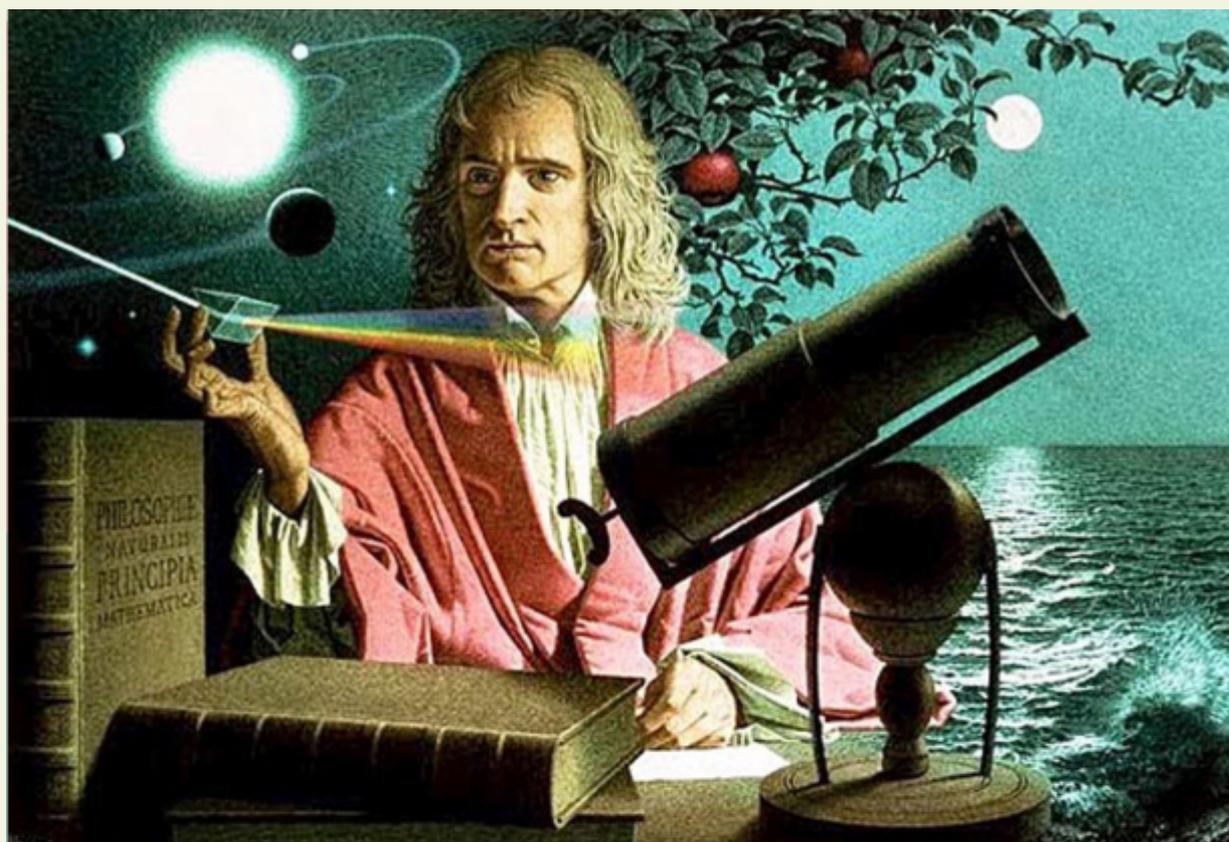


OUTSTANDING SCIENTISTS AND INVENTORS IN PHYSICS

Содержание



OUTSTANDING SCIENTISTS AND INVENTORS IN PHYSICS

*Выдающиеся ученые
и изобретатели в области физики*

Об издании

Основной титульный экран

Дополнительный титульный экран неперидического издания – 1

Дополнительный титульный экран неперидического издания – 2

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«Алтайский государственный педагогический университет»

OUTSTANDING SCIENTISTS AND INVENTORS IN PHYSICS

Выдающиеся ученые и изобретатели в области физики

Учебно-методическое пособие

Барнаул
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Учебно-методическое пособие «Outstanding scientists and inventors in physics» предназначено для студентов 2–3 курсов неязыковых высших учебных заведений по направлению подготовки «Физика» и направлено на обучение практическому владению языком специальности для его активного применения в профессиональной деятельности. Пособие содержит разнообразный материал, касающийся работы, открытий и изобретений выдающихся английских и американских ученых-физиков.

Пособие разработано с учетом грамматического и лексического материала, изучаемого в курсе английского языка в неязыковых высших учебных заведениях, составлено в соответствии с требованиями программы обучения иностранному языку в неязыковом вузе и имеет ярко выраженную профессиональную направленность.

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Предисловие

Пособие адресовано студентам 2–3 курсов неязыковых высших учебных заведений, обучающихся по направлению подготовки «Физика».

Цель пособия – формирование у студентов умений и навыков работы с частично адаптированными аутентичными текстами, описывающими жизнь и профессиональную деятельность наиболее выдающихся британских и американских ученых-физиков, а также развитие у студентов навыков устного общения в рамках языка специальности.

Пособие состоит из пяти уроков, включающих следующие разделы: Pre-reading activity, Reading, Vocabulary, Comprehension, Grammar, Speaking. Основой каждого урока является базовый текст, представляющий жизнеописание известных английских и американских физиков, их открытия и изобретения. Структурное построение каждого урока максимально способствует активизации различных видов речевой деятельности. Система разнообразных упражнений направлена на усвоение специфики работы с аутентичным иностранным текстом, расширение словарного запаса профессионально-ориентированной лексики, закрепление и активизацию грамматического материала, а также навыков устной речи.

Кроме того, содержащийся в конце каждого урока дополнительный материал, имеющий коммуникативно-речевую направленность и представленный в виде интересных фактов из жизни ученых-физиков, их знаменитых цитат, смешных рассказов и загадок, также способствует развитию у обучающихся навыков устной речи и повышает у них интерес к изучению английского языка.

Предлагаемое пособие разработано с учетом грамматического и лексического материала, изучаемого в курсе английского языка в неязыковых высших учебных заведениях, составлено в соответствии с требованиями программы обучения иностранному языку в неязыковом вузе и имеет ярко выраженную профессиональную направленность.

Unit 1. Sir Isaac Newton (1642–1727)



Pre-reading activity:

1. You are going to read about life and work of the famous English physicist and mathematician Sir Isaac Newton. Before you read the text answer the following questions:

- What do you know about Newton's life?
- What is he famous for? What discoveries did he make?
- What fields of science did he work in?

2. Read and pay attention to the correct pronunciation of the following words:

Woolthorp	['wuləʊ:p]	philosophy	[fi'lɒsəfi]
Graham	['greɪəm]	inertia	[ɪ'nɜ:ʃiə]
influential	[,ɪnflu'ɛnʃ(ə)nl]	acceleration	[ək'selə'reɪʃ(ə)n]
calculus	['kælkjuləs]	scholar	['skɒlə]
mathematics	[,mæθ(ə)'mætiks]	atheism	['eɪθiɪz(ə)m]
optics	['ɒptiks]	insomnia	[ɪn'sɒmniə]
astronomy	[ə'strɒnəmi]	spectrum	['spektrəm]
plague	['pleɪg]	knight	[naɪt]

3. Read and try to guess the meaning of the following international words:

synonym, talent, mathematics, optics, physics, astronomy, fundamental, experimental,

theoretical, telescope, colleague, mass, argument, role, planet, operation, reaction, basis, concentrate.

Reading:

Part I

Isaac Newton is synonymous with apples and gravity. He became the most influential scientist of the 17th century, whose ideas became the basis for modern physics. He was born on January 4th, 1643 in Woolthorpe, Lincolnshire, England. His father was a farmer but unfortunately he died three months prior to birth of Isaac Newton. While Newton was living with his grandparents, his mother had to re-marry. At the age of thirteen, young Isaac left to attend Grammar School in Graham. His mother insisted that when he turned seventeen he would return home to look after the farm. Unfortunately, Isaac made a terrible farmer. An uncle recognized his scholarly talents and persuaded his mother to let him attend university. In 1661 Newton went to Trinity College in Cambridge where he picked interest in mathematics, optics, physics and astronomy.

During his first three years at Cambridge, Isaac was able to pay his tuition by waiting tables and cleaning rooms for faculty and wealthier students. At that time the plague was spreading across Europe and caused the university to close in the summer of 1665. Newton returned home where he spent the next two years in self-study, concentrating on astronomy, mathematics and physics. During that time he was able to carry out research on gravity and optics making more discoveries on fluxion. Thus he discovered the law of universal gravitation, began to develop a new branch of mathematics (calculus), and discovered that white light is composed of all colors of the spectrum. These findings enabled him to make fundamental contributions to mathematics, astronomy, and theoretical and experimental physics and led to the publication of his *Principia* in 1687.

Isaac Newton went back to Cambridge University in 1667 where he was given a fellow of Trinity College. A reflecting telescope made by him in 1668 made him famous in the world of science and in recognition of his contribution he was made a fellow of the Royal Society. The Society was a community of scholars brought together for the purpose of “improving natural knowledge”. Among his members were poets and architects as well as scientists and mathematicians. Unfortunately, Newton quarreled with several of the leading scientists of the time and was reluctant to publish his experiments and philosophies for long time. He was a very complex personality who was easily unhappy or moody and got entangled in a harsh argument

with his colleagues.

It was only in 1687 that he published his ideas on astronomy and physics in *Philosophiae naturalis principia mathematica*, now known as *the Principia*. In this work Newton first laid out the three universal laws of motion, Isaac Newton's Laws that would not to be improved for more than two hundred years. With the Principia, Newton became the most famous scientist in Europe and changed our view of the universe forever.

Part II

Newton's famous three laws of motion are as follows:

Newton's First Law of Motion:

An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues to stay in motion with the same speed and in the same direction unless acted by a net external force. This law is also referred to as the law of inertia.

Newton's Second Law of Motion:

The relationship between an object's mass m , its acceleration a , and the applied force F is $F = ma$. The acceleration of an object is directly proportional to the net force exerted and inversely proportional to the object's mass.

Newton's Third Law of Motion:

For every action there is an equal and opposite reaction.

Even today these three laws are the basic adage on which physics rests and the first principles that every high school physics student learns.

The Principia fell upon European scholars like a bombshell. The first edition, written and published in Latin, sold out quickly. Although the scientific community quickly acknowledged the importance of what Newton had done, wide acceptance of his arguments did not come immediately. Critics questioned how gravity worked and whether his explanation left room for divine intervention. He was even accused for promoting atheism.

Thus, Newton decided to publish a second edition in 1713 in which he attempted to placate his critics. He admitted that he never claimed to understand the nature of

gravity, but only the mathematical laws that governed its operation. Meanwhile, he appended a section on the role of God to the second edition, in which he insisted that “Gravity explains the motion of the planets, but it cannot explain who set the planets in motion. God governs all things and knows all that is or can be done.” God himself was beyond human understanding: “as a blind man has no idea of colors,” Newton wrote, “so we have no idea of the manner by which the all-wise God perceives and understands all things.”

Shortly after the complete publication of *Principia*, Newton reached the peak of his scientific career; he was prepared to take a new direction in life. In 1689, he was elected to represent Cambridge in Parliament.

