nail and the horse flies so long that they nearly reach the sun. The Persian prince, seeing what a horrible death awaits him in the heavenly regions, seeks and finds another nail, which he presses, thus compelling the horse to descend to earth (Figure 38).

The Roman poet Ovid narrates in his "Metamorphoses" of Phaëthon, who drove the sun-chariot harnessed to white horses but was killed by a thunderbolt at the hands of Jupiter (Figure 39).



FIGURE 37. Sinbad the Sailor flies to the sky on a winged man

#### Astolph journeys to the sun in a horse-drawn chariot

Ariosto describes a journey to the sun by one of his heroes, Astolph, in "Orlando Furioso" (Figure 40) in the following manner:

Scarcely had the sun sunk into the bosom of the waters and a sickle of moon appeared than the holy servant, Evangelist John, bade that a chariot be prepared for those who were to be raised to the sky. In this chariot the prophet Elijah in his time had been seen over the Judean Hills. Four bright-colored horses were yoked to the chariot. The Evangelist took his seat next to Astolph, grasped the reins and set off into the sky. Soon the chariot was in a region of fire, whose heat died down in the presence of the holy man. Flying past the heat they arrived at the vast world of the moon, whose surface gleams like bright steel.

#### The Prophet Elijah is carried to heaven

In the Fourth Book of Kings (Bible), pp. 11 – 12 [Russian version], there is the description of Elijah being borne to heaven: "And it came to pass, as they still went on, and talked, that behold, there appeared a chariot of

fire, and horses of fire, and parted them both asunder; and Elijah went up by a whirlwind into heaven.



FIGURE 38. The Emperor of Persia's son flying on his magic horse to the sun

"And Elisha saw it, and he cried, 'My father, my father, the chariot of Israel, and the horsemen thereof!' And he saw him no more." (Figure 41).

G. Vechfinskii, in his "Aero— Yesterday, Today, Tomorrow"\* (Kharkov, 1925, p. 7) treats the story of Elijah thus: "And someone spread in panic the rumor that some holy prophet by the name of Elijah was driving through the sky in a chariot. Ignorant boors and cranks believed this rumor and thus Elijah became engraved in their minds as the first conqueror of the sky" (Figure 42).

\* "Aero — vchera, segodnya, zavtra."



FIGURE 39. Phaëthon's disastrous flight to heaven

### Journeys to the sun, moon and stars in Russian fairy tales

The mode of journeying to the sky in Russian fairy tales is very primitive. The heroes travel there either on foot or by horse.

The following are excerpts from A. N. Afanas'ev's "Russian Fairy Tales."\*

The Sun, Moon and Voron-Voronovich (Vol. 1, p. 67, 1897). An old man journeys (on foot?) to the sun and moon who are married to his daughters.

The Witch and the Sun's Daughter (Ibid., p. 69). Ivan the Tsarevitch, escaping from the witch, gallops off on his horse to the tower of the sun's sister (Zorya), who opens the window for the Tsarevitch to climb in. Then the witch demands that she and Ivan be weighed. "If I outweigh him, then I will eat him up, and if he outweighs me, then let him kill me!"

\* "Narodnye russkie skazki."

Off they went (to earth, probably); first Ivan sat on the scale and then the witch; the witch merely put one foot on the scale and Ivan was sent flying with such force that he fell on the sky, in the tower of the sun's sister. . .

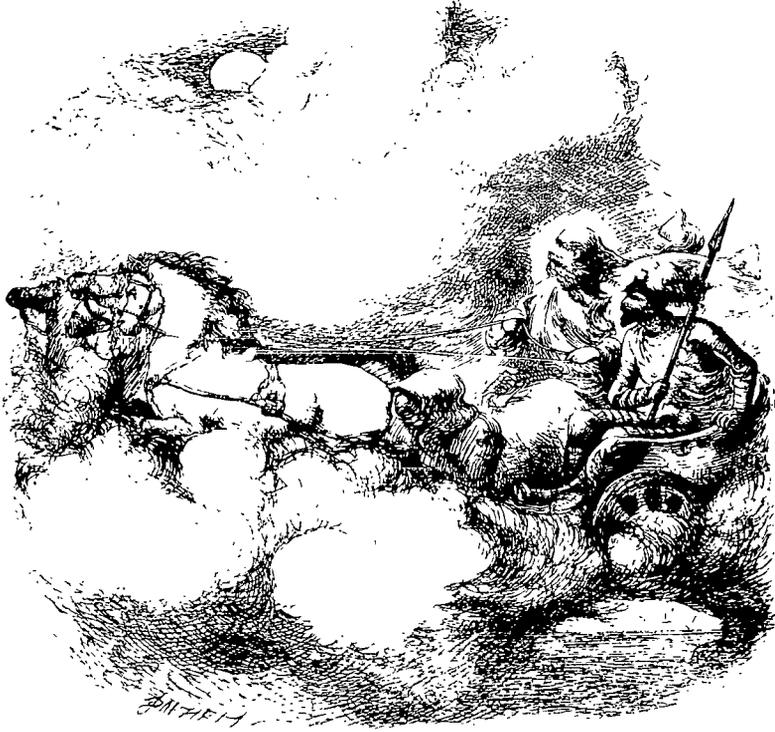


FIGURE 40. A stolp and the Evangelist John fly to the moon in a horse-drawn chariot

Marko the Rich Man and Vasilii the Luckless (*Ibid.*, p. 245). In the note to this tale there is attached another. . . The Tsar dispatches a worthy young man to the sun in order to ascertain why it has not shone for three days. The young man rides on a horse to the sun, finds out what was required and then returns home.

The Fire-Bird and Vasilisa-Tsarevna (*Ibid.*, p. 267). In the note to this tale there is told the Malorossiia version: "An honest young man, at the behest of his beloved, travels to the other end of the world where the sun spends its nights. . . A similar theme is present in the South Russian tale of "Ivan who rode to the tower of the sun, built over the blue sea."

### The flight of Ivanushka-Durak on the Humpback Horse

The horse with the golden bridle broke loose  
And made his way to the sun.

P. Ershov, "The Humpback Horse"\*

\* "Konek-Gorbunok."



FIGURE 41. Elijah the Prophet is carried to heaven (according to the Bible)

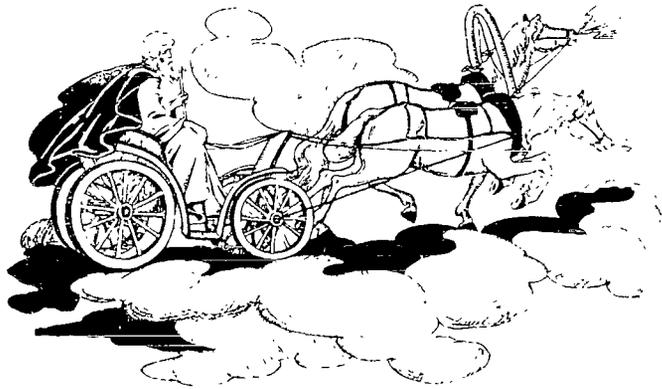


FIGURE 42. Elijah the Prophet flies in the sky (according to Vechfinskii)

The talented P. Ershov, in his story "The Humpback Horse," narrates of the flight of Ivanushka-Durak on the Humpback Horse to the moon which, as the Tsar-Devitsa told him, is her mother:



FIGURE 43. Ivanushka-Durak goes to the moon on the Humpback Horse

Said the Devitsa to him  
The moon is my mother, the sun my brother.

At the command of the Tsar, Ivan rides on his horse to the moon  
(Figure 43).

The horse ran there,  
Where (I heard in a whisper)  
The sky joins the earth,  
Where the peasants spin flax,  
The spinning wheels are placed in the sky.  
Here Ivan parted with the earth  
And found himself in the sky  
And rode like a prince  
Hat at his side, filled with good spirits.  
What marvel! What marvel!  
Our kingdom while beautiful,  
He tells his horse  
Amidst the azure glades,  
Cannot be compared  
To this heaven we have here;  
What is the earth? It is indeed

Black and dirty;  
Here the earth is blue,  
And how it gleams!  
Look, Humpback,  
Do you see, there to the east,  
Like summer lightning  
A heavenly window  
Something high?  
Thus asked Ivan of the horse.  
It is the tower of the Tsar-Devitsa!  
Our future Tsarina!  
Humpback screams to him:  
The sun sleeps here at night,  
And at midday  
The moon enters for repose.

Ivan approaches the moon and gives it an account of the Tsar-Devitsa (Figure 44) and then:



FIGURE 44. Ivanushka-Durak talks to the moon

Bowing, as he knew well  
On his horse he sat  
Whistled like a noble knight  
and set forth on the return flight.



FIGURE 45. Why are there no longer any genies, good or evil, who would carry me off to those strange worlds on their wings (Faure and Graffini)

## Chapter V

### FLYING ON SUPERNATURAL BEINGS

#### The flight of Simon the Magician

In his "Dictionnaire généalogique, historique et critique de l'Histoire Sainte," Abbé Sicard tells of Simon who, in the endeavor to impress his power on Emperor Nero (66 A.D.), declares that he will raise himself to the sky before the eyes of the entire nation. At a certain time all the people assemble to watch this singular event. Simon ascends on an evil spirit, but St. Peter, by force of prayer, destroys the powers of the demons and Simon falls to his death.

#### "Le voyage de milord Ceton dans les sept planètes ou le nouveau mentor"

The above is the title of a 7-volume work by Marie Anne de Roumier which was published in The Hague in 1765. The author describes the journey of an Englishman, Lord Ceton, and his sister Marimma to the planets: the Moon, Mercury, Venus, Mars, the Sun, Jupiter and Saturn. The journey is accomplished with the help of the genie Zahiela, who transforms Ceton and his sister into flies during the flight in order to ease the burden of flying, but at each planet they are transformed into a dweller of that planet. To Jupiter they fly as a group of chained interconnected atoms. On their return to earth it transpires that Marimma is not in actual fact Ceton's sister but a Georgian princess, and the two wed.

### **Mohammed flies to the heavens on a winged being**

In Chapter VII of the Koran, under the title "Nocturnal Journey," Mohammed tells of what he has heard from God during the course of the night and describes it thus: "Praised be He who carried His servant during the night from the sacred Temple of Mecca to the far away Temple of Jerusalem. . ."

Here there is the account of an aerial journey of Mohammed from Mecca to Jerusalem and then across the seven heavens to the throne of God. Mohammed is transported across the heavens by the Angel Gabriel on the winged being Borak who, according to the description, has the head of a woman, the body of a horse, and the tail of a peacock.

In the early days of Islam, the credibility of this event was the subject of argument; some maintained that the aerial ascent was nothing more than a vision, while others insisted that what had happened to Mohammed was essentially corporeal. The first group based its arguments on the testimony of Mohammed's companion Moavia, who always viewed this journey as a vision, and on the words of Aisha, Mohammed's wife, who stated that he always spent his nights at home. However, in view of the hatred that some sects, the Shiites for example, harbored against the above persons, the opposite view was spread and thus it came about that the generally accepted belief is that it did indeed happen. At the same time, it is added that the journey during which Mohammed saw the seven heavens and spoke with God took place so rapidly that his bed was still warm when he returned and the jug of boiling water still full, although on his departure the water was ready to boil over.

### **A missionary travels to the sky**

One medieval missionary tells of how he came across a place where the sky meets the earth (Figure 46).

### **Hyperbolus' magic flight to the planets**

"The Journey of Hyperbolus to the Planets," a 5-volume work by Cophrin-Rohny was published in Paris in 1808. Hyperbolus, the hero of this work, is the son of a magician and a Persian woman who visits the planets, starting with the Moon and ending with Saturn, aided by a genie.

### **The flight of the witch to the stars and the devil to the moon. The flight of the blacksmith Vakula on the devil along the stars and the moon**

Gogol, in his short story "The Night before Christmas,"\* describes how a witch flies to the stars (Figure 47).

\* "Noch' pered Rozhdestvom."



FIGURE 46. The medieval missionary comes to the place where the sky meets the earth

"Clouds of smoke arose to the sky from the chimney of a hut and with the smoke there ascended a witch mounted on a broom. She sailed so high that only a tiny black spot flickered above. But wherever this spot appeared the stars, one after the other, vanished in the sky. The witch filled her arms with them. Three or four still glittered. Suddenly, from the other side, there appeared another tiny spot which increased, started to expand, and soon was no longer a spot. . . one might conjecture that it was the devil. . . he stole quietly to the moon (Figure 48) and had just stretched out his hands to seize it, but suddenly backed away as if burned, sucked at his fingers, stamped his foot and ran to the other side and again jumped and drew back his hand. However, in spite of his failure, the cunning devil did not abandon his mischief. Running up he suddenly caught the moon with both hands, grimaced, and blew on his fingers, throwing the moon from one hand to the other, like a peasant taking a live coal in his hand for his pipe; finally, quickly thrusting it in his pocket, he ran on as if nothing had taken place." Later, he met the witch and returned to earth with her: "The witch. . ., raising her hand above and turning one leg aside, brought herself into a position like a man flying on a horse and, not moving one muscle, descended in the air as if she were on the icy slope of a mountain, and landed in the chimney. The devil, in the same manner, followed after her. . ."

In another part of the story Gogol describes the flight of the blacksmith Vakula on the devil:

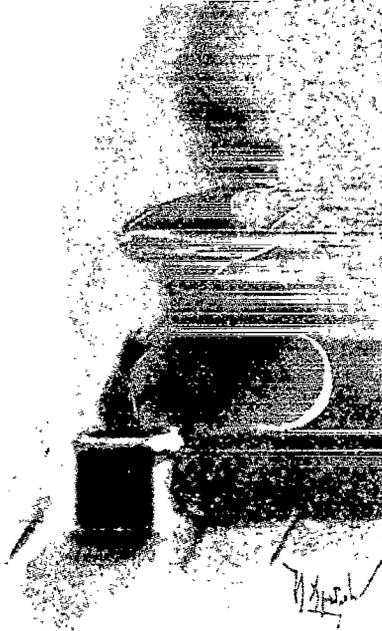


FIGURE 47. The witch steals the stars (Gogol)



FIGURE 48. The devil steals the moon (Gogol)

"How strange everything appeared to Vakula, especially when he arose from the earth to such heights that he could no longer see anything below, and he flew like a fly right under the very moon; if he had not bent his head a little his cap would have struck it. . . He could see exactly how the stars gathered in a cluster were playing blindman's bluff."

## The Hussar flies to the stars

In his poem, "The Hussar,"\* Pushkin describes how a Hussar, having drunk a magic potion, flies off to the witches' Sabbath:

Headlong I fly, fly, fly,  
To where I do not remember nor do I know,  
To the oncoming stars I cry:  
Right! . . . and on the earth I fall.

\* "Gusar."

*Chapter VI*

*FLIGHTS IN THE BIBLE AND  
OCCULT WRITINGS*



FIGURE 49. The Sphinx — symbol of occultism

Epigraph

Mysticism is not so far afield from the positive sciences as superficial minds assume, and the mathematical outlook on the laws and phenomena of nature sometimes leads directly to mysticism.

