ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ
«ЮЖНЫЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»

С.Ю. РЕЗНИКОВА, Ю.Ю. ГАФАРОВА,
М.А. САМОЛЕТОВА, Е.Б. СЫТНИКОВА

SCIENTISTS AND INVENTORS WHO SHAPED THE WORLD

Ростов-на-Дону
2008

Рецензенты:

Преподаватель СКАГС

Зайцева Н.В.

Старший преподаватель ЮФУ

Петросян К.С.

Резникова С.Ю., Гафарова Ю.Ю., Самолетова М.А., Сытникова Е.Б.

Scientists and Inventors who Shaped the World: Учебное пособие. – Ростов-на-Дону, 2008. – 154 с.

Учебное пособие на модульной основе «Scientists and Inventors who Shaped the World» предназначено для практических занятий по развитию и совершенствованию навыков чтения и говорения на основе прочитанного материала. Учебное пособие построено на аутентичных материалах, посвященных ученым и изобретателям, которые внесли наиболее значительный вклад в развитие информационных и компьютерных технологий. Каждый модуль включает текст для аудиторного чтения, набор лексико-грамматических упражнений, задания, направленные на развитие навыков говорения, а также творческие задания.

Данное учебное пособие предназначено для студентов 1 курса, изучающих информационные и компьютерные технологии и может быть рекомендовано как для аудиторной, так и для самостоятельной работы.

Методическая записка

Данное учебное пособие на модульной основе предназначено для аудиторной работы студентов 1 курса по теме «Scientists and Inventors who Shaped the World».

Учебное состоит из 10 модулей, посвященных ученым и изобретателям, которые внесли наиболее значительный вклад в развитие информационных и компьютерных технологий. Основной целью учебного пособия является развитие и совершенствование навыков чтения и говорения на основе прочитанного материала.

Учебное пособие построено на аутентичных материалах, основными источниками которых являются Интернет, британские и американские научно-популярные издания.

Каждый модуль учебного пособия включает следующие рубрики:

«Before you start» способствует повышению интереса и мотивации студентов к изучаемому материалу.

«Reading» включает текст, содержащий биографии ученных и изобретателей с рядом заданий, ориентированных на развитие навыков различных видов чтения.

«Vocabulary» содержит задания, направленные как на закрепление активной лексики модуля, так и на расширение словарного запаса по теме.

«Grammar» акцентирует внимание студентов на характерных для биографических текстов сложных грамматических явлениях и предлагает задания, позволяющие устранить трудности, возникающие при чтении и переводе текстов.

«Speaking» предлагает задания, направленные на обобщение прочитанного материала в форме его краткого изложения и формирование умения прокомментировать прочитанные тексты.

«Points for reflection» способствует рефлексии прочитанного и формированию личностного отношения к предложенному материалу. Студентам предлагается выполнить задание рубрики в письменном виде и

внести его результаты в «Языковой портфель».

Progress test осуществляет рубежный контроль знаний материала и мониторинг академических навыков.

Модули включают рекомендации для эффективного выполнения заданий и тренировки академических навыков.

Для осуществления самооценки предполагается использование рейтинговой системы контроля знаний. Каждый модуль включает таблицу итогового контроля, который предполагает полное и правильное выполнение основных заданий, предлагаемых в модуле.

Модули 5 и 10 учебного пособия являются итоговыми и содержат ряд игровых и творческих заданий, способствующих закреплению полученных знаний и повышению интереса к изучаемому материалу. В модуль 5 включена ссылка на сайт формата Hotlist (информационно-аналитические сборник) «Outstanding Scientists and Inventors», посвященные ученным и изобретателям в области информационных и компьютерных технологий, физики, радиотехники, системного анализа и математики. Сайт формата Hotlist имеет своей целью обеспечение широкого спектра дополнительного аутентичного материала по теме, что обеспечивает возможность личного выбора тематики, индивидуальный график подготовки, а также способствует развитию аналитических и поисково-исследовательских навыков студентов.

Модуль 10 включает проектное проблемно-деятельностное задание «An Internet WebQuest on Greatest Scientists», которое предлагает студентам реальную проблему, рассматриваемую с возможно диаметрально противоположных позиций; связывает воедино технологическое решение поставленной проблемы с развитием высших мыслительных процессов, так как при работе над проектом наиболее важен элемент анализа используемой информации, на основе которого происходит синтез вывода. В ходе выполнения квест-проектов студенты учатся сотрудничать и развивают навыки работы в группе. умение твердо и четко аргументировать свою позицию, приводя доводы в свою пользу, что способствует повышению

уверенность и самооценки личности.

Выполнение заданий итогового модуля является дополнительным и может проводиться преподавателем в форме тестового контроля изученного материала. Каждый студент может, по желанию, самостоятельно выполнить некоторые задания модуля, представив их результаты в виде приложения к профессионально-языковому портфелю.

Учебное пособие также содержит ключи к наиболее сложным лексическим и грамматическим упражнениям, что позволяет использовать данные материалы для самостоятельной работы студентов, и список общенаучной и терминологической лексики по модулям, рекомендуемой для расширения словарного запаса по теме.

Учебное пособие может использоваться в работе со студентами с различным уровнем знания английского языка, как для групповой, так и для индивидуальной работы.

Module 1 Thomas Alva Edison (1847-1931)

Before you start

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

a) What do you know about Thomas Edison's life?

b) What is he famous for?

c) What important inventions in the last decades of the 20th century do you know? Who made them? How did they affect people's lives?

Рис. 1 Edison's lamp

Reading

1 Pay attention to the correct pronunciation of the following words:

New Jersey	[ˌ nju:ˊʤɜ:zɪ]	dynamo	[ˊdaɪnəməu]
patent	[ˊpeɪtnt]	motor	[ˊməutə]
incandescent	[ˌ ɪnkænˊdesnt]	sewing	[ˊsəuɪŋ]
filament	[ˊfɪləmənt]	thread	[θred]
phonograph	[ˊfəunəgra:f]	foil	[fɔɪl]
laboratory	[ləˊbɔrətrɪ]	develop	[dɪˊveləp]
carbonized	[ˊka:bənaɪzd]	current	[ˊkʌrənt]

2 Here are some international words which you will come across in the text. Try to guess their meaning. Consult the dictionary to check their pronunciation.

electricity, project, philosophy, method, complex, operation, exploitation, business, industry, commercial, station, laboratory, chance, signal, company, secret

3 Read the text about Thomas Edison and make a time line of the most essential dates and events in his life.

How to make a time line

A timeline of historical events is a graphic representation of time.

1) Make a list of events and the dates when these events occurred.

2) List the events in a chronology from the earliest to the latest.

3) Decide what units of time you will use (days, months, years, decades, centuries, etc.) to divide your timeline into segments.

4) Calculate the number of segments that your timeline will have.

5) Draw a line and divide it into the number of equal segments that you figure you will need.

The Hero of the Electricity Age

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 his life. (1)

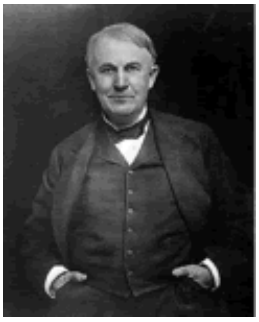


Рис. 2
Thomas Edison

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 seems to have 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. (2)

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. In general, Edison was probably the world's greatest inventor. He had patented on 1,093 inventions. (3)

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. (4)

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. (5)

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. (6)

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. The first phonograph was not at all like a record player of our time. (7)

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. (8)

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. (9)

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 continues to grow until in 1889 they were brought together to form Edison General Electric. Despite the use of Edison in the company title however, Edison never controlled this company. The tremendous amount of capital needed to develop the incandescent lighting industry had necessitated the involvement of investment bankers such as J.P. Morgan. 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. (10)

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. (11)

When Edison moved to West Orange, he was doing experimental work in makeshift facilities in his electric lamp factory in nearby Harrison, New Jersey. However, 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 extant and facilities superior to any other for rapid and cheap development of an invention". 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 clearly 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. Further, Edison's work paved the way for the modern alkaline battery. (12)

In 1913 he produced talking motion pictures. 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. (13)

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.(14)

Edison was also a ruthless businessman who fought to defeat his competitors. One of the most famous examples of his competitive vigor was the war of the currents (direct current vs alternating current) he conducted to discredit Nicola Tesla's Alternating Current system. (15)

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". The average work week was six days for a total of 55 hours. But if Edison had a bright idea, days at work would extend far into the night. What was it like to work for Edison? One "mucker" said that he "could wither one with his biting sarcasm or ridicule one into extinction". Just think how it would feel to listen to the world's greatest inventor criticize your work. On the other hand, as electrician Arthur Kennelly stated, "The privilege which I had being with this great man for six years was the greatest inspiration of my life". (16)

(Adapted from the Internet sites)

4 Look back in the text and make a list of Edison's inventions.

5 Read the text again and answer the following questions:

a) What kind of education did Edison get?
b) How did phonograph work?
c) How many inventions did Edison patent?
d) How did Edison's electric light work and how was it improved?
e) What was his philosophy of life?
f) Could you name other men of science equally possessed by the idea to create so that they were "deaf and blind to everything else in the world except science?" like Edison?
g) How can you characterize Edison's education?
h) Does Edison create for people or is his only goal to find medium for the expression of his ideas, feelings, and get free of his obsession?
i) How did Edison's inventions change our everyday life?

Vocabulary

1 Fill in the table with the missing words. Consult the dictionary if necessary:

Study help
An adjective can have both an **-ed** and **-ing** ending

verb	**noun**	**adjective**	**adverb**
to demonstrate			demonstratively
	invitation	inviting	
			inventively
to develop			-
	telegraph		

2 Complete the sentences with the right form of the word in bold:

a) The site is being … by a local property company. **DEVELOPMENT**

b) The manager gave us a brief … of the computer's functions**.** **DEMONSTRATION**

c) A scientist showed an … design of a new computer laboratory. **INVENTION**

d) Leaving your car unlocked is just … someone to steal it. **INVITATION**

e) … - a means of sending messages by the use of electric current along wires. **TELEGRAPH**

3 Put the following words under the correct heading. Consult the dictionary if necessary:

staff patent belief merge tour device improve receive

noun	both	verb

Find in the text other words that can be used both as nouns and verbs.

4 Look back in the text and find words that have a similar meaning to:

a) skilled and competent (2)
b) planned for (3)
c) spread (3)
d) play back sound (6)
e) surprised (7)
f) combined (10)
g) huge (10)
h) was spoiled (11)
i) had (12)
j) a cinema film (13)

5 Complete the sentences with prepositions if necessary:

a) Edison attended … schools only for three month.

b) At the age of 13 Edison began to work … a newsboy, selling newspapers and candy.

c) A number of people had worked … the idea related … developing electric lighting.
d) He began work … a large difference engine which he believed he could complete in three years.
e) Edison hired the young engineers who were superior … the any other candidates.

6 Give English equivalents to the following words and word combinations:

получить работу; воспроизвести звук; самосовершенствование; приносить международную славу; записать, сделать запись; любопытный ребенок; ходить в школу; проводить много свободного времени; читать научные и технические книги; дать шанс; обзавестись семьей; капиталовложения банкиров; конкурент, соперник; самостоятельно обучаться; основать первую лабораторию

Grammar

1 Translate the sentences into Russian. Pay attention to the part of the sentence in bold.

Example: - He was proficient enough **to work** as a telegrapher full time. - *Он был достаточно опытным,* ***чтобы работать*** *телеграфистом полный рабочий день.*

a) An electric vote recorder is a device intended for use by elected bodies such as Congress **to speed** the voting process.
b) Babbage was sent to a country school **to recover** from a life-threatening fever.
c) Edison was invited to the White House **to demonstrate** the tin foil phonograph.
d) The results were so breathtakingly original, that it took some time for the

mathematical and engineering community **to realize** their significance.

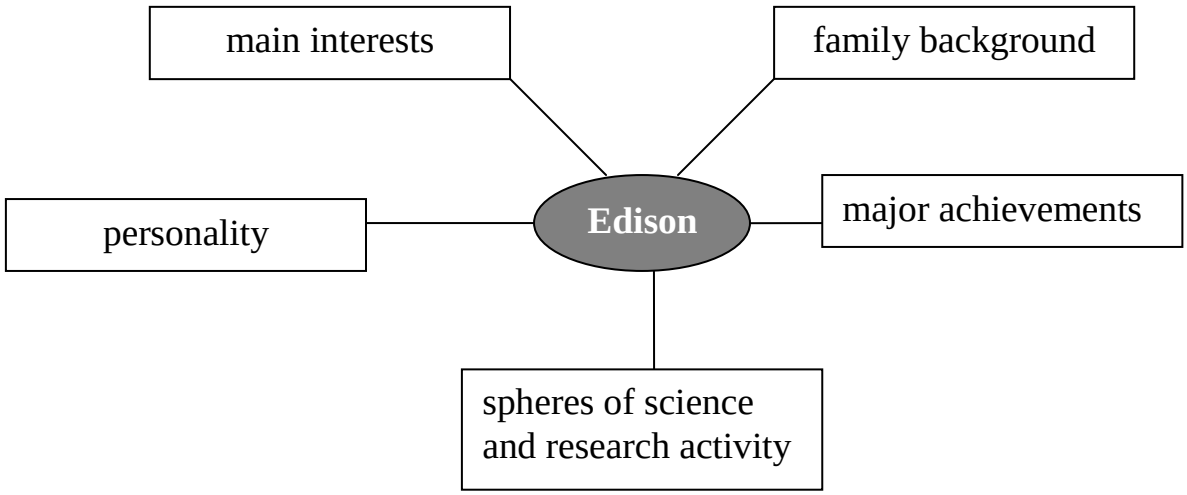
In 1970, NASA leadership asked von Braun to move to Washington, D.C., **to head up** the strategic planning effort for the agency.

e) Tesla built an experimental station in Colorado Springs **to experiment** with high frequency electricity and other phenomena.

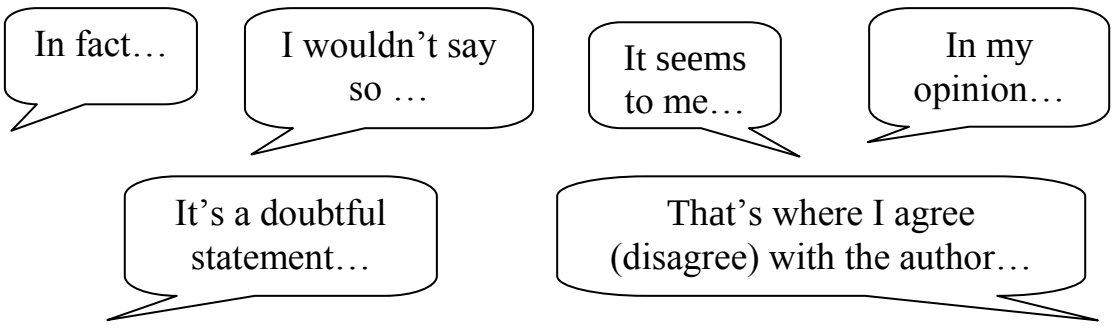
2 Translate paragraph 8 into Russian.

Speaking

1 Sum up the text expanding the following mind map:



2 Comment on Edison's quotations using the following openings:



a) He said that work was bringing out secrets of nature and applying them for the happiness of man.
b) Self-educated, he knew the value of learning: “Education isn’t play. It is hard, hard work. But it can be made interesting work..”
c) “If you do not learn to think when you are young, you may never learn”.
d) “Genius is one percent inspiration and 99 percent perspiration.”
e) “Hell, there are no rules here—we're trying to accomplish something.”

3 Work in groups of 3-4. Make a list of things you would like to know about Thomas Edison. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

4 Thomas Edison wrote a test of general knowledge. Anyone who wanted a job for T Edison Inc. had to take this test. Do this test to check if Mr. Edison would have hired you for his team. Edison mental fitness test 1920.