In 1693, at the age of 50, Newton began a period of instability, suffering from insomnia and depression. In 1696, fully recovered from his nervous breakdown, Newton finally achieved the governmental position he had so passionately desired, he was appointed Master of the Royal Mint (the agency responsible for coining money in England), a position he would hold for the remaining twenty-eight years of his life.

In 1703, Newton was elected to the presidency of the Royal Society and was annually reelected until his death.

In 1704, he published his second major work, the *Opticks*, based on the results of his earlier studies on light.

Queen Anne knighted him in 1705, making him the first scientist to be knighted for his work and granting him the aristocratic rank he had always desired.

By the end of his life Newton was one of the most famous men in England. He had become wealthy, investing his income wisely and even contributed gifts to charity. Whether or not he was happy is another question. Newton never made friends easily and never married. He lived as the “monk of science.” His only close relationship with women was with his niece and mother.

Isaac Newton died at the age of 85 (a substantial life in those days) and was buried in Westminster Abbey.

(Adapted from the Internet sites)

<http://www.livescience.com/20296-isaac-newton.html>

<http://www.newton.ac.uk/about/isaac-newton/life>

<http://www.biography.co.in/isaac-newton-biography.html>

Vocabulary:

1. Give the Russian equivalents for the following English words and word combinations:

to persuade somebody to do something, to pay tuition, gravity, to make contribution to something, a reflecting telescope, external force, acceleration, nervous breakdown, to be knighted, to suffer from.

2. Find the English equivalents for the following Russian words and word combinations in the text:

влиятельный, чума (заболевание), проводить исследование, открыть закон, сложный характер (о человеке), божественный, обвиняться в чем-либо, страстно желать, немедленно (тотчас же), благотворительность.

3. Find the words in the text that have similar meanings to the following words and word combinations:

fundamental principle

abilities to study

self-education

to do something that helps to achieve something or make it successful

to be given membership

easily becoming unhappy or angry for no particular reason

to happen unexpectedly with a shocking effect

like a God or related to God

money or food that is given to people who are poor or ill

to have a very strong feeling of wanting something

4. Complete the following sentences with the necessary prepositions:

1. In 1696, fully recovered ... his nervous breakdown, Newton finally achieved the governmental position.

2. In 1704, he published his second major work, the *Opticks*, based ... the results of his earlier studies on light.

3. The *Principia* fell ... European scholars like a bombshell.

4. God himself was ... human understanding: “as a blind man has no idea of colors,” Newton wrote.
5. Newton’s third Law of motion states that ... every action there is an equal and opposite reaction.
6. After publishing his *Principia* Newton was even accused ... promoting atheism.
7. When Newton turned seventeen he had to return home to look ... the farm.
8. Newton went to Trinity College in Cambridge where he picked interest ... mathematics, optics, physics and astronomy.
9. At that time the plague was spreading ... Europe.
- 10.... the end of his life Newton was one of the most famous men in England.

5. *Fill in the missing adverbs from the list below:*

unfortunately, wealthy, annually, quickly, wisely, passionately, fully, immediately

1. He had become _____, investing his income _____ and even contributed gifts to charity.
2. In 1696, _____ recovered from his nervous breakdown, Newton finally achieved the governmental position he had so _____ desired.
3. In 1703, Newton was elected to the presidency of the Royal Society and was _____ reelected until his death.
4. Although the scientific community _____ acknowledged the importance of what Newton had done, wide acceptance of his arguments did not come _____.
5. _____, Isaac made a terrible farmer.

6. *Read and translate the following phrasal verbs, consult the dictionary if necessary. Find in the text and translate the sentences containing these verbs:*

to look after, to carry out, to bring together, to lay out, to sell out.

7. Fill in the table with the missing words according to the required part of speech:
M o d e l: observe – observation – observational

verb	noun	adjective
examine		examinational
	description	
		compositional
represent		
		educational
	exception	
inform		

Comprehension:

1. Make a time line of the most essential dates and events in Newton's life.
2. Speak about Newton's famous book *Principia*.
3. Mark the statements as true or false. Explain your choice:
 1. For many people Isaac Newton is associated with apples and direct currents.
 2. After finishing Grammar school Newton showed himself a perfect farmer.
 3. Newton always helped his father with farming.
 4. During his studying at Cambridge Newton was given scholarship.
 5. Newton took a great interest in mathematics, optics, physics and astronomy.

6. He was a very easy-going and open personality.
7. Newton was elected to the presidency of the Royal Society no long before his death.
8. Newton's first law of motion deals with inertia.
9. He had become wealthy, investing his income wisely but never contributed gifts to charity.
10. Influenza caused the university where Newton studied to close in the summer of 1665.

4. Answer the following questions:

1. What is Newton synonymous with?
2. Who persuaded Newton's mother to let him attend university?
3. Why did university of Cambridge have to close in the summer of 1665?
4. What did Newton do in order to pay his tuition?
5. What was Newton busy with during his two year's self-study at home?
6. What was the first invention that made him famous in the world of science?
7. Why was Newton reluctant to publish his experiments and philosophies for long time?
8. Why did Newton decide to publish a second edition of *Principia* in 1713?
9. What was Newton's second major book about?
10. Where was Newton buried?

Grammar:

1. Transform the sentences into Passive making the necessary changes:

Model: Newton's uncle recognized his scholarly talents – Newton's scholarly talents were recognized by his uncle.

1. Newton's uncle persuaded his mother to let him attend university.
 2. Newton carried out research on gravity and optics.
 3. All colors of the spectrum compose white light.
 4. In 1687 Newton published his ideas on astronomy and physics in book now known as *the Principia*.
 5. Newton wrote and published the first edition of the Principia in Latin.
 6. Newton invested his income wisely and even contributed gifts to the charity.
 7. In 1705 Queen Anne knighted Newton and granted him the aristocratic rank.
 8. In 1704 Newton published his second major work, the *Opticks*.
 9. Critics accused Newton for promoting atheism.
 10. Newton changed our view of the universe forever.
2. *Open the brackets using Past Simple, Past Perfect or Past Continuous:*
1. In 1669 Newton finally (to achieve) the governmental position he so passionately (to desire).
 2. Queen Anne (to knight) Newton in 1705 and (to grant) him the aristocratic rank he always (to desire).
 3. While Newton (to live) with his grandparents, his mother (to re-marry).
 4. At that time the plague (to spread) across Europe and (to cause) the university to close in the summer of 1665.
 5. By the end of his life Newton (to become) wealthy, investing his income wisely.
 6. During the time of self-studying at home Newton (to carry out) research on gravity and optics making more discoveries on fluxion.
 7. After Newton (to discover) his laws of gravitation and (to developed) other important laws, he (to publish) his book *Principia*.
 8. With *Principia*, Newton (to become) the most famous scientist in Europe and (to change) our view of the universe forever.

9. Newton (to be) a very complex personality.
10. After Newton (to complete) the publication of *Principia*, he (to reach) the peak of his scientific career.

3. Find the Gerund, define its function and translate the sentences into Russian:

1. Newton was even accused for promoting atheism.
2. Concentrating on astronomy, mathematics and physics was Newton's priority during his two years of self-study.
3. During his first three years at Cambridge, Isaac was able to pay his tuition by waiting tables and cleaning rooms for faculty and wealthier students.
4. The importance of discovering the laws described in *Principia* made Newton famous.
5. Investing his income wisely let Newton live a wealthy life.

Speaking:

1. *Speak about:*

Newton's family background and education

Newton's spheres of science and research activity

Newton's major discoveries

Newton's personality

2. *There are many interesting facts about Sir Isaac Newton, including facts about his religious inclination, his love for the Bible, philosophical works and his personal life. Read the following information and discuss it in class.*

One of the interesting facts was that Newton had a deep interest in Alchemy. He left a mass of manuscripts on the subjects of alchemy and chemistry, then closely

related topics. Most of these were extracts from books, bibliographies, dictionaries, and so on, but a few are original.

The discipline of alchemy can be split into three separate parts. Alchemists were responsible for a large group of technologies that included making pigments and dyes, manufacturing mineral acids and distillation of “strong waters” for drink. These and other skills were often used to provide an income for the alchemist. The second part of an alchemist’s work was to be at the forefront of early modern pharmacology with a new emphasis on mineral based drugs with a stress on the use of laboratory technologies such as distillation and sublimation for their production. The third area of study and perhaps the most mysterious one was the search for a formula for turning less precious materials such as base metals into gold, known by the Greek term “chrysopoeia”.

Newton was involved in all three sections of the discipline and devoted much time on practical experiments into the nature of matter and the possibility of changing it into different forms. He began intensive experimentation in 1669, continuing till he left Cambridge, seeking to unravel the meaning that he hoped was hidden in alchemical obscurity and mysticism. He sought understanding of the nature and structure of all matter, formed from the “solid, massy, hard, impenetrable, movable particles” that he believed God had created. Newton spent 30 years engaged in the study of the mysterious art of alchemy, or as it was more commonly known then, chemistry. In the “Queries” appended to “Optics” and in the essay “On the Nature of Acids” (1710), Newton published an incomplete theory of chemical force, concealing his exploration of the alchemists, which became known a century after his death.

Another interesting fact about Newton was a story about the falling apple.

After receiving his degree from Trinity College (at Cambridge University), Newton had to come back home. The university was closed because of the plague that affected England in 1665-1666. Home for Newton at that time was his mother’s house known as Woolsthorpe Manor, in Lincolnshire. There was a garden there with the “Flower of Kent” apple tree. One day at Woolsthorpe, as the story goes, Newton was thinking about the apples growing in his mother’s garden. He wondered why they always fell straight to the ground instead of falling in some other direction. He reasoned that there was some type of force making the apples fall as they did. Now we call this force “gravity”.

Is the apple story true? Or is it just a legend? What is its source?

London’s Royal Society, where Newton once worked, has an original manuscript which helps us answer those questions. It is William Stukeley’s 1752 Memoirs of Sir

Isaac Newton's Life. On page 15 of the manuscript we read the story about the apple incident (split into paragraphs here for easier reading):

After dinner, the weather being warm, we went into the garden, & drank tea under the shade of some apple trees, only he, & myself. Amidst other discourse, he told me, he was just in the same situation, as when formerly, the notion of gravitation came into his mind.

“Why should that apple always descend perpendicularly to the ground,” thought he to himself: “Why should it not go sideways, or upwards? but constantly to the earths centre?”

Assuredly, the reason is, that the earth draws it. There must be a drawing power in matter. & the sum of the drawing power in the matter of the earth must be in the earths centre, not in any side of the earth. Therefore, does this apple fall perpendicularly, or toward the centre. If matter thus draws matter; it must be in proportion of its quantity. Therefore the apple draws the earth, as well as the earth draws the apple.”

So, one source of the apple story comes from Newton's biographer. Is there any other source?

Newton also told the story to John Conduitt, his assistant at the Royal Mint. Married to Newton's niece, Catherine Barton, John Conduitt recalled the story:

In the year 1666 he retired again from Cambridge to his mother in Lincolnshire. Whilst he was pensively meandering in a garden it came into his thought that the power of gravity (which brought an apple from a tree to the ground) was not limited to a certain distance from Earth, but that this power must extend much further than was usually thought.