Camille Flammarion  
"Inhabitants of Outer Space"

And the will therein dieth not. Who knoweth the mysteries of the will, with its vigor? For God is but a great will pervading all things by nature of its intentness. Man doth not yield himself to the angels, not unto death utterly, save only through the weakness of his feeble will.

Edgar Allan Poe  
"Ligeia"

All religions recognize that the soul of man after death is carried to heaven, although the exact place where this soul will find sanctuary is viewed differently by different peoples. For example, the Eskimos believe that when they die their souls will settle on the moon. Other faiths believe that the angels will take the souls of dead children to heaven, or bring them back to earth from heaven (Figure 50).



FIGURE 50. "He carried the young soul in his embrace  
For the world of sorrow and tears"

### The yogis fly to the moon

According to the sacred Hindu text "Bhagavad-Gita," the yogis or Indian sages may fly to the moon at a certain time of the year.

## **Transmigration of the soul to the planets according to Vedic teachings**

In the ancient Hindu Vedic writings it is said that a man's soul after death goes to that planet or star which corresponds to the works of the man, for example, the sun or the moon.

The Bible narrates of living people being carried to heaven.

### **Enoch is carried to heaven**

1. "And Enoch walked with God: and he was not; for God took him." (Genesis 5 : 24). (Others are "dead," but of Enoch, "God took him.")

2. "By faith Enoch was translated that he should not see death." (Hebrews 11 : 5).

### **The ascension of Jesus Christ to heaven**

The evangelist Mark (Mark 16 : 19) says: "So then, after the Lord had spoken unto them, he was received up into heaven, and sat on the right hand of God."

The evangelist Luke (Luke 24 : 51), on this same phenomenon, says: "And it came to pass, while he blessed them, he was parted from them, and carried up into heaven."

Finally, in the Acts of the Apostles (Acts 1 : 9), it says: "And when he had spoken these things, while they beheld, he was taken up, and a cloud received him out of their sight."

The artist Gustave Doré depicts the ascension of Christ in a painting (Figure 51).

### **The corporeal ascension of the Virgin Mary**

Nowhere in the Bible is the death of the Virgin Mary mentioned, and of the circumstances surrounding her death there is only sacred legend. In the second century, the Sardinian Bishop St. Meliton tells of her corporeal ascension to heaven. In the 15th century, Nikifor Kallist collected all the legendary details of this occurrence in his church history.

### **Kepler's flight to the moon in a dream**

In 1634, there was published posthumously in Frankfurt a book by the renowned astronomer Johannes Kepler, entitled "Somnium, seu opus posthumum de Astronomia lunari." The book was published by Kepler's son. Here is how he explains how it came to be written. "In 1608, I read by chance the history of a certain celebrated sorceress Libuše and, in accordance with the instructions given in the book, concentrated heavily

for a few hours on the stars and the moon, and then I fell asleep, and in my dreams I experienced a number of impressions, as if I had been on the moon. This book is dedicated to those impressions." In it the author describes how the surrounding world appears to a man finding himself on the moon.



FIGURE 51. The Ascension of Christ

### Voyage of a soul to the moon

In 1692, a book by Father Daniel, entitled "Journey in the World of Descartes," was published in which the author, a follower of Descartes, describes a fantastic journey to the moon, during which he succeeds in learning, through some marvelous secret which he has gleaned from

Descartes, how to separate the soul from the body, and how the soul can depart from the body, travel a great distance and then return to the body, which spends this time as if asleep.

"Finally" — says the author — "We (he and his friend) set off for the moon; my soul experienced indescribable bliss hovering in those immeasurable spaces in which my soul when in union with the body could be carried only with the help of vision."

Others who made ecstatic journeys to the starry spheres were St. Paul (who was carried to the third heaven), Dante, and Kircher.

### Dante journeys to the sky

Dante, in his "Paradise" (1300), narrates that with the help of Virgil at the beginning, and of his friend Beatrice later, he succeeded in flying in the sky and visiting the Moon, Mercury, Venus, the Sun, Mars, Jupiter, Saturn, the fixed stars, Empyrean, etc.

### The ecstatic journey of Athanasius Kircher

In 1656, there appeared in Rome the book "Ecstatic Heavenly Journey" by Father Athanasius Kircher. In this book the author tells how he, under the name of Theodidactis, aided by a genie, Cosmiel, was transformed into a spirit and in this manner, together with Cosmiel, goes to the moon and a number of other planets right up to Saturn and to the fixed heaven (firmament).

### The journey of Swedenborg's soul to the planets

The Swedish scientist and mystic, in his "Arcana coëlestia" — "The worlds of our solar system and the worlds of the starry heaven; of their inhabitants, spirits and angels, on the basis of what was heard and seen by Emanuel Swedenborg, 1758" — tells of the journey of his soul to Mercury, Jupiter, Mars, Venus, the Moon, and the world of the stars. His soul, in order to make the journey, was separated from the body, which remained in Stockholm.

Camille Flammarion, writing in his "In the Skies" (p. 83), says that mental powers can of course be transported from one world to another, but not always, not everywhere, and not all. An action of this kind is subject to known laws and conditions.

### The spiritual journey to the planets and stars C. Flammarion

The French astronomer Camille Flammarion, in another of his works, "Along the Waves of Infinity," describes the journey of a man's soul to the

different planets and stars. In the process he develops the following judgment on the nature of man. There are, he says, three different elements in man: one — the body, two — the vital force, and three — the soul. The soul is joined to the body through the medium of the vital force. As soon as life is extinguished the soul immediately separates from the body. At the same time, its immediate relation to space and time is discontinued. An inexplicable force compels the soul to rush through celestial space with inconceivable speed, one that is equal to the speed of thought.

Flammarion's descriptive manner compels the reader to follow the flight of his thoughts and transfers him to the different planets and stars, describing the appearance and character of the various worlds in an attractive form.

### **The reincarnation and transmigration of souls to other worlds**

C. Flammarion in his "Multiplicity of Populated Worlds," expounding the development of doctrines on the possibility of populating worlds other than the earth, describes a doctrine preached by the most ancient book of the Hindy Vedic teaching that after death the soul of man can be reincarnated many times on other celestial bodies, and can migrate to other physical mantles.

### **Astral movement of man in interplanetary space**

Occult doctrines presume the possibility of separating from the material body of man his astral body which, being in itself an extraordinarily rarefied substance, may at will be conveyed for long distances. Why then could not this substance, changing its density just as one wished, be carried from planet to planet under the influence of the repulsive action of light rays and the attraction of the planet?

### **Occult flight through four dimensional space to planets invisible to earth**

V. I. Kryzhanovskaya, in her novel "The Magi"\* (St. Petersburg, 1902, p. 55), describes how the hero of the novel, Prince Supramati, and his guide, the Flying Dutchman Dagir, who is preparing to initiate the Prince in hierophantic arts, flies to a planet of the solar system which is invisible to earth. The flight was accomplished from the Prince's castle in Scotland. Here we leave the story to the author:

When evening fell, the Dutchman led his pupil into a room which the Prince had never seen before in his castle, and closed the door so carefully that not a trace of it remained visible and the wall appeared unbroken.

"Here is the laboratory for the journey we are about to take. The air in this room has been especially prepared."

\* "Magi."

When the moon came out, Supramati examined the room closely. It was a circular salon. In the center there stood what appeared to be a pavilion with glass walls. Further, deep in the room, there could be seen a basin and in the center a fountain which in the light of the moon sprayed out all the colors of the prism. At Dagir's summons Supramati undressed, bathed, and received from Dagir clothing resembling leotards, woven of a soft and lightweight material like the softest batiste; it was like satin skin to the touch. In the twinkling of an eye, the material completely covered him, not only his hands but his head as well so that all that remained uncovered was his face. However, this in no way hindered movement; despite its lightness it was as warm as fur and produced a prickly sensation like electricity flowing through the body. Supramati felt as if the clothing had fused with his own skin, this taking on a grayish steel color. Dagir was also clothed in a similar costume.

"We call this material skin of the spirits, said Dagir. "The costume is necessary for penetrating into the dominion of the dead — in four dimensional space," he continued, opening one of the walls of the glass pavilion which was shaped in the form of a door, and inviting his friend to follow. Supramati found himself in a glass room illuminated by the delicate bluish light of the moon. In the middle of the room stood a small glass table and two armchairs. On the table lay an open casket containing two goblets filled with a sapphire colored steaming liquid and two pieces of what appeared to be gingerbread.

"Let us be seated and drink to the success of our journey," said Dagir, sinking into the armchair.

With these words the Dutchman emptied the goblet at one gulp. Supramati followed suit. The liquid was like fire but did not burn and it tasted like old, very spicy wine; but what sent him into absolute ecstasy was the taste of the brown dough.

Gripped by a pleasant fatigue, Supramati leaned back in his chair.

How long this unconscious but completely delightful state continued, he could not say, but on opening his eyes he saw that he was still in his chair. The door of the pavilion was open and at the threshold stood Dagir who appeared to Supramati to be floating in the air.

"Let us go, it is time!" cried Dagir.

Supramati arose, but emitted a cry as he lost his balance; he ascended and somersaulted several times. The more he tried to stand on his feet the more he overturned; hovering in the air he turned over and threshed with his arms like a drowning man. . . (. . . the description continues how Supramati gradually learned to maintain equilibrium, and there is a comparison of his state with somnambulism when people lose their balance).

The young men walked to the window, which Dagir opened by pressing a spring concealed in the wall. A strong gust of wind roared into the room, flinging them back at first and then carrying them outward. For a moment they spun in the air. Everything around them whistled and crackled and emitted strange sounds. Suddenly the grayish atmosphere surrounding them flared open with a dry crackle, and before them was revealed a vast expanse flooded with the reddish glow of fire. Chaotic and irascible sounds reached Supramati's ears and a gust of air smelling of putrefaction fanned him momentarily, stifling his breathing.

"What does it mean? Where are we?" asked Supramati in astonishment, scanning the endlessness drowned in purple light that lay before him.

"This is four dimensional space – the dominion of the incorporeal," replied Dagir with a smile.

"You mean at this moment we are something in the nature of being dead?"

"You might say that. We are penetrating their kingdom and experiencing the same feeling that the spul does on departing from its corporeal shell."

During this conversation the powerful air current continued to carry them with headlong force. . . (Examining the occult world, invisible to the simple earthly mortal, Supramati and Dagir depart for a planet invisible from earth where the Tsar of the Larvs maintains his residence. This is a small dead planet of the solar system. It is very close to the earth, but obscure and invisible. The two quickly start for this planet).

"We are nearing the goal of our journey," said Dagir. "Do you see that immense black outline? That is the corpse of a small world – our neighbor of whose existence our astronomers have not the vaguest idea."

Suddenly, it seemed to Supramati that he had been seized by a whirlwind and was being whisked away. Then the feeling changed and it seemed that he was falling, drawn by a powerful current. He was overcome by a fiery, dense and saturated odor of putrefaction. Then this sleepy, torpid and semiconscious feeling was replaced by another sensation. It seemed to him that he was standing at the window of a train and looking out on a strange and obscure landscape spread out before him in pale green, reddish, even dark purplish colors.

Suddenly, he received an unexpected jolt that closed his eyes. Movement ceased. They had reached the goal of their journey, arriving at the ruins of a colossal temple on the new planet. . . (after looking around the planet and conversing with its inhabitants, Dagir and Supramati set forth on their return to earth).

Dagir lifted his sceptre – and in the air there became visible a fiery symbol. Supramati became faint and felt a powerful force seize him and carry him through space. Then by the successive jolts, different light, and rending vibrations, Supramati knew that they had entered the atmospheric belt of the earth.

Then he suddenly felt a hard and unexpected bump, as if he had crashed into something, and the flight halted. A few minutes later he saw with surprise that he was in the same crystal pavilion which he had left behind when he went with Dagir to penetrate the four dimensional world.

As if through a haze, he saw that the pavilion was now illuminated with a purple light, and he remembered that he had drunk from the goblet standing on the table. He was overcome by a deep somnolence and lost consciousness.

When he opened his eyes he found himself in his bed and understood that his journey had ended.

### **Astral flight of the Magus to a star**

The writer V. I. Kryzhanovskaya in her novel "The Legislators"\* (Petrograd, p. 328, 1916) describes how one of the "great devoted," the Magus Ebramar, and the female magus Nara ascend to a star. The ascent occurs from the planet to which the Magi migrated from earth after the latter's destruction. Here is how the author tells of how this phenomenon occurred:

• "Zakonodатели."

Ebramar, after several thousands of years of life, informs his pupils of his departure:

"I am going to a star which we call the star of the Magi, of which you know, having studied the celestial map. She always appears at a time when the Great Missionary, the Son of Light, resting there and preparing for a high appointment, descends to earth in order to place on himself a heavy garment of flesh and accept a bloody and terrible end. This blessed star will send down to me a ray and I will ascend to it."

At last came the day designated by Ebramar and with the approach of night, the final preparations were made. The Magi, male and female, and all the hierophants donned festive white garments, and lined up on both sides of a long gallery leading from the gates of a sanctuary to a secluded small square in granite cliffs, in whose interior there was carved out an underground city. Here the supreme hierophants assembled. In the middle of the square was a golden dais around which there blazed blue flames, and at the four sides stood the great astrologers who knew how to speak in the tongue of the stars.

Around four o'clock in the morning a burst of thunder shook the walls of the underground temples, the gates to the sanctuary were flung open, bright light poured out from within, and then Ebramar was revealed encircled by transparent vapor. Seven rays formed around his head like a glittering wreath, on his handsome face there radiated an expression of indescribable bliss and rapture, and he pressed a magic sword to his breast. His toes did not touch earth and he drifted along the gallery like a vision, and all those present followed after him.

Ascending to the square, Ebramar stopped or, more accurately, hovered over the golden dais, and those who had gathered there by this time burst into a hymn of glorious and wondrous melody.

Quiet reigned, even nature herself appeared silenced. In the air not the slightest motion could be felt; the night became warm, fragrant, luxuriant, and only a barely audible crackle suggested that in the air something unusual was taking place. Then the four astrologists burst into a marvelous song in a secret language known only to the stars and suddenly, in the sapphire-blue heaven, a bright star lit up and from the depth of infinity a golden ray filled the square with an extraordinarily bright lambent color. The air swarmed with transparent and bright beings, protectors of this earth, spirits of the sphere; finally four groups of spirits shone — servants of the great devoted — and four fiery bands bound up Ebramar with them.

"Thank you, higher spirits of the elements, for your faithfulness, obedience and service."

For a moment Ebramar's gaze wandered among the assembled.

"Greetings, scholars, friends, pupils, please accept my gratitude."

"Take your repose, friend and untiring toiler, in the abode of the unspoken," said the supreme hierophant, raising his hand.

At this moment a bright flash of lightning fell on Ebramar with a mighty flame and lighted up the rays of his wreath. The assembled, excluding the astrologists and supreme hierophants, fell to their knees and their eyes were offered a strange sight. The terrestrial body of Ebramar burned and the liberated radiant astral flew along the golden ray at a dizzy speed.