 **http://www.nps.gov/archive/edis/edifun/quiz/quizhome.htm**

Points for reflection

1 Have you learnt anything new about Edison from the text?
2 Has anything surprised you?
3 What facts were the most amazing?
4 Did you like the text? Why? /Why not?

Progress Test

Choose the correct answer a, b or c. There is one point for each correct answer.

1) One of the projects Edison was involved in was the development of a
a) lead-acid storage batteries b) flashlight battery c) alkaline battery

2) Edison was devoted to the development and exploitation of

a) alternating current b) direct current c) dynamo

3) Edison is famous for …….the electric bulb.

a) developing b) developer c) developed

4) The beginning of the electric age started with the ……of the first commercial power station.

a) operated b) operation c) operating

5) Edison's life was devoted … the bringing out secrets of nature and applying them …the happiness of man.

a) for, on b) at, to c) to, for

6) In 1876 Edison moved to the small village of Menlo Park, 25 miles southwest of New York City, where he *established* a new facility containing all the equipment so as to work on any invention.

a) organized b) set up c) built

7) 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.

a) для того чтобы работать b) для работы c) работать

8) 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.

a) демонстрировать b) для демонстрации

c) для того чтобы проводить демонстрации

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	4	
4	4	
5	2	
Vocabulary		
1	2	
2	2	
3	2	
4	2	
5	2	
6	2	
Grammar		
1	4	
2	6	
Speaking		
1	6	
2	8	
3	10	
4	2	
Points for reflection	2	
Progress test	8	
Total	64	

Module 2 Guglielmo Marconi (1874-1937)

Before you start

1 You are going to read about life and work of the Italian inventor, Guglielmo Marconi. Before you read the text answer the following questions:

a) Who is considered to be “the father of wireless telegraphy”?

b) Have you ever heard about Guglielmo Marconi?

c) What is he famous for?

d) What field of science did he work in?

2 Complete the table about Guglielmo Marconi:

things I know	things I’m not sure about	things I would like to know

Reading

1 Pay attention to the correct pronunciation of the following words:

Guglielmo	[ˊgʌglɪəmə]	pursue	[pəˊsju:]
Marconi	[ˊma: ˊkəunɪ]	ether	[ˊɪ:θə]
Bologna	[ˊbɔuˊlɔunjə]	determine	[dɪtɜ:mɪn]
Wight	[ˊwaɪt]	curvature	[ˊkɜ:vətʃə]
Bournemouth	[ˊbɔ:nməθ]	aerial	[ˊeərɪəl]

Poldhu	[ˊpəuldhju:]	successfully	[ˊsəkˊsesfəlɪ]
Nobel	[nəuˊbel]	launch	[lɔ:ntʃ]
Hertz	[hɜ:ts]	microwave	[ˊmaɪkrəweɪv]
Lodge	[ˊlɔʤ]	industry	[ˊɪndəstrɪ]

2 Read the text about Guglielmo Marconi and comment on the title.

A Radio Star

There cannot be many people who were “losers” at school, failed to get into university, and then went on to win a Nobel Prize for Physics. But at least one did, and with good reason: he made radio happen. A lack of formal education, high-powered family connections and an unstoppable will to succeed helped Guglielmo Marconi to transmit the first radio signal across the Atlantic and launch the wireless-communications industry. Guglielmo Marconi was born at Bologna, Italy, on April 25, 1874, the second son of Giuseppe Marconi, an Italian country gentleman, and Annie Jameson. He was educated privately at Bologna, Florence and Leghorn. Marconi's education was patchy[1], not to say poor. Primary school was a disaster, and he was 12 before he got into a secondary school in Florence where he did badly. The following year, he started to attend more congenial technical school, but Marconi’s progress was still very modest. He never qualified for higher education, even with the help of a private physics tutor. (1)

Рис. 3 Guglielmo Marconi

But even as a boy he took a keen interest in physical and electrical science and studied the works of Maxwell, Hertz and others. In 1895 he began laboratory experiments at his father's country estate at where he succeeded in sending wireless signals over a distance of one and a half miles. (2)

In 1896 Marconi took his apparatus to England and later that year he was granted the world's first patent for a system of wireless telegraphy. He demonstrated his system successfully in London, and across the Bristol Channel,

and in July 1897 formed The Wireless Telegraph & Signal Company Limited (in 1900 re-named Marconi's Wireless Telegraph Company Limited). In the same year he gave a demonstration to the Italian Government during which wireless signals were sent over a distance of twelve miles. In 1899 he established wireless communication between France and England across the English Channel. He erected permanent wireless stations at The Needles, Isle of Wight, at Bournemouth and later at the Haven Hotel, Poole, Dorset. (3)

Marconi's first aim in perfecting communication without wires had been to break the isolation of those at sea. The first life-saving possibilities of wireless communication were realized in 1899 when a wireless message was received from the East Goodwin lightship - which had been equipped with Marconi wireless apparatus. It had been rammed in dense fog by a steamship R.F. Matthews. A request was made for the assistance of a lifeboat. And in 1900 he took out his famous "7777"patent which documented a system for tuned coupled circuits and allowed simultaneous transmissions on different frequencies. Adjacent stations were now able to operate without interfering with one another and ranges were increased. On an historic day in December 1901, determined to prove that wireless waves were not affected by the curvature of the Earth, he used his system for transmitting the first wireless signals across the Atlantic between Cornwall, and Newfoundland, a distance of 2100 miles. (4)

Between 1902 and 1912 he patented several new inventions. In 1902, during a voyage in the American liner "Philadelphia", he first demonstrated "daylight effect" relative to wireless communication and in the same year patented his magnetic detector which then became the standard wireless receiver for many years. In December 1902 he transmitted the first complete messages to Poldhu from stations at Glace Bay, Nova Scotia, and later Cape Cod, Massachusetts. These early tests culminated in 1907 in the opening of the first transatlantic commercial service between Glace Bay and Ireland, after the first short-distance public service of wireless telegraphy had been established between Italy and Montenegro. In 1905 he patented his horizontal directional aerial and in 1912 a

"timed spark" system for generating continuous waves. (5)

During his war service in Italy from 1914 he returned to his investigation of short waves, which he had used in his first experiments. After further tests by his collaborators in England, an intensive number of trials, leading to the establishment of the beam system for long- distance telegraphy was conducted in 1923. Proposals to use this system as a means of Imperial communications were accepted by the British Government and the first beam station, linking England and Canada, was opened in 1926. (6)

In 1931 Marconi began research into the propagation characteristics of still shorter waves, resulting in the setting up in 1932 of the world's first microwave radiotelephone link between the Vatican City and the Pope's summer residence. Two years later he demonstrated his microwave radio beacon for ship navigation and in 1935, again in Italy, gave a practical demonstration of the principles of radar, the coming of which he had first foretold in a lecture to the American Institute of Radio Engineers in New York in 1922. (7)

He has been the recipient of honorary doctorates of several universities and many other international honors and awards, among them the Nobel Prize for Physics, which in 1909 he shared with Professor Karl Braun, the Albert Medal of the Royal Society of Arts, the John Fritz Medal and the Kelvin Medal. He was decorated by the Tsar of Russia with the Order of St. Anne; the King of Italy created him a plenty of different ranks and titles as well. (8)

Marconi's 1909 Nobel Prize was an extraordinary surprise for him - unlike the physicist he shared it with, Ferdinand Braun - Marconi was not, by his own admission, any kind of scientist, or even much of an inventor. He did not really make any fundamental discoveries, and radio was mostly a matter of assembling parts created by other people. But the vision which was needed to see the possibilities of a new communication era, and the unstoppable will to pursue this objective were all his own. According to his own words, he made the whole world see the importance of his inventions, approve and, more importantly, buy them. (9)

Marconi moved to Rome in 1935, never to leave Italy again. He died in the

early hours of 20 July 1937 aged 63 and his body was laid to rest in the mausoleum in the grounds of Villa Griffone. In a fitting tribute[3], wireless stations throughout the world fell silent for 2 minutes and the ether[4] was as silent as it had been before Marconi. (10)

He left behind him a world that even before his death had come to regard radio as a commodity[2], not a miracle. Britain even had an infant television service, broadcast via Marconi equipment. He also left behind a legion of detractors[5] who correctly pointed out that others, such as Lodge and the Russian Alexander Popov, had sent wireless messages before Marconi got his patent. It does not really matter. What Marconi doubtless did invent was an entirely new science-based industry. We are used to being told that some new technology will change the world. Marconi's is one of the few that did. (11)

(Adapted from the Internet sites)

-[1]обрывочный, незаконченный

-[2] предмет потребления

-[3] дань уважения

-[4] эфир

-[5] клеветники

3 Read the text again and choose the correct option.

a) Guglielmo Marconi was the first who

1) assembled radio.

2) invented radio.

3) transmitted the first radio signal.

b) As a boy he liked to spend his free time

1) carrying out laboratory experiments.

2) studying with the help of a private tutor.

3) reading the works of famous scientists.

c) He received higher education

1) with the help of a private physics tutor.

2) on his own but it was very hard.

3) He never had any kind of a university degree.

d) He was granted his first patent for

1) magnetic detector.

2) a system of wireless telegraphy.

3) horizontal directional aerial.

e) A lot of people didn't think he was a great scientist because

1) he was not the only person who sent wireless messages.

2) he was not the first person who sent wireless messages.

3) he never sent any wireless messages.

f) During his life Marconi considered himself to be

1) a successful industrialist and businessman.

2) a famous inventor.

3) an outstanding physicist.

4 Ask and answer the questions:

a) What/family background?

b) What/education/get?

c) What sciences/ was interested in/ boy?

d) What/ famous physicists/ influenced?

e) What/ first patent invention?

f) What/ discovery/ make/ in 1900?

g) What/main inventions and patents?

h) What/attitude/ to Nobel Prize?

Vocabulary

1 Use the affixes in the table to form adjectives from the words below:

history, success, commerce, intensity, continue, practice, direction, nation, physics, electricity, ridicule, vary, remark, continent, expense, structure, response, fame, danger, stress, charity, create, event, break, believe, explosion, magnet

-able/-ible	-al	-ic	-ful	-ive	-ous
unstoppable	historical	public	successful	intensive	continuous

2 Match the words in column **A** with the words in column **B** to make compounds which you come across in the text.

A	**B**
1) day	a) based
2) science	b) powered
3) wireless	c) light
4) long	d) telephone
5) radio	e) distance
6) high	f) communication

Use the words below to make word combinations with the compounds:

effect family telegraphy industry(x2) link

3 Cross out an odd word in each line. Suggest an appropriate word for the odd ones:

a) to conduct: an experiment, a baby, an interview, an orchestra
b) to erect: a station, a leg, a tent, an institution.
c) short: waves, building, man, speech.
d) fundamental: mistake, distinction, discovery, hotel.
e) to assemble: a car, an army, forces, flowers.

4 Look at the following words that often come together and add at least 3 words of your own to each group. Consult the dictionary if necessary.

a) to attend: a university, a meeting, ...
b) to launch: a campaign, a satellite, ...
c) to send: a telegram, a volunteer, ...
d) to decorate: a dress, a room, …
e) to establish: a company, contacts, …

5 Complete the sentences with prepositions if necessary

a) He tried to qualify … higher education with the help of a private tutor.
b) Marconi was granted his first patent … a system of wireless communication.
c) From an early childhood he took a keen interest … physical and electrical science
d) First he succeeded … sending wireless signals over a distance of one mile.
e) Marconi was decorated … many international honors and awards.
f) His tests culminated … the opening of the first transatlantic commercial service.

6 Give English equivalents to the following words and word combinations: непрекращающееся желание преуспеть; передать радио сигнал; обучался частным образом; проявлял острый интерес к; система беспроводного телеграфа; основал постоянную станцию; возможности беспроводной

коммуникации; был оснащен ; антенна; сотрудники; радиомаяк; получатель почетных международных наград; был награжден; фундаментальное открытие; преследовать цель; создать новую отрасль промышленности, опирающаяся на научных знаниях

Grammar

1 Divide the following sentences into two parts according to the model. Translate the original sentence.

Model: Lodge and Alexander Popov **had sent** wireless messages **before** Marconi **got** his patent. - **First** Lodge and Alexander Popov **sent** wireless messages. **Then** Marconi **got** his patent. – *Лодж и Александр Попов отправляли беспроводные сообщения* ***до того, как*** *Маркони получил свой патент.*

a) The opening of the first transatlantic commercial service between Glace Bay and

Ireland took place after the first shorter-distance public service of wireless telegraphy had been established between Italy and Montenegro.

b) The military understood the usefulness of remote-controlled vehicles after Tesla's patents had expired.

c) He gave a practical demonstration of the principles of radar, the coming of which he had first foretold in New York in 1922.

d) It was widely discussed that Nikola Tesla refused the Nobel Prize because Marconi had already received his.

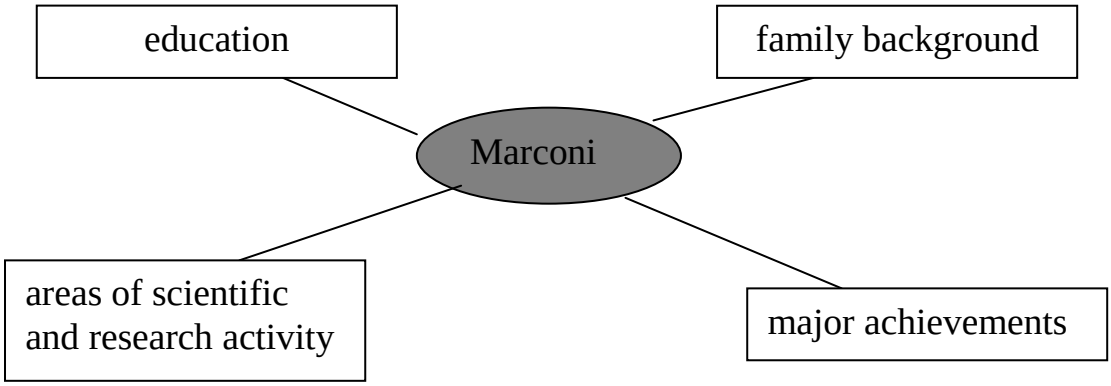
e) He left behind him a world that even before his death had come to regard radio as a commodity, not a miracle.

f) In 1877 Edison made a recording on a little machine which he had invented.

2 Translate paragraphs 10-11 into Russian.

Speaking

1 Sum up the text using the following mind map:



2 Comment on the statements:

a) Guglielmo Marconi is one of the most prominent inventors of the 20th century.

b) Guglielmo Marconi made radio happen.

c) Guglielmo Marconi is just a successful industrialist and businessman.

How to comment
1) Decide whether you agree or disagree with the statement.
2) Find proofs in the text.
3) Express your own opinion on the statement.

3 Do you agree with the following quotations on Marconi's work?

a) "… the emission and reception of signals by Marconi by means of electric oscillations is nothing new. In America, the famous engineer Nikola Tesla carried the same experiments in 1893." Alexander Popov

b) "In a few days time, Marconi won't just hit the ground running; it'll take off as Europe's brightest technology company." George Simpson

4 Work in groups of 3-4. Make a list of things you would like to know about Guglielmo Marconi. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

Points for reflection

1 Have you learnt anything new about Marconi from the text?
2 Has anything impressed you?
3 What facts were the most amazing?
4 Did you like the text? Why? /Why not?

Progress test

Choose the correct answer: a, b or c. There is one correct point for each answer.

1) Guglielmo Marconi became a “radio star” because
   a) he launched the wireless-communication industry.
   b) made a lot of fundamental discoveries in the field of radio physics.
   c) assembled the first radio.

2) His most outstanding achievements belonged to the sphere of
   a) ship navigation . b)wireless telegraphy.
   c) magnetic detection.