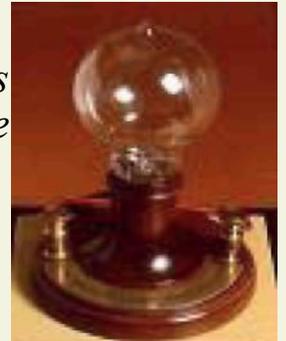
“Why not as high as the Moon,” said he to himself, “& if so, that must influence her motion & perhaps retain her orbit,” whereupon he fell a calculating what would be the effect of that supposition.

<https://www.awesomestories.com/asset/view/Isaac-Newton-and-the-Falling-Apple>

Unit 2. Thomas Alva Edison (1847-1931)

Pre-reading activity:

1. You are going to read about life and work of the famous American inventor Thomas Alva Edison. Before you read the text answer the following questions:



- What do you know about Thomas Edison's life?
- What is he famous for?
- What important inventions in the last decades of the 20th century do you know? Who made them? How did they affect people's lives?

2. Read and pay attention to the correct pronunciation of the following words:

New Jersey [ˌnjuːˈdʒɜːzi]

Ohio [əʊˈhaɪəʊ]

Michigan [ˈmɪʃɪɡən]

Detroit [dəˈtrɔɪt]

proficient [prəˈfɪʃ(ə)nt]

manufacturing [ˌmænjəˈfæktʃ(ə)rɪŋ]

efficiency [ɪˈfɪʃ(ə)nsɪ]

equipment [ɪˈkwɪpmənt]

incandescent [ˌɪnkæˈdes(ə)nt]

carbonize [ˈkɑːb(ə)naɪz]

dynamo [ˈdʌnəməʊ]

sewing [ˈseʊɪŋ]

foil [fɔɪl]

acid [ˈæsɪd]

phonograph [ˈfəʊnəgrɑːf]

gasoline [ˈgæs(ə)lɪːn]

vehicle [ˈviːkl]

buoy [bɔɪ]

vigor [ˈvɪgə]

genius [ˈdʒɪːniəs]

3. Read and try to guess the meaning of the following international words:

formal, arithmetic, technical, to operate, revolution, industry, profession, electric, telegraph, laboratory, machine, international, to demonstrate, company, electric,

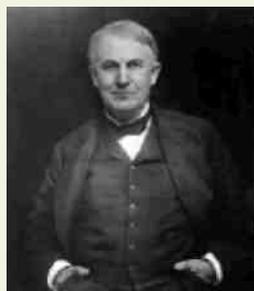
lamp, methods, automobile, philosophy.

Reading:

Part I

Thomas Alva Edison was born on February 11, 1847 in Milan, Ohio; the seventh and last child of Samuel and Nancy Edison. When Edison was seven, his family moved to Port Huron, Michigan. Edison lived here until he struck out on his own at the age of sixteen. Edison had very little formal education as a child, attending school only for three months. He was taught reading, writing, and arithmetic by his mother, but was always a very curious child and taught himself much by reading on his own.

This belief in self-improvement remained throughout life.



Edison began working at an early age, as most boys did at the time. At thirteen he took job as a newsboy, selling newspapers and candy on the local railroad that ran through Port Huron to Detroit. He spent much of his free time reading scientific and technical books, and also had opportunity at this time to learn how to operate a telegraph. By the time he was sixteen Edison was proficient enough to work as a telegrapher full time.

The development of the telegraph was the first step in the communication revolution and the telegraph industry expanded rapidly in the second half of the 19th century. This rapid growth gave Edison and others like him a chance to travel, see the country and gain experience. Edison worked in a number of cities throughout the United States before arriving in Boston in 1868 where he began to change his profession from telegrapher to inventor. He received his first patent on an electric vote recorder, a device intended for use by elected bodies such as Congress to speed the voting process. He had patented on 1,093 inventions.

Edison moved to New York City in 1869. He continued to work on inventions related to the telegraph and developed his first successful invention, an improved stock ticker called the “Universal Stock Printer”. For this and some related inventions Edison was paid \$40,000. Edison set up his first laboratory and manufacturing facility in New Jersey in 1871. During the next five years, Edison worked in Newark inventing and manufacturing devices that greatly improved the speed and efficiency of the telegraph. He also found time to get married to Mary Stilwell and start a family.

In 1876 Edison sold all his Newark manufacturing concerns and moved his family and staff of assistants to the small village of Menlo Park, 25 miles southwest of New York City. Edison established a new facility containing all the equipment so as to work on any invention. This research and development laboratory was the first of its kind anywhere; the model for later, modern facilities such as Bell Laboratories, this is sometimes considered Edison's greatest invention. Here Edison began to change the world.

The first great invention developed by Edison in Menlo Park was the tin foil phonograph. The first machine that could record and reproduce sound created a sensation and brought Edison international fame. Edison toured the country with the tin foil phonograph and was invited to the White House to demonstrate it to President Rutherford B. Hayes in April 1878.

In 1877 Edison made a recording on a little machine which he had invented and played it back to himself. Although he knew that he would hear his own words, he was astonished just the same when they were spoken back to him.

Part II

Edison next undertook his greatest challenge, the development of a practical incandescent, electric light. The idea of electric lighting was not new, and a number of people had worked on, and even developed forms of electric lighting. But up to that time, nothing had been developed that was remotely practical for home use. After one and a half year of work, success was achieved when an incandescent lamp with a filament of carbonized sewing thread burned for thirteen and a half hours. The first public demonstration of the Edison's incandescent lighting system was in December 1879, when the Menlo Park laboratory complex was electrically lighted. Edison spent the next several years creating the electric industry. In September 1882, the first commercial power station went into operation providing light and power to customers in a one square mile area; thus marking the beginning of the electric age.

The following decade was devoted to the invention and exploitation of methods for the distribution of electricity, improved dynamos and motors, and an electric railway for carrying freight and passengers. In 1885 he patented a method of transmitting telegraphic signals from moving train.

The success of his electric light brought Edison to new heights of fame and wealth, as electricity spread around the world. Edison's various electric companies continued to grow until in 1889 they were brought together to form Edison general Electric. When Edison General electric merged with its leading competitor Thompson-

Houston in 1892, Edison was dropped from the name, and the company became simply General Electric.

This period of success was marred by the death of Edison's wife Mary in 1884. Edison's involvement in the business and of the electric industry had caused Edison to spend less time in Menlo Park. After Mary's death, Edison was there even less, living instead in New York City with his three children. A year later, while vacationing at a friend's house in New England, Edison met Mina Miller and fell in love. The couple married in February 1886 and moved to West Orange, New Jersey where Edison had purchased an estate Glenmont, for his bride. Thomas Edison lived here with Mina until his death.

A few months after his marriage, Edison decided to build a new laboratory in West Orange itself, less than a mile from his home. Edison possessed the both resources and experience by this time to build the best equipped and largest laboratory. The new laboratory complex consisting of five buildings opened in November 1887. The large size of the laboratory not only allowed Edison to work on any sort of project, but also allowed him to work on as many as ten or twenty projects at once. One of the projects he was involved in was the development of a better storage battery for use in electric vehicles which he enjoyed very much. He even owned a number of different types of automobiles, powered by gasoline, electricity, and steam. Edison thought that electric propulsion was the best method of powering cars, but realized that conventional lead-acid storage batteries were inadequate for the job. Edison began to develop an alkaline battery in 1899. It proved to be Edison's most difficult project, taking ten years to develop a practical alkaline battery. By the time Edison introduced his new alkaline battery, the gasoline powered car had so improved that electric vehicles were becoming increasingly less common, being used mainly as delivery vehicles in cities. However, the Edison alkaline battery proved useful for lighting railway cars and signals, maritime buoys, and miners lamps.

On his seventy-fifth birthday Edison was asked what his philosophy of life was. He said that work was bringing out secrets of nature and applying them for the happiness of man.

He worked till the very last moment of his life. At ten o'clock on the evening of his funeral, in homage to the memory of a great man, every American switched off the electric light and for the space of one minute the entire country was in darkness.

Edison had enough genius to see the genius in others. Already by the time he moved to Menlo Park, he had gathered many of the men who would work with him for the rest of their lives. By the time Edison built his West Orange lab complex, men came from all over the US and Europe to work with the famous inventor. Often these

young “muckers”, as Edison called them, were fresh out of college or technical training. What better place to start a career? Unlike most inventors, Edison depended upon dozens of “muckers” to build and test his ideas. In return, they received “only workmen's wages”. But, the inventor said, it was “not the money they want, but the chance for their ambition to work”. An electrician Arthur Kennelly who worked with Edison stated, “The privilege which I had being with this great man for six years was the greatest inspiration of my life”.

(Adapted from Internet sites)

<http://www.edisonmuckers.org/tag/edison-test/>

<http://www.sound-physics.com/>

Vocabulary:

1. Give the Russian equivalents for the following English words and word combinations:

to strike out on one's own, self-improvement, proficient, to gain experience, to receive a patent on something, to possess both resources and experience, to bring somebody fame, to make a recording, electric railway, to be brought together, to be marred by.

2. Find the English equivalents for the following Russian words and word combinations in the text:

в раннем возрасте, работать полный рабочий день, быстрый рост, изобретение, завести семью, исследовательская лаборатория, революция в сфере связи, фонограф с валиком из фольги, век электричества, распространяться по миру, электрические приборы, вдохновение.

3. Find the words in the text that have similar meanings to the following words and word combinations:

- self-betterment
- skilled and competent
- creation
- to spread fast

- to establish
- productivity
- to show
- surprised
- to newly graduate from
- to turn off

4. Complete the following sentences with the necessary prepositions:

1. Edison was taught reading, writing, and arithmetic ... his mother.
2. The development ... the telegraph was the first step ... the communication revolution.
3. Edison worked ... a number of cities ... the United States before arriving in Boston ... 1868.
4. He had patented ... 1,093 inventions.
5. Edison set ... his first laboratory and manufacturing facility ... New Jersey in 1871.
6. In 1877 Edison made a recording ... a little machine which he had invented and played it ... to himself.
7. The first commercial power station went ... operation in September 1882.
8. The following decade was devoted ... the invention and exploitation of methods ... the distribution of electricity.
9. Edison depended ... dozens of “muckers” to build and test his ideas.
10. Edison worked ... the very last moment ... his life.

5. Fill in the missing words from the list below:

the idea, gain experience, the best equipped, self-improvement, efficiency, possessed

1. Belief in _____ remained throughout all Edison’s life.

2. The rapid growth of the telegraph industry gave Edison a chance to travel, see the country and _____.
3. Edison worked in Newark inventing and manufacturing devices that greatly improved the speed and _____ of the telegraph.
4. Edison _____ the both resources and experience by this time to build _____ and largest laboratory.
5. _____ of electric lighting was not new.

6. *Make up the nouns from the verbs using the suffixes -tion, -ment:*

Model 1: to operate – operation

Model 2: to develop – development

1. to expand, to introduce, to invent, to communicate, to demonstrate
2. to improve, to involve, to equip, to move, to establish, to astonish

7. *Read and translate the following adjective paying attention to the suffix -al:*

international, practical, formal, technical, commercial, general, conventional.

Comprehension:

1. *Make a time line of the most essential dates and events in Edison's life.*
2. *Make up a list of Edison's inventions mentioned in the text.*
3. *Mark the statements as true or false. Explain your choice:*
 1. Edison attended school till he turned sixteen.
 2. Edison's first working experience was operating a telegraph.
 3. Edison worked in a number of cities throughout the United States.
 4. Edison's electric vote recorder was intended for use by elected bodies such as Congress to record the speeches of congressmen.
 5. Edison set up his first laboratory inventing and manufacturing devices that greatly improved the speed and efficiency of the telegraph.