In the twinkling of an eye, the covering of one of the female Magi blazed up and her body fell to the ground, and from it there was discharged a glittering shadow like a silver moth. This was Nara following after her

beloved teacher. Minutes later the vision paled, the beings faded away and the ray and shadows were extinguished.

On the golden dais there remained only a small handful of phosphorescent ash, and Ebramar's pupils gathered his remains with veneration and placed them in a crystal urn crowned with a cross.

Nara's body did not burn but became light, lissom and remarkably transparent, resembling a wax statue breathing light.

### Occultism in interplanetary journeys

Alexander Yaroslavskii, in his Utopian novel "Argonauts of the Universe" (Moscow-Leningrad, 1926, p. 155), describes the flight of his main characters, Goryanskii, his wife Elena, and child Muks, from the earth to the moon in a jet-propelled radium craft; these characters are placed in a difficult situation when on arriving at the moon they discover that for some unexplainable reason their supply of radium is gone, and the means of return to earth cut off. But at this moment Elena falls into a trance. Her face, notwithstanding her wide open eyes, is like one sleeping and shines as though illuminated from within.

Responding to a call, she leads her husband, as if in a dream, to a cave where she finds radium which she hands over to him.

And he received it from the hands of Elena in an impossible and fantastic way. "Or, perhaps, the occultists are right and the unreal, the preterensual, exists?" Suddenly on the dark pink granite there appear ordinary Russian letters, in shimmering gold. "Do not fear, I am not a spirit, not a ghost! I am just as much alive, thinking, and rejoicing as you! It is only that I am older than you, much older: indeed, I am more than ten thousand years old! I am speaking to you from a faraway world and will help you, for you and I are one. But we have advanced incalculably, immeasurably, in comparison with you, terrestrial brothers. I can produce as much radium as you want, but that is not important! There are other forces, an immeasurable quantity of forces, some of which you will know one day, that are much more powerful than radium; they are the manifestation of one universal force which we know. With the help of this force I speak with you now from a distance which light passes in hundreds of millions of years.

"The planets do not live a separate life — they are bound up with each other by a sublime force of attraction whose essence will be incomprehensible to you for a long time. Besides this, light constantly flows between them like blood in the organism. The movement of light is the true blood circulation of the universe; the bodies of the planets exchange rays like kisses. The most slender, elusive particles — embryos of life and bacteria — are transferred by light rays by virtue of radiation pressure from one planet to the other — the planets fertilize each other.

"You have an Indian legend about rice and wheat falling from heaven — that is true: not only rice and wheat but many, many more gifts have you received from other planets, but the greatest of all you have received from our moon, where there were wise beings and civilization when the burning young earth was still a small sun.

"As soon as the earth started to cool, fearless men on the moon came to the earth on craft similar to your rocket and on other mechanisms which you would not understand. However, these also battled stiffly with the elements... and many of them perished, particularly from terrestrial bacteria.

"But, again and again, craft flew from the moon to earth and finally the newcomers settled in, the earth became like a colony of the moon.

"Your legend of Adam is not without some foundation, and when the anthropoid apes appeared on earth there were already on her civilized beings of lunar extraction and the two species developed in a parallel manner.

"However, with the passing of time there developed far greater and more interesting prospects for the moon dwellers; communications with the earth slowed down and were almost forgotten; very rare were the expeditions to it.

"The myths of the Peruvians of a white god Gvetzago, the Scandinavian legends and sagas of the fair-haired Baldur, the Chinese myths of dragons flying from the moon — these are the recollections of them.

"The highly civilized newcomers stood at the head everywhere. They gave birth to ancient culture. Nearly simultaneously, steam, the airplane and electricity appeared in Atlantis, China and Egypt. Their civilization could almost be compared with yours but it bore more of an isolated character. Your legend of the divine origin of power refers to this epoch. The titles of Pharaoh and Chinese Emperor ("son of heaven") were taken literally, for they and their closest associates were really of heavenly (lunar) ancestry and they and all those surrounding them still recalled this...

"There are two races on earth: one that is simple, coarse, earthly, being born, living and dying, buried in daily labor, thinking only of it; but there is a dim recollection of the native planet preserved among the second race: it looks at the stars, it flings at sweet madness, its proud banner bears the words of the Romans "Sic itur ad astra," proclaiming that the road of culture leads to the stars...

"Do not be surprised that I write here in your native tongue: the root of languages is one for all our planetary system, and I write thoughts clothing them in the letters of a language understood by you, utilizing power immeasurably faster than light, similar to gravity, power as yet unknown on earth. I am communicating with you from remote space, and we live on more beautiful planets.

"The moon serves us only as a storage point, a cosmic port, a temporary graveyard for those of us (we long ago conquered old age and death) who desire a rest for a short time from life, tired of immortality, in order to rise again in the future.

"Sometime, my brother, you too will conquer old age, death, time and space and will be with us on the planets and suns, for you too are citizens of the universe.

"You were the first to start conquering interplanetary space, you were the first to fly to us; on your return to earth let hundreds of new rockets, hundreds of new craft rush to the first station in outer space — the moon — and then to the stars and suns, to the boundless space of the universe;

remember, there are no enemies among you except death, time and space, and having conquered them you will organize love.

"Rejoice over nature everywhere and always! We await you in the ocean of the universe. Farewell, my brother! Greetings to the earth!"

For a moment the golden letters on the granite trembled and then disappeared without a trace, as if they had entered the stone.

Elena turned back with the same wide open eyes, mute as before.

Then, awakening and losing the mechanical lifelessness, she rushed towards Goryanskii:

"What is this? Where are we? I felt just now as though I were walking without end in an illuminated crystal castle."

"You were really there, my darling," replied Goryanskii gravely, pointing to the case with radium and relating all that had occurred. . .

### **Flight of the astral body of man to Mars**

Edgar Rice Burroughs in "John Carter of Mars" (Martians) tells of how Captain John Carter chances to come to Mars and his adventures there.

While traveling in Arizona, Carter finds himself in a strange cave where he is overcome by sleepiness.

"My drowsiness became intensified" — he says. "I made a superhuman effort to keep from falling asleep. But in the end I staggered like a drunken man, leaning against one of the side walls, and then fell on the ground in a heap.

"Suddenly a dreadful bellow roared through the cave. This was a terrible blow to my strained nerves. With an inhuman effort I tried to throw off my numbness. This was not physical exertion — indeed, I could scarcely move one joint — this was an effort of all my will, all my senses and all my nerves. And something happened! I felt a slight nausea, then a straining as if a large steel spring were wound up in my body, and in a minute I stood leaning against the opposite wall of the cave, shaken and excited, and could not for the life of me say what had happened.

"Moonlight poured over the front of the cave and I saw my own body in front of me. It lay in the same position, stretched out on the floor of the cave with eyes gazing at the entrance and with immovable arms outstretched. I looked in wild amazement at it and then at myself. I lay there clothed and stood here completely naked.

"The transition from one state to the other took place so suddenly and so unexpectedly that at first I could think of nothing else save this strange transformation.

"I involuntarily walked to the entrance and climbed out of the cave and stood, sunk in contemplation of faraway Arizona and then glanced up at the sky. Myriads of stars quietly twinkled, completing the bewitching scene.

"My attention was soon caught by a large star with a reddish hue shining from afar. It was Mars; gazing at it I felt the effect of some kind of force over me.

"I do not know why but somehow I have always been attracted to that planet. . .

"Perhaps I, as a soldier, like the name given it in honor of the God of War. Be that as it may, it radiated a kind of charm. I stood on a ledge high above the earth and it seemed to me that I heard its call over infinite distance. Mars beckoned to me; drew me to itself as a magnet draws a piece of iron.

"A yearning for the faraway star overcame my whole being. I closed my eyes, stretched out my hand in the direction of Mars, and felt how I, as fast as one could think, was being drawn high into the vastness of space. There was a moment of unusual cold and a complete haze. . .

"...opening my eyes I saw a strange and melancholy scene. I knew that I was on Mars.

"I saw everything so clearly, so tangibly, that I did not have to ask whether I was sleeping or not. I knew absolutely that it was not a dream, it was reality. My inner consciousness confirmed that I was on Mars. I was as convinced of this as you are that you are on earth."

After a long series of adventures on Mars which lasted for ten years, it falls to Carter to save Mars from a lack of air suitable for breathing.

To obtain this, Carter with great hardship reaches the remaining factory that produces this air; he opens the door with difficulty but becomes powerless to take another step and falls, and as he falls he sees his Martian companions go on; then he loses consciousness.

"It was dark when I opened my eyes" — he continues. "A strange heavy garment clothed my body, a garment that clanked when I sat down. I felt myself from head to toe. I was clothed, although I was naked when I fell near the heavy door.

"Through a small opening I saw before me a tiny piece of the sky lighted up by the moon.

"I quickly went out and found myself on a narrow path; I was astonished by the skies opening before me: there in front of my eyes was the Arizona valley, and I stood on the spot from which I had looked at Mars ten years ago. . ."

In "John Carter of Mars," Burroughs includes a description of how Carter again is carried to Mars in the same manner.

## A natural flight of man

V. Kryzhanovskaya in her novel "On a Neighboring Planet"\* (Mars) tells in the following manner of the flight of man without any equipment:

1. Atarva (a Magus) made a sign with his hand and immediately started to leave the earth. Rocking quietly he floated in the air, soaring higher and higher until he finally disappeared in the darkness of night.

This flight took place in one of the refuges of the Magi in the Himalayan Mountains.

2. The second flight occurred on Mars. The inhabitants of one of the regions, selenites, are able to fly similarly.

Some young boys and girls, hands joined, spin around in a circle on the square and then ascend in the air and fly along the cliffs while others descend lightly and gracefully, like butterflies.

\* "Na sosednei planete."

"We have affinities with a birdlike species, so to speak," smiled Amara (heroine of the book); "our skeleton in structure resembles that of a bird and we easily adapt to the rarefied air in the higher layers. . . ."

"Naturally, we cannot fly in the full sense of the word, but by waving our arms with regular motions we can float in the air and ascend to a high altitude."

With these words, she easily ascended in the air like a piece of fluff and soared upward.

#### [Another] natural flight of man

The French astronomer Camille Flammarion in his "Along the Waves of Infinity" describes the flight of the spirit Lumen in his previous incarnation on one of the planets of the constellation Virgo.

"On the planet of Virgo" — he remarks — "I was able to fly as fast as I walk. For this I needed no aircraft, although neither there nor on the earth did I have wings. I cut through the air, using both hands and legs, similar to a swimmer when he dives and swims under water. Seeing how I fly, it is quite clear to me that I need neither wings nor an Archimedean screw, not to speak of a balloon. When I want to fly I push up, as if I were to jump, spread out my arms and float through the air without any effort. Sometimes, having reached the top of a steep mountain on foot, I jump from it, one leg tightly pressed against the other, and then I slowly descend in an oblique line in any direction I choose until I stand on firm ground. Sometimes, too, I lie in the air and slowly describe an ascending spiral line similar to a dove returning to his dovecote.

"Imagine, at the time of my earthly incarnation I had many dreams, and thousands of times in those dreams I lay on the air in exactly the same way without any effort, naturally, and without any devices."

#### V. Goncharov's interplanetary psychological machine (psycho-machine)

In Leningrad, in 1924, a science fiction book by V. Goncharov was published in two parts: the first part was called "The Psychological Machine" and the second, "Interplanetary Traveler."\*

In the book the author describes a journey taken in 1922 by several earth dwellers to the Moon, Venus and other planets of our solar system and other worlds.

For this flight he proposes a vehicle called the "psychological machine" whose work and structure consists of the following:

Principle of the flight. The power putting the craft into motion radiates from the central nervous system of the pilot, in other words the psychological force of man serves as its source. The author gives four examples which graphically illustrate the evidence for the presence of this force.

First example: a hawk falling from the sky on its prey hidden in the shrubs falls faster, due to its desire, than if a dead hawk fell from this height.

\* "Psikho-mashina," "Mezhplanetnyi puteshestvennik."

Second example: when a man throws a stone at a target, he moves forward and it is as if his desire, transmitted in the wake of the stone, sends it more quickly to the target.

Third example: you have dropped a glass and not caught it in time but you mentally try to hold it and this somehow keeps it from falling.

Fourth example: the ascent of an Indian fakir into the air. The fakir, relying upon the concentrated attention of the viewers, exerts his will and ascends.

A special magnet is placed in the psychological machine that catches the waves of universal psychological energy, and when it is lacking in a given place it can harness the energy of the pilot the more strongly, the stronger his will.

Structure of the psychological machine. In outward appearance it is cigar-shaped and made of white, non-heatconducting metal (Figure 52). It absorbs the energy of people in its accumulators which are in the form of aluminum-covered tetragonal cases arranged in rows on both sides of the machine. From them conductors run to a special apparatus resembling a gramophone because of its loudspeaker. A "psychological compass," for example somebody's handkerchief, serves to direct the flight. If this handkerchief is inserted in the tetragonal glass case, which has a glass globe inside, empty in the middle and with an indicator, the latter will show which direction must be taken in order to reach that person. Usually, during long flights, the machine operates on the psychological energy of the world, but this energy at the onset passes over via the loudspeaker to the brain of the pilot who concentrates his thoughts on striving for the known person and then the machine moves. The machine is about 5 meters long and 2 meters in diameter. Inside, besides two rows of accumulators, there are glass vessels fixed to the walls in threes and filled with a turbid liquid for the purpose of producing oxygen for breathing.

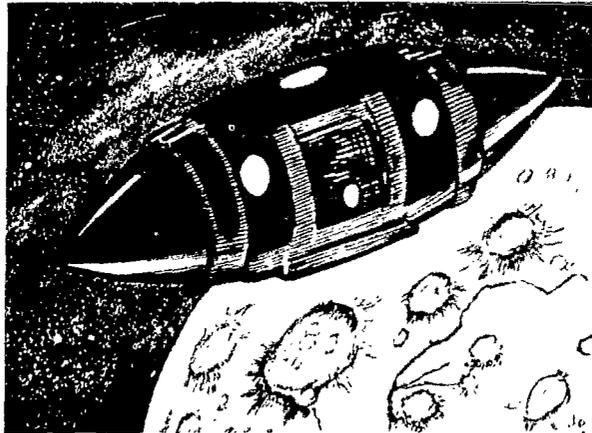


FIGURE 52. Goncharov's interplanetary psychological machine

In the second machine, which is of a more perfect type, instead of a gramophone-like loudspeaker another device is used. The pilot wears a

ring which has conductors from the accumulators where the psychological energy is stored on both sides. The psychological energy is gathered as before. An ordinary conductor extends from the front protuberance of the ring; it leaves the machine and then breaks up into a whole network of conductors smaller in diameter; these blanket the whole envelope of the machine. Before take-off, the pilot assumes an air of concentration, exerts his will, and the machine ascends.

To the right of the pilot there is an apparatus registering altitude and to the left one registering the speed.