3) Effect, invent, create, collaborate, product, act
   a) –ful b) –able c)–ive

4) He was the man who managed to ……. the first radio signal across the Atlantic.
   a) pass b)catch c)transmit

5) His persistent wish to pursue this *objective* helped Guglielmo Marconi launch the wireless-communication industry.
   a) purpose b)position c)interests

6) Despite the lack of formal education he took a keen interest …. physical and electrical science.

a) with b)in c)of

7) He presented the results of his famous experiment he already ……..… in his influential paper in 1980s.

a) has described b)described c)had described

8) Before the first beam station was erected, there ……..……. some proposals to use this system as a means of Imperial communications.

a) had been b)were c)have been

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	2	
Vocabulary		
1	2	
2	2	
3	2	
4	2	
5	2	
6	2	
Grammar		
1	4	

2	6	
Speaking 1 2 3 4	 6 8 8 10	
Points for reflection	2	
Progress test	8	
Total	64	

Module 3 Nikola Tesla (1856 – 1943)

Before you start

Рис. 4 Induction motor

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

a) What field of science did he work in?

b) What is he famous for?

Reading

1 Pay attention to the correct pronunciation of the following words.

Croatia	[krɔu´eɪʃɪə]	coil	[kɔɪl]
Serbian	[´sə:bɪən]	magnetic	[mæg´netɪk]

Roentgen	[ˊrɔntgən]	induction	[ɪnˊdʌkʃn]
Niagara	[naɪˊægərə]	turbine	[ˊtɜ:baɪn]
Austria	[ˊɔstrɪə]	remote	[rɪˊməut]
direct	[dəˊrəkt]	robotics	[rəuˊbɔtɪks]
alternating	[ˊɔltəneɪtɪŋ]	X-ray	[ˊeks reɪ]
polyphase	[pəlɪˊfeɪz]	terrestrial	[təˊrestrəl]
control	[kənˊtrəul]	hypothesis	[haɪˊpθəsɪs]

2 Read the text and comment on the title.

The Genius Who Lit the World

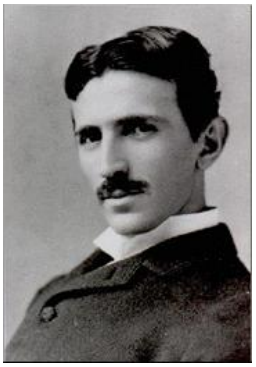


Рис. 5 Nikola Tesla

Nikola Tesla was born on July 10, 1856 in Smiljan, Croatia, which was then part of the Austo-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 physics and mathematics, but soon he became fascinated with electricity. (1)

He began his career as an electrical engineer with a walking with a friend through the city park after seeing a telephone company in Budapest in 1881. Once when Tesla was at the demonstration of the "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 radical device, Tesla accepted an offer to work for Thomas Edison

in New York. His childhood dream was to come to America to harness the power of Niagara Falls. (2)

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? (3)

Edison’s lamps were weak and inefficient when supplied by direct current. This system had a severe disadvantage in that it could not be transported more than two miles due to its inability to step up to high voltage levels necessary for long distance transmission. Consequently, a direct current power station was required at two mile intervals. Direct current flows continuously in one direction; alternating current changes direction 50 or 60 times per second and can be stepped up to vary high voltage levels, minimizing power loss across great distances. He was convinced that the future belonged to alternating current. 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. (4)

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. (5)

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[1]. 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. (6)

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. (7)

Tesla built an experimental station in Colorado Springs, Colorado in 1899, to experiment with high voltage, high frequency electricity and other phenomena. When the Colorado Springs Tesla Coil magnifying transmitter[2] was energized, it created sparks 30 feet long. From the outside antenna, these sparks could be seen from a distance of ten miles. 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. (8)

The old Waldorf Astoria was the residence of Nikola Tesla for many years. He lived there when he was at the height of financial and intellectual power. Tesla organized elaborate dinners, inviting famous people who later witnessed spectacular electrical experiments in his laboratory. (9)

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 untold numbers of younger men to enter the new field of radio and electrical science. (10)

Nikola Tesla was one of the most celebrated personalities in the American press, in this century. 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. Here is how he explained his creative process: *"Before I put a sketch on paper, the whole idea is worked out mentally. In my mind I change the construction, make improvements, and even operate the device. Without ever having drawn a sketch I*

can give the measurements of all parts to workmen, and when completed all these parts will fit, just as certainly as though I had made the actual drawings. It is immaterial to me whether I run my machine in my mind or test it in my shop. The inventions I have conceived in this way have always worked. In thirty years there has not been a single exception. My first electric motor, the vacuum wireless light, my turbine engine and many other devices have all been developed in exactly this way." (11)

Tesla possessed a striking physical appearance over six feet tall with deep set eyes and a stately manner. To the contemporaries he was a man endowed with remarkable physical and mental freshness, ready to surprise the world with more and more inventions as he grew older. (12)

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. (13)

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. (14)

(Adapted from the Internet sites)

-[1] самолет с вертикальным взлетом

-[2] передатчик усиления трансформатора Тесла в Колорадо Спрингз

3 What do these figures refer to?

700 1884 200 1943 6 1856 1915 25 59

4 Look back in the text and make a list of Tesla's inventions and developments.

5 Read the text again and answer the following questions:

a) What sciences attracted Tesla?
b) Where did he work?
c) What was his childhood ambition? Did he achieve it?
d) How did he come across the idea of induction motor?
e) Did European manufacturers get interested in it?
f) What advantages did alternating current have over/versus direct current?
g) What was the reason for the war of currents?
h) What did he look like?
i) How did Tesla develop his ideas?
j) Were Tesla's inventions and ideas studied after his death?
k) Do you think Nikola Tesla was a successful inventor?

Vocabulary

1 Look at the following words from the text. What do they have in common?

unclear discover invalid immaterial wireless

Find the other words in the text that have negative affixes.

Are there any rules?

There is no rule. The most usual and the most used is **"un-"**. **"in-"** is a prefix from Latin, so it is usually seen with Latin roots or with one syllable native English roots. **"in-"**changes to **"im-"** before "m", "p", and "b". It changes to **"il-"** before "l" and to **"ir-"** before "r". **"dis-"** creates a negative state or the absence of something. The affix **"-less"** negates a quality and it is the opposite of "-ful". "**-mis**" has the meaning of something wrong. Always consult a dictionary.

es

connect	responsible	literate	use	finite
logical	advantage	care	take	finished
possible	complete	productive	accuracy	understood
fortunate	patient	like	publish	real

2 Make a list of the electrical terms from the text. Use the dictionary to check their pronunciation. Translate them into Russian. Which of them are international words?

3 Look back in the text and find words that have a similar meaning to:

a) interested in (1)
b) was going to (1)
c) worked (2)
d) imagined (2)
e) making better (3)
f) resulted in (3)
g) working on (4)
h) predicted (6)
i) tried (7)
j) flash (8)
k) devised (11)
l) run out (14)

4 Complete the sentences with prepositions if necessary.

a) While studying at the University of Prague, Tesla was fascinated … electricity.
b) In the USA he joined … T. Edison's team in New Jersey.
c) Nikola Tesla worked … Edison until Tesla conceived polyphase alternating current system.
d) How many inventions did Tesla hold patens …?
e) Tesla experimented a lot … radio waves, X-rays and terrestrial stationary waves.
f) Tesla had many reasons to refuse … the Nobel Prize.

5 Look back in the text and explain the phrases and sentences in italics in your own words.

a) Tesla's lectures … *inspired untold numbers of younger men to enter the new field* of radio and electrical science.
b) Tesla was clearly *ahead of his time, a problem which would haunt his entire career.*
c) … began researching it over *from scratch*, …
d) Tesla never *made a dime off* of the discovery … .

6 Give English equivalents to the following words and word combinations.

специализироваться в к-л области науки; представить устройство; разрабатывать динамо-машину; неэффективность ламп; серьезный недостаток; сводить потери мощности к минимуму; идеальное сотрудничество; постигать принцип; предвидеть межпланетную связь; объявить об открытии; заявлять о первенстве; наземные стационарные волны; искусственная молния; мысленно разрабатывать; усовершенствовать устройство; делать набросок; задумать изобретение; отказаться от приза

Grammar

1 Look at the chart. Make sentences about Nikola Tesla according to the model. Translate the sentences.

Model: With a stick, Tesla drew a diagram of a rotating magnetic field in the sand. **He explained** to his friend the principle of the induction motor. - With a stick, Tesla drew a diagram of a rotating magnetic field in the sand, **explaining** to his friend the principle of the induction motor. – *Тесла палкой начертил на песке диаграмму магнитного поля,* ***объяснив (объясняя)*** *другу принцип электродвигателя.*

a) He published schematic diagrams of the radio transmitter. Tesla described all the basic elements of the radio transmitter which was later used by

Marconi.

b) During the World War II, Claude Shannon was interested in the possibility of building a machine that could imitate the human brain. He worked with Alan Turing for a few months.
c) In 1909 Marconi received the Nobel Prize for physics. He shared it with Ferdinand Braun.
d) Wiener changed the way everyone thought about computer technology. He influenced several later developers of the Internet.
e) Edison had very little formal education as a child. He attended school only for three months.
f) Tesla organized elaborate dinners. Tesla invited to dinners famous people who later witnessed spectacular electrical experiments in his laboratory.

2 Link the pairs of sentences using **after/before … ing**.

Model: First Tesla saw a demonstration of the "Gramme dynamo". Then he visualized a rotating magnetic field. – **After** see**ing** a demonstration of the "Gramme dynamo", Tesla visualized a rotating magnetic field.

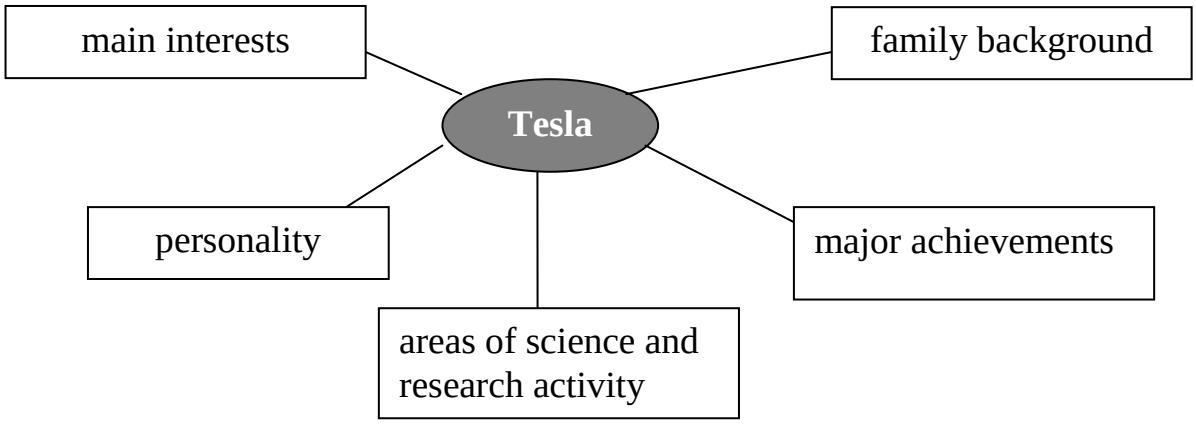
a) First Tesla worked out the whole idea of any device mentally. Then he put the sketch of the device on paper.
b) First Babbage completed a small difference engine. Then he announced his invention to the Royal Astronomical Society.
c) First Shannon graduated from MIT in 1940. Then he spent a year as a National Research Fellow at Princeton University.
d) In 1931 Marconi began research into the propagation characteristics of still shorter waves. Then he demonstrated his microwave radio beacon for ship navigation.
e) Norbert Wiener was awarded a BA in mathematics in 1909 at the age of 14. Then he began graduate studies in zoology at Harvard. And in 1910 he transferred to Cornell to study philosophy.

f) First Edison worked in a number of cities throughout the United States. Then he arrived in Boston in 1868 where he began to change his profession from telegrapher to inventor.

3 Translate paragraph 7 into Russian.

Speaking

1 Sum up the text using the following mind map:



2 Comment on the statements:

a) Tesla was the genius who ushered in the age of electrical power.

b) Tesla had a vivid imagination.

c) Nikola Tesla left his mark in science, engineering and industry.

3 Read the following quotes by Tesla. Do you think he was right? Provide real life examples.

a) “Our virtues and our failings are inseparable, like force and matter. When they separate, man is no more.”

b) “Today's scientists have substituted mathematics for experiments, and they wander off through equation after equation, and eventually build a structure which has no relation to reality.” Nikola Tesla, Modern Mechanics and Inventions, July, 1934

c) “Let the future tell the truth, and evaluate each one according to his work and accomplishments. The present is theirs; the future, for which I have really worked, is mine.” Nikola Tesla

4 Work in groups of 3-4. Make a list of things you would like to know about Nikola Tesla. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

Points for reflection

1 Have you learnt anything new about Nikola Tesla from this unit?
2 What made the greatest impression on you?
3 Has anything surprised you?
4 Did you like the text? Why? /Why not?

Progress Test

Choose the correct answer A, B or C. There is one point for each correct answer.

1) What device did Nikola Tesla conceive and design first?

a) remote control b) induction motor c) Tesla coil

2) What invention did Tesla consider his most important one?

a) electrical transmissions systems b) principle of alternating current
c) terrestrial stationary waves

3) Which device by Tesla is still widely used in electronic equipment?

a) Tesla coil b) X-ray tubes c) fluorescent lamp

4) Thomas Edison conducted the war of the currents (direct vs alternating currents) to …… Nicola Tesla's Alternating Current system.

a) uncredit b) discredit c) miscredit

5) Nikola Tesla did not *try* to proclaim his priority in discovering radio or X-rays.

a) attempt b) start c) effort

6) Nikola Tesla *created in his mind* all the details of the devices he invented.

a) developed b) imaged c) visualized

7) The fact that Nikola Tesla refused …….. the Nobel Prize surprised the scientific community.

a) from b) - c) on

8) Tesla joined Continental Edison Company in Paris where he designed dynamos before ……..to America.

a) going b) he goes c) having going

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	2	
5	2	
Vocabulary		
1	2	
2	2	
3	2	

4 5 6	2 2 2	
Grammar 1 2 3	 4 4 6	
Speaking 1 2 3 4	 6 8 8 10	
Points for reflection	2	
Progress test	8	
Total	78	

Module 4 Charles Babbage (1792-1871)

Before you start

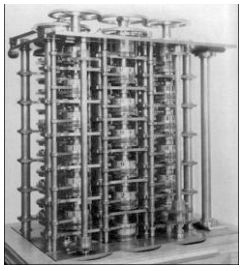


Рис. 6
Difference engine

1 You are going to read about life and work of the British inventor, Charles Babbage. Before you read the text answer the following questions.

a) What field of science did he work in?

b) What is he famous for?

Reading

1 Pay attention to the correct pronunciation of the following words.

Babbage	[ˊbæbɪʤ]	irascible	[ˊlɔgərɪðəm]
Leibniz	[ˊlaɪbnɪts]	logarithm	[məˊʃɪːnərɪ]
Lagrange	[ləˊgraːn(d)s]	machinery	[ˊenʤɪn]
Trinity	[ˊtrɪnətɪ]	engine	[ˊʤɪːnɪəs]
association	[səˊsaɪətɪ]	genius	[əbˊskjuərətɪ]
society	[ˊdɪfrəns]	obscurity	[ˌæ ˌænəˊlɪtɪkl]
difference	[ə səusɪˊeɪʃn]	analytical	[ɪˊræsəbl]

2 Read the text and think of the proper title for it. Explain your choice.

* * *

British inventor Charles Babbage is one of the great paradoxes of computing history. Although he is often credited with developing the first "general-purpose computer," he never actually built any examples of his design. His steam-powered Analytical Engine, as it was called, would seem extremely primitive to us today, but in the 1830s, it was a groundbreaking design. (1)

Рис.7 Charles Babbage

Babbage was born in Teignmouth, Devonshire (UK) into a middle-class banking family. He followed an educational path typical for his age and status. His father’s money allowed Charles to receive instruction from several schools and tutors during the course of elementary education.