6. Edison failed when he undertook his greatest challenge, the development of a practical incandescent, electric light.
7. Edison's various electric companies were brought together to form Edison general Electric and this name still remained unchanged.
8. Edison didn't pay wages to his workers saying, it was "not the money they want, but the chance for their ambition to work".
9. Edison always dreamed of a good laboratory but he never had one.
10. Edison's most difficult project was to develop lead-acid storage batteries

4. Answer the following questions:

1. What kind of education did Edison get?
2. What was his first work experience?
3. What did the expansion of telegraph industry and its rapid growth give Edison?
4. How did the tin foil phonograph work?
5. How many inventions did Edison patent?
6. What was Edison's most difficult project?
7. What was the philosophy of Edison's life?
8. What happened on the evening of his funeral?
9. What people worked with the famous inventor?
10. How did Edison's inventions change people's everyday life?

Grammar:

1. Give the correct translation of the sentences paying attention to the underlined part:

1. Edison was taught reading, writing, and arithmetic by his mother.
2. For some inventions Edison was paid \$40,000.

3. Edison was invited to the White House to demonstrate his new invention to President Rutherford B. Hayes in April 1878.
 4. The whole decade was devoted to the invention and exploitation of methods for the distribution of electricity.
 5. On his seventy-fifth birthday Edison was asked what his philosophy of life was.
 6. Edison demonstrated the first incandescent lighting system in December 1879.
 7. Edison set up his first laboratory and manufacturing facility in New Jersey in 1871.
 8. He received his first patent on an electric vote recorder in 1868.
 9. In Menlo Park Edison developed the tin foil phonograph.
 10. A number of people worked on the idea of electric lighting.
2. *Open the brackets using Past Simple and Past Perfect:*
1. By the time Edison was sixteen he (to learn) how to operate a telegraph.
 2. Edison (to work) in a number of cities throughout the United States before he (to arrive) in Boston in 1868.
 3. In 1877 Edison (to make) a recording on a little machine which he (to invent) and (to play) it back to himself.
 4. The idea of electric lighting was not new, and a number of people already (to work) on it.
 5. The couple (to marry) in February 1886 and (to move) to West Orange, New Jersey where Edison earlier (to purchase) an estate Glenmont, for his bride.
 6. Before Edison (to move) to West Orange, New Jersey he (to purchase) there an estate Glenmont.
 7. Edison (to work) till the very last moment of his life.
 8. By the time he (to move) to Menlo Park, he (to gather) many of the men who would work with him for the rest of their lives.
 9. By the time Edison (to introduce) his new alkaline battery, the gasoline

powered car (to be improved) already.

10. In 1885 Edison (to patent) a method of transmitting telegraphic signals from moving train.

3. Translate the sentences paying attention to Participle I:

1. At thirteen Edison took job as a newsboy selling newspapers and candy on the local railroad.
2. Edison spent much of his free time reading scientific and technical books.
3. Edison worked in Newark inventing and manufacturing devices that greatly improved the speed and efficiency of the telegraph.
4. Edison spent the next several years creating the electric industry.
5. In September 1882, the first commercial power station went into operation providing light and power to customers in a one square mile area.

Speaking:

1. Speak about:

- Edison's family background and education
- Edison's spheres of science and research activity
- Edison's major inventions
- Edison's personality

2. Thomas Edison was famous for giving job applicants a special “practical” test he had composed. Many well-educated “college men” had great difficulty passing this test. There were originally 150 questions for the applicant to answer. Here is a very shortened version which appeared in the October 11, 2004 print edition of U.S. News & World Report. Take the test and then see the answers below.

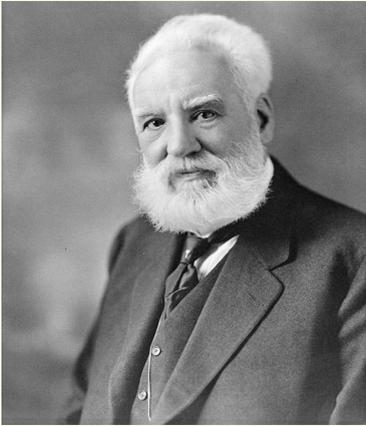
1. What city in the United States is noted for its laundry-machine making?

2. Who was Leonidas?
3. Who invented logarithms?
4. Where is Magdalena Bay?
5. What is the first line in the Aeneid?
6. What is the weight of air in a room 10 by 20 by 30 feet?
7. Who composed Il Trovatore?
8. What voltage is used in streetcars?
9. Which countries supply the most mahogany?
10. Who was the Roman Emperor when Jesus Christ was born?
11. How many cubic yards of concrete in a wall 12 by 20 by 2 feet?
12. Who assassinated president Lincoln?

Answers: 1. Newton, Iowa 2. Spartan general who died at Thermopylae 3. John Napier 4. Baja California 5. Arma virumque cano, Troiae qui primus ab oris 6. Air at 0, 075 pounds per cubic foot x 6,000 = 450 pounds 7. Giuseppe Verdi 8. 600 volts at the time 9. Brazil, Bolivia 10. Augustus 11. 17.78 cubic yards 12. John Wilkes Booth

<http://www.edisonmuckers.org/tag/edison-test/>

Unit 3. Alexander Graham Bell (1847 – 1922)



Pre-reading activity:

1. You are going to read about life and work of the famous American educator, scientist and inventor Alexander Graham Bell. Before you read the text answer the following questions:

- a. What do you know about Alexander Bell's life?
- b. What is he famous for? What did he invent?
- c. What fields of science did he work in?

2. Read and pay attention to the correct pronunciation of the following words:

elocution	[, elə'kju:ʃən]	obsession	[əb'seʃ(ə)n]
Graham	['greɪəm]	wire	[waɪə]
flour	['flaʊə]	expertise	[, ekspɜ:'ti:z], [-spə-]
wheat	[(h)wɪ:t]	suit	[s(j)u:t]
deaf	[def]	conceive	[kən'si:v]
windpipe	['wɪn(d)paɪp]	microphone	['maɪkrəfəʊn]
tuberculosis	[t(j)u:, bɜ:kjə'ləʊsɪs]	pursue	[pə'sju:]
physiology	[, fɪzɪ'ɒlədʒɪ]	entire	[ɪn'taɪə], [en-]

3. Read and try to guess the meaning of the following international words:

pianist, active, process, machine, fact, vocal, experiment, idea, electrical, container, microphone, operation, concentrate.

Reading:

Part I

Alexander Graham Bell was born March 3, 1847 in Edinburgh, Scotland in the family of Alexander Melville Bell and Eliza Grace Symonds. His father was a professor of speech and elocution at the University of Edinburgh. He also wrote books about speech and elocution which sold very well in the UK and North America. Alexander's mother, who was nearly deaf, became an accomplished pianist.

The young Alexander was home-schooled until 11. Then he attended Edinburgh's Royal High School for four years. He enjoyed science but didn't do well academically. Although his schoolwork was poor, his mind was very active. One day, he was playing at a flour mill owned by the family of a young friend. He noticed that husking the wheat grains was a very slow and boring process. He saw that it would be possible for a machine to do the work, so he built one. He was only 12 at the time. The machine Bell built was used at the mill for several years.

At the age of 16 Alexander enrolled at Western House Academy in Elgin, Scotland, where he learned Greek and Latin and also earned some money teaching elocution. He also joined his father in his work with the deaf. One interesting fact – at that time he and his brother tried to build a talking robot. They built a windpipe and a realistic looking head. When they blew air through the windpipe, the mouth could make a small number of recognizable words.

Bell continued to carry out his own research into sound and speech. He worked very hard indeed, and by the time he was 20 he was in a very poor health and returned to his family home, which was now in London. When Bell was 23 both of his younger brothers died of tuberculosis. Bell's parents were terrified that Alexander would suffer a similar fate. Bell's father had gone to Canada when he was younger and found that his poor health had improved dramatically. He decided that the family should move to Canada. So by late 1870, they were living in Brentford, Ontario. Alexander's health began to improve.

Part II

In 1871 Alexander Bell moved to Boston and opened his School of Vocal Physiology and Mechanics of Speech, where he taught deaf people to speak. Next year at the age of 26, although he didn't have a university degree, he became Professor of Vocal Physiology and Elocution at the Boston University School of Oratory.

Speech had become Bell's life: his mother had gone deaf, and his father had developed a method of teaching deaf people to speak, which Bell taught. His research into mechanizing human speech had become a relentless obsession. In Boston Bell began work on a device that would allow the telegraph transmission of several messages set to different frequencies. Between 1873 and 1874 during his experiments he became interested in the idea of transmitting the human voice over wires. He had found that human speech came in waves like patterns. He now hoped to produce an electrical wave that would follow the same patterns as someone's speech. For this purpose he hired Thomas Watson, a skilled electrical engineer, and the two created a great partnership with Bell being the idea man and Watson having the expertise to bring Bell's idea to reality.

Through 1874 and 1875, Bell and Watson worked on a voice transmitting device. On March 10, 1876 they were successful. According to the legend Bell knocked over a container of transmitting fluid and shouted, "Mr. Watson, come here. I want to see you!" The more likely explanation was Bell heard noise over the wire and called to Watson. In any case, Watson heard Bell's voice through the wire and thus, he received the first telephone call.

With this success, Alexander Graham Bell began to promote the telephone in a series of public demonstrations. At the Centennial Exhibition in Philadelphia in 1876 Bell demonstrated the telephone to the Emperor of Brazil, Dom Pedro, who exclaimed, "My God, it talks!" Other demonstrations followed, each at a greater distance than the last. The Bell Telephone Company was organized on July 9, 1877.

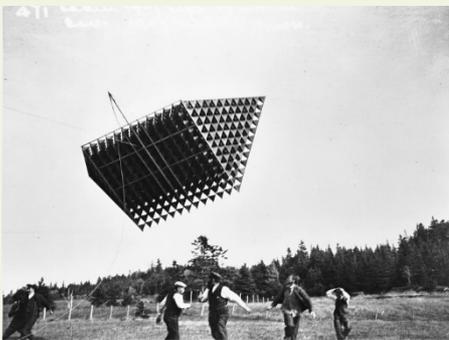
On July 11, 1877, Bell married Mable Hubbard. Over the course of the next year, they traveled to Europe demonstrating the telephone. Upon their return to the USA, Bell was summoned to Washington D.C. to defend his telephone patent from law suits by others claiming they had invented the telephone or had conceived of the idea before Bell.

Over the next 18 years, the Bell Company faced over 550 court challenges but none of them were successful. Even during these patent battles the company grew. Between 1877 and 1886 over 150,000 people in the U.S. owned telephones. Improvements were made on the device including the addition of a microphone,

invented by Thomas Edison, which eliminated the need to shout into the telephone to be heard.

By all accounts, Alexander Graham Bell was not a businessman and by 1880 began to turn business matters over to Hubbard and others so he could pursue a wide range of inventions and intellectual pursuits. In 1880 he established the Volta Laboratory, an experimental facility devoted to scientific discovery. He also continued his work with the deaf, establishing the American Association to promote teaching of speech to the deaf in 1890.

In the remaining years of his life Bell worked on a number of projects. He devoted a lot of time to exploring flight, starting with the tetrahedral kite in 1890s. A tetrahedron is a four-sided object whose sides and base are all triangles.