**Flight.** The speed of flight is equal to or even faster than the speed of thought. The trip from the earth to the moon is completed within a few minutes, the distance from Venus to the earth is covered in three hours. During the flight in interstellar space, the machine must descend on the planets encountered to charge the psychological accumulators; this is more easily accomplished there since the inhabitants are more cultured.

A stronger machine is capable of flying 4 billion kilometers in five minutes.

**Conclusions.** The only idea worthy of note in the whole book is the idea of exploiting psychological energy. There are experiments now current in this context, but thus far there are no results which could be applied in practice.

## Telepathy

Many scientists and investigators have for a long time observed the phenomenon of thought transference. It is apparent that we are concerned here with the transference of a certain energy whose source is man, and which is now undergoing experimental study. Interesting and successful experiments have been conducted by the British Society of Psychical Research (1883) and French professor Charles Rich (1888). Other experiments in this field have been conducted and analyzed in France by Varcolle, in the United States by Dr. Morney at Columbia University, in Boston by the Society of Psychical Research, and in particular by Harvard University under Dr. Easterbrook.

In one of the medical institutes in Leningrad, A. E. Mendelshtam and Dr. D. P. Brovkin have carried out a number of highly interesting experiments that are the first steps towards research into the radiobiology of the human organism.

For this purpose, a generator (transmitter) and a receiver for catching radiowaves were installed. As the patients moved there was observed a greater or lesser deviation in the needle of the sensitive galvanometer connected with the receiver. In order not to affect the reflection of the radiowaves, a record of the deviation of the galvanometer needle was made with the help of a telescope by an observer standing 13 meters from the receiver.

The experiments revealed that every living organism has an individual capacity for reflecting short electromagnetic waves.

To speak now of the application of this force of thought transference in technology is, of course, premature, all the more so since the existence of the force itself is disputed by many; yet in any event, to anticipate the idea

of applying it as a propellant for an interplanetary vehicle, as Goncharov has done in his book, is interesting.

## THE ROCKET SHIPS OF ATLANTIS

The writers and historians of antiquity — Homer, Solon, Herodotus, Diodorus and Plato — refer in their writings to the massive continent that was once in the Atlantic Ocean. On this continent, Atlantis, there lived millions of people; its cultural standards were high, its cities and harbors rich, its rulers powerful, but all this sank beneath the sea as the result of terrible earthquakes and the eruption of volcanos.

Around 1800, reports on the existence and destruction of Atlantis appear in the works of the Rosicrucians, Illuminati and Masons, and later among the theosophists. These reports are based on evidence found in ancient Indian books inaccessible to the layman and preserved in the vaults and temples of India. The theosophists further conclude that the ancestors of the people of Atlantis flew there from another planet. On the basis of these mystical writings, unsupported by historical documentation, it is possible for one to conjure up a picture of the development of aviation already in that remote epoch. Here is how this development might be sketched:

"The beginning of the history of Atlantis started 4 million years before the common era. The first law-givers of this race were people with a highly developed intellect and immense spiritual power. They knew the arts of magic to perfection and could exploit the forces of nature extensively.

"They constructed aerial vehicles of a light metal resembling aluminum, and of specially processed wood.

"The vehicles were of different types and could carry 5 to 100 persons in the air. The material of the vehicle was very durable and shone in the dark.

"Serving in the capacity of a moving force were either the "human vrille" (the personal, strangely magnetic force concealed within man which the people of Atlantis possessed) or the massive power of an electro-etheral substance obtained from the atmosphere.

"The vehicle consisted of a central frame, side wings, keels and rudders. From an inner compartment a stream of the substance was ejected through two longitudinal pipes to the tail. These pipes were mobile and easily regulated.

"In addition, from the central compartment there followed another eight pipes which branched out in pairs below. The substance ejected from the vertical pipes produced the reaction to raise the vehicle. When this reached a certain altitude, the longitudinal pipes went into action, communicating a forward movement to the vehicle. Then the vertical pipes ceased their work and a supporting force was obtained, as in an airplane, due to its wings.

"These rocket ships, as they may justifiably be called, were automatically controlled with the help of a sight-compass directed at the spot of the designated flight. Flight speed reached 200 km/hr and altitude 300 — 400 m. Overflight of mountains was avoided since it was considered that at such an altitude the air was rarefied (?) and unable to maintain the craft.

"At the onset the inhabitants of Atlantis (a red race) were a devout people, rich and happy, and the Golden Age ruled. Then the cult of Satan arose, the people forgot their gods, started wars, morality declined. . . the gods were enraged and wrought their vengeance. A disaster struck the country, which the theosophists place at 9564 B.C. However, the hierophants, remaining faithful to their gods, had foreseen the disaster and escaped on their aircraft to neighboring countries: Africa, America. . . where they built up new colonies. Some of them, it is said, even flew to the moon and other planets."



FIGURE 53. Atlantis and its rocket ships

In Figure 53, the artist has portrayed the capital of Atlantis, the Golden Gate City, with its towers, observatories, harbor, channels and buildings. Overhead fly the rocket ships. In Figure 54, we see the destruction of Atlantis, sinking under the sea, and in Figure 55, the escape of the hierophants in a rocket ship.

## OTHER VOYAGES IN FOUR DIMENSIONAL SPACE

Travel in four dimensional space is treated in different ways by writers. Some approach the question from the geometrical point of view, others from the mathematical, the third group from the occult, and the fourth considers time as a fourth dimension. The preceding section on Atlantis described a flight in four dimensional space from the occult point of view. H. G. Wells in the story "Mr. Plattner" describes the flight of a schoolteacher, Mr. Plattner, in four dimensional space from the geometrical point of view. Here is how the flight takes place:

One of Plattner's students brings him an apothecary's measuring glass containing a greenish powder. Plattner, in the attempt to analyze it, puts a flame to the glass. The powder begins to glow, fuse, and suddenly there is a terrible explosion. . . Plattner finds himself in four dimensional space. He is able to walk through walls, people are able to walk through him, etc. He remains like this for nine days until he stumbles on a stone and falls on the side where the glass with the green powder is lying inside his pocket; another terrible explosion and Plattner with astonishment sees himself again in three dimensional space.

Travel in four dimensional space presents no special problem to the mathematicians. They can calculate the properties not only of four dimensional space but even higher dimensions. It is sufficient to recall the work of Lobachevskii, Riemann, Gauss, and others.

If we consider time as a fourth dimension, interesting themes for authors arise; of them we have chosen excerpts from H. G. Wells and



FIGURE 54. Destruction of Atlantis

V. Nikol'skii. In "The Time Machine" Wells describes the journey of a man into the past and the future.

The hero of the book, who is called the Time Traveller, constructs first a model of a time machine, and then the machine itself.

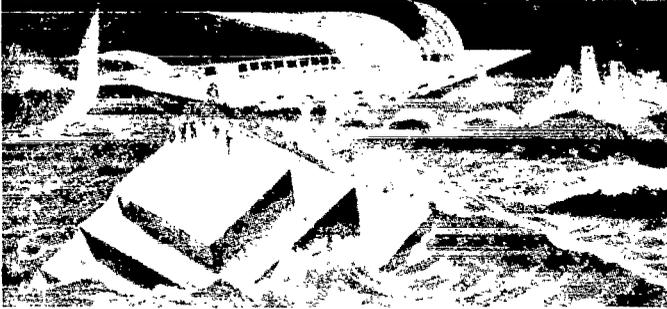


FIGURE 55. Hierophants of Atlantis escape on a rocket ship

The model consisted of a glittering metallic framework, scarcely larger than a small clock, and very delicately made. There was ivory in it, and some transparent crystalline substance.

The model looked singularly askew, and there was an odd twinkling appearance about the bar, as though it were in some way unreal.

Placing the mechanism on the table, the Time Traveller pointed to two levers. One lever, on being pressed, sent the machine gliding into the future, and the other reversed the motion. The Time Traveller pressed the first lever and the model suddenly swung round, became indistinct, was seen as a ghost for a second perhaps, as an eddy of faintly glittering brass and ivory, and then it was gone, vanished!

The large machine was a copy of the model.

Parts were of nickel, parts of ivory, parts had been filed or sawn out of rock crystal. In this machine, the Time Traveller intended to explore time.

Here is how he describes his departure:

"I gave it a last tap, tried all the screws again, put one more drop of oil on the quartz rod, and sat myself in the saddle. . . I pressed the first lever, and almost immediately the second. I seemed to reel. . . The laboratory got hazy and went dark. . ." The author describes the impressions of his flight into future time extending for many thousands of years; he sees the future Golden Age, the decline of life on earth, its transformation into a planetary corpse, and, finally, returns to the present time in his laboratory.

The end of the book finds the Time Traveller again disappearing in his Time Machine, never to return. The author does not say whether the Time Traveller is carried back to the past centuries or whether he again departs for the future.

## NIKOL'SKII'S CHRONOMOBILE

Wells' notion of a time machine is reflected in V. Nikol'skii's book "In One Thousand Years."\* The main character in this book, Professor Farbenmeister, invents a time machine in Berlin which he describes as

\* "Cherez tysyachu let."

follows: Working on the nature of cosmic rays I discovered a way to separate a part of space and make it move at a desired speed in the "direction of time" by a special kind of ultra-high frequency electrical oscillation. The "chronomobile" (Figure 56) is built on this principle. Its form is spherical, it is 3-4 meters high and has two small round illuminators covered with thick glass, an entrance hermetically sealed, and a porthole. The outer surface of the sphere is covered with a compound of geocoronium in which the inventor produces new electrical oscillations that isolate the entire apparatus from the surrounding space and time and serve as an invincible shell to which neither time nor matter is a threat. The shell is necessary in order to prevent travelers arriving at the shores of the future from colliding with some material obstacle.

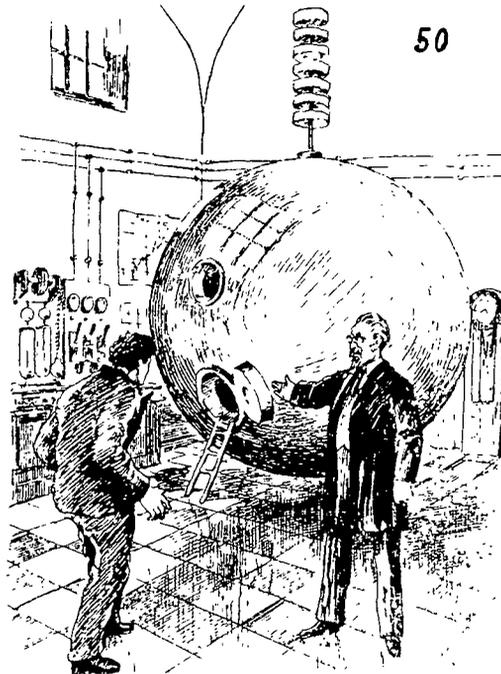


FIGURE 56. Nikolskii's chronomobile.

Inside the craft there are engines and electric generators from which there lead ropes and cables, intertwined around the marble switchboard.

There are also lamps and two armchairs.

A meter registering the movement of the craft in time is attached to the switchboard. When the meter needle stops at zero, time stops for the travelers. When it moves to the right they are carried into the future, when to the left, they are carried into the past.

Professor Farbenmeister and a Russian engineer, Andrei Osorgin, set forth on the journey. At first they travel into the past, moving back for 50,000 years, and then 1,000 years into the future.

Their adventures on earth 1,000 years in the future are described. There is also a love story introduced between Osorgin, who finds the young girl Ree in the future, slays a rival, and returns to the present in the "chronomobile" where he had left his brother Rep, after which he flies back into the future.

FLIGHT IN THE FOURTH DIMENSION ACCORDING  
TO N. A. MOROZOV

N. A. Morozov, in his letters from the Shlisselburg fortress (written in 1891 and issued in 1910 under the title "At the Border of the Unknown"\* — Scientific Semi-Fantasies), sketches a picture of flight in the fourth dimension, understanding this as time.

"If" — he says — "we could not only be passively carried by a uniform course of time into some unknown remoteness but could also travel along it into the past and future at our will! Then, of course, time would appear to be only one of the directions, like those of up and down, backward and forward, left and right. . ."

The author goes on to describe a voyage into the past and future with some imprisoned comrades and in humorous form depicts the shock of the prison warders on learning of their disappearance from prison, the meeting with King Solomon, the movement of objects in a reverse direction during their return from future and present time to the past, etc.

\* "Na granitse nevedomogo."

Epigraph

We inhabit the stars...  
We — are in the sky!  
The Earth carries us into space...  
"Stella" C. Flammarion

*Chapter VII*

*FLIGHTS ON CELESTIAL BODIES*

**Flight into the highest layers of the atmosphere on a magic arrow**

In 1711 a book was published in Paris entitled "Gongam or the Wild Man in Space, in the Bottomless Seas and Earth." Titetoophneuf. The hero, Gongam, travels across the world on a magic arrow, starting from the highest layers of the atmosphere and rapidly being carried over the earth.

This is a repetition of Herodotus' idea — he tells of a similar voyage by Arabis, the Hyperborean, who possessed a magic arrow that transported him to any place in the universe.



FIGURE 57. Voyage on a sunray

### **Micromégas journeys to the stars and the planets on a sunray and on a comet**

The French philosopher Voltaire (1694 – 1778) in his "Micromégas, Histoire philosophique," 1752, describes the voyage of an inhabitant of the star Sirius to the different planets of the solar system, among them earth. Micromégas is 32 kilometers tall. Enlisting the forces of gravity and laws of attraction and repulsion, he takes off from Sirius with the help of a light-ray and also a certain comet and is carried from star to star, finally arriving at Saturn. Here he meets up with one of its dwellers, who looks like a dwarf since he is only 3 kilometers tall, whom he invites to journey on with him.

They jump on a ring of Saturn which appears to be flat, and then cross over from one satellite to another. Chancing to see a comet passing by, they move over to it with their servants and instruments. After flying for about 600 million kilometers, they meet a satellite of Jupiter and then come down on Jupiter itself, where they live for a year.

Flying further for some 400 million kilometers they land on Mars. Finally, abandoning Mars they fly on and see the earth, where they decide to stop. Crossing the tail of a comet and finding themselves in the region of the northern lights, they pass over and from there return to earth, landing on the northern shores of the Baltic Sea. This was on 7 July 1737.

### **Voyage in the planetary system on an aerolite**

In 1838, Boitard published a book in France (*Voyage aux planètes*) on his travels in the planetary system together with the devil atop an aerolite, stopping first on the Sun and then on Mercury, Venus, Mars, Uranus and the Moon.

### **Communication from Mars to earth by meteorite, according to Uminskii**

V. Uminskii, in his story "Unknown World"\* (*Mars i ego zhiteli*, St. Petersburg, 1897), describes the fancies of a mad astronomer who communicates the news that the inhabitants of Mars have sent a message to earth via a meteorite 1 kilometer in diameter that has flown close to Mars and is due to fall on earth.