Around age eight he was sent to a country school to recover from a life-threatening fever with the strict instruction to the master not to press too much knowledge upon him. Perhaps this great idleness and a well-stocked library in the academy in Middlesex prompted his love of mathematics. Here he began to show a

passion for mathematics but a dislike for the classics. On leaving the academy, he continued to study at home, having an Oxford tutor to bring him up to university level. He had read extensively in Leibniz, Lagrange, Simpson and was seriously disappointed in the mathematical instruction available at Trinity College in Cambridge. In response, he, John Hershel, George Peacock and several other friends formed the Analytical Society to try to bring the modern continental mathematics to Cambridge. (2)

Babbage and Herschel produced the first of the publications of the Analytical Society when they published Memoirs of the Analytical Society in 1813, a remarkably deep work when one realises that it was written by two undergraduates. They gave a history of the calculus, and of the Newton, Leibniz controversy. In spite of being the top mathematician he failed to graduate with honours. (3)

As an active participant in the mathematical circles of the day, he founded the Analytical Society, the British Association for the Advancement of Science, and the Royal Astronomical Society and served as Lucasian professor of mathematics at Cambridge. He also published a number of books on mathematics, statistics, and a variety of mechanical and industrial topics. His fascination with the mechanics was a lifelong interest. Rather than watch plays and operas with his society counterparts, he chose to go behind the scenes to view the trap doors, stage elevators, and other mechanisms of an 1800s theater. (4)

Babbage is without doubt the originator of the concepts behind the present day computer. The computation of logarithms had made him aware of the inaccuracy of human calculation around 1812. Once he wrote: "... *I was sitting in the rooms of the Analytical Society, at Cambridge, my head leaning forward on the table in a kind of dreamy mood, with a table of logarithms lying open before me. Another member, coming into the room, and seeing me half asleep, called out, Well, Babbage, what are you dreaming about?" to which I replied "I am thinking that all these tables" (pointing to the logarithms) "might be calculated by machinery." (5)*

Certainly Babbage did not follow up this idea at that time but in 1819, when his interests were turning towards astronomical instruments, his ideas became more precise and he formulated a plan to construct tables using the method of differences by mechanical means. Such a machine would be able to carry out complex operations using only the mechanism for addition. He completed a small difference engine in 1822. It was on 14 June 1822 when Babbage's computing career began. He announced his invention in a paper Note on the application of machinery to the computation of astronomical and mathematical tables read to the Royal Astronomical Society. It would become his downfall as well. (6)

Although Babbage envisaged a machine capable of printing out the results it obtained, this was not done by the time the paper was written. An assistant had to write down the results obtained. Babbage illustrated what his small engine was capable of doing by calculating successive terms of the sequence n2 + n + 41. (7)

As he was convinced that a large difference engine could do the work undertaken by teams of people saving cost and being totally accurate, he sought public funds for the construction of a large difference engine. In 1823 Babbage received a gold medal from the Astronomical Society for his development of the difference engine and his initial grant for 1500 pounds. He began work on a large difference engine which he believed he could complete in three years. However the construction proceeded slower than had been expected. Over the next several decades, he designed the Difference Engine again and again, making each incarnation more efficient, more elegant and more compact than the one before, and leaving a trail of unfinished efforts in his creative wake. (8)

In 1834 Babbage published his most influential work On the Economy of Machinery and Manufactures, in which he proposed an early form of what today we call operational research. The same year was the one in which the work stopped on the difference engine. By that time the government had invested 17000 pounds into the project and Babbage had put 6000 pounds of his own money. (9)

By the 1840s, Babbage had moved on to an even more ambitious machine that he called the Analytical Engine. It was never built either, but in theory,

anyway, it represented a substantial advancement over the Difference Engine. A programmable machine with memory and a central processor, capable of looping and conditional branching, the Analytical Engine possessed many structural elements of the modern digital computer. But in 1842 funding for Babbage and his work stopped, the government decided not to proceed and stuck the incomplete Difference Engine in the Science Museum, where it still sits. (10)

Babbage's biographers have noted that the government failed to recognize the potential of Babbage's insights, the immense possibilities of his work, ignored the advice of the most reputable scientists and engineers, misunderstood his motives and the sacrifices he had made, and failed to protect him from the ridicule he suffered as a result of its failure. However, Babbage never gave up hope of building his Analytical Engine, he wrote;" **... if I survive some few years longer, the Analytical Engine will exist...** ". He applied once more for funding in 1851 but was turned down. He was reviled in the press and by the public for his careless spending of public funds and died in obscurity[1]. (11)

A classic curmudgeonly polymath who was known--with good reason—as "The Irascible Genius," Babbage was an inveterate, obsessive thinker, a mathematician with a penchant for engineering that led him, over the course of his long and colorful life, to invent such varied items as the ophthalmoscope, the cowcatcher found on the fronts of locomotives, the black-box recorder (for trains), a submarine automated by compressed air, a seismograph for measuring earthquakes, a "coronagraph" for generating artificial eclipses, a pen that drew dotted lines (for mapmaking), ergonomic paper (green ink on green paper, Babbage found, was easiest on the eyes), and a pair of shoes designed to let the wearer walk on water (Babbage nearly drowned when testing them, thus establishing that his considerable mental powers did not extend to working miracles). (12)

When he wasn't busy inventing, Babbage dabbled in cryptography, wrote books of social criticism, and raised insult to an art form. The irascible genius was known for his ability to alienate people, and honed his talent on everyone from the

Royal Society (which he attacked in a scurrilous book on how governmental corruption was contributing to the decline of English science) to street musicians (who met Babbage's persistent efforts to silence them by playing loudly right outside his window). (13)

Dismissed as a crackpot[2] during his own lifetime and subsequently forgotten by all but the most enthusiastic computer buffs and obsessive Victorianists, Babbage has been relegated to the footnotes of history, a curious example of a man whose ideas were too far ahead of his time to make sense. Babbage's reputation as a visionary and engineer was vindicated when several of the machines he designed, notably the second Difference Engine and its 2.5-tonne printer, were built by the London Science Museum to commemorate the 200th anniversary of his birth in 1991. They had not been built at the time he had lived, mainly due to lack of funds. It was subsequently proven that the critical tolerances required by his machines exceeded the metallurgy and technology available at the time. Built from his original plans, not only did they work, they worked exceptionally well. Modern scientists have stated that Babbage's Analytical Engine was also a viable model, although the limitations of Newtonian physics (upon which it was based) might have prevented its realization at the time. (14)

(Adapted from the Internet sites)

-[1] умереть в безвестности

-[2] чокнутый

3 What do these figures refer to?

1500 1812 1792 17000 1822 2.5 1834 6000 1842 200

4 Make a list of Babbage’s inventions and developments.

5 Read the text again and answer the following questions:

a) Where did Charles Babbage receive his early education?

b) When did he get interested in math?
c) Why did he get disappointed in math studies in Cambridge?
d) What was the Analytical Society aimed at?
e) What fields of science was Babbage interested in?
f) Why did he come across the idea of mechanical computations?
g) What kind of device did those ideas result in?
h) When did he announce of his invention?
i) Was the device able to print out the results it obtained?
j) What kind of device did he conceive in the late 1830s?
k) How much money was invested in Babbage's work? Was it repaid?
l) What kind of personality was Charles Babbage?

Vocabulary

1 Fill in the table with the missing words. Consult the dictionary if necessary.

action	activity/result of action	person/device	characteristic
		thinker	
			original
advise			
	advancement		
			analytical
		undergraduate	
apply			
			operational
	government		
construct			
		visionary	

2 Explain how the following compounds are formed. Put the phrases under the correct heading.

Recognize a participle when you see one.

Participles come in two varieties: past and present. They are two of the five forms or principal parts that every verb has. Look at the charts below.

Past Participle	Present Participle
giggled	giggling
brought	bringing

Notice that each present participle ends in -ing. This is the case 100 percent of the time.

On the other hand, you can see that past participles do not have a consistent ending. The past participles of all regular verbs end in -ed; the past participles of irregular verbs, however, vary considerably. Consult a dictionary whenever you are unsure of a verb's past participle form.

Example: steam-powered engine – an engine that is powered by steam

adjective+noun	noun+participle I	noun+participle II	adverb+participle II	noun+adjective
		steam-powered		

general-purpose computer, life-threatening fever, well-stocked library, wireless communication industry, lifelong interest, science-based industry, well-disposed stance, error-correcting code, man-made lightning, world-wide fame, high voltage level, radio-controlled automation, remotely-controlled torpedoes, brand-new science, properly-designed computer, binary digit code, life-saving possibilities, household appliances

3 Complete the sentences with the prepositions if necessary.

a) Babbage is credited … numerous inventions.

b) He had several publications … various topics that captured his interest.
c) At that time scientists announced … their inventions and discoveries at the meetings of the Royal Scientific Academy.
d) Babbage's passion … mathematics and mechanics shaped his life.
e) Being aware … human inaccuracy, Babbage dreamt about mechanical methods to do complex calculations.
f) In the 19th century there were many scientific and technological limitations that prevented … realization of Babbage's Analytical Engine.

4 Look back in the text and explain the following phrases and sentences in your own words.

a) … a groundbreaking design. (1)
b) … not to press to much knowledge upon … (2)
c) His fascination with the mechanics was a lifelong interest. (4)
d) It would become his downfall … . (6)
e) …his considerable mental powers did not extend to working miracles. (11)
f) …raised insult to an art form. (12)
g) … has been relegated to the footnotes of history … (13)
h) Babbage's reputation … was vindicated … (13)
i) … the critical tolerances required by his machines exceeded the metallurgy and technology available at the time. (13)

5 Give English equivalents to the following words and word combinations.

приписывать кому-л изобретение; обучаться где-л; пробудить любовь к чему-л; нелюбовь к учебному предмету; разочароваться в методах преподавания математики; написать поразительно глубокую работу; окончить университет с отличием; неточность вычислений; метод нахождения разности; проводить сложные вычисления; предвидеть совершенно новое устройство; признавать чью-л проницательность\глубину понимания; страдать от насмешек; ругать за легкомысленную растрату общественных средств; заниматься каким-л

делом непрофессионально; жизнеспособная модель

Grammar

1 Express contrast using the following the prompts in brackets.

A comma after However

When you use however at the beginning of a sentence you need to put a comma.

If you use however at the beginning of a sentence and don't insert a comma, however means “in whatever manner” or “to whatever extent.”

although	He was interested in mathematics **although** he never used his mathematical skills in any jobs he held. **Although** he was interested in mathematics**,** he never used his mathematical skills in any jobs he held.
however	He was sure he could complete the difference engine in three years. **However,** the construction proceeded slower than he expected.
in spite of	**In spite of** be**ing** a top mathematician**,** he failed to graduate with honours.
despite	**Despite** be**ing** a top mathematician**,** he failed to graduate with honours.

a) Turing produced unconventional answers. But he won almost every possible mathematics prize at school. (in spite of)

b) Modern scientists have stated that Babbage's Analytical Engine was a viable model. But the limitations of Newtonian physics prevented its realization at the time. (although)

c) For the first time Turing was able to find someone with whom he could share his thoughts and ideas. But his friend Morcom died in February 1930. (however)
d) Edison knew he would hear his own words when experimenting with tin foil phonograph. But he was astonished when they were spoken back to him. (although)
e) Edison's name was used in the title of electric company – Edison General Electric. But he never controlled this company. (despite)
f) With the development of gasoline powered cars electric vehicles were becoming less common. But the Edison alkaline battery still proved to be useful. (however)
g) Babbage is often credited with developing the first general-purpose computer. But he never actually built any of them. (although)

2 Translate paragraphs 1-2 into Russian.

Speaking

1 Look through the text and divide it into parts. Entitle each part. Summarize the text in no more than 10 sentences using your key points.

Summary writing

1) Read the text again and underline the key words and sentences.
2) Write summary in your own words.
3) Follow the structure of the original text.
4) The objective of the summary is your point of view.
5) Always check if your summary coincides with the original idea of the text

2 Comment on the following quotations:

a) "... if I survive some few years longer, the Analytical Engine will exist... " Charles Babbage, autobiography. Do you think he was right in his predictions? Why? /Why not?

b) "The whole of the developments and operations of analysis are now capable of being executed by machinery. ... As soon as an Analytical Engine exists, it will necessarily guide the future course of science." Passages from the Life of a Philosopher (London 1864). Why was Babbage sure about the future of mechanical computations? Do you agree with his point of view?

c) "The Victorians did have the capacity to build a computer. What they didn't have was the vision to see why they should want to." the curator of computing at London's Science Museum Doron Swade.

3 Work in groups of 3-4. Make a list of things you would like to know about Charles Babbage. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

Points for reflection

1 Have you learnt anything new about Charles Babbage from this unit?
2 What made the greatest impression on you?
3 Has anything surprised you?
4 Did you like the text? Why? /Why not?

Progress Test

1) Which of the following devices did Charles Babbage develop?

a) a seismograph b) a tin-foil phonograph c) ergonomic paper
d) electronic paper e) a computer f) a differential engine

Choose the correct answer A, B or C. There is one point for each correct answer.

2) When was Babbage's Differential Engine built up?

a) in the 19th century b) 20 years after his death c) in the 20th century

3) The most reputable scientists and engineers ……. the government to support the work of Charles Babbage.

a) advice b) adviced c) advised

4) Charles Babbage was one of the first scientists who …….. mechanical computations.

a) originating b) originated c) originator

5) The British government *failed to recognize* the potential of Babbage's insights.

a) didn't acknowledge the importance b) failed to estimate

c) recognized

6) Charles Babbage is often credited ……. developing the concept of the general-purpose computer.

a) to b) with c) -

7) During his long life Babbage invented such various items from the Analytical Engine to ophthalmoscope. …….., he died in obscurity forgotten by majority of people.

a) Although b) Despite c) However

8) Charles Babbage continued working on his project ……. the lack of funding.