Tetrahedral kite

In 1907, Bell formed the Aerial Experiment Association with Glenn Curtiss and several other associates. The group developed several flying machines, including the Silver Dart. The Silver Dart was the first powered machine flown in Canada. He later worked on hydrofoils and set a world record for speed for this type of boat. A hydrofoil is a boat that has fins attached to the bottom by braces for lifting the hull clear of the water to allow faster speeds



Bell's hydrofoil

In January 1915, Bell was invited to make the first transcontinental phone call. From New York, he spoke with his former associate Thomas Watson in San Francisco. Bell died peacefully with his wife by his side in Baddeck, Nova Scotia, Canada, on August

2, 1922. The entire telephone system was shut down for one minute in tribute to his life.

(Adapted from the Internet sites)

<http://www.famousscientists.org/alexander-graham-bell/>

<http://www.biography.com/people/alexander-graham-bell-9205497>

<http://www.history.com/topics/inventions/alexander-graham-bell>

Vocabulary:

1. Give the Russian equivalents for the following English words and word combinations:

eloquence, to exclaim, a flour mill, to go deaf, to become a relentless obsession, frequency, to hire somebody, to be summoned, intellectual pursuits, to promote something.

2. Find the English equivalents for the following words and word combinations in the text:

одаренный пианист, лущить пшеничные зерна, проводить исследования, судьба, глухой, передавать человеческий голос по проводам, компетенция (знания), судебные иски, установить мировой рекорд.

3. Find the words in the text that have similar meanings to the following words and word combinations:

- articulation
- talented
- to study at home
- destiny
- to lose the ability to hear
- strong passion for something
- experienced
- to advertise something
- to exclude the need to do something
- intercontinental call

4. Complete the following sentences with the necessary prepositions:

1. Bell's father used to write books ... speech and elocution.
2. The young Alexander Bell was home-schooled ... 11.
3. One day, Alexander was playing at a flour mill owned ... the family of a young friend.
4. At the age of 11 Bell joined his father in his work ... the deaf.
5. At the age of 26 Bell became Professor of Vocal Physiology and Elocution ... the Boston University School of Oratory.
6. In Boston Bell began work ... a device that would allow the telegraph transmission of several messages set to different frequencies.
7. ... his experiments Bell became interested ... the idea of transmitting the human voice over wires.
8. ... his return to the USA, Bell was summoned to Washington D.C. to defend his telephone patent from law suits.
9. Improvements were made ... the device including the addition of a microphone.
10. Watson heard Bell's voice ... the wire and thus, he received the first telephone call.

5. *Fill in the missing adjectives from the list below:*

poor (2 times), slow, public, active, boring, relentless

- Although Bell's schoolwork was _____, his mind was very _____.
- Husking the wheat grains was a very _____ and _____ process.
- Bell's research into mechanizing human speech had become a _____ obsession.
- In 1876 Alexander Bell began to promote the telephone in a series of _____ demonstrations.
- In Canada Bell's father found that his _____ health had improved dramatically.

6. *Read and translate the following phrasal verbs, consult the dictionary if necessary. Find in the text and translate the sentences containing these verbs:*

to conceive of something, to carry out, to become interested in, to work on

something, to be devoted to something.

7. *Form adverbs from the following adjectives. Give their translation.*

dramatic, academic, complete, peaceful, intellectual, additional, significant.

Comprehension:

1. *Make a time line of the most essential dates and events in Bell's life.*

2. *Speak about Bell's background. What do you know about his family?*

3. *Mark the statements as true or false. Explain your choice:*

1. The young Alexander attended Edinburgh's Royal School until he was 11.
2. During his life Bell was able to combine both business matters and inventions.
3. The Bell Company faced over 550 court challenges some of them were successful.
4. At the age of 16 he and his brother tried to build a talking robot.
5. Watson and Bell created a great partnership with Watson being the idea man and Bell having the expertise to bring Watson's idea to reality.
6. In the remaining years of his life Bell worked only on improvements of his telephone.
7. Alexander Bell never had a University degree.
8. The Group formed by Bell developed several flying machines.
9. All members of Bell's family had perfect health.
10. At the beginning of his career Bell helped his father in his work with the deaf.

4. *Answer the following questions:*

1. Where and when was Alexander Graham Bell born?
2. What was Bell's first invention?
3. Where did Bell study after graduating from High school?
4. Did Bell help his father in work with the deaf?

5. Why did Bell's father decide to move to Canada?
6. Why did speech become Bell's life?
7. What was Bell's relentless obsession?
8. What was his idea when he started experiments with the human voice?
9. Why did Bell have to defend his patent on invention of the telephone?
10. How was the first telephone call made?

Grammar:

1. Transform the sentences into Passive making the necessary changes:

Model: Bell's father also wrote books and sold them in the UK and North America. – Books by Bell's father were sold in the UK and North America.

1. People used the machine Bell built for several years.
 2. In 1871 Alexander Bell opened his School of Vocal Physiology and Mechanics of Speech.
 3. Bell hired Thomas Watson, a skilled electrical engineer, to help him in his work.
 4. At the Centennial Exhibition in Philadelphia in 1876 Bell demonstrated the telephone to the Emperor of Brazil, Dom Pedro.
 5. Bell's Aerial Experiment Association with Glenn Curtiss and several other associates developed several flying machines.
 6. At his School of Vocal Physiology and Mechanics of Speech, Bell taught deaf people to speak.
 7. Bell's father developed a method of teaching deaf people to speak.
 8. Bell received the first telephone call on March 10, 1876.
 9. Bell organized The Bell telephone Company on July 9, 1877.
 10. Bell devoted a lot of time to exploring flights.
- ### 2. Open the brackets using Past Simple, Past Perfect or Past Continuous:
1. In Canada Bell's father (to find) that his poor health (to improve) dramatically.
 2. Some people (to claim) they (to invent) the telephone or (to conceive) of the idea before Bell.

3. One day, when young Alexander (to play) at a flour mill he (to notice) that husking the wheat grains (to be) a very slow and boring process.
 4. At the age of 26, although he (not to have) a university degree, he (to become) Professor of Vocal Physiology and Elocution at the Boston University School of Oratory.
 5. Through 1874 and 1975, Bell and Watson (to work) on a voice transmitting device.
 6. Although Bell's schoolwork (to be) poor, his mind (to be) very active.
 7. Bell's father (to go) to Canada when he (to be) younger.
 8. Bell's father (to develop) a method of teaching deaf people to speak, which Bell (to teach).
 9. While Bell (to work) at the Boston University School of Oratory, he (to start) his research into mechanizing human speech.
 10. He (to find) that human speech (to come) in waves like patterns.
3. *Find Participle I, Participle II and translate the sentences into Russian:*
1. The machine built by Bell was used at the mill for several years.
 2. One day Bell was playing at a flour mill owned by the family of a friend.
 3. Bell's mother was an accomplished pianist.
 4. Bell and his brother tried to build a talking robot.
 5. Thomas Watson was a skilled electrical engineer.

Speaking:

1. Speak about:

- Alexander Bell's family background and education
- Bell's spheres of science and research activity
- Bell's major inventions
- Bell's personality

2. Here are some interesting facts about Alexander Graham Bell's

inventions. Read and discuss them in class.

Alexander Graham bell had a restless mind. The telephone made him wealthy and famous, but he wanted new challenges, and he continued inventing and innovating. Here are some of his inventions:

The Photophone or Optical telephone

Today it is standard practice to transmit huge amounts of data using photons of light through optical fiber. In 1880, Bell and his assistant transmitted wireless voice messages a distance of over 200 meters in Washington D.C. The voice messages were carried by a light beam, and Bell patented the photophone. This was two decades before optic fiber communications became commercially viable.

The Metal Detector

In 1881, after President James Garfield was shot, Bell invented the metal detector to locate the bullet precisely. The rudimentary metal detector worked in tests, but the bullet in the President's body was too deep to be detected by the early detecting equipment.

3. Here are some of the Bell's quotes. Read and comment on them:

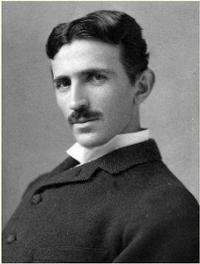
“Before anything else, preparation is the key to success”

“A man, as a general rule, owes very little to what he is born with – a man is what he makes of himself”

“The day will come when the man at the telephone will be able to see the distant person to whom he is speaking”

“The inventor looks upon the world and is not contented with things as they are. He wants to improve whatever he sees, he wants to benefit the world; he is haunted by an idea. The spirit of invention possesses him, seeking materialization”

Unit 4. Nikola Tesla (1856-1943)



Pre-reading activity:

1. You are going to read about life and work of the famous American inventor Nikola Tesla. Before you read the text answer the following questions:

- What do you know about Nikola Tesla's life?
- What is he famous for?
- What field of science did he work in?

2. Read and pay attention to the correct pronunciation of the following words:

Croatia	[krəu'eɪʃɪə]	fluorescent	[flɔ:'res(ə)nt]
Serbian	['sɜ:biən]	satellite	['sæt(ə)laɪt]
Prague	[pr'a:g]	X-ray	['eksreɪ]
fascinate	['fæsmeɪt]	Roentgen	['rɒntʃən], [-tʃən]
polytechnic	[,pɒlɪ'teknɪk]	diagram	['daɪəgræm]
prototype	['prəutətaɪp]	genius	['dʒɪ:niəs]
inefficiency	[ɪnɪ'fɪʃ(ə)nsɪ]	hypothesis	['haɪ'pɒθəsɪs]
polyphase	['pɒlɪ, feɪz]	vehicle	['vi:kl]
voltage	['vɒlʌtɪdʒ]	torpedo	[tɔ:'prɪ:dəu]
alternating	['ɔ:lʔənertɪŋ]	technique	[tek'nɪ:k]

3. *Read and try to guess the meaning of the following international words:*

signal, empire, to specialize, career, engineer, magnetic, principle, productive, cyclic, generator, radio, laser, communication, phenomenon, planet, genius, prize, hypothesis, magnetic.

Reading:

Part I

Nikola Tesla was born on July 10, 1856 in Smiljan, Croatia, which was then part of the Austro-Hungarian Empire. His father was a Serbian Orthodox Priest and his mother was an inventor in her own right of household appliances. Tesla studied at the Realschule, the Polytechnic Institute in Graz, Austria, and the University of Prague. At first he intended to specialize in mathematics but soon he became fascinated with electricity. He began his career as an electrical engineer with walking with a friend through the city park after seeing a telephone company in Budapest in 1881.

Once when Tesla was demonstrating “Gramme dynamo” (a machine that when operated in one direction is a generator, and when reversed is an electric motor), he visualized a rotating magnetic field. With a stick he drew a diagram in the sand explaining to his friend the principle of the induction motor.

Before going to America, Tesla joined Continental Edison Company in Paris where he designed dynamos. While in Strasbourg in 1883, he privately built a prototype of the induction motor and ran it successfully. Unable to interest anyone in Europe in promoting this device, Tesla accepted an offer to work for Thomas Edison in New York.