### **Flying on a comet from Mercury to Mars**

The French writers Le Faure and Graffigny in "Aventures extraordinaires d'un savant russe" describe how several travelers, finding themselves on Mercury, are carried from there to that part of the planet cut off during a

• "Nevedomyi mir."

collision with Tuttle's comet (Figure 58). Flying in its orbit near to Mercury and colliding with it (Figure 59), it turns round the sun and carries the travelers to Mars.



FIGURE 58. Journey on the tail of a comet

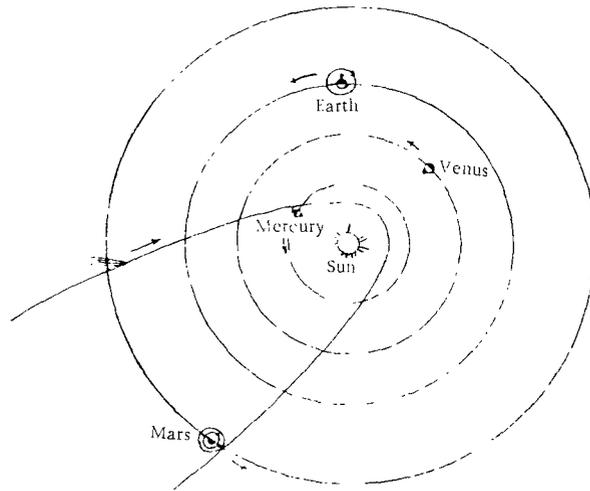


FIGURE 59. Orbit of Tuttle's comet

### Flight to the moon on a comet

The German writer Karl Meier-Lemgo in his "Voyage to the Moon. The Adventure of Two Children on the Moon" (translated from German, 1924) writes of the imaginary flight of two children to and from the moon on the back of a comet (Figure 60). To protect them from the heat and cold the comet gives them two warm magic coats. In the pockets of these coats there are always supplies of magic sandwiches and milk. The children breathe by swallowing from a bottle filled with magic juice. During the flight a jolt sends the girl flying but she is caught in time.

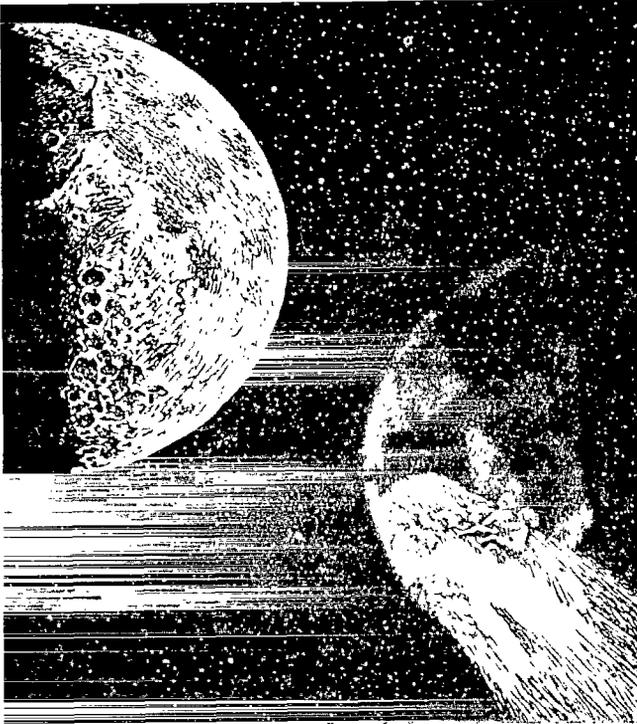


FIGURE 60. Flight of two children on a comet to the moon

The story, which is told in entertaining form, contains a description of a flight in outer space and notes the most troublesome aspects of such a flight: cold, heat, and lack of air.

### Flight on a comet to the sun

Jules Verne in his novel "Hector Servadac" (Russian translation, Moscow, 1887) describes the collision of a comet with the earth; in this, part of the earth with its inhabitants is carried off by the comet.

Here is how the main event of the book is described:

The astronomer Palmiren Rozett sees an unknown comet in the sky, determines its course and calls it "Gallia." Calculations reveal that the comet must collide with the earth in that part where Algeria is situated. The collision takes place exactly as the astronomer computed. The comet, having a nucleus, skids on the earth and rips off part of its surface with several people (Captain Servadac, his orderly Ben-Zuf, the astronomer, several Englishmen and Spaniards, two children and a Jew).

The collision, according to Verne, takes place as follows:

Suddenly Captain Servadac and Ben-Zuf found themselves stretched out on the ground, struck by a formidable force. Why at this very moment should the horizon change so abruptly in such an unusual way that the eyes of the most experienced sailor would be unable to find the line where heaven meets earth?

Why did the waves reach a height never before admitted by the scientists?

Why did the ground open with such an unimaginably dreadful crash and roar, as if the very frame of the earth had split, why was there heard the terrible roar of waves raging at a normal depth and the whistle of atmospheric layers whirling like a cyclone?

Why did there suddenly appear an unusual color in the sky, brighter than the northern lights, eclipsing for a moment the brilliance of all the stars?

Why did the basin of the Mediterranean Sea suddenly become empty and then fill up again with raging waves?

Why did the light of the moon become abruptly magnified to such an extent that this night star, 384,000 kilometers from the earth, suddenly moved to 40,000 kilometers from the earth?

Why did an enormous flaming spheroid, unknown to the cosmographers, appear in the sky and then disappear behind the dense layers of clouds?

Finally, what strange phenomenon produced this upheaval, so deeply shaking the earth, seas, sky, in a word, all of space?

As a result of the collision, the comet carries off a fragment of the globe including that part of the Mediterranean from Gibraltar to Malta with part of Algeria.

The comet and fragment of the earth after the collision describe an elliptical orbit in the universe, cutting across the orbits of Venus and Mars during their journey, and after two years are again due to approach the earth. The heroes of the book utilize these factors to return to earth. They construct a large balloon which they fill with hot air, and then placing everything in the balloon basket await the moment when the atmosphere of the comet, while approaching earth, comes in contact with earth's atmosphere. They ascend shortly before the contact; by their calculations the balloon should slip through from one atmosphere to the other, avoiding a direct hit, and after remaining for some time in the earth's atmosphere should descend safely to earth.

Here is how the flight over the earth takes place:

The last cables were cut and the balloon majestically ascended in the air above "Gallia."

Above the boat in a somewhat oblique direction the disk of the globe in all its splendor could be seen. It appeared to fly on "Gallia" and its mass eclipsed a huge part of the sky... (Figure 61).

Suddenly the passengers felt a vibration: Gallia's atmosphere had entered the earth's atmosphere dragging with it the balloon which threatened to burst.

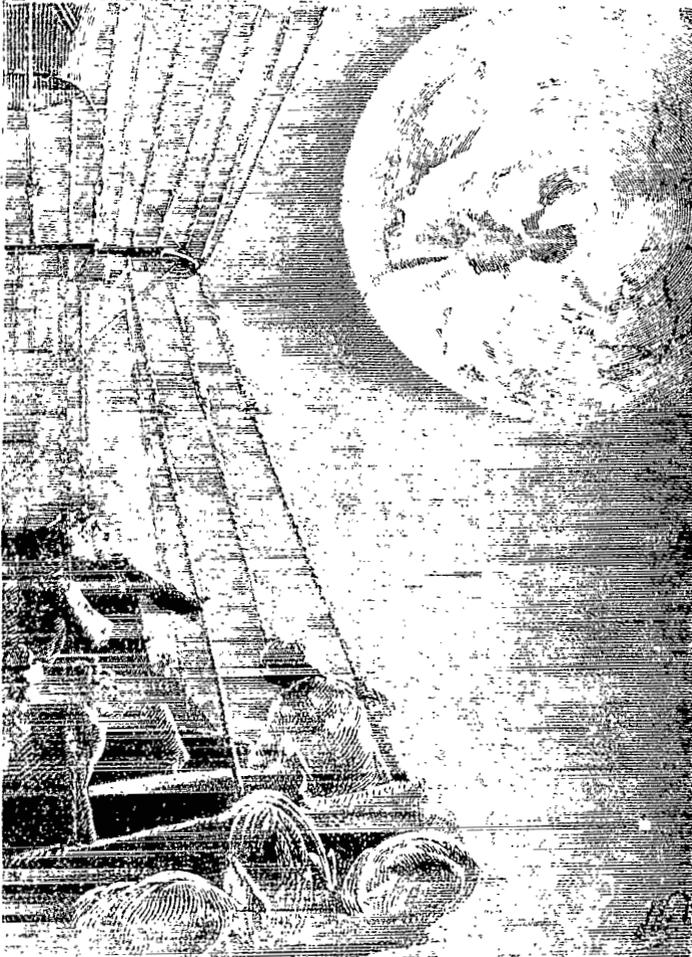


FIGURE 61. The descent of Jules Verne's heroes from the comet to earth in a balloon

In horror they grasped the side of the boat... The atmospheres fused; thick clouds formed. The passengers were now unable to see anything, either above or below; it seemed to them that they were encircled on all sides by a huge flame, that their legs had lost their point of support, and without knowing how they found themselves on earth. They returned exactly as they had left - unconscious.

Not a trace of the balloon remained.  
"Gallia" flew away in an oblique direction; against all expectation it only touched the globe lightly and disappeared to the east.

After a two-year voyage in the solar system, all the characters of the book returned safe and sound to the same place from which they had started.

### **Journey of Martians to earth on a comet, according to Uminskii**

V. Uminskii, in his story "Unknown World" (Mars i ego zhiteli, St. Petersburg, 1897) tells of the hallucinations of an insane astronomer who reports that some Martians have flown to earth on a comet at a speed of 1,000 km/sec.

### **Flight on a meteorite**

In the story "Invisible Beings"\* (Mir priklyuchenii, No. 9, p. 55, 1926), N. Kopylov describes how a fallen meteorite brings microscopic living creatures to earth, who move with the help of minute cigar-shaped implements fashioned out of alloys of silver, platinum, uranium and an unknown element resembling radium. The latter apparently serves as an operating mechanism for the craft. However, the unskillful treatment of the "invisible beings" brings about their death and the scientist is unable to decipher the mystery of their craft and from whence they had come.

### **The flight of two astral bodies on a comet from earth to mars**

C. Flammarion in his book "Stella" describes how the hero Raphael Darjilan and his wife Stella, during a trip to the Alps, see one night from a mountain top a comet approaching the earth. The entire surroundings to a great distance are illuminated by the electricity generated during the flight of the enormous bolide; the couple appear to be enveloped in flames, due to the discharge of this unusual mass of electricity, and die at the height of bliss, loving each other and intoxicated with the wonders of the celestial world.

But their souls continue to exist although they have flown from the earth, carried into space by the comet which, barely touching the earth's atmosphere with the end of its tail, proudly continues on its journey to the constellations. Soaring like two birds over the mountain tops, becoming closer than they had been on earth and merging into one double being, these souls appear to be asleep, dreaming, carried on a shining cloud which rapidly ascends into the starry sky (Figure 62). Raphael is the first to awaken and finds that he is holding Stella in his arms. Their bodies are identical with earthly

\* "Nevidimki."

bodies, but are weightless and consist of an electrical substance — astral fluid bodies that are bearers of the spirit and are the intermediate link between celestial and terrestrial organisms. Then Stella awakens and smiles at the pink glow surrounding her, unaware of the change they have undergone. Raphael himself does not recognize that they are being carried by a comet. Just as we appear to be standing still while riding in a balloon at the speed of the wind, so too the souls of the couple do not feel the enormous speed with which they are being carried in celestial space; they imagine that they are dreaming enchanting dreams following after their intoxicating love.

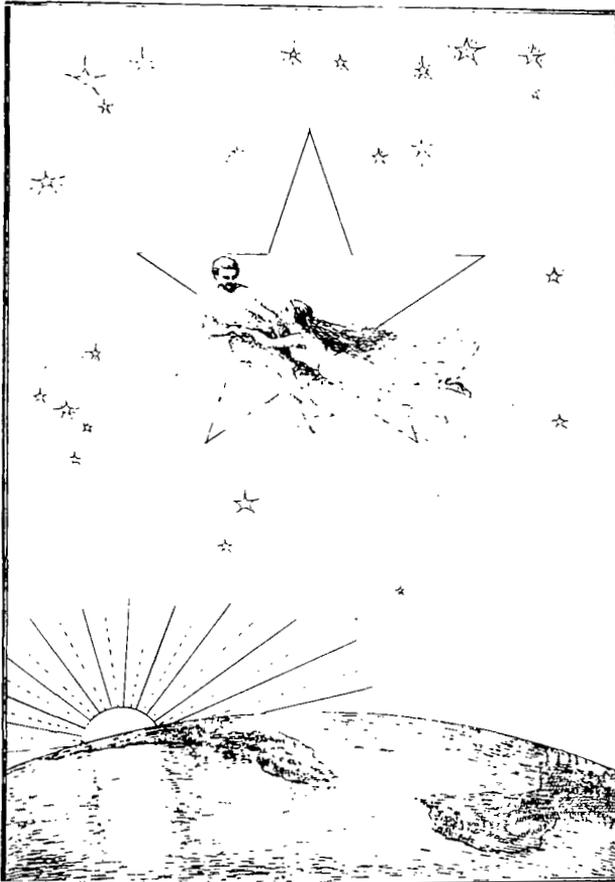


FIGURE 62. The flight of Flammarion's heroes, Raphael and Stella, on a comet to Mars

The comet, whose flaming tail nearly seizes the earth, soars higher with dizzying speed in the direction of our neighbor, Mars. Due to a combination of celestial movements, it happens that the globular star gripped Mars just before it touched the earth, and the souls of our couple see with astonishment that they are nearing a planet wholly unlike the one where they have been

up to this moment — a planet on whose surface there spread reddish plains, straight lines of verdure never seen by them before, numerous glistening canals and light human-like creatures flying in the air. Suddenly they feel they are quietly descending on this planet, like the falling stars they have often seen smoothly and slowly descending on earth and leaving behind a luminous, almost immobile cloud.

The astral body has the ability to condense atmospheric fluids on some planets and form new organisms from them. One of the advantages of this ability is that the ethereal being is not compelled to be born in the womb of the mother and then appear as a senseless child. Transported to another world, the soul although born there emerges in the full bloom of all its force.

Raphael and Stella live on Mars to this very day.

### Transmission of a manuscript from a star of Cassiopeia to earth by meteor

Among the stars of the constellation Cassiopeia there is a particular ternary star consisting of one handsome yellow star of magnitude 4.5 and two small ones of the 9th and 10th magnitudes.

In 1855 this complex star was the theme of an English novel — "The Star of Cassiopeia, a remarkable history of one of the worlds in space, a description of the unique nature, customs, journeys and literary works of its inhabitants." The introduction, written in poetry with a great expenditure of eloquence, tells us that the manuscript now in our possession has come from another world and was found inside a meteor which fell in the Himalayas. In the book the author conjures up a system of worlds so well put together that they could not last one week. He describes creatures so uniquely organized that they have no head, arms, legs, or chest, although in the drawing attached he tries to give a picture of a small family, representatives of this world, composed of a man, woman and child. The entire nature is essentially terrestrial, but the transformation, or rather the distortion, is such that the anonymous author has presented us with a handsome proof of the substantiation of the premise that the human imagination cannot create an image; it can only make a combination of parts of objects known to it, assemble different parts into one whole or reject parts from the known whole.