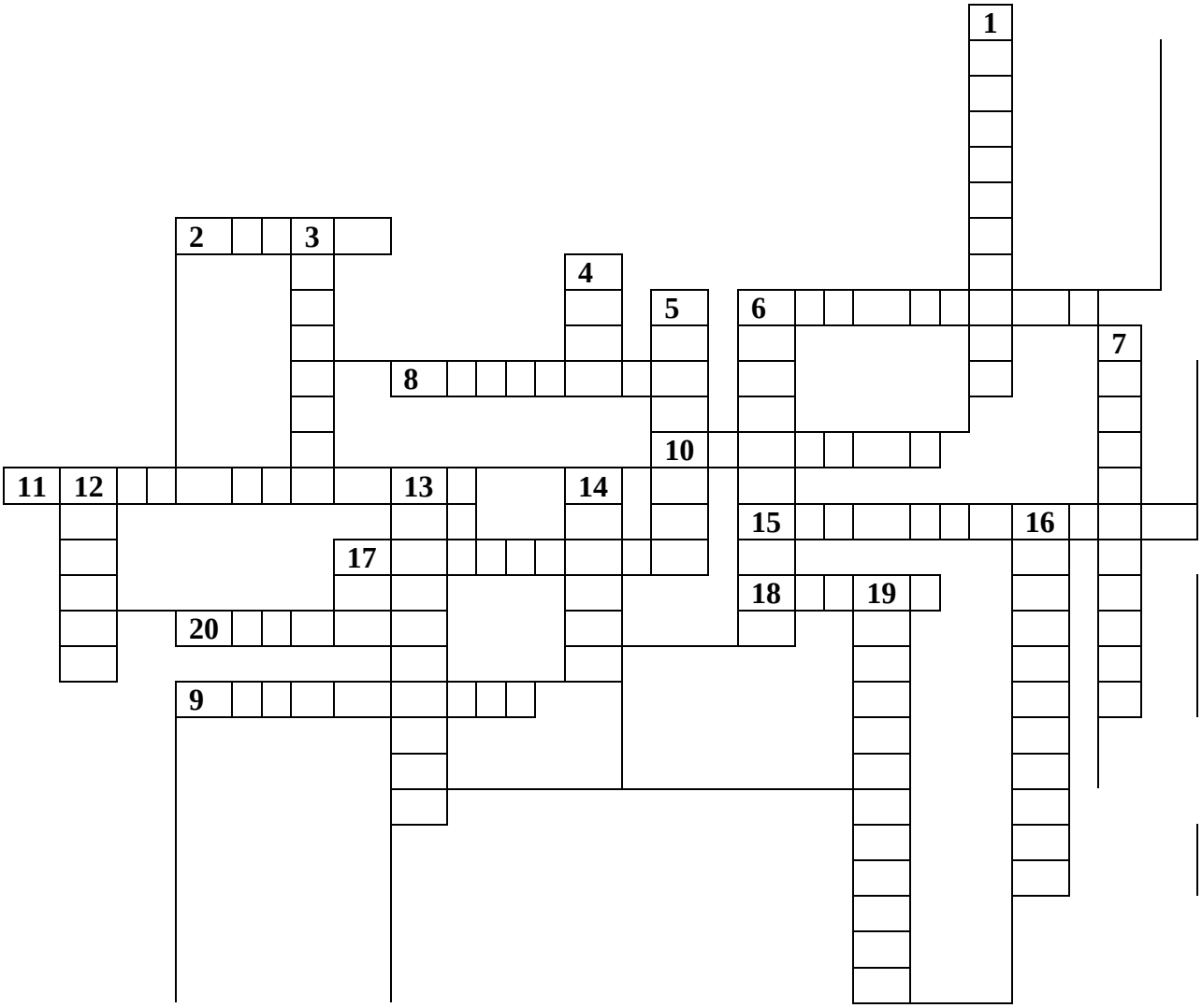
a) although b) despite c) in spite

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	2	
5	2	
Vocabulary		
1	2	
2	2	
3	2	
4	2	
5	2	
Grammar		
1	4	
2	6	
Speaking		
1	6	
2	8	
3	10	
Points for reflection	2	
Progress test	11	
Total	67	

Module 5 Follow Up Activities

1 Do the crossword



Across

2 - small flash of light produced by

6 - a flash, or several flashes, of very bright light caused by electricity

8 - a thin wire in a light bulb that produces light when electricity is passed through it

9 - a means of sending messages over long distances, using wires that carry electrical signals

10 - the flow of electricity through a wire

11 - device that measures and records information about earthquakes

15 - piece of equipment used for sending radio signals

17 - a substance that allows electricity or heat to pass along it or through it

18 - the process of sending and receiving messages through the air using electromagnetic waves

20 - a device for turning mechanical energy from movement into electricity

Down

1 - form of energy from charged elementary particles

3 - a piece of radio equipment that changes broadcast signals into sound or pictures

4 - the form that some types of energy such as heat, sound, light, etc. take as they move

5 - a device for discovering the presence of smth, such as changes in pressure or temperature

6 - a room or building used for scientific research, experiments

7 - a substance producing bright light by using some forms of radiation

12 - the part of a vehicle that produces power to make the vehicle move

13 - a piece of equipment for playing records (old-fashioned)

14 - an official right to be the only person to make, use or sell a product or an invention

16 - a device for reducing or increasing the voltage of an electric power supply

19 -the quality of giving out light when heated

2 Make a poster presentation (group work)

Step One - Brainstorm and discuss the ideas on what points to highlight in your poster.

Step Two - Develop the materials you want to include in your poster into separate paragraphs. Write each paragraph on a separate piece of paper.

Step Three - Structure your text. Discuss the order and place of each paragraph on your poster.

Step Four - Proofread the material checking the spelling, punctuation, grammar and vocabulary.

Step Five - Choose a person to design the poster. Help him/her to make necessary additions (photos, diagrammes, etc.)

Step Six - Choose a person to present your poster in class. Help him/her with the pronunciation and intonation.

Step Seven - Pin the poster on the wall of the classroom and make your presentation.

3 To find information on other scientists and inventors in the fields of information technologies, physics, mathematics, engineering, use Hotlist «Outstanding Scientists and Inventors».

Outstanding Scientists and Inventors

"Genius is 1 percent inspiration and 99 percent perspiration" - T.A. Edison

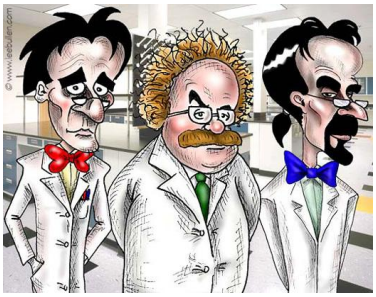


Рис. 8

Individual reading is an integral part of the English language course that allows you to widen the limits of any topic you study. The hotlist "Outstanding Scientists and Inventors" brings you face-to-face with the extraordinary scientists, thinkers and pioneers who have shaped our world. It is an index of supplementary reading material.

Individual reading class takes place once a month. The requirements are:

1. Choose a scientist or inventor who made a significant contribution into

further development of physics, engineering, mathematics, computer science, information technology, systems analysis.

2. Read and translate into Russian the biography of the scientist/inventor (5000 characters).

3. Sum up the information you have read in no more than 10 sentences, highlighting the most important and interesting facts in the scientist/inventor's life and work.

4. Practice reading aloud one of the paragraphs – check the pronunciation of the proper names, terms, etc.

Links:

- Eric Weisstein's World of Scientific Biography - A database of very brief biographies for over 1,000 figures in science
  http://scienceworld.wolfram.com/biography/

- The MacTutor History of Mathematics archive - Comprehensive collection of biographies and history of mathematics articles
  http://www-history.mcs.st-and.ac.uk/

- Academy of US Achievement: Science and Exploration - Collection of Biographies of US explorers, profiles and interviews with them.
  http://www.achievement.org/autodoc/halls/sci

- Biographies PolySearch Engine - Search for biographical information, sketches, and full biographies of famous and infamous scientists.
  http://www2.hawaii.edu/~jacso/extra/egyeb/poly-bio.htm

- Scientists, Inventors and Explorers - Guide to science biography indexed by subject and academic level, timelines and science on stamps
  http://www.juliantrubin.com/sciencebiography.html

- Nobel prize.org - All related information on all Nobel Prize Laureates, biographies, autobiographies, interviews and lectures
  http://nobelprize.org/nobel_prizes/

- About:Inventors - A collection of biographies of famous inventors indexed in alphabetical order
  http://inventors.about.com/library/bl/bl1_1.htm

- Cybernetics and Systems Thinkers - a list of the most influential theorists in the field of cybernetics and systems theory and related domains
  http://pespmc1.vub.ac.be/CSTHINK.html

- Inventor of the Week Archive
  http://web.mit.edu/invent/iow/i-archive-ct.html

- John von Neumann - Genius of Man and Machine
  http://light-science.com/vonneumann.html

- John Nash – Autobiography
  http://nobelprize.org/nobel_prizes/economics/laureates/1994/nash-autobio.html

- Ludwig von Bertalanffy **http://www.isss.org/lumLVB.htm**
- Free Russian English Dictionary and English to Russian online
  http://www.rustran.com/

- Online Dictionary, Language Guide, Foreign Language and Etymology - allows sound

  http://www.allwords.com/

- Dictionary - MSN Encarta - Online dictionary with over 100000 entries, definitions, and pronunciation

  http://encarta.msn.com/encnet/features/dictionary/dictionaryhome.aspx

This Worksheet was created by Reznikova Svetlana

4 Participate in a Student Conference

Hold a mini-conference in your group devoted to the outstanding people in your field of science (information technologies, mathematics, physics, engineering, systems analysis). Prepare a five-minute presentation on the scientist's biography and work.

a) Find information on any scientist or inventor who is the most interesting from the point of view of the biography and contribution. Think of bits that might get listeners interested.
b) Develop the materials into separate paragraphs. Write each paragraph on a separate piece of paper.
c) Structure your text. Decide on the order of each paragraph.
d) Write the text as a whole, adding introduction, conclusion and links between paragraphs.
e) Think of a "catchy" beginning and an interesting ending but be brief.
f) Proofread the material checking the spelling, punctuation, grammar and vocabulary
g) Practise to be very precise with time: rehearse it.
h) Don't forget you must speak, not read.

i) Use various visual aids (handouts, PowerPoint, photos, sound) to make your presentation interesting and captivating.

j) Be ready to answer any questions that might arise.

Module 6 Claude Shannon (1916-2001)

Before you start

1 You are going to read about life and work of the American scientist, Claude Shannon. Before you read the text answer the following questions.

a) Have you ever heard about Claude Shannon?

b) What field of science did he work in?

c) What is his most significant contribution to the world science?

2 Complete the table about Claude Shannon:

things I know	things I'm not sure about	things I would like to know

Reading

1 Pay attention to the correct pronunciation of the following words:

Claude [kɪɔːd] code [kəud]

Shannon	['ʃænən]	relay	[ˊrɪ:leɪ]
mathematician	[ˌ mæθəmə'tɪʃn]	theory	[ˊθɪərɪ]
physicist	['fɪzɪsɪst]	equation	[ɪˊkweɪʒn]
process	['prəusəs]	reliability	[rɪ ˌ laɪə'bɪlətɪ]
honorary	['pnərərɪ]	binary	[ˊbaɪnərɪ ˌ]
scientific	[ˌ saɪən'tɪfɪk]	thermodynamics	[ˌθɜ:məudaɪˊnæmkɪs]

2 Here are some international words from the text. Guess their meaning. Consult the dictionary if necessary.

technology, machine, institute, laboratory, mathematics, engineering, theory, method, publication, information, discipline, modem, file, university

Give some more examples.

3 Read the text about Claude Shannon and comment on the title.

The Father of Information Theory

American mathematician Claude Elwood Shannon was born in Gaylord, Michigan on April 30, 1916. Shannon's father Claude was a judge in a small town of

Gaylord, and his mother Mabel was the principal of the local high school. When a child, Shannon turned out to be mathematically precocious and received scientific encouragement from his grandfather, who was an inventor and a farmer and whose inventions included the washing machine and farming machinery. (1)

Рис.9
Claude Shannon

From an early age, Shannon showed an affinity for both engineering and mathematics, and graduated from Michigan University with degrees in both disciplines. For his advanced degrees, he chose to attend the Massachusetts Institute of Technology. At the time, MIT was one of the prestigious institutions conducting research that would eventually

formulate the basis for what is now known as the information sciences. Its faculty included mathematician Norbert Wiener, who would later coin the term cybernetics to describe the work in information theories that he, Shannon, and other leading American mathematicians were conducting. It also included Vannevar Bush, MIT's dean of engineering, who in the early 1930s had built an analog computer called the Differential Analyzer which was developed to calculate complex equations. It was a mechanical computer, using a series of gears and shafts. Its only electrical parts were the motors used to drive the gears. This work formed the basis for Shannon's influential 1938 paper "A Symbolic Analysis of Relay and Switching Circuits," in which he put forth his developing theories on the relationship of symbolic logic to relay circuits. (2)

Shannon graduated from MIT in 1940 with both a master's degree and doctorate in mathematics. After graduation, he spent a year as a National Research Fellow at the Institute for Advanced Study at Princeton University. In 1941, Shannon joined the Bell Telephone Laboratories, where he became a member of a group of scientists charged with the tasks of developing more efficient information transmitting methods and improving the reliability of long-distance telephone and telegraph lines. While working at the Bell Labs they started to develop the theory of the error-correcting code. (3)

One of the most important features of Shannon's theory was the concept of information entropy[1]. Entropy happened to be equivalent to a shortage in the information content in a message and this fact was proved by Shannon. According to physics' second law of thermodynamics, entropy is the degree of randomness[2] in any system which increases over a period of time. Thus, many sentences can be significantly shortened without losing their meaning. Moreover a signal proved to be sent without distortion. So this concept has been developed over the decades into sophisticated error-correcting codes that ensure the integrity of the data on which society interacts. While studying the relay switches on the Differential Analyzer, Shannon noted that the switches were always either open or closed, or on and off. This led him to think about a mathematical way to describe

the open and closed states. Shannon theorized that according to a binary system a switch in the on position would equate to one and in the off position, it would be a zero. Reducing information to a series of ones and zeros, he noticed that it could be processed by using on-off switches .He believed that information was no different than any other quantity and therefore could be manipulated by a machine. (4)

In the late 1940s, Shannon's research was presented in “The Mathematical Theory of Communications”. It was in this work that Shannon first introduced the word 'bit,' comprised of the first two and the last letter of 'binary digit' to describe the yes-no decision that lay at the core of his theories. (5)

Shannon's most important scientific contribution was his work on communication. In 1941 he began a serious study of communication problems, partly motivated by the demands of the war effort. This research resulted in the classic paper entitled "A mathematical theory of communication" in 1948. Combining mathematical theories with engineering principles he set the stage for the development of the digital computer and the modern digital communication revolution. The results were so breathtakingly original, that it took some time for the mathematical and engineering community to realize their significance. But soon his ideas were picked up, elaborated upon, extended, and complemented with new related ideas. As a result a brand-new science had been created in the form of Information theory, with the publication of that single paper, and the frame work and terminology he established remains standard even today. (6)

During the World War II, Alan Turing, a leading British mathematician spent a few months working with Shannon. Both scientists were interested in the possibility of building a machine that could imitate the human brain. In the 1950s, Shannon continued his efforts to develop what was then called "intelligent machines" - mechanisms that emulated the operations of the human mind to solve problems. (7)

Shannon's information theories saw application in a number of disciplines in which a language is a factor, including linguistics, phonetics, psychology and cryptography. His theories also became a cornerstone of the developing field of

artificial intelligence, and his famous conference at Dartmouth College in 1956 was the first major effort in organizing artificial intelligence research. He wrote a paper entitled "Programming a computer for playing chess" in 1950, and developed a chess playing computer. (8)

Shannon's interest did not stop with these. He was known to be an expert juggler who was often seen juggling three balls while riding a unicycle. He was an accomplished clarinet player, too. (9)

"Shannon was the person who saw that the binary digit was the fundamental element in all of communication," said Robert Gallagher, a professor of electrical engineering who worked with Shannon at the Massachusetts Institute of Technology. "That was really his discovery, and from it the whole communications revolution has sprung," considered Marvin Minsky of M.I.T., who as a young theorist worked closely with Shannon. (10)

Shannon received a plenty of numerous honorary degrees and awards. His published and unpublished documents (a total of 127) cover an unbelievably wide spectrum of areas. Many of them have been a priceless source of research ideas for others. One could say that there would be no internet without Shannon's theory of information; every modem, every compressed file, every error correcting code owes something to Shannon. (11)

Shannon died at age 84 on February 27, 2001 in Medford, Mass., after a long fight with Alzheimer's disease. (10)

(Adapted from the Internet sites)

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[1]-энтропия, сбой в любой системе, возникающий с определенной периодичностью

[2]-случайность, беспорядочность (как явление в физике)

4 What do these figures refer to?

1930s 1940 2001 1941 late 1940 1956 1950 1916 1938

5 Read the text again and agree/disagree with the following statements:

a) Claude Shannon showed a keen interest for sciences from an early childhood.
b) In the 1930's Massachusetts Institute of Technology was one of the most prestigious scientific and research institutions conducting the work in information theories.
c) The Differential Analyzer was the first electronic computer.
d) Shannon graduated from MIT with only the Master's degree.
e) Shannon's concept of entropy was applied to probability theory.
f) Shannon was the first who introduced the word "bit" to describe the "yes-no" decision.
g) Shannon stopped his scientific activity in the early 1950's.
h) Nowadays we have an opportunity to use the Internet due to Shannon's theory of information.
i) Claude Shannon is one of the most outstanding scientists of the 20^{th} century

6 Answer the following questions.

a) What was Shannon's family background?
b) Who had a strong scientific influence on young Shannon?
c) What fields of science was he interested in?
a) Where did he receive his higher education?
e) What was Shannon's early work devoted to?
f) What work was he involved in working at the Bell Telephone Laboratories?
g) What was his most significant scientific achievement?
h) What kind of mechanism did he try to develop in the 1950's together with Alan Turing?
i) What other sciences was his information theory applied to?
j) What is the title of his most famous paper?