Nikola Tesla came to the United States in 1884 with an introduction letter from Charles Batchelor to Thomas Edison: “I know two great men,” wrote Batchelor, “one is you and the other is this young man.” Tesla spent the next 59 years of his productive life living in New York. Tesla set about improving Edison’s line of dynamos while working in Edison’s lab in New Jersey. It was here that his disagreement with Edison over direct current versus alternating current began and soon led to the war of the currents as Edison fought a losing battle to protect his investment in direct current equipment and facilities. Tesla pointed out the inefficiency of Edison’s direct current electrical powerhouses that have been built up and down the Atlantic seaboard. The secret, he felt, lay in the use of alternating current, because to him all energies were cyclic. Why not build generators that would

send electrical energy along distribution lines first one way, than another, in multiple waves using the polyphase principle?

Nikola Tesla developed polyphase alternating current system of generators, motors and transformers and held 40 basic U.S. patents on the system. He introduced his motors and systems in a classic paper, “A New System of Alternating Current Motors and Transformers” which he delivered before the American Institute of Electrical Engineers in 1888. One of the most impressed was the industrialist and inventor George Westinghouse. One day he visited Tesla’s laboratory and was amazed at what he saw. Tesla had constructed a model polyphase system consisting of an alternating current dynamo, step-up and step-down transformers and A.C. motor at the other end. The perfect partnership between Tesla and Westinghouse for the nationwide use of electricity in America had begun.

Later Tesla discovered the principle that drives almost every practical use of electricity today, the rotating magnetic field. The field is what powers generators and all forms of electrical motors. Although the generator had already been discovered, it was Tesla who figured out why it worked.

Part II

Tesla was a pioneer in many fields. The Tesla coil, which he invented in 1891, is widely used today in radio and television sets and other electronic equipment. That year also marked the date of Tesla's United States citizenship. His alternating current induction motor is considered one of the ten greatest discoveries of all time. Among his discoveries are the fluorescent light, laser beam, wireless communications, wireless transmission of electrical energy, remote control, robotics, Tesla’s turbines and vertical take off aircraft. Tesla is the father of the radio and the modern electrical transmissions systems. He registered over 700 patents worldwide. His vision included exploration of solar energy and the power of the sea. He foresaw interplanetary communications and satellites.

The Electrical Review in 1896 published X-rays of a man, made by Tesla, with X-ray tubes of his own design. They appeared at the same time as when Roentgen announced his discovery of X-rays. Tesla never attempted to proclaim priority. Roentgen congratulated Tesla on his sophisticated X-ray pictures, and Tesla even wrote Roentgen's name on one of his films. He published schematic diagrams describing all the basic elements of the radio transmitter which was later used by Marconi. In 1896 Tesla constructed an instrument to receive radio waves. He experimented with this device and transmitted radio waves from his laboratory on

South 5th Avenue to the Gerlach Hotel at 27th Street in Manhattan. The device had a magnet which gave off intense magnetic fields up to 20,000 lines per centimeter. The radio device clearly establishes his priority in the discovery of radio. And in 1943 the United States Supreme Court, held Marconi's most important patent invalid, recognizing Tesla's more significant contribution as the inventor of radio technology.

Tesla built an experimental station in Colorado Springs, Colorado in 1899, to experiment with high voltage, high frequency electricity and other phenomena. From this laboratory, Tesla generated and sent out wireless waves which mediated energy, without wires for miles. In Colorado Springs, where he stayed from May 1899 until 1900, Tesla made what he regarded as his most important discovery - terrestrial stationary waves. By this discovery he proved that the Earth could be used as a conductor and would be as responsive as a tuning fork to electrical vibrations of a certain frequency. He also lighted 200 lamps without wires from a distance of 25 miles and created man-made lightning. At one time he was certain he had received signals from another planet in his Colorado laboratory.

Tesla lectured to the scientific community on his inventions in America and before scientific organizations in both England and France in 1892. Tesla's lectures and writings of the 1890s aroused wide admiration among contemporaries, popularized his inventions and inspired numbers of younger men to enter the new field of radio and electrical science.

Tesla was the genius who ushered in the age of electrical power. Tesla had a vivid imagination and an intuitive way of developing scientific hypotheses. He used his imagination to prove and apply his hypotheses.

In 1915, a New York Times article announced that Tesla and Edison were to share the Nobel Prize for physics. Oddly, neither man received the prize, the reason being unclear. It was rumored that Tesla refused the prize because he would not share with Edison, and because Marconi had already received his.

Tesla was clearly ahead of his time, a problem which would haunt his entire career. His inventions and patents for remote operation of robotic devices, for instance, were stunningly advanced but largely ignored at the time. The military inexplicably failed to understand the usefulness of remote-controlled attack vehicles and torpedoes until after Tesla's patents had expired. Even then, they began researching it over from scratch, rather than working with his established techniques. The end result was military technology nearly identical to Tesla's inventions, but developed literally decades later and at many times the cost. Tesla never made a dime off of the discovery of the radio-controlled automation that today is the basis of a multibillion dollar aerospace specialty.

(Adapted from the Internet sites)

<http://www.pbs.org/newshour/rundown/5-things-you-didnt-know-about-nikola-tesla/>

<http://www.teslasociety.com/biography.htm>

Vocabulary:

1. Give the Russian equivalents for the following English words and word combinations:

an offer, to intend to do something, to become fascinated with something, to promote, magnetic field, to foresee interplanetary communications and satellites, to proclaim something, priority, to be ahead of one's time, to haunt.

2. Find the English equivalents for the following Russian words and word combinations in the text:

магнитное поле, постоянный ток, переменный ток, электростанция, широко использоваться, гражданство, признать недействительным, дистанционно управляемый, не заработать ни цента, вдохновлять.

3. Find the words in the text that have similar meanings to the following words and word combinations:

- clergyman
- discovery in science
- to operate something
- controversy in points of view
- throughout the country
- discoverer, founder
- to predict the upcoming events
- ineffective, not taken any more
- preference
- to follow somebody

4. Complete the following sentences with the necessary prepositions:

1. ... a stick he drew a diagram in the sand explaining to his friend the principle of the induction motor.
2. Nikola Tesla developed polyphase alternating current system of generators, motors and transformers and held 40 basic U.S. patents ... the system.
3. Tesla lectured ... the scientific community ... his inventions ... America.
4. ... the discovery of terrestrial stationary waves he proved that the Earth could be used as a conductor.
5. The radio device clearly establishes Tesla's priority ... the discovery of radio.
6. Tesla never made a dime ... of the discovery of the radio-controlled automation.
7. Tesla was a pioneer ... many fields.
8. He transmitted radio waves ... his laboratory on South 5th Avenue ... the Gerlach Hotel at 27th Street in Manhattan.
9. From this laboratory, Tesla generated and sent ... wireless waves which mediated energy, ... wires for miles.
- 10.... going to America, Tesla joined Continental Edison Company in Paris where he designed dynamos.

5. Fill in the missing words from the list below:

electricity, generators, field, radio-controlled, specialize, proclaim, citizenship

- At first Tesla intended to _____ in mathematics but soon he became fascinated with _____.
- Tesla never attempted to _____ priority in discovering X-rays.
- The rotating magnetic _____ is the field that powers _____ and all forms of electrical motors.
- The year 1891 marked the date of Tesla's United States _____.
- Today _____ automation is the basis of multibillion dollar aerospace

specialty.

6. *Read and translate the following phrasal verbs, consult the dictionary if necessary. Find in the text and translate the sentences containing these verbs:*

to set about, to point out, to figure out, to take off, to give off, to send out.

7. *Make up the adverbs from the adjectives given below using the suffix -ly:*

Model: private – privately

successful, large, stunning, inexplicable, special, wide, clear.

Comprehension:

1. *Make a time line of the most essential dates and events in Tesla's life.*

2. *Make up a list of Tesla's inventions mentioned in the text. Speak about one of them in detail.*

3. *Mark the statements as true or false. Explain your choice:*

1. Tesla got his education in Croatia.
2. Tesla began his career as a mathematician in Budapest.
3. Before going to America Tesla worked for Continental Edison Company in Paris.
4. Working in Edison's lab in New Jersey, Tesla totally supported Edison's theory on direct current.
5. Nikola Tesla developed polyphase alternating current system of generators, motors and transformers.
6. In 1896 Tesla proclaimed priority on the discovery of X-rays.
7. In 1915 both Tesla and Edison were to share the Nobel Prize for physics though none of them received this prize.
8. Tesla's inventions for remote operation of robotic devices were widely used by the military at the time.

9. Tesla was an American citizen.
10. Before going to America Tesla worked in France.

4. Answer the following questions:

- Who were Tesla's parents?
- How did it happen that Tesla had decided to connect his life with electricity?
- Why did Tesla leave Europe for the United States?
- How did Tesla's disagreement with Edison begin?
- How many inventions did Tesla patent?
- What Tesla's invention is considered one of the ten greatest discoveries of all time?
- What was Tesla's experimental station in Colorado Springs, Colorado used for?
- What device helped Tesla to establish his priority in the discovery of radio?
- How did Tesla develop his scientific hypotheses?
- Why is it considered that Tesla was ahead of his time?

Grammar:

1. Give the correct translation of the sentences paying attention to the underlined part. What grammar phenomenon does it represent?

1. Edison's direct current electrical powerhouses have been built up and down the Atlantic seaboard.
2. Although the generator had already been discovered, it was Tesla who figured out why it worked.
3. At one time Tesla was certain that the signals from another planet had been received in his Colorado laboratory.
4. One day the industrialist and inventor George Westinghouse visited

Tesla's laboratory and saw a model polyphase system which had been earlier constructed by Tesla.

5. The Nobel Prize had already been received by Marconi when Tesla refused it.

2. Open the brackets using Past Simple and Past Continuous:

1. When Tesla (to walk) with a friend through the city park in Budapest he (to see) a telephone company and (to decide) to start a career of an electrician.
2. Once when Tesla (to demonstrate) "Gramme dynamo" he (to visualize) a rotating magnetic field.
3. While he (to stay) in Strasbourg, he privately (to build) a prototype of the induction motor and (to run) it successfully.
4. With a stick Tesla (to draw) a diagram in the sand while he (to explain) to his friend the principle of the induction motor.
5. During the time when he (to work) in Edison's lab in New Jersey, Tesla (to improve) Edison's line of dynamos.
6. In 1896 Tesla (to construct) an instrument to receive radio waves.
7. Tesla (to be) clearly ahead of his time.
8. Tesla (to build) an experimental station in Colorado Springs, Colorado in 1899 where he (to experiment) with high voltage, high frequency electricity and other phenomena.
9. While Tesla (to stay) in Colorado Springs from May 1899 until 1900, he (to make) his most important discovery - terrestrial stationary waves.
10. Tesla (to be) the genius who (to usher) in the age of electrical power.

3. Translate the sentences into Russian paying special attention to the part of it in bold:

- Tesla built an experimental station in Colorado Springs **to experiment** with high frequency electricity and other phenomena.
- With a stick Tesla drew a diagram in the sand **to explain** the principle of

the induction motor to his friend.

- Tesla generated and sent out wireless waves **to produce** energy, without wires for miles.
- He used his imagination **to prove** and **apply** his hypotheses.
- Tesla's lectures and writings inspired numbers of younger men **to enter** the new field of radio and electrical science.

Speaking:

1. *Speak about:*

Tesla's family background and education

Tesla's spheres of science and research activity

Tesla's major inventions

Tesla's personality

2. *Here is a list of interesting facts you would probably never knew about this famous inventor. Read and discuss it with other students in your group:*

1. **He was born during the lightning storm**

Nikola Tesla was born around midnight, between July 9 and July 10, 1856 during a fierce lightning storm. According to family legend, midway through the birth, the midwife wrung her hands and declared the lightning a bad omen. "This child will be a child of darkness", she said, to which his mother replied: "No. He will be a child of light".