*Chapter VIII*

*FLIGHTS ON AIRCRAFT*

At the end of the preceding chapter, there was a description of people flying from a comet to earth in a balloon. Various writers have concocted a multitude of similar flights in balloons, airplanes and other craft.

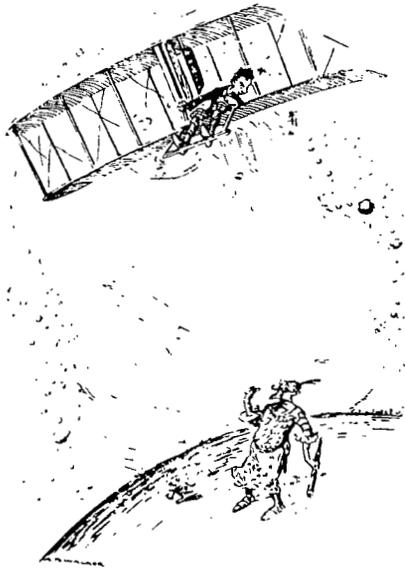


FIGURE 63.

"Is that Earth?"

"No, just a bit further, third planet to your right!"

**Flight to the moon in a balloon**

Edgar Allan Poe, in his "The Unparalleled Adventures of One Hans Pfaall" (1835), describes a flight to the moon by a Dutchman, one Hans Pfaall, who, in order to escape his creditors, constructs a balloon for this

purpose. From the moon he dispatches a moon-dweller in a balloon to Rotterdam with a letter for the burgomaster of that city, asking for permission to return to Holland with impunity for his transgression, in return for which he will communicate many interesting details of his journey.

Here are some details of the balloon:

The envelope was made of cambric muslin and covered with three coats of rubber varnish, and there was a basket of wicker-work. A gas was obtained through the action of a common acid on a special metallic substance or semimetal; it had previously not been discovered. It is a constituent part of nitrogen and its density is about 1/37.4 that of hydrogen. It is tasteless, but not odorless; it burns, and is fatal to animal life. The volume of the balloon was more than 40,000 cubic feet and it could take up Hans Pfaall himself with all his implements and 175 pounds of ballast.

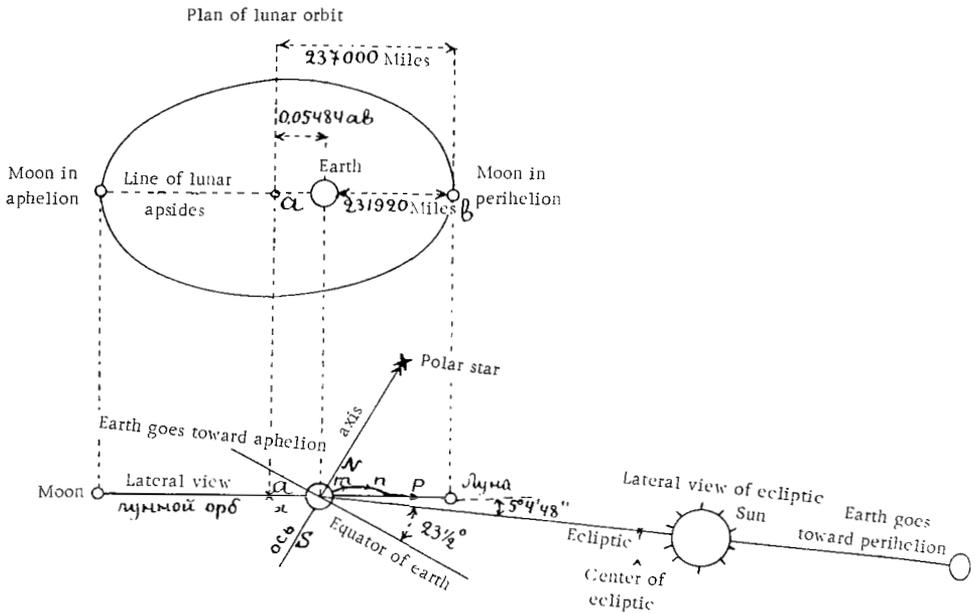


FIGURE 61. Scheme of Hans Pfaall's balloon flight to the moon

The possibility of flying to the moon through outer space is based on the assumption that space is filled with an ether, although an extremely rarefied one; nevertheless, a balloon is capable of flying in it. The ascent itself would be accelerated in proportion to the decrease of density of the medium. The gas in the balloon expanding in proportion to the penetration of a less dense medium would escape, but in such quantity that its lifting power would always be greater than the weight of the craft and its load.

The author describes how the traveler sets the course of his flight to the moon.

The flight takes place on 19 April in Rotterdam, Holland. During the ascent the balloon does not fly in the plane of the lunar orbit, which is inclined toward the ecliptic at an angle of  $5^{\circ}4'48''$ , but in the direction  $mn$  and only then in its plane, i.e., along the line  $np$  (Figure 64).

The time for the flight is selected when the moon is in perigee (place b), i.e., when it is closest to earth. The traveler is faced with a journey of 231,920 miles, i.e., the distance between the surfaces of moon and earth in perigee.



FIGURE 65. The flight of two Frenchmen from earth to the moon in a balloon

The story further describes the arrival of the balloon on the moon and the meeting with its inhabitants.



FIGURE 66. The flight of two Frenchmen from the moon to Saturn on bats

## **Two Frenchmen journey from earth to the moon in a balloon**

Sometime around 1900 a book appeared in Paris under the title of "Voyage dans la lune avant 1900 par A. de Ville d'Avray." This was a colored picture-book for children with explanatory captions describing the humorous voyage of two Frenchmen, Baboufiche and his servant Papavouen, to the moon in a balloon, and from there on bats to Saturn. An ordinary balloon filled with gas was used for the flight; to the balloon there was attached a gondola seating the two travelers (Figure 65). In order to save themselves from lunar monsters the voyagers mount some bats and fly into space, but an oncoming comet unseats them from the bats and they fall on Saturn, whose inhabitants are reminiscent of butterflies in their development: in the beginning they crawl, like their larvae, and then fly. After sundry adventures, the travelers are attacked by flying lizards who tear them to pieces, and they in horror... awaken. The whole voyage is just a dream.

## **Descent by comet towards Mars' satellite "Phobos" and then onto Mars by balloon**

Le Faure and Graffigny, in their book "Aventures extraordinaires d'un savant russe" (1889), tell how several travelers, having fallen on a fragment of Mercury torn from it by Tuttle's comet and being carried along with the latter, decide to transfer to Mars' satellite "Phobos" when the comet flies near it. For this purpose they fill the balloon with hydrogen and attach a basket in which they sit in pressure suits (the atmosphere of the comet is composed of carbon dioxide, which is unsuitable for breathing). When the proper moment arrives, they ascend from the surface of the fragment of Mercury and are soon in the atmosphere of "Phobos" and seated on its surface, with the exception of one traveler who lost his grip when the balloon became lighter on landing and was carried off into space in the direction of Mars. The balloon, ascending high in the air, flies over the zone of attraction of "Phobos" and starts to fall on Mars. Four hundred meters from Mars' surface the balloon abruptly changes its course, and instead of pursuing a vertical direction flies in a horizontal one: it falls into a powerful air current, artificially produced by the Martians who use this method to accelerate the flight of their craft. In this current the travelers fly over the ocean of Kepler and with great difficulty land on dry land (Figure 67).

Descent from the moon by parachute is outlined by A. Laurie in his "Les exiles de la terre." A description of this will be found in the next volume of this series in connection with other artificial alterations of lunar movement.

## **Five men fly to a satellite of Mars on an air ship**

In 1744, there was published in Germany E. C. Kindermann's "Rapid Voyage of an Air Ship to the Heavens, Which Was Accomplished Recently

by Five Persons with the Aim of Learning whether on 10 July of This Year the Planet Mars Would Appear for the First Time, in all the Years of the Existence of the World, with Some Satellite or Moon."\*

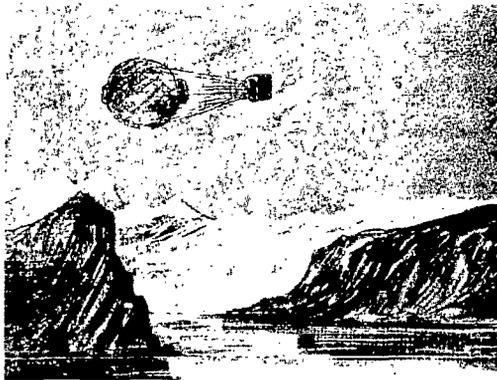


FIGURE 67. Descent of balloon on Mars

The story is about five young persons: Auditus, Visus, Odor, Gustus and Tastus (hearing, vision, odor, taste and touch), who decide to travel to a satellite of Mars. They construct an air ship to a design given to them by Fama (rumor). A description of this ship would read as follows (Figure 68): Its gondola is made of light sandalwood (1) and is propelled in the air by oars (2) and a rudder (3). For this same purpose there is a sail (4). At the stern of the ship there is a curtain (5) to protect the passengers from the burning rays of the sun. The supporting and lifting force come from six light metallic balloons (6), from which air is removed by heating, the lower apertures of which balloons are closed by cocks. The bracing wire (7) reinforces the mast and sail, and cables fasten the gondola to the balloons.

Laying in supplies of water and food, and of mushrooms soaked in water, which must be held to the nose for breathing at high altitudes, they leave the earth accompanied by winged Fama (rumor).

In Figure 68 there is depicted the flight. Below, we see the earth on which the people stand to see them off. During the ascent they run into a storm with thunder and lightning, later they see the lunar crescent (left) and the planet Venus (right). Beneath the ship winged Fama with a megaphone can be seen. En route they meet a "resilient body" resembling a man — an inhabitant of celestial worlds who can move in celestial space at a speed of 1 million miles an instant.

Later they land safely on a satellite of Mars (above left hand corner, small circle), live there for a time, become acquainted with its inhabitants and, finally, return to earth in the same manner.

\* Eberhard Christian Kindermann "Die Geschwinde Reise auf dem Luft-Schiff nach der obern Welt, welche jüngsthin fünf Personen angestellt, um zu erfahren, ob es eine Wahrheit sey, dass der Planet Mars den 10. Juli dieses Jahrs das erste mahl, so lange die Welt stehet, mit einem Trabanten oder Mond erschienen"? Der untern Welt zu curieuseur Gemüths-Ergötzung und Versicherung dieser Begebenheit mitgetheilet durch die allgemeine Fama. 1744.

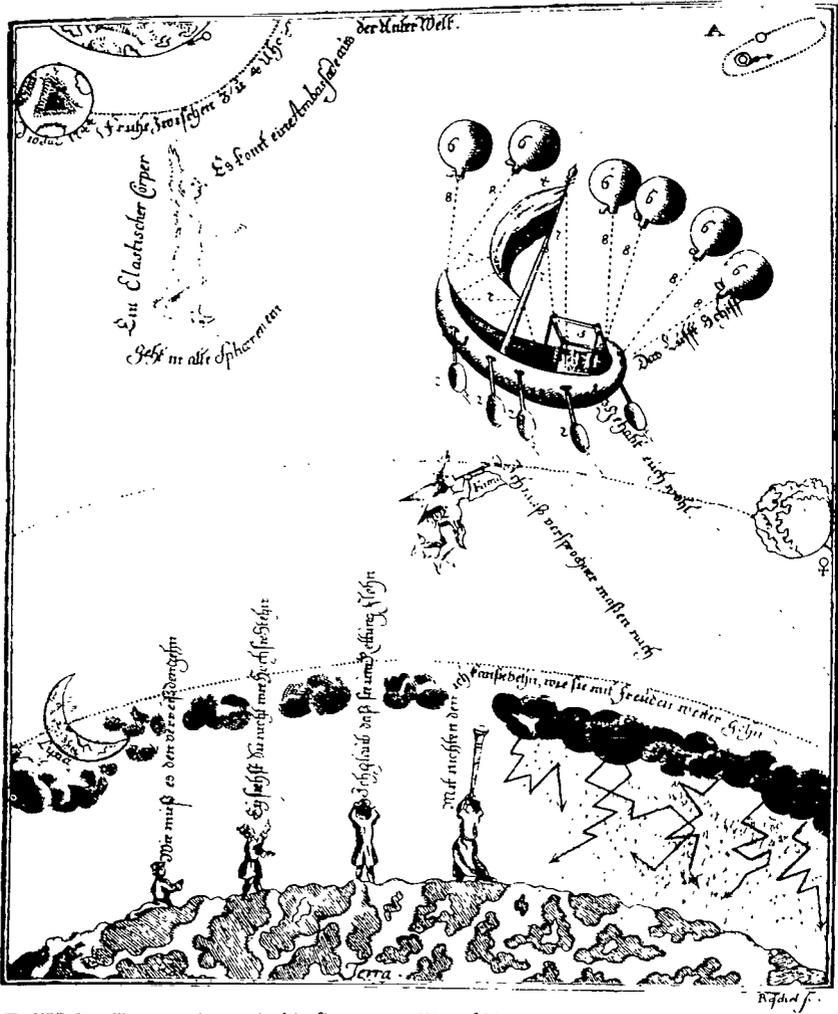


FIG-URE 68. Five men in an air ship fly to a satellite of Mars

A point of interest in this description is the principle of flying in balloons from which the air is pumped out. This principle is in essence correct and could be applied to flights in the atmosphere (but not outer space) if a balloon whose weight was less than its lifting force could be constructed.

**Egor Poddevkin flies to the moon in a plane**

Nikolai Ryazanov, in his book "The Adventure of Egor Poddevkin in an Airplane"\* (Kharkov, No. 1, 1924 p. 13), describes the imaginary plane flight of his hero to the moon:

\* "Priklyuchenie Egora Poddevkina na samolete."

"Poddevkin flew and flew, higher and higher... looked down below: somehow the earth had become smaller, something like a saucer. Egor glanced at the instrument registering how many versts [1 verst = 3,500 ft] the plane had already climbed from earth. He gasped: 300,000 versts!

'That's great,' he thought to himself, 'at this rate I should now be on the moon...'

"And in truth, no sooner had he given voice to his thoughts than the plane suddenly bumped into something soft..."

"On the moon Poddevkin found only one old man and after a conversation with him, started back:

"In five minutes Egor Poddevkin was being borne through the black sky (from the moon the sky is not blue, as we see it, but black, as at night). As he approached the earth, he was filled with joy: once again he could smell the fields and the damp sea air."

### The Lyakide ornithopter for flight to the planets

A. G. Lyakide, in his "In the Ocean of the Stars"\* (Astronomicheskaya Odisseya, 1892), describes the voyage of two Russian scientists from St. Petersburg to the different planets of the solar system in a craft built by one of them in the form of an ornithopter. Its construction consisted of the following: (Figures 69 and 70). The passenger compartment is in the form of a flattened hexagon. 