Vocabulary

1 Use the affixes in the table to form nouns from the words below:

farm, compute, reliable, develop, graduate, emulate, inform, communicate, converse, motivate, significant, confer, intelligent, introduce, operate, critic, scholar, transform, exist, conduct, cryptography, distant, generate, appear, partner, define, measure

-ment	-ship	-tion	-ism	-ance/-ence	-er/-or	-ty
encouragement	relationship	application	mechanism	appliance	inventor	possibility

Add at least 3 words of your own to each column.

2 Look back in the text and make a list of terms related to the field of information technologies. Use the dictionary to check their pronunciation. Translate them into Russian. Which of them are international terms?

3 Match words in column A with the words in column B to make the word combinations from the text.

A	**B**
1) to coin	a) the basis
2) to become	b) theories
3) binary	c) the term
3) to lay	d) a cornerstone
4) spectrum	e) operation
5) to emulate	f) at the core
6) to form	g) of areas

7) to set	h) intelligence
8) artificial	i) the stage
10)to put forth	j) digit

4 Look back in the text and find words that have a similar meaning to:

a) got (1)
a) caring out (2)
b) finally (2)
c) suggested (2)
d) was responsible for (3)
e) new and not yet used (6)
f) importance (6)
g) sphere (8)
h) a great number of (9)

5 Complete the sentences with prepositions if necessary.

a) Shannon graduated … Michigan University with degrees in two disciplines.
b) He was charged … a very important task.
c) The word ‘bit’ is comprised … the first two and the last letter of ‘binary digit’
d) The concept of ‘binary digit’ lay … of his theories.
e) Shannon and Turing were interested… the possibility of building ‘intelligent machines’.
f) Soon his original ideas were picked…, extended and complemented… new related ideas.
g) His research resulted… the paper called “A mathematical theory of communication”

6 Give English equivalents to the following words and word combinations:

способный к математике; получить научное вдохновение; проявить склонность; окончить университет; проводить научное исследование; предложить теорию; в конечном итоге; придумать термин; научный вклад; подготовить почву для чего-либо; применение; искусственный интеллект;

код с исправлением ошибок, статья, степень доктора наук по математике, в соответствии с.

Grammar

1 Change the following sentences according to the model. Translate them.

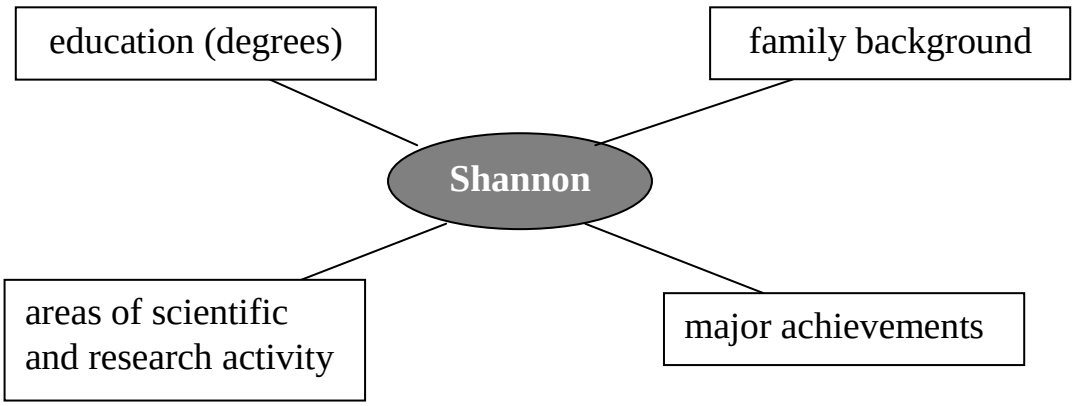
*Model***:** When a child**,** Shannon **turned out to be** mathematically precocious. – When a child**,** it **turned out that** Shannon was mathematically precocious. - *Оказалось, что уже с детства Шеннон был математически одаренным.*

a) Entropy happened to be equivalent to a shortage in the information content in a message.
b) He seems to have spent much of his free time reading scientific and technical books.
c) He is said to have taught himself to read in three weeks and to have shown an early affinity for numbers and puzzles.
d) Alan Turing is often considered to be the father of modern computer science.
e) Moreover a signal proved to be sent without distortion.
f) He was known to be an expert juggler who was often seen juggling three balls while riding a unicycle.

2 Translate paragraph 4 into Russian.

Speaking

1 Sum up the text using the following mind map:



2 Comment on the statements:

a) Claude Shannon is considered to be “the father of information theory”.

b) Shannon’s scientific and research contribution to the world science is enormous.

c) There would be no internet without Shannon's theory of information.

3 How do these quotations by Claude Shannon characterize him?

a) “I visualize a time when we will be to robots what dogs are to humans, and I'm rooting for the machines.”

b) “Information is the resolution of uncertainty.”

c) “Information: the negative reciprocal value of probability.”

d) “Use the word cybernetics, Norbert, because nobody knows what it means. This will always put you at an advantage in arguments.”

4 Work in groups of 3-4. Make a list of things you would like to know about Claude Shannon. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

Points for reflection

1 Have you learnt anything new from the text?

2 Has anything surprised you?

3 What facts were the most amazing?

4 Did you like the text? Why? /Why not?

Progress test

Choose the correct answer a, b or c. There is one correct point for each answer.

1) Shannon's most important scientific contribution was
   a) his work on communication.
   b) the development of chess-playing computer.
   c) artificial intelligence research.

2) His investigations in information theory set the stage for the development of
   a) entropy. b) modern digital communication revolution.
   c) analog computers.

3) His work on information theory became the cornerstone for the growth of ……. revolution.
   a) communicating b) communication c) communicative

4) His theory saw application in different ……..…. of science.
   a) areas b) fields c) parts

5) It took some time for other mathematicians and engineers to realize the *significance* of his work
   a) meaning b) importance c) value

6) He believed that information could be manipulated …… a machine, like any other quantity.
   a) on b) in c) by

Укажите, какое из русских предложений соответствует данному английскому

7) He is said to take part in the scientific conference.
   a) Он сказал, что примет участие в научной конференции.
   b) Ему сказали, что он примет участие в научной конференции.
   c) Говорят, что он примет участие в научной конференции.

8) Our colleague is reported to have made a fundamental discovery in the field of mathematics.
   a) Наш коллега сообщил, что сделал фундаментальное открытие в области математики.
   b) Сообщают, что наш коллега сделал фундаментальное открытие в области математики.
   c) Нашему коллеге сообщили, что он сделал фундаментальное открытие в области математики.

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	2	
5	2	
6	2	
Vocabulary		
1	2	
2	2	
3	2	
4	2	

5 6	2 2	
Grammar 1 2	 4 6	
Speaking 1 2 3 4	 6 8 8 10	
Points for reflection	2	
Progress test	8	
Total	68	

Module 7 Norbert Wiener (1894 – 1964)

Before you start

1 You are going to read about life and work of the American theoretical and applied mathematician Norbert Wiener. Before you read the text answer the following questions.

a) What field of science did Norbert Wiener work in?

b) What is his most significant contribution to the world of science?

Reading

1 Pay attention to the correct pronunciation of the following words:

Warsaw	[ˊwɔ:sɔ:]	hypersensitive	[◌ haɪpəˊsensətɪv]
Wiener	[ˊwɪ:nə]	Nazi	[ˊna:tsɪ]
Harvard	[ˊha:vəd]	ancestry	[ˊænsestrɪ]
Cambridge	[ˊkeɪmbrɪdʒ]	ballistics	[bəˊlɪstkɪs]
Jewish	[ˊdʒu:ɪʃ]	amateur	[ˊæmətə]
Stockholm	[ˊstɔkhɔum]	prominence	[ˊprɔmɪnəns]
cybernetics	[◌ saɪbəˊnetɪks]	axiomatic	[◌ æksɪəˊmætɪk]
Leo	[ˊlɪ:əu]	sympathizer	[ˊsɪmpəθaɪzə]

2 Here are some international words from the text. Guess their meaning. Consult the dictionary if necessary.

immigrate, dissertation, pacifist, intrigues, era, potential, uniform, position, communication, to recruit, a pioneer

3 Mach the words in column A with their definitions in column B:

A	B
1) interference	a) teaching, instruction
2) interlude	b) a period of time coming between 2 events or stages
3) tutelage	c) disturbance or interruption to a radio signal, caused by a second signal
4) spouse	d) enough or more than enough
5) ample	e) a husband or wife

4 Read the text about Norbert Wiener and take notes under the following headings:

- Family background
- Early education
- Education (institutions and degrees)
- Early investigations and achievements
- Contribution to science

Note Taking

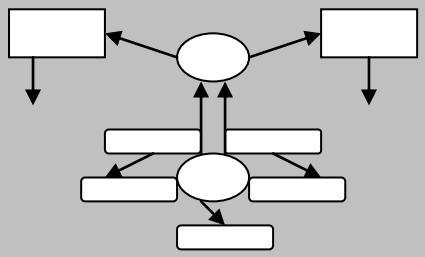
1) Adopt an analytical approach - always be critical.
2) Don't laboriously copy out abstracts from the text - note what you want to remember.
3) Make notes brief and simple.
4) Record key words, phrases, sentences - add your own comments and evaluation. It may be a good idea to keep your comments separate from your notes on the text by using a wide margin. When you return to them it will be clear what the text said and what you thought.
5) Write summaries of what you have read. If you're not clear you understand, summarize aloud before writing.

There are 2 strategies for note taking:

Linear

1.
  1)
  2)
    a)
    b)
2.

Mapping



Norbert Wiener was an American theoretical and applied mathematician. He was a pioneer in the study of noise processes, contributing work relevant to electronic engineering, electronic communication and control systems. Wiener is perhaps best known as the founder of cybernetics, a field that formalizes the notion of feedback and has implications[1] for engineering, systems control, computer science, biology, philosophy, and the organization of society. (1)

Norbert Wiener was the first child of Leo Wiener a Russian – Jewish immigrant and Bertha Kahn, of German – Jewish decent. Leo Wiener had a major influence on his son. He attended medical school at the University of Warsaw but

was unhappy with the profession, so he went to Berlin where he began training as an engineer. This profession seemed only a little more interesting to him than the medical profession, and he immigrated to the United States. Throughout his education Leo was interested in mathematics that was a deep amateur interest to him all through his life, although he never used his mathematical skills in any jobs he held. (2)

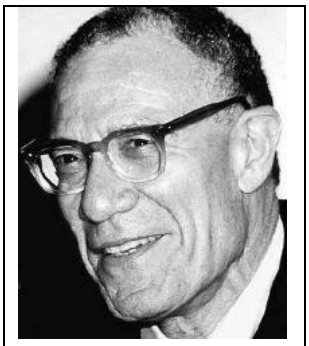


Рис. 10
Norbert Wiener

Having arrived in New Orleans in 1880, Leo tried his hand at various jobs in factories and farms before becoming a school teacher in Kansas City. He progressed from being a language teacher in schools to becoming Professor of Modern Languages at the University of Missouri. (3)

Leo educated Norbert at home until 1903, except for a brief interlude when Norbert was 7 years of age. Thanks to his father's tutelage and his own abilities, Wiener became a child prodigy. Although Leo earned his living teaching German and Slavic languages, he read widely and accumulated a personal library from which the young Norbert benefited much. Leo also had ample ability in mathematics, and tutored his son in the subject until he left home. Having graduated from Ayer High School in 1906 at 11 years of age, Wiener entered Tufts College. He was awarded a BA in mathematics in 1909 at the age of 14, whereupon he began graduate studies in zoology at Harvard. In 1910 he transferred to Cornell to study philosophy. Having returned to Harvard next year, he still continued his philosophical studies. Back at Harvard, Wiener came under the influence of Edward Vermilye Huntington, whose mathematical interests ranged from axiomatic foundations to problems posed by engineering. Harvard awarded Wiener a Ph.D. in 1912, when he was a mere 18, for a dissertation on mathematical logic, supervised by Karl Schmidt. (4)

In 1914, Wiener travelled to Europe, to study under Bertrand Russell and G. H. Hardy at Cambridge University, and under David Hilbert and Edmund Landau at the University of Göttingen. In 1915-16, he taught philosophy at Harvard, then

worked for General Electric and wrote for the Encyclopedia Americana. When World War I broke out, Oswald Veblen invited him to work on ballistics at the Aberdeen Proving Ground in Maryland. Thus Wiener the eventual pacifist wore a uniform 1917-18. Living and working with other mathematicians strengthened and deepened his interest in mathematics. After the war, Wiener was unable to secure a position at Harvard because he was Jewish (despite his father being the first tenured[2] Jew at Harvard), and was rejected for a position at the University of Melbourne. At W. F. Osgood's invitation, Wiener became an instructor in mathematics at MIT, where he spent the remainder of his career, rising to Professor. In 1926, Wiener returned to Europe as a Guggenheim scholar. He spent most of his time at Göttingen and with Hardy at Cambridge, working on Brownian motion, the Fourier integral, Dirichlet's problem, harmonic analysis, and the Tauberian theorems. Wiener's parents did not tell him that he was of Jewish ancestry. In 1926, his parents arranged his marriage to a German immigrant, Margaret Engemann, who was not Jewish; they had two daughters. Margaret was a Nazi sympathizer and did not keep that fact a secret. (5)

During World War II, his work on the automatic aiming and firing of anti-aircraft guns[3] led Wiener to communication theory and eventually to formulate cybernetics. (6)

After the war, his prominence helped MIT to recruit what was perhaps the world's first research team in cognitive science, made up of some of the brightest researchers in neuropsychology and the mathematics and biophysics of the nervous system, including Warren Sturgis McCulloch and Walter Pitts. These men went on to make pioneering contributions to computer science and artificial intelligence. Shortly after this painstakingly assembled research group was formed, Wiener suddenly and inexplicably broke off all contacts with its members. (7)

Speculation still flourishes as to why this split occurred; were the reasons professional, was his hypersensitive personality to blame, or did the split result from intrigues by his spouse Margaret? Whatever the reason, the split led to the premature end of one of the most promising scientific research teams of the era. (8)

Nevertheless, Wiener went on to break new ground in cybernetics, robotics, computer control, and automation. He freely shared his theories and findings, and generously credited the contributions of others. This stance[4] resulted in his being well-disposed towards Soviet researchers and their findings, which placed him under regrettable suspicion during the Cold War. He was a strong advocate of automation to improve the standard of living, and to overcome economic underdevelopment. His ideas became influential in India; whose government he advised during the 1950s.Wiener declined an invitation to join the Manhattan Project, and was arguably the most distinguished scientist to do so. After the war, he became increasingly concerned with what he saw as political interference in scientific research, and the militarization of science. His article "A Scientist Rebels" in the January 1947 issue of The Atlantic Monthly urged scientists to consider the ethical implications of their work. (9)

After the war, he refused to accept any government funding or to work on military projects. The way Wiener's stance towards nuclear weapons and the Cold War contrasted with that of John von Neumann is the central theme of Heims (1980). Wiener's vision of cybernetics had a powerful influence on later generations of scientists, and inspired research into the potential to extend human capabilities with interfaces to sophisticated electronics, such as the user interface studies conducted by the SAGE program. Wiener changed the way everyone thought about computer technology, influencing several later developers of the Internet, most notably J.C.R. Licklider. (10)

Having won the US National Medal of Science in 1964, he published one of his last books entitled "God and Golem, Inc.: A Comment on Certain Point Where Cybernetics Impinges on Religion." (11)

The first heart attack having occurred ten years before and in 1964, on March 18, Norbert Wiener died in Stockholm of a second heart attack. (12)

(Adapted from the Internet sites)

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[1]- вовлечение, причастность, подразумеваемое

[2]- срок пребывания в должности

[3]- автоматически целящееся зенитное оружие

[4]- позиция

5 Look back into the text and make a list of the traditional branches of science and newer fields that you come across in the text. Translate them into Russian.