2. **He was really funny**

Most people don't know that Tesla had a terrific sense of humor. For example, after dining with writer and poet Rudyard Kipling, he wrote this in a correspondence to a close friend:

April 1, 1901

My dear Mrs. Johnson,

What is the matter with inkspiller Kipling? He actually dared to invite me to dine in an obscure hotel where I would be sure to get hair and cockroaches in the soup.

Yours truly,

N. Tesla

3. He and Edison were rivals, but not sworn enemies

Many have characterized Tesla and inventor Thomas Edison as enemies but this relationship has been misrepresented. Early in his career Tesla worked for Edison, designing direct current generators, but famously quit to pursue his own project: the alternating current induction motor. Sure, they were on different sides of the so-called “Current Wars”, with Edison pushing for direct current and Tesla for alternating current. But W. Bernard Carlson, author of “Tesla: Inventor of the Electrical Age” considers them the Steve Jobs and Bill Gates of their time: one the brilliant marketer and businessman and the other a visionary and “tech guy”. On a rare occasion, Edison attended a conference where Tesla was speaking. Edison not wanting to be spotted, slipped into the back of the auditorium to listen to the lecture. But Tesla spotted Edison in the crowd, called attention to him and led the audience in giving him a standing ovation. Marc Seifer, author of “Wizard: Life and Times of Nikola Tesla” qualifies it more, saying that at first Edison dismissed Tesla, but came to eventually respect him.

4. He developed the idea for smartphone technology in 1901

In the race to develop transatlantic radio, Tesla described to his funder and business partner, J.P. Morgan, a new means of instant communication that involved gathering stock quotes and telegram messages, funneling them to his laboratory, where he would encode them and assign them each a new frequency. That frequency would be broadcast to a device that would fit in your hand, he explained. In other words, Tesla had envisioned the smart phone and wireless internet. Of all of his ideas that was the one that stopped him in his tracks. He was the first to be thinking about the information revolution in the sense of delivering information for each individual user.

5. Pearls drove him crazy

Tesla could not stand the sight of pearls, to the extent that he refused to speak to women wearing them. When his secretary wore pearl jewelry, he sent her home for the day. No one knows why he had such an aversion, but Tesla had a very particular sense of style and aesthetics and believed that in order to be successful, one needed to look successful. He wore white gloves to dinner every night and prided himself on being a “dapper dresser”.

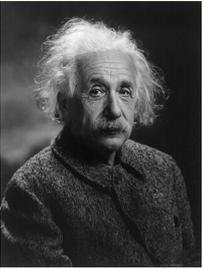
6. He had a photographic memory and a fear of germs

Tesla had what's known as a photographic memory. He was known to memorize books and images and stockpile visions for inventions in his head. He also had a powerful imagination and the ability to visualize in three dimensions, which he used to control the terrifying vivid nightmares he suffered from as a child. It's in part what makes him such a mystical and eccentric character in popular culture. He was also known for having excessive hygiene habits, born out of a near-fatal bout of cholera as a teenager.

(From 8 Things You Didn't Know About Nikola Tesla by Rebecca Jacobson)

<http://www.pbs.org/newshour/rundown/5-things-you-didnt-know-about-nikola-tesla/>

Unit 5. Albert Einstein (1879-1955)



Pre-reading activity:

1. You are going to read about life and work of Albert Einstein, the famous physicist who is widely regarded as the greatest scientist of the 20th century. Before you read the text answer the following questions:

- What do you know about Albert Einstein's life?
- What is he famous for?
- What field of science did he work in?

2. Read and pay attention to the correct pronunciation of the following words:

Jewish	[ˈdʒuːɪʃ]	photoelectric	[.fəʊtəʊɪˈlektɪk]
Munich	[ˈmjuːnɪk]	molecule	[ˈmɒlɪkjʊːl]
Bern	[bɜːn]	equation	[ɪˈkweɪʃ(ə)n]
Zurich	[ˈz(j)ʊərɪk]	diagnose	[ˈdaɪəgnəʊz]
Switzerland	[ˈswɪts(ə)lənd]	acceleration	[əkˌseləˈreɪʃ(ə)n]
Czech	[tʃek]	aneurysm	[ˈænjəˌrɪz(ə)m]
polytechnic	[ˌpɒlɪˈteknɪk]	honorary	[ˈɒn(ə)rəri]
prestigious	[presˈtɪdʒəs]	theory	[ˈθɪəri]
dyslexia	[dɪsˈleksiə]	eclipse	[ɪˈklɪps]

3. Read and try to guess the meaning of the following international words:

compass, model, molecule, mechanical, college, polytechnic, theory, recommendation, clerk, journal, effect, energy, formula, conference, expedition.

Reading:

Part I

Albert Einstein was born in 1879 in Ulm in Württemberg, Germany. His parents were Hermann Einstein, a salesman who later ran an electrochemical works, and his wife Pauline. In 1881 the family moved to Munich where Albert's sister Maja was born. Albert adored his sister and they had a close relationship their whole lives. Although being from a Jewish family, Albert attended a Catholic elementary school and, at the insistence of his mother, was also given violin lessons during his youth. At five years of age, his uncle showed him a pocket compass, and he realized that something in "empty" space acted upon the needle. He built models and mechanical devices for fun, but was considered a slow learner as a child possibly due to dyslexia or simply because of his shyness. Einstein also failed to impress his teachers. From elementary school through college, his teachers and professors thought him lazy, sloppy, and insubordinate. Many of his teachers thought he would never amount to anything.

In 1894 the Einsteins moved to Pavia, Italy from Munich. Albert remained in Munich to finish school. He completed a term by himself and then moved to Pavia to join his family. In 1895, Einstein took an exam for the prestigious Polytechnic Institute in Zurich, Switzerland, but failed. After that he spent a year studying at a local high school and retook the entrance exam in October 1896 and passed. That same year, Einstein renounced his German citizenship, becoming stateless. Einstein did not like school. He would often skip class, preferring to stay home and read about the newest in scientific theory. After graduation Einstein was unable to find a job because none of his teachers liked him enough to write him a recommendation letter. For nearly two years, Einstein worked at short-term jobs until a friend was able to help him get a job as a patent clerk at the Swiss Patent Office in Bern. Finally with a job and some stability, Einstein was able to marry his college sweetheart, Mileva Maric (who was also a friend of Nicola Tesla), whom his parents strongly disapproved. The couple went on to have two sons: Hans Albert (born 1904) and Eduard (born 1910).

For seven years, Einstein worked six days a week as a patent clerk. He was responsible for examining the blueprints of other people's inventions and then determining whether or not they were feasible. If they were, Einstein had to ensure no one else had already been given a patent for the same idea. Somehow, between his very busy work and family life, Einstein not only found time to earn a doctorate from

the University of Zurich (awarded 1905), but found time to think. It was while working at the patent office that Einstein made his most shocking and amazing discoveries.

In 1905, while working at the patent office, Einstein wrote five scientific papers, which were all published in one of the major scientific journals.

In one paper, Einstein theorized that light must not just travel in waves but existed as particles, which explained the photoelectric effect. Einstein himself described this particular theory as "revolutionary." This was also the theory for which Einstein won the Nobel Prize in Physics in 1921.

In another paper, Einstein revealed the mystery of why pollen never settled to the bottom of a glass of water, but rather, kept moving (Brownian motion). By declaring that the pollen was being moved by water molecules, Einstein solved a longstanding, scientific mystery as well as proved the existence of molecules.

His third paper described Einstein's "Special Theory of Relativity," in which Einstein revealed that space and time are not absolutes. The only thing that is constant, Einstein stated, is the speed of light; the rest of space and time are all based on the position of the observer.

Einstein discovered that energy and mass, once thought completely distinct items, were actually interchangeable. In his $E=mc^2$ equation (E =energy, m =mass, and c =speed of light), Einstein created a simple formula to describe the relationship between energy and mass. This formula reveals that a very small amount of mass can be converted into a huge amount of energy, leading to the later invention of the atomic bomb. Einstein was only 26 years old when these articles were published and already he had done more for science than any individual since Sir Isaac Newton.

Part II

Recognition from the academic and scientific community did not come quickly. Perhaps it was difficult to take seriously a 26-year-old patent clerk who, until this time, had only earned disdain from his former teachers. Or perhaps Einstein's ideas were so profound and radical that no one was yet prepared to consider them truths. In 1909, four years after his theories were first published, Einstein was finally offered a teaching position. Einstein enjoyed being a teacher at the University of Zurich. He had found traditional schooling as he grew up extremely limiting and thus he wanted to be a different kind of teacher. Arriving at school unkempt, with hair uncombed and his clothes too baggy, Einstein taught from the heart. Within only a few years,

Einstein worked at the University of Zurich (Switzerland), then the German University in Prague (Czech Republic), and then back to Zurich for the Polytechnic Institute.

Numerous conferences that Einstein attended, and his preoccupation with science, left Mileva (Einstein's wife) feeling both neglected and lonely. When Einstein was offered a professorship at the University of Berlin in 1913, she didn't want to go. Einstein accepted the position anyway. Not long after arriving in Berlin, Mileva and Albert separated and she took the kids back to Zurich. They officially divorced in 1919.

During World War I Einstein stayed in Berlin and worked diligently on new theories. He worked like a man obsessed. With Mileva gone, he often forgot to eat and forgot to go to sleep. In 1917, the stress eventually took its toll and he collapsed. Diagnosed with gallstones, Einstein was told to rest. Einstein's cousin Elsa helped him. The two became very close and when Albert's divorce was finalized, Albert and Elsa married.

It was during this time that Einstein revealed his General Theory of Relativity, which considered the effects of acceleration and gravity on time and space. If Einstein's theory was correct, then the gravity of the sun would bend light from stars.

In 1919, Einstein's General Theory of Relativity could be tested during a solar eclipse. In May 1919, two British astronomers (Arthur Eddington and Sir Frances Dyson) were able to put together an expedition which observed the solar eclipse and documented the bent light. In November 1919, their findings were announced publicly. Einstein became a worldwide celebrity. It wasn't just his revolutionary theories (which many people couldn't really understand); it was Einstein's general persona that appealed to the masses. Einstein's disheveled hair, poorly fitting clothes, doe-like eyes, and witty charm endeared him to the average person. Yes, he was a genius, but he was an approachable one. Instantly famous, Einstein was followed by reporters and photographers wherever he went. He was given honorary degrees and asked to visit countries around the world. Albert and Elsa took trips to the United States, Japan, Palestine (now Israel), South America, and throughout Europe.

The political climate in Germany was changing drastically. When Adold Hitler took power in 1933, Einstein was luckily visiting the United States (he never returned to Germany). The Nazis declared Einstein an enemy of the state, ransacked his house, and burned his books. As death threats began, Einstein finalized his plans to take a position at the Institute for Advanced Study at Princeton, New Jersey. He arrived at Princeton on October 17, 1933. Einstein suffered a personal loss when Elsa died on December 20, 1936.

From 1922 until the end of his life, Einstein worked on finding a "unified field theory." He searched for a single, unified theory that could combine all the fundamental forces of physics between elementary particles.