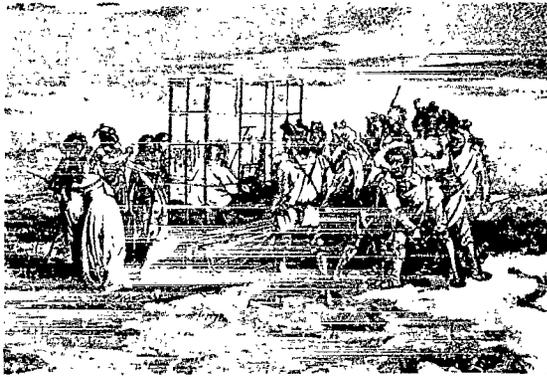


FIGURE 69. Lyakide's ornithopter on Venus

Inside there is a soft armchair; in front of the armchair is a control lever operating through a mechanism hidden in a box. Along the sides of the compartment huge wings, which are brought into movement by the above-mentioned mechanism, are fastened. The outer shape of the device is that of a bird. The wings are of slender, flexible iron rods covered with leather. On the ground the bird can be rolled about on wheels. The wings spread, and fold against the compartment, like a bird. To ascend, the mechanism

\* "V okeane zvezd."

brings the wings into a flapping movement and the bird arises, easily maneuvers in the air, and then returns to the starting point. In this vehicle the passengers fly to the planets. To protect themselves from the cold of interplanetary space, they set up a glass booth in the compartment with a stove inside and for breathing they condense air in a special reservoir. For landing on the moon where it is cold and there is no air, they don rubber suits containing a supply of warmth and air. These suits have been treated chemically to prevent heat and cold from penetrating. The supply or charge of the mechanism operates for seven days. The bird possesses complete stability and the passengers are able to move about freely.



FIGURE 70. Lyakide's ornithopter on Mercury

Conclusions on Lyakide's design: the idea of an ornithopter is indeed in principle a correct one, that is, there is nothing inconceivable about the building of a machine with flapping wings for flight in the air, but only in the air and not in interplanetary space where there would be no point of support for wings and where Lyakide's bird would be unable to fly. His devices for protecting the passengers from cold and heat, and for renewing the air, are naive and not well-founded. In general, the project is not very instructive.

### Ornithopter of the Martians

The writer Aleksei Tolstoi in his novel "Aelita" (1923) describes the construction of a portable aircraft which the Martians use.

"A remarkable creature described a circle in the indigo-blue sky. Gradually the huge bird descended. One could see clearly the human-like

being sitting in the seat of the flying machine. From the waist down the rider was suspended in the air; two curved wings flapped at the level of his shoulders. Beneath him, to the front, there whirled a dark disk— obviously the propeller. Behind the seat there was a tail with rudders spread out like a fork. The whole apparatus was as mobile and flexible as a living being. The Martian flapped his wings, descended, skimmed over the earth, and jumped from his seat."

In order to ascend, he jumped into his seat and flew off without taking a run.

### **Munchausen flies to the moon**

Baron Munchausen, hero of the imaginative tales by R. Raspe, describes two of his journeys to the moon:

#### **First journey**

Seeing how two bears had fallen on one bee in order to seize its honey — he relates — I threw a hatchet I had with me at them but the aim was so clumsy that it flew on the moon. What to do! How could I recover it? I remembered that kidney beans grow uncommonly fast and reach amazing heights. I quickly sat myself on one of the beans. It began to grow and grew and grew, higher and higher, and soon hooked onto one of the horns of the moon. It only remained for me to scramble up the stem to the moon which I did, arriving safely; but it was not so easy to find the hatchet. Finally I located it in a clump of straw.

Now it became necessary to return home — but to my dismay the sun's burning rays had so dried my stem that to return the way I had come meant I would break my neck. What to do! I wove for myself a rope out of the straw. One end of this straw rope I tied to the moon and let myself down to the other end. Here I firmly grasped it with my left hand and with my hatchet in my right hand I cut off the end of the rope and tied it to the lower end (Figure 71).

I repeated this many times and soon found myself so low that I could make out the place from which I had ascended. I was already four or five miles from the earth when the rope broke; I fell to the ground with such a terrible force that I was stunned and found myself in a hole at least 9 sagues [19 meters] deep, which had been torn up by my body falling from above. However, I climbed to the surface, although with difficulty.

#### **Second journey**

Later I made a second journey to the moon, one that was much more pleasant.

I was on an ocean voyage. Suddenly a hurricane lifted our ship at least a thousand miles above the surface of the water (Figure 72) and carried us forward with enormous speed; finally, we discerned in the sky a huge territory, bright and firm, like a glittering island; floating into a convenient port, we went ashore and were soon convinced that the country was inhabited. Its inhabitants flew in the air on kites of immense dimensions with three heads. Here we learned that the Emperor of the Moon was battling against the Sun. We also saw several inhabitants of Sirius on the moon. Their faces resembled the face of a huge dog and their eyes sat at the lower edge

of the nose or at its tip. They had no eyelids and when they went to sleep they closed their eyes with the tip of their tongue. Their average height was 20 feet. The dwellers of the moon reach a height of 36 feet. To eat they open up a hole in their sides and place the food directly into the stomach. Animals and people on the moon are born on trees. They keep their heads under their arms, etc.

(Compare this description with the flight of Lucianus on a sandstorm, p. 29.)



FIGURE 71. Baron Munchausen descends from the moon

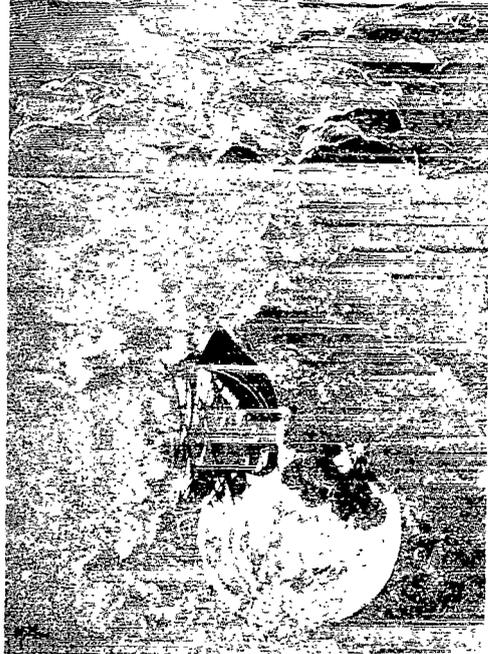


FIGURE 72. The flight of Baron Munchausen in the ship from earth to the moon

Epigraph

Let us fly away by the will  
Of all-sustaining eternal powers  
And seek our destiny  
In the world of whirling stars.

N.Morozov  
"Zvezdnye pesni," Book 2, p.99

*Chapter IX*

*TECHNICAL DESIGN*

In the following technical designs the authors offer a more serious description of the technical aspects of flying in outer space, which impels the reader to be persuaded of their absurdity.

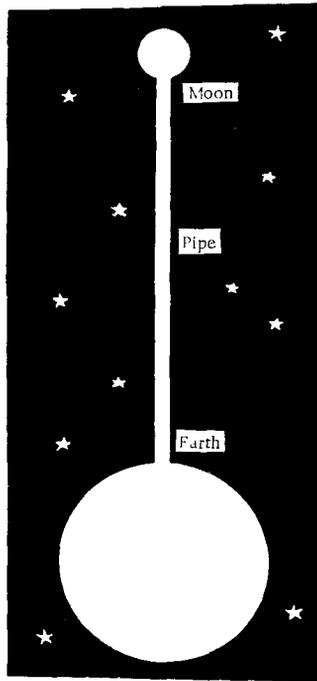


FIGURE 73. Connecting the earth with the moon by a pipe

## Connecting the earth with the moon by a pipe

The French writer André Laurie, in his novel "Les exiles de la terre," describes one of his designs to set up communications with the moon, which is presented to members of the "Lunar Company." This design proposes the construction of an iron pipe which would reach from the earth to the moon (Figure 73). The author himself scoffs at this design. The realization of such a project would take 3,600,000 years, not to mention the impossibility of building such a pipe and the need to change its length due to the variable distance of the moon from earth. Besides this, insuperable difficulties would arise in working in the midst of interplanetary space with its cold and absence of air. Instead of this, the author proposes another project, described in the next book of this series (bringing the moon close to the earth with a magnet).

In 1775, M. D. L. Folie de Rouen tells, in his "Le philosophe sans prétention ou l'homme rare," how Scintilla, an inhabitant of Mercury, flies from his planet to earth in a craft which the author explains (Figure 74). Electricity serves as its propulsive force.



FIGURE 74. Arrival of Scintilla on earth from Mercury in an electrical ship

Above the machine two glass globes are located. Its wooden columns are covered with glass. Between the columns there are springs. In order to ascend, the globes must be brought into rotary motion, which creates rarefaction of the atmosphere above. Under the machine there flow streams of light. The rapidity of ascent is regulated by the speed of globe rotation.

## Swift's magnetic craft

The Irish writer Jonathan Swift, in his satire "Gulliver's Travels – an Account of the Four Voyages into Several Remote Nations of the World," describes in the part entitled "A Voyage to Laputa" an island that flies in the air, rising and falling by means of a magnet located on the island.

The description of the magnet, the manner of its support, the mechanics of flight and the details of ascent, descent and various movements in the air are as ingenious as they are amusing. The explanation of the system of progressive motion, which Gulliver delivers in strictly scientific language accompanied by a lettered diagram, endows the tale with the significance of mathematical proof, the aim of which obviously is to stiffen its biting irony.



FIGURE 75. Swift's flying island

Here is how Swift, through the mouth of Gulliver, tells of meeting the flying island, and of its working principles:

"I turned back and perceived a vast Opaque Body, moving forwards towards the Island: It seemed to be about two Miles high. . . As it approached nearer over the Place where I was, it appeared to be a firm Substance, the Bottom flat, smooth and shining very bright from the Reflexion of the Sea below. . . I took out my Pocket-Perspective and could plainly discover Numbers of People moving up and down the Sides of it. . .

"Yet soon after it advanced nearer; and I could see the Sides of it, encompassed with several Gradations of Galleries and Stairs. . .

". . . and in less than Half an Hour. . . the flying Island being raised to a convenient Height, the Verge directly over me, a Chain was let down from the lowest Gallery, with a Seat fastened to the Bottom, to which I fixed myself, and was drawn up by the Pullies."

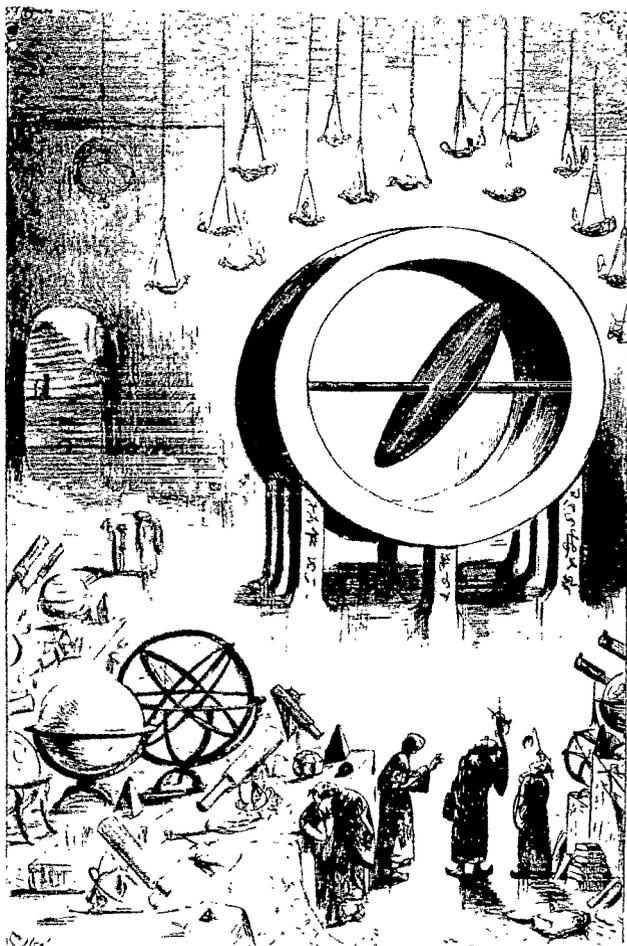


FIGURE 76. Load-stone of Swift's flying island

Gulliver goes on to describe the island (Figure 75):

"The flying or floating Island is exactly circular; its Diameter 7837 Yards or about four Miles and a Half, and consequently contains ten thousand acres. It is three Hundred Yards thick. Above it lye the several Minerals in their usual Order; and over all is a Coat of rich Mould. . .

"At the Center of the Island there is a Chasm about fifty Yards in diameter, from whence the Astronomers descend into a large Dome, which is therefore called Flandona Cagnole or Astronomers Cave; situated at the Depth of an Hundred Yards beneath the upper Surface of the Adamant. In this Cave are Twenty Lamps continually burning, which from the Reflection of the Adamant cast a strong Light into every Part. The Place is stored with great Variety of Sextants, Quadrants, Telescopes, Astrolabes, and other Astronomical Instruments. But the greatest Curiosity, upon which the Fate of the Island depends, is a Load-stone of a prodigious Size, in Shape resembling a Weaver's Shuttle. It is in Length six yards, and in the thickest Part at least three Yards over. This Magnet is sustained by a very strong Axle of Adamant, passing through its Middle, upon which it plays and is poised so exactly that the weakest Hand can turn it. It is hooped round with an hollow Cylinder of Adamant, four Foot deep, as many thick and twelve Yards in Diameter, placed horizontally, and supported by Eight Adamantine Feet, each Six Yards high. In the Middle of the Concave Side there is a Groove Twelve Inches deep, in which the Extremities of the Axle are lodged, and turned round as there is Occasion.

"This Stone cannot be moved from its Place by any Force, because the Hoop and its Feet are one continued Piece with that Body of Adamant which constitutes the Bottom of the Island.

"By means of this Load-stone the Island is made to rise and fall, and move from one Place to another. For, with respect to that Part of the Earth over which the Monarch presides, the Stone is endued at one of its Sides with an attractive Power, and at the other with a repulsive. Upon placing the Magnet erect with its attracting End towards the Earth, the Island descends; but when the repelling Extremity points downwards, the Island mounts directly upwards. When the Position of the Stone is oblique, the Motion of the Island is so too. For in this Magnet the Forces always act in Lines parallel to its Direction.