6 Now read the text again and answer the following questions:

a) What role did Wiener's parents play in his childhood?
b) What educational background does Wiener have?
c) What field of science did he work in?
d) What was his greatest achievement in science?
e) What is the range of his contributions?
f) What famous scientists influenced him greatly?
g) What degrees and awards did Wiener get?
h) Think of a proper title for the text.

Vocabulary

1 Use the affixes **-en**; **-ize**; **en**- form verbs from the words below. Add at least 3 more words of your own to each group.

-en	-ize	en-
deepen	realize	entitle

sympathy, military, formal, super, strength, large, vision, short, theory, courage, sure, wide, minimum, maximum, real, special, critic, roll, close, counter, organ, visage

2 Make word combinations using words below as different parts of speech (noun and verb). Make necessary spelling changes. Pay attention to the word-stress and pronunciation.

Example: Noun a private tutor; to have a harmful influence.
Verb to tutor privately; to be harmful influenced.

process; position; split; progress; contact; credit; comment; pioneer; recruit; advice; blame; increase; advocate; contrast

Write two sentences of your own with 2 pairs of the word combinations.

3 Look back in the text and make a list of mathematical terms. Use a dictionary to check their pronunciation. Translate them into Russian. Which of them are international words?

4 Cross out an odd word in each line.

to accumulate: a lot of books; evidence; flowers; a fortune; interest.
to arrange: a dinner; the CDs; a marriage; meeting; ideas.
sophisticated: manner; taste; novel; traveler; abilities; techniques.
to accept: a present; a post; an offer; a letter; equipment.

5 Explain the italicized parts of the following sentences in your own words.

a) Whatever the reason, the split led to *the premature end* of one of the most promising scientific research teams of the era.
b) *Leo tried his hand at various jobs* in factories and farms before becoming a school teacher in Kansas City.
c) Thanks to his father's tutelage and his own abilities, Wiener became *a child prodigy*.
d) Nevertheless, Wiener went on *to break new ground in* cybernetics.

e) These men went on *to make pioneering contributions* to computer science and artificial intelligence.

6 Complete the sentences with prepositions if necessary:

a) Wiener's vision of cybernetics had a powerful influence … later generations of scientists.
b) What did lead one of the most promising scientific research team … the split?
c) He was sure that he had benefited … the research.
d) Communication theory resulted … his experimental work.
e) Wiener influenced … Indian government during the 1950s.
f) Weiner inspired researchers … the further development of cybernetics.

7 Give English equivalents to the following words and word combinations:

придавать официальный статус; формирование общества; любитель, непрофессионал; заработать средство к существованию; разразиться (о войне); быть отстраненным от должности; быть сторонником нацизма; хранить что-то в секрете; научно-исследовательская группа; выдающиеся исследователи, сверх восприимчивая личность; преждевременный конец; улучшать жизненный уровень; преодолеть экономически слабое развитие; политическое вмешательство; ядерное оружие; сердечный приступ, собрать частную коллекцию книг, основатель кибернетики, отказаться принимать государственное финансирование

Grammar

1 Change the following sentences according to the model. Translate them.

Model: **Having graduated** from Ayer High School in 1906 at 11 years of age, Wiener entered Tufts College. - **After Wiener had graduated** from Ayer

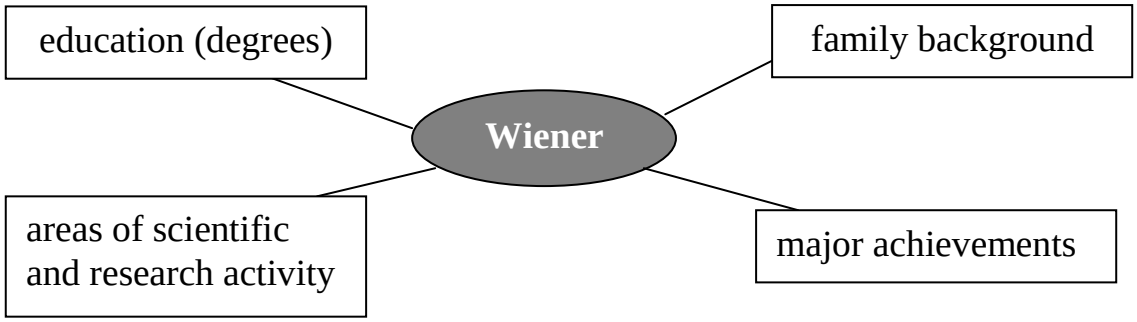
High School in 1906 at 11 years of age, he entered Tufts College. - ***Окончив*** *школу Эйер в 1906 году в возрасте 11 лет, Винер поступил в Тафт колледж.*

a) **Having arrived in New Orleans in 1880,** Leo tried his hand at various jobs in factories and farms.
b) **Having leaved the academy**, Babbage continued to study at home, having an Oxford tutor to bring him up to university level
c) **Having returned to Harvard next year,** he still continued his philosophical studies.
d) **Having won the US National Medal of Science in 1964,** he published one of his last books called "God and Golem, Inc.: A Comment on Certain Point Where Cybernetics Impinges on Religion."
e) **Having reduced information to a series of ones and zeros**, Shannon noticed that it could be processed by using on-off switches.
f) **Having constructed an instrument to receive radio waves in 1896**, Tesla experimented with this device and transmitted radio waves from his laboratory to the hotel he lived in.

2 Translate paragraphs 7-9 into Russian.

Speaking

1 Sum up the text using the following mind map:



2 Comment on Wiener's quotations:

a) "…mathematics was not only a subject to be done in the study but one to be discussed and lived with."

b) "The more we get out of the world the less we leave, and in the long run we shall have to pay our debts at a time that may be very inconvenient for our own survival"

c) "The nervous system and the automatic machine are fundamentally alike in that they are devices, which make decisions on the basis of decisions they made in the past"

d) "A single inattention may lose a chess game, whereas a single successful approach to a problem, among many which have been relegated to the wastebasket, will make a mathematician's reputation."

3 Work in groups of 3-4. Make a list of things you would like to know about Norbert Wiener. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

4 Read the real life story happened to N. Wiener and discuss how this anecdote describes his personality.

After several years teaching at MIT, the Wieners moved to a larger house. Knowing her husband was likely to forget where he now lived, Mrs. Wiener wrote down the address of the new house on a piece of paper and made him put it in his shirt pocket. At lunchtime, an inspiring idea came to the professor, who proceeded to pull out the paper and scribble down calculations, and to subsequently proceed to find a flaw and throw the paper away in disgust. At the end of the day, it occurred to Wiener that he had thrown away his address. He now had no idea where his home was. Putting his mind to work, he concocted a plan: go to his old home and wait to be rescued. Surely Margaret would realize he was lost and come to pick him up. When he arrived at the house, there was a little girl standing out

front. "Excuse me, little girl," he asked, "would you happen to know where the people who used to live here moved to?" "It's okay, Daddy," the girl replied, "Mommy sent me to get you." (Decades later, Norbert Wiener's daughter was tracked down by a mathematics newsletter. She said the story was essentially correct, except that Wiener had not forgotten who she was.)

Points for reflection

1 Have you learn anything new about Wiener from this unit?
2 What made the greatest impression on you?
3 Has anything amassed you?
4 Did you like the text? Why? /Why not?

Progress Test

Choose the correct answer a, b or c. There is one point for each correct answer.

1) The major project, Wiener was involved in was his greatest achievement in science.

   a) robotics b) computer control and automation c) cybernetics

2) Throughout his education Leo was interested in this science, although he never used these skills in any jobs he held.

   a) computer science b) mathematics c) neuropsychology

3) He was a strong advocate of automation to improve the standard of living, and to overcome economic

   a) underdevelopment. b) underdeveloper c) underdeveloping

4) The most …….. scientists went on to make pioneering contributions to computer science and artificial intelligence.

a) distinguishing b) distinguish c) distinguished

5) Wiener suddenly and inexplicably made … his mind to brake … all contacts with one of the most promising scientific research teams of the era.

a) out, on b) up, to c) up, off

6) His *spouse* Margaret was a Nazi sympathizer and did not keep that fact a secret.

a) wife b) bride c) aunt

7) *Having made* pioneering contributions to computer science and artificial intelligence Wiener changed the way everyone thought about computer technology.

a) After making b) After had made c) After had make

8) *Having been awarded* a BA in mathematics in 1909 at the age of 14 and PhD at 18 years for a dissertation on mathematical logic, he never used his mathematical skills in any jobs he held.

a) After had been b) After being c) After have been

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	4	

5	2	
6	2	
Vocabulary		
1	2	
2	2	
3	2	
4	2	
5	2	
6	2	
7	2	
Grammar		
1	4	
2	6	
Speaking		
1	6	
2	8	
3	10	
4	8	
Points for reflection	2	
Progress test	8	
Total	71	

Module 8 Alan Turing (1912 - 1954)

Before you start

1 You are going to read the text about life and work of the English mathematician Alan Turing. Before you read the text complete the chart.

things I know	things I'm not sure about	things I would like to know

Reading

1 Pay attention to the correct pronunciation of the following words.

cryptographer	[krıp´tɔgrəfə]	Einstein	[´aınstaın]
cipher	[´saıfə]	morphogenesis	[ˌmɔ:fəu´dʒenəsıs]
emphasis	[´emfəsıs]	cyanide	[´saıənaıd]
distinguished	[dı´stıŋgwıst]	poisoning	[´pɔızənıŋ]
Mathison	[´mæθısn]	intelligence	[ın´telıdʒəns]
Turing	[tju(ə)rıŋ]	calculus	[´kælkjələs]
purpose	[´pɜ:pəs]	algorithm	[´ælgərıðm]

2 Here are some international words from the text. Guess their meaning. Consult the dictionary if necessary.

logician, service, to record, commission, to risk, colony, puzzle, natural,

elementary, extrapolate, instruction, algorithm, identical, to design, intelligent, equivalent

3 Read the text and think of a proper title for it.

* * *

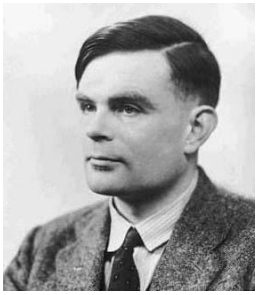


Рис. 11
Alan Turing

A shy, awkward man born into the British upper middle class in 1912, Turing played a seminal role in the creation of computers. To be sure, many other people contributed, from mathematicians Charles Babbage and Ada Lovelace in the 1830s to Herman Hollerith at the turn of the century. But it was Turing who made the critical conceptual breakthrough, almost as an aside in a paper he wrote while in his 20s. (1) A mathematician, logician, and cryptographer, Alan Mathison Turing is often considered to be the father of modern computer science. (2)

Turing's father, Julius Mathison Turing, was a member of the Indian civil service. Julius and his wife Ethel wanted Alan to be brought up in England, so they returned to Paddington, London, where Alan Turing was born on June 23, 1912. His father's civil service commission was still active, and during Turing's childhood years his parents travelled between Guildford, England and India, leaving their two sons to stay with friends in England, rather than risk their health in the British colony. Very early in life, Turing showed signs of the genius he was to display more prominently later. He is said to have taught himself to read in three weeks, and to have shown an early affinity for numbers and puzzles. (3)

His parents enrolled him at St. Michael's, a day school, at the age of six. The headmistress recognized his genius early on, as did many of his subsequent educators. At the age of 14, he went on to Sherborne School in Dorset. Turing's natural inclination toward mathematics and science did not earn him respect with the teachers at Sherborne, a famous and expensive public school (a British private school with charitable status), whose definition of education placed more emphasis

on the classics. His headmaster wrote to his parents: "I hope he will not fall between two schools. If he is to stay at Public School, he must aim at becoming educated. If he is to be solely a Scientific Specialist, he is wasting his time at a Public School". He was criticised for his handwriting, struggled at English, and even in mathematics he was too interested with his own ideas to produce solutions to problems using the methods taught by his teachers. Despite producing unconventional answers, Turing did win almost every possible mathematics prize while at Sherborne and continued to show remarkable ability in the studies he loved, solving advanced problems without having even studied elementary calculus. At the age of sixteen, Turing encountered Albert Einstein's work; he didn't only understand it, but he extrapolated Einstein's questioning of Newton's laws of motion from a text in which this was never made explicit. (4)

The event which was to greatly affect Turing throughout his life took place in 1928. He formed a close friendship with Christopher Morcom, a pupil in the year above him at school, and the two worked together on scientific ideas. Perhaps for the first time Turing was able to find someone with whom he could share his thoughts and ideas. However Morcom died in February 1930 and the experience was a shattering one to Turing. He had a premonition of Morcom's death at the very instant that he was taken ill and felt that this was something beyond what science could explain. (5)

The computer room at King's is now named after Turing, who became a student there in 1931 and a Fellow four years later. Due to his unwillingness to work as hard on his classical studies as on science and mathematics, Turing failed to win a scholarship to Trinity College, Cambridge, and went on to the college of his second choice, King's College, Cambridge. He graduated it with a distinguished degree, and after that was elected a Fellow at King's. Then he moved on to Princeton University. It was during this time that he explored what was later called the "Turing Machine". (6)

Turing helped pioneer the concept of the digital computer. The Turing Machine that he envisioned is essentially the same as today's multy–purpose

computers. He described a machine that would read a series of ones and zeros from a tape. These ones and zeros described the steps that needed to be done to solve a particular problem or perform a certain task. The Turing Machine would read each of the steps and perform them in sequence, resulting in the proper answer. This concept was revolutionary for the time. Most computers in the 1950's were designed for a particular purpose or a limited range of purposes. What Turing envisioned was a machine that could do anything, something that we take for granted today. He essentially described a machine which knew a few simple instructions. Making the computer perform a particular task was simply a matter of breaking the job down into a series of these simple instructions. This is identical to the process programmers go through today. He believed that an algorithm could be developed for any problem. The hard part was determining what the simple steps were and how to break down the larger problems. (7)

During World War II, Turing used his knowledge and ideas in the Department of Communications in Great Britain. He used his mathematical skills to break German ciphers. The Enigma machines of the German navy were much harder to break as it was able to generate a constantly changing code but this was the type of challenge which Turing enjoyed. Turing contributed several insights into breaking the Enigma machine and was, for a time, head of the section responsible for reading German Naval signals. In 1945, Turing was awarded the OBE for his wartime services. (8)

After World War II, Turing worked for the National Physical Laboratory and continued his research into digital computers. Here he worked on developing the Automatic Computing Engine, one of the first steps at creating a true digital computer. It was during this time that he began to explore the relationship between computers and nature. He wrote a paper called "Intelligent Machinery". This was one of the first times the concept of artificial intelligence was raised. (9)

Turing believed that machines could be created that would mimic the processes of the human brain. In his mind, there was nothing the brain could do that a well designed computer could not. As a part of his argument, he described

devices already in existence that worked like parts of human body, such as television cameras, microphones. (10)