On April 12, 1955, Einstein collapsed at his home. Just six days later, on April 18, 1955, Einstein died when the aneurysm that he had been living with for several years had finally burst. He was 76 years old.

(Adapted from the Internet sites)

<http://inventors.about.com/library/inventors/bleinstein.htm>

http://biographybase.com/biography/einstein_albert.html

Vocabulary:

1. Give the Russian equivalents for the following English words and word combinations:

insubordinate, to skip classes, to be feasible, longstanding, solar eclipse, worldwide celebrity, to declare somebody an enemy of the state, to suffer a loss, to change drastically, gravity.

2. Find in the text the English equivalents for the following Russian words and word combinations:

по настоянию, снискать презрение, удивительные открытия, скорость света, быть взаимозаменяемыми, научное сообщество, принимать кого-либо всерьез, обыскивать, занять должность (пост), элементарная частица.

3. Find the words in the text that have similar meanings to the following words and word combinations:

- to achieve something
- high-class
- to deny something
- to find, to discover
- industriously, taking pains
- to miss classes

- realizable
- replaceable
- keenness on science
- a famous public figure

4. Complete the following sentences with the adjectives given below:

1. In 1919 Einstein's General Theory of Relativity could be tested during a _____ eclipse.
2. Perhaps Einstein's ideas were so _____ and radical that no one was yet prepared to consider them truths.
3. Einstein discovered that energy and mass were actually _____.
4. It was while working at the patent office that Einstein made his most _____ and _____ discoveries.
5. In 1896 Einstein renounced his German citizenship, becoming _____.
6. In 1895 Einstein took an exam for the _____ Polytechnic Institute in Zurich, Switzerland.
7. Einstein's teachers and professors thought him _____ and _____.
8. Einstein was a genius, but he was an _____ one.
9. The _____ climate in Germany was changing drastically in 1933.
10. Einstein searched for a theory that could combine all the fundamental forces of physics between _____ particles.

elementary, lazy, stateless, insubordinate, political, solar, prestigious, amazing, approachable, profound, shocking, interchangeable.

5. Fill in the gaps with the correct verb in the Past Simple Tense:

- Einstein ... a simple formula to describe the relationship between energy and mass.
- Einstein's General Theory of Relativity ... the effects of acceleration and gravity on time and space.

- Einstein ... the position at the University of Berlin in 1913.
- As a child Einstein ... a Catholic elementary school.
- Einstein ... being a teacher at the University of Zurich.
- In 1919 Einstein ... a worldwide celebrity.
- Einstein ... a personal loss when Elsa died on December 20, 1936.
- In 1933 the Nazis ... Einstein an enemy of the state.
- In 1894 the Einsteins ... to Pavia, Italy from Munich.
- With Mileva gone, Einstein often ... to eat and to sleep.

to move, to enjoy, to attend, to declare, to consider, to create, to suffer, to become, to accept, to forget

6. Read and translate the following phrasal verbs, consult the dictionary if necessary. Find in the text and translate the sentences containing these verbs:

to work on, to put together, to search for, to be responsible for, to appeal to.

7. Make up the nouns from the verbs given below using the suffix -ance/-ence:

Model: to exist - existence

To prefer, to insist, to attend, to enter, to differ, to depend.

Comprehension:

- 1. Make a time line of the most essential dates and events in Einstein's life.*
- 2. Make up a list of Einstein's discoveries mentioned in the text. Speak about one of them in detail.*
- 3. Fill in the blanks with the proper words and word combinations:*

1. As a child Albert attended

- a) German school b) Jewish school c) Catholic school
2. During his youth Einstein was given
 - a) piano lessons b) violin lessons c) guitar lessons
3. At school Einstein
 - a) was a diligent student b) failed to impress his teachers c) used to attend all classes
4. In 1895 Einstein ... an exam for the prestigious Polytechnic Institute in Zurich.
 - a) successfully took b) failed to take c) left the idea about taking
5. Einstein often
 - a) skipped classes b) attended only lectures c) spent a lot of time at the Institute
6. In his “Special Theory of Relativity” Einstein stated that only ... is constant.
 - a) space b) time c) speed of light
7. Being a university professor Einstein used to come to work
 - a) neatly dressed b) very late c) sloppy and uncombed
8. Scientific community
 - a) recognized Einstein very quickly b) didn't recognize Einstein at all c) recognized Einstein's contribution to the world science after several years
9. It was Einstein's ... that appealed to the masses.
 - a) genius b) general persona c) discoveries
10. Einstein spent his last years
 - a) in the USA b) in Germany c) in Switzerland

4. Answer the following questions:

1. What do you know about Einstein's family?
2. What did Einstein's teachers think of him?
3. When and where did he get higher education?

4. Why couldn't he find a job after graduation?
5. What were Einstein's duties as a patent clerk?
6. What is his famous formula that describes the relationship between energy and mass?
7. What theory was he given the Nobel Prize in 1921 for?
8. How was Einstein's Theory of Relativity tested?
9. What do you know about Einstein's appearance?
10. Why couldn't Einstein return to Germany?

Grammar:

1. Give the correct translation of the sentences paying attention to the underlined part. What grammar phenomenon does it represent?

1. Einstein spent a year studying at a local high school and then he had to retake the entrance exam for the Polytechnic Institute.
2. After graduation Einstein was unable to find a job.
3. Finally with a job and some stability Einstein was able to marry his college sweetheart, Mileva Maric.
4. Einstein's formula reveals that a very small amount of mass can be converted into a huge amount of energy.
5. According to Einstein's theory the light must not just travel in waves but exists as particles.
6. Einstein had to examine the blueprints of other people's inventions and then determining whether or not they were feasible.
7. Many people couldn't really understand Einstein's revolutionary theories.
8. Sometimes Einstein might even forget to eat and to go to sleep.
9. Between his very busy work and family life, Einstein was able to find time to earn a doctorate from the University of Zurich.
10. After a year studying at a local high school Einstein had to retake the entrance exam for the Polytechnic Institute in Zurich.

2. *Open the brackets using the required form of the Passive Voice:*

1. Einstein's first scientific papers (to publish) in one of the major scientific journals.
2. At the insistence of his mother Einstein (to give) violin lessons.
3. While working as a patent clerk Einstein had to ensure that no one else (to give) already a patent for the same idea.
4. According to Einstein's theory the speed of light is constant but the rest of space and time (to base) on the position of the observer.
5. Einstein (to give) honorary degrees and (to ask) to visit countries around the world.
6. In another Einstein's paper, the mystery of why pollen never settled to the bottom of a glass of water, but rather, kept moving (to reveal).
7. By declaring that the pollen (to move) by water molecules, Einstein solved a longstanding, scientific mystery.
8. In 1909, four years after his theories first (to publish), Einstein finally (to offer) a teaching position.
9. Einstein (to diagnose) with gallstones and (to tell) to rest.
10. Instantly famous, Einstein (to follow) by reporters and photographers wherever he went.

3. *Translate the sentences into Russian paying attention to the part of it in bold:*

- **It was during this time that** Einstein revealed his General Theory of Relativity.
- **It wasn't just his revolutionary theories; it was Einstein's general persona that** appealed to the masses.
- **It was while working at the patent office that** Einstein made his most shocking and amazing discoveries.
- **It was the theory that light existed as particles which** Einstein won the Nobel Prize in Physics for.

- **It was only four years after his theories were first published that Einstein was finally offered a teaching position.**

Speaking:

1. Speak about:

- Einstein's family background and education
- Einstein's spheres of science and research activity
- Einstein's major discoveries
- Einstein's personality

2. Here are some of Einstein's famous quotations. Read and comment on them:

- a) "Scientists investigate that which already is; engineers create that which has never been".
- b) "It is the supreme art of the teacher to awaken joy in creative expression and knowledge"
- c) "If the facts don't fit the theory, change the facts"
- d) "The important thing is not to stop questioning"
- e) "I never teach my pupils. I only attempt to provide the conditions in which they can learn"
- f) "The release of atomic energy has not created a new problem. It has merely made more urgent the necessity of solving an existing one"
- g) "Gravitation cannot be held responsible for people falling in love. How on earth can you explain in terms of chemistry and physics so important a biological phenomenon as first love? Put your hand on a stove for a minute and it seems like an hour. Sit with that special girl for an hour and it seems like a minute. That's relativity"
- h) "Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution"

3. *Here is one of the Einstein's riddles. Try to solve it!*

There are 5 houses of different colors next to each other on the same road. In each house lives a man of different nationality. Every man has his favourite drink, his favourite brand of cigarettes, and keeps pets of a particular kind.

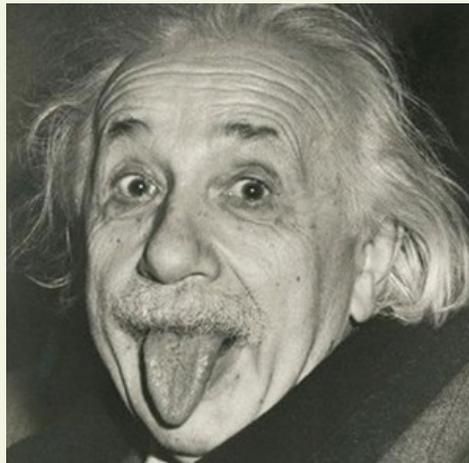
1. The Englishman lives in a red house.
2. The Swede keeps dogs.
3. The Dane drinks tea.
4. The green house is just to the left of the white one.
5. The owner of the green house drinks coffee.
6. The Pall Mall smoker keeps birds.
7. The owner of the yellow house smokes Dunhill.
8. The man in the center house drinks milk.
9. The Norwegian lives in the first house.
10. The Blend smoker has a neighbor who keeps cats.
11. The man who smokes Blue Masters drinks beer.
12. The man who keeps horses lives next to the Dunhill smoker.
13. The German smokes Prince.
14. The Norwegian lives next to the blue house.
15. The Blend smoker has a neighbor who drinks water.

WHO HAS THE FISH?

<http://curiosity.im/EinsteinsRiddle>

4. *Here are some interesting facts about Albert Einstein. Read and discuss them in class.*

The famous photo of Albert Einstein sticking out his tongue was taken at the end of his 72nd birthday celebration. A photographer tried to persuade him to smile for the camera for a last time, but having smiled for photographers many times that day, Einstein stuck out his tongue instead.



In 1952, Albert Einstein was offered the Presidency of the State of Israel. He declined this offer saying that as a scientist trained to deal with objective facts, he lacked the aptitude and experience to deal with people.

A day prior to his death, Einstein refused surgery saying “I want to go when I want. It is tasteless to prolong life artificially. I have done my share, it is time to go. I will do it elegantly”.

When Einstein met Charlie Chaplin, Chaplin remarked “People applaud me because everybody understands me, and they applaud you because no one understands you”.

Заключение

Учебно-методическое пособие представляет собой познавательный и увлекательный экскурс в историю физики, знакомит с выдающимися британскими и американскими учеными, совершившими величайшие открытия в этой области, а также дополняет общеизвестные факты из их жизни и деятельности интересными деталями.

Разнообразный материал пособия представляет интерес как со стороны содержания, так и со стороны языковых особенностей.

Пособие направлено на формирование навыков работы с аутентичным текстом, расширение словарного запаса профессионально-ориентированной лексики, закрепление и активизацию грамматического материала, а также готовит к англоязычному общению на профессиональную тематику.

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