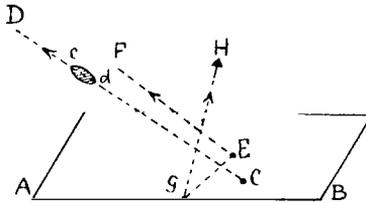


FIGURE 77. The theory of flight of Swift's island

"By this oblique Motion the Island is conveyed to different Parts of the Monarch's Dominions. To explain the Manner of its Progress, let (Figure 77) AB represent a line drawn across the Dominions of Balnibarbi; let the Line cd represent the Load-stone, of which let d be the repelling End, and c

the attracting End, the Island being over C; let the Stone be placed in the Position cd with its repelling End downwards; then the Island will be driven upwards obliquely towards D. When it is arrived at D, let the Stone be turned upon its Axle till its attracting End points towards E, and then the Island will be carried obliquely towards E; where if the Stone be again turned upon its Axle till it stands in the Position EF, with its repelling point downwards, the Island will rise obliquely towards F, where by directing the attracting End towards G, the Island may be carried to G, and from G to H, by turning the Stone, so as to make its repelling Extremity point directly downwards. And thus by changing the situation of the Stone as often as there is Occasion, the Island is made to rise and fall by Turns in an oblique Direction; and by those alternate Risings and Fallings (the Obliquity being not considerable) is conveyed from one Part of the Dominions to the other.

"When the Stone is put parallel to the Plane of the Horizon, the Island standeth still; for in that Case, the Extremities of it being at equal Distance from the Earth, act with equal Force, the one in drawing downwards, the other in pushing upwards; and consequently no Motion can ensue."

#### Design of an interplanetary vehicle based on the movement of heavy masses and reaction of the surroundings

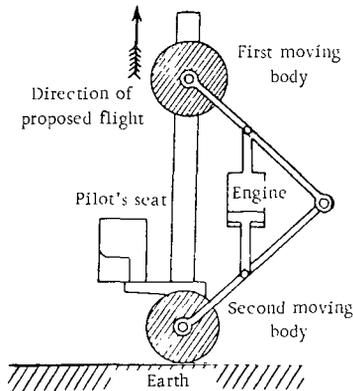


FIGURE 78. Flight with the help of movement of masses

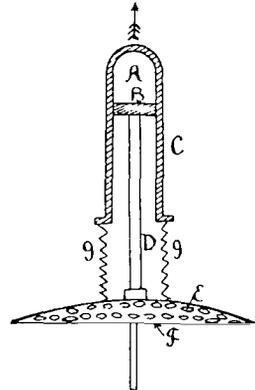


FIGURE 79. Tatarinov's flying machine

In this design (Figure 78) the device is composed of two heavy spherical masses. One is the lower and is fixed, with a mast attached to it. The second is the upper, which with the help of the engine can slide up rapidly and descend slowly. The difference in kinetic energies provides, as a result, the tractive force directed upward. However, not to speak of a machine of this kind contradicting Newton's law of the equality of action and reaction,

even if this vehicle succeeded in getting off the ground, if it chanced upon a place where the force of the earth's attraction was zero, it would remain there, since the center of gravity of the vehicle could not be moved, no matter how its masses were to be arranged in it.

In order for the vehicle to be raised, it is necessary that while the engine is working the lower body have some support that is independent of the vehicle, for example, on the ground or in the surrounding medium, but in such an event the vehicle would not be suitable for flying outside the earth's atmosphere.

It is on this principle that V. V. Tatarinov's flying machine was built (Figure 79). The idea consists of the following: the machine is composed of two parts: the light but large area of parachute F, and the heavy but small area of cylinder C. In cylinder C moves piston B with rod D which rests on parachute F. The cylinder and parachute are joined by the taut springs G. In order to ascend on such a vehicle (in the direction of the arrow), an explosion occurs in A; since the reaction of the air during movement of the parachute downward is very great in comparison with reaction of the air during movement of the cylinder upward, the parachute would appear to become similar to the immobile lower body of the previous design. Body C, ascending after the explosion, draws near parachute F shifting it slowly slightly upward. Repeating explosion after explosion we obtain a shifting of the vehicle upward. To render movement of the parachute downward difficult and to ease its movement upward, the automatic valves E which open and let air through during movement upward and close during movement downward, are installed. In addition, the parachute itself, following along these lines, is convex above and concave below.

The movement of such a vehicle is, of course, possible only in a comparatively dense medium, and consequently is unsuitable for interplanetary flights.

### **Interplanetary vehicle for communications between Mars and its satellite Phobos**

The French writers Le Faure and Graffigny, in their "Aventures extraordinaires d'un savant russe" (1899), describe a vehicle on which the inhabitants of Mars maintain communication with their satellites. Since (in the opinion of the authors) there is an atmosphere between these planets, and from Mars it is possible to create an artificial stream of air to any of its satellites, the vehicle is constructed on the heavier-than-air principle and is driven by a propeller (Figure 80).

There are two parts to the craft: a gondola for passengers below and an engine above. The engine consists of a huge metal cylinder with a conical front; it is around 160m long and 12m in diameter. A pipe leads along the entire length of the cylinder and inside the pipe there is the axis around which the cylinder rotates; it is driven by strong electrical machines that are located in the gondola; powerful propellers, 25m in diameter, with a pitch of 50m, perform 5 rps and provide the ship with a speed of 700 km/hr.

## Jet engine for a flight from Mars to Jupiter and Saturn

In this same work there is given a description of a vehicle in which travelers fly from Mars to Jupiter (Figure 81). The vehicle is a metal cylinder around 7 m long and 5 m in diameter. Inside the cylinder along its axis there runs a pipe up to  $1\frac{1}{2}$  m in diameter; the front has a conical-shaped tip and the back gradually widens. In the middle there rotates an Archimedean screw driven by electricity. The principle of flight is as follows: the travelers wait until Mars has fallen into the region of falling stars — into the stream of asteroids and asteroidal masses borne in outer space. After ascending and entering this mass, the passengers rotate the screw. The screw sucks the mass in at the front and expels it at the back, through which a jet action is obtained.

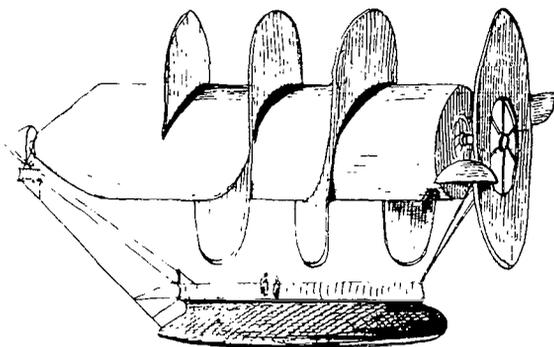


FIGURE 80. Le Faure's and Craffigny's ship for a flight from Mars to Phobos

The space between the outer wall and the pipe is divided by two partitions, vertical and horizontal, into four chambers: two upper and two lower. Three of these chambers serve as cabins for the passengers and the fourth to house the mechanisms and supplies. In addition there is a small compartment near the propeller for the pilot. A six months' supply for the electric accumulators and for food and respiration is taken on board.

On such a vehicle the travelers fly to Jupiter in the asteroidal stream, and flying just short of the planet emerge from the stream and are carried in a vacuum until they enter the atmosphere of Jupiter. This atmosphere proves to be so dense that the vehicle floats in it like a balloon and then, finally, finds itself in a hurricane, which carries the vehicle with such a speed that the passengers can be carried on further and develop such a centrifugal force as to plunge them back into the asteroidal stream, without having had to land on the inhospitable surface of Jupiter, covered with fire-spitting volcanoes and geysers. The vehicle flies on to Saturn and then moored to a fragment of Tuttle's comet, they fly to earth.

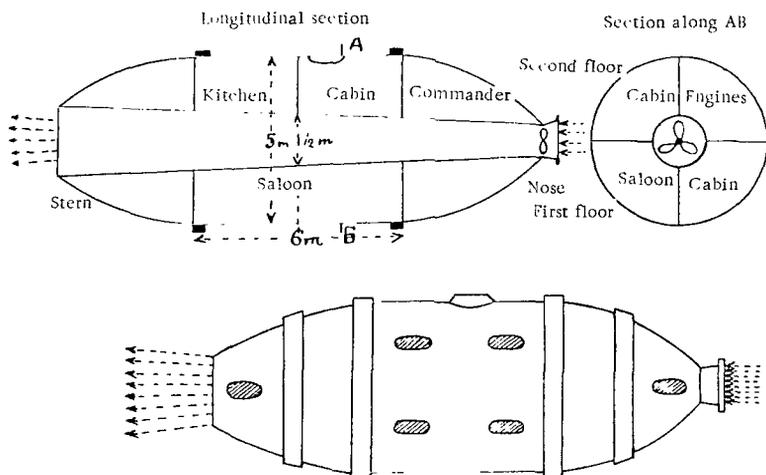


FIGURE 81. Faure and Graffigny's vehicle for the flight from Mars to Jupiter

#### N. MOROZOV'S INTERPLANETARY SHIP

N. A. Morozov, in his book "At the Border of the Unknown" (1910),\* narrates of an imaginary flight in outer space taken by himself and some of his fellow-prisoners from the Shlisselburg Fortress; their vehicle is somewhat like the above-described vehicle of Graffigny. The flight, in general, took place as follows:

"With unimaginable speed we flew higher and higher under the influence of the powerful cylinders of our flying ship, driving through the ether, and impelled by this, like the movement of turbines, our ship soared far away from earth in an accelerated manner. . . ."

Morozov's companion (Polivanov) tries to sketch the perspective of the pale green sickle of the far-away earth, radiant against the background of the constellations of Orion and Gemini, shining wonderfully in one of the huge crystal windows in spite of the bright sunlight entering in slanting streams at the opposite window of the ship.

"And time passed on. The ship rapidly approached the surface of the moon. With each moment its pale disk, half illuminated by the sun, half submerged in the deep night, emerged more distinctly. Soon it became necessary to reverse the action of the engine in order to counteract gradually the increased force of gravitation toward the moon. We were no longer flying about the compartment but were slowly falling on its former ceiling, now the floor of our compartment. The time had arrived to reverse the ship, stern to the moon."

\* This fantasy [see p.83] appeared first in manuscript form (1891) and only later was it published.

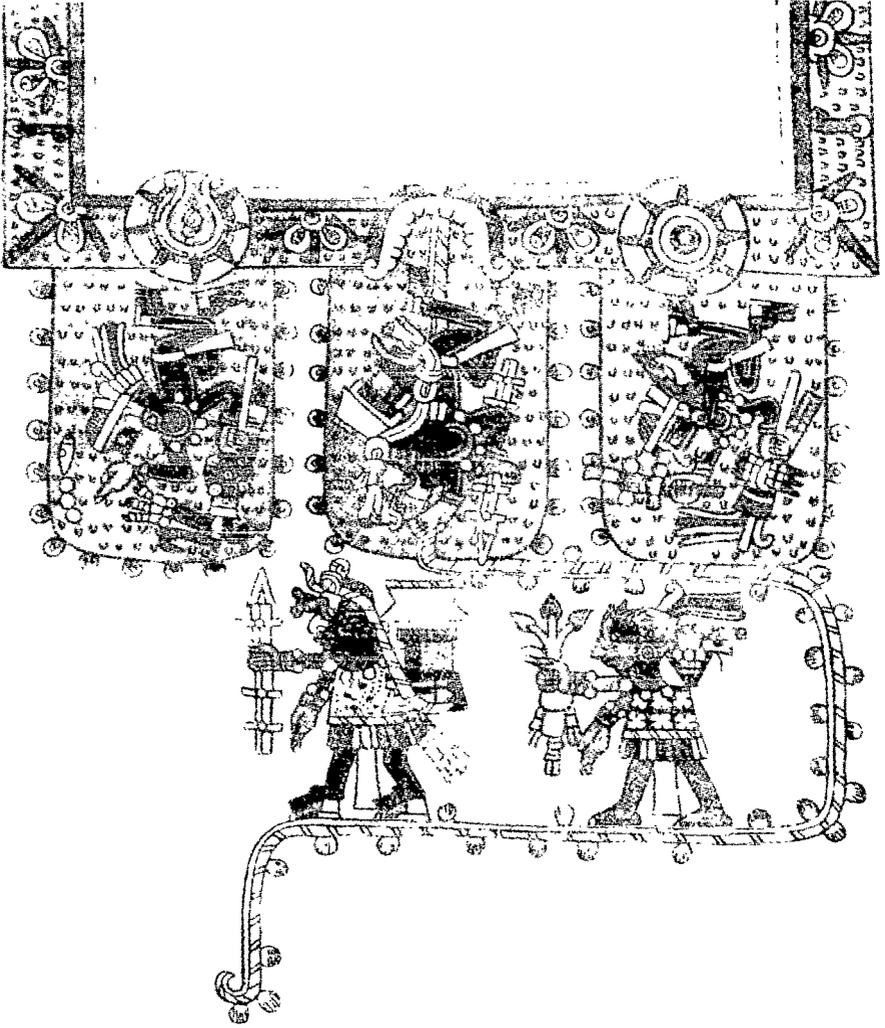


FIGURE 82. The gods of the Mayas (Mexico) descend to earth from the sky on a spider's web (p.22)  
(the small circles are stars)

Further, the author describes his impressions of the flight and the return to earth:

"Everything passed successfully. It was only towards the end of the journey that we nearly broke our limbs from the unexpected jolt we received on entering the earth's atmosphere, through not allowing for the fact that the latter quickly moves from west to east as the result of the rotary movement of the earth. This movement of air, in spite of its rarefaction and altitude, thrust our ship so rapidly to one side that we were thrown down, but suffered no ill effects. . ."

## CONCLUSION

The ideas and fantasies in the preceding account are legendary, mythical, satirical (Voltaire, Swift), and often religious. Those based on scientific or technical knowledge are comparatively few. Of the latter Cyrano de Bergerac's schemes must be singled out, notably his flights aided by rockets and also under the influence of lunar attraction.

It is interesting to note the repetition of the idea of flight by the later writers, influenced obviously by the earlier ones. For example, the idea of a magnet described by Swift (p. 105), is clearly inspired by the work of Cyrano de Bergerac (p. 43); this is also repeated by Laurie (p. 104). Tolstoi's ornithopter (p. 100) is similar to Lyakide's (p. 99). Descriptions of flights on comets and navigation between planets by balloons (p. 93) are also repeated. In particular flights on horses (p. 53) and birds (p. 30) are widespread. Most often one finds flights of man's soul or his astral body.

At the dawn of civilization, when the understanding of topography and perspective vision were unknown to man, people seeing the sun, moon or stars behind the trees and the rooftops of their homes thought that these celestial bodies were actually close to those objects and that all that was necessary was to climb on top of the trees and the rooftops in order to reach the celestial lights.

For such methods of reaching them and describing them in legends, epics and fairy tales, see Kalevala (p. 23), the story of the cat (p. 24), the night before Christmas, etc. As knowledge on topography and perspective increased and observations of the stars became more widely developed, man began to realize that the stars were far more remote from earth. Tales of flights to these bodies on birds, magic horses, wings, etc. appeared. Then followed the idea of building flying machines, at first balloons and planes, and finally, rockets, electric craft, missiles, etc.

In the next book of this series, "Mezhplanetnye soobshcheniya v sovremennykh romanakh" (Interplanetary Communication in Modern Novels) we present descriptions of flights on cosmic ships as modern writers, under the influence of scientific and technical developments, conceive of them.

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