In 1950 he wrote a paper describing what is now known as the “Turing Test”. He proposed a bold measure for machine intelligence: If a person could hold a typed conversation with "somebody" else, not realizing that a computer was on the other end of the wire, then the machine could be deemed intelligent. The test consisted of a person asking questions via keyboard to both a person and an intelligent machine. He believed that if computer's answers could not be distinguished from those of the person after a reasonable amount of time, the machine was somewhat intelligent. This test has become a standard measure of the artificial intelligence community. Since 1990 an annual contest has sought a computer that can pass this "Turing Test." Nobody has yet taken the $100,000 purse. Turing would no doubt be delighted that engineers all over the world are still trying. (11)

Turing left the National Physical Laboratory before the completion of the Automatic Computing Engine and moved on to the University of Manchester. There he worked on the development of the Manchester Automatic Digital Machine (MADAM). He truly believed that machines would be created by the year 2000 that could replicate the human mind. He worked to create the operating manual for the MADAM. (12)

One major aspect of Turing’s life that often goes unnoticed is his work in biology. He worked from 1952 until his death on mathematical biology, specifically morphogenesis. He published one paper on the subject called "The Chemical Basis of Morphogenesis". Later papers went unpublished until 1992 when Collected Works of A.M. Turing was published. (13)

Turing was himself an enigma. He adored maps and chess as a child and survived the brutal boarding school system by withdrawing into eccentricity. Later he found solace in distance running. Although he was completely open about his sexuality, he lived a secret life forbidden to talk about research he was doing due to the Official Secrets Act. Soon his security clearance was withdrawn. Security

officers were now extremely worried that someone with complete knowledge of the new decoding and intelligence work going on at GCHQ was now labelled a security risk. He had many foreign colleagues, as any academic would, but the police began to investigate his foreign visitors. (14)

In 1954, at 41, he died suddenly of cyanide[1] poisoning, from eating a cyanide-poisoned apple. The apple itself was never tested for contamination with cyanide. It is interesting that this method of self-poisoning was similar to Turing's favourite film Snow White and the Seven Dwarfs[2]. The official explanation was that it was a "moment of mental imbalance". But his mother said he used to experiment with household chemicals, trying to create new substances and became careless. Others claimed he was embarrassed about his sexuality. (15)

Whatever the reason for his death, Turing was truly one of the great forerunners in the field of computers leaving the world a permanent legacy. Computers have revolutionised so many aspects of our world that today it is hard to imagine life without them. But today's computer scientists still refer to his papers. The concept of the algorithm lies at the heart of every computer program for any type of digital computer. It is very conceivable that his idea of thinking machines by the year 2000 is not so far from the truth. (16)

Since 1966, the Turing award has been given annually by the Association for Computing Machinery to a person for technical contributions to the computing community. It is widely considered to be equivalent of the Nobel Prize in the computing world. (14)

(Adapted from the Internet sites)

- [1] цианин
- [2] гном

4 Look back in the text and make a list of Turing's inventions and advances.

5 Read the text again and answer the following questions.

a) Where and when was Turing born?
b) What kind of education did he get?
c) What difficulties did he have in education? Why?
d) Did he enjoy his studies at the University? Why?
e) What field did he work in?
f) What contribution did he make into the development of digital computers?
g) What did he mean under the concept of artificial intelligence?
h) Why did he have to live a secret life?

Vocabulary

1 Fill in the table with the missing words. Consult the dictionary if necessary.

action	activity/result of action	person/device	characteristic
publish			
		processor	-
	generality		
		computer	
program			
			creative
	criticism		
		educator	
generate			
			contributed
	experiment		

2 Put the following phrases under the correct heading.

Turing machine, vote recorder, radio wave, anti-craft gun, Fourier integral, tin foil

phonograph, code breaker, Touberian theorem, cellular telephone, fluorescent light, nuclear weapon, development laboratory, incandescent lamp, microwave device, control system, Brownian motion, amateur interest, Direchlet's problem, gold medal, Nobel Prize, computer buffs, step-up transformer, alkaline battery, acid storage batteries, wireless message, education problems

a) **name**+noun **Turing** test
b) noun+**part** turbine **engine**
c) **person/activity**+noun **development** laboratory
d) **material**+noun **cyanide** poisoning
e) **function**+noun **attack** vehicle
f) **property**+noun **solar** energy

3 Look back in the text and make a list of education terms.

4 Match a word in column **A** with the word or phrase in column **B** to make word combinations from the text.

A	**B**
1) solve	a) manual
2) distinguished	b) problem
3) civil	c) degree
4) show	d) time
5) earn	e) service
6) waste	f) affinity
7) concept of	g) respect
8) operating	h) algorithm

6 Look back in the text and find the words that have an opposite meaning to:

a) smart(1)
b) destruction(1)
c) military (3)
d) stupidity (3)
e) illiterate (4)
f) inexact (4)
g) to succeed (6)
h) wish (6)
i) repair (7)
j) approximate(7)
k) natural (9)
l) permitted (14)
m) temporary(16)

7 Complete the following sentences with the prepositions if necessary.

a) Turing's genius did not earn him respect **….**the teachers at Sherborne.
b) Turing aimed ….creating machines that would mimic the processes of the human brain.
c) Alan was awarded …. a distinguished degree after graduating from King's college.
d) Turing contributed …. the development of the digital computer.
e) Turing died suddenly…. cyanide poisoning at the age of 41.
f) During WWII Turing was a head of the section responsible …. reading German Naval signals.

8 Explain the italicized parts of the following sentences in your own words.

a) Very early in life, *Turing showed signs of the genius* he was to display more prominently later.
b) Turing's natural inclination toward mathematics and science *did not earn him respect* with the teachers at Sherborne.
c) What Turing envisioned was a machine that could do anything, *something that we take for granted today.*
d) Machines will be created by the year 2000 that *can replicate the human mind*.

e) The concept of the algorithm *lies at the heart* of every computer program for any type of digital computer.

9 Give the English equivalents to the following words and word combinations: стеснительный, неуклюжий, поступать в университет, заслуженная степень, склонность, не удаваться получит стипендию, отравление химикатами, ссылаться на, ежегодные соревнования, испытывать смущение по причине чего-либо, решать проблему, заболеть, концептуальный прорыв, делать упор на, природная склонность к, сыграл свою роль, проявил гениальность, предчувствие смерти, выполнять определенные задания, взаимосвязь между природой и машинами

Grammar

1 Write the sentences using the prompts:

*Model***:** A machine **will read** a series of ones and zeros from a tape. (Turing described a machine) - Turing described a machine that **would read** a series of ones and zeros from a tape. - *Тюринг описал машину, которая* ***будет считывать*** *с пленки ряды единиц и нулей.*

will		would
can		could
may	changes to	might
Present Simple - *take*		Past Simple - *took*
Present Prog. - *is doing*		Past Prog. - *was doing*
Past Simple - *took*		Past Perfect - *had taken*

a) A machine can do anything, something that we take for granted today. (He envisioned a machine)

b) Machines will be created by the year 2000 that can replicate the human

mind. (He truly believed)

c) Wireless waves are not affected by the curvature of the Earth. (Guglielmo Marconi determined to prove)
d) Information is no different than any other quantity and therefore can be manipulated by a machine. (Shannon believed)
e) According to a binary system a switch in the on position will equate to one and in the off position, it will be a zero. (Shannon theorized)
f) He will hear his own words. (Edison knew)

2 Translate paragraphs 7 and 10 into Russian.

Speaking

1 Look through the text and divide it into parts. Summarize the text in no more than 15 sentences using your plan.

How to make a plan

There are three techniques you could use to make your plan. The plan you develop here can guide your essay structure and form the basis of your paragraphs.

1 Question Approach

It helps you not only to organize the key points of the text but also to check their understanding.

2 Using Tables

Table organizes information in the presentable form and helps to appreciate it.

3 Mind Mapping

It structures the key points and shows their interconnection.

2 Comment on the following statements:

a) Turing is the founder of modern computer science.

b) Turing's scientific and research contributions to the world science are enormous.

c) Alan Turing is a man of contrasts.

d) Alan Turing is a farsighted mathematician.

3 How do these quotations by Alan Turing characterize him?

a) "Science is a differential equation. Religion is a boundary condition."

b) "We can only see a short distance ahead, but we can see plenty there that needs to be done."

c) "A computer would deserve to be called intelligent if it could deceive a human into believing that it was human."

d) "Mathematical reasoning may be regarded rather schematically as the exercise of a combination of two facilities, which we may call intuition and ingenuity."

e) "I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted."

4 Work in groups of 3-4. Make a list of things you would like to know about Alan Mathison Turing. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

Points for reflection

1 Have you learnt anything new about Alan Turing from this unit?

2 What made the greatest impression on you?

3 Has anything surprised you?

4 Did you like the text? Why? /Why not?

Progress Test

Choose the correct answer: a, b or c. There is one point for each correct answer.

1) Turing Machine, designed by Alan Turing, was
   a) the computer that read simple instructions to perform one particular task.
   b) the digital computer, that can be called the "intelligent machine".
   c) The first multi-purpose digital computer that performed a series of instructions.

2) Turing Test is the measure for
   a) the correctness of the algorithm instructions.
   b) the machine intelligence.
   c) both a person and a machine intelligence.

3) ……. the computer essentially means breaking the task down into a series of simple instructions.
   a) program b) programming c) programmed

4) Turing also introduced the … of artificial intelligence.
   a) concept b) notion c) view

5) Turing was truly one of the great forerunners in computer sphere leaving the world permanent legacy.
   a) pioneers b) predecessors c) inventors

6) Turing aimed … creating machines that would mimic the process of the human brain.
   a) at b) for c) on

7) He believed that there was nothing that brain could do that a well designed computer could not.

a) Он полагал, что нет ничего, что мог делать мозг, чего не мог сделать хорошо сконструированный компьютер.

b) Он полагал, что нет ничего, что может делать мозг, чего не может сделать хорошо сконструированный компьютер.

c) Он полагал, что нет ничего, что мог бы делать мозг, чего не мог бы сделать хорошо сконструированный компьютер.

8) He believed that an algorithm could be developed for any problem.

a) Он считал что можно разработать алгоритм для любой проблемы.

b) Он считал что можно было разработать алгоритм для любой проблемы.

c) Он считал что можно было бы разработать алгоритм для любой проблемы.

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	2	
5	2	
Vocabulary		
1	2	
2	2	
3	2	
4	2	

5 6 7 8	2 2 2 2	
Grammar 1 2	 4 6	
Speaking 1 2 3 4	 6 8 8 10	
Points for reflection	2	
Progress test	8	
Total	78	

Module 9 Wernher von Braun (1912–1977)

Before you read

1 You are going to read the text about life and work of the American outstanding figure Wernher von Braun. Before you read the text answer the following questions:

a) What do you know about Wernher von Braun?

b) Is he a scientist or an inventor?

c) Why is his name famous all over the world?

d) What is his contribution?

e) How has his work changed the way we live?

Reading

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

conjuncture	[kən´dʒʌnktʃə]	Jupiter	[´dʒu:pɪtə]
conciliate	[kən´sɪlɪeɪt]	Saturn	[´sætən]
propellant	[prə´peɬənt]	Nazi	[´na:tsɪ]
liquid-fueled	[´lɪkwɪd´fjuəld]	astronaut	[´æstrənɔ:t]
launch	[´lɔ:ntʃ]	vehicle	[´vɪ: ɪkl]
missile	[´mɪsɪl]	diameter	[´daɪæmɪtə]

2 Here are some international words from the text. Guess their meaning. Consult the dictionary if necessary.

planet, project, resources, pioneer, rocket, contract, grant, dissertation, orbit, potential, ballistic, escort, mission, station, toroid, gravity, expedition, astronaut, diameter, station.

3 Read the text and comment on its title.

Crusader for Space Travel

Since immemorial times, when the first human being looked up to the sky, the challenge was already outlined, but it was only in 1969 A.D. that man set foot on another celestial body. The journey to the Moon and planets is in the heart and soul of all human beings, but it is not in our direct, near-term interest of everyday life. It required singular events, people and conjuncture to become real. (1)

Рис. 12

Wernher von Braun

A project like Space Travel is nothing like a garage work performed by a single person working in secrecy over many years. It involves huge resources and people passionately involved to carry the immense difficulties involved in the political, financial, managerial and technical arenas. Wernher von Braun was the personality that could circulate among all these channels, interacting and creating synergy among technicians and scientists, getting presidential support and interested businessman that would be involved in sending man to space. He was an exceptional engineer, a prominent salesman for the cause of space exploration, a skillful political amalgamator that conciliated all the views in one direction, a profuse writer and divulgator of space travel among the general public, a enormously successful fund raiser for space projects and ‘the personality’ that could be identified with space exploration. In other words, he was a crusader for space travel all the way. (2)

Wernher von Braun was born in Wyrzysk, Wielkopolska, in the German Kingdom of Prussia. He was born second of three sons with an impressive pedigree[1]. His father, the conservative politician Magnus Freiherr von Braun, served as a Minister of Agriculture in the Federal Cabinet during the Weimar Republic. His mother, Emmy von Quistorp could trace ancestry through both her parents to medieval European royalty. Wernher von Braun decided at 10 years of age that he would "turn the wheel of time." Among other projects, he composed music, wrote poetry, and built an automobile out of old parts. In fact, he spent so much time building his car that he flunked mathematics and physics. After reading Hermann Oberth's "Rocket into Interplanetary Space" and receiving a telescope from his mother, he decided to become a space pioneer and physicist. At the age of 13, von Braun got in trouble again when he obtained six skyrockets, strapped them to a toy red wagon and set them off. Streaming flames and a long trail of smoke, the wagon roared five blocks into the center of town, where the rockets then

exploded. Also he drew a sketch of a space ship he hoped to make someday that would take men to the moon and beyond. (3)

The next step for the eighteen-year-old Wernher von Braun was to enter the Technische Hochschule[2] in the Berlin district of Charlottenburg. Von Braun quickly joined the Verein für Raumschiffahrt (VfR, Society of Space Travel) and was soon participating in rocket experiments. But in 1932 Adolf Hitler was in power. Nazi Germany was going to ban all rocketry experiments and discussion - outside of the German military. On November 1, 1932, von Braun signed a contract with the Reichswehr to conduct research leading to the development of rockets as military weapons. In this capacity, he would work for Captain Walter Dornberger. His association with Dornberger would last for over a decade. In the same year, under an Army grant, von Braun enrolled at the Friedrich-Wilhelm-Universität from where he graduated two years later with a Ph.D. in physics. His dissertation dealt with the theoretical and practical problems of liquid propellant rocket engines[3]. (4)

Even before he graduated, von Braun was busy conducting his first rocket tests at Kummersdorf, an old Army artillery range outside of Berlin. A few of von Braun's colleagues from the VfR days joined him and started work on what would be called the A1 rocket. The A1 would eventually evolve into the A2 and A3. These rockets were successfully tested off the coast of Germany in the North Sea. By, 1935, von Braun and his team, which had grown to eighty members, were regularly firing liquid-fueled engines with great success. Throughout his time at Kummersdorf Von Braun showed that he was a team leader; he didn't work alone like Goddard, but encouraged those who worked for him to accomplish their best. He was also able to assimilate large amounts of data, literature, and technical drawings while keeping the big picture always in his mind. (5)

Dornberger held a public test of the A-2 which was greatly successful. Both the Luftwaffe and the Wehrmacht fought over who could give von Braun's rocket team more money. On December 22, 1942, Adolf Hitler signed the order approving the production of the A-4 as a "vengeance weapon"[4] and the group

developed it to target London. SS General Hans Kammler, who as an engineer had constructed several concentration camps including Auschwitz, had a reputation for brutality and had originated the idea of using concentration camp prisoners as slave laborers in the V-2 rocket program. More people died building the V-2 rockets than were killed by it as a weapon. Von Braun admitted visiting the plant at Mittelwerk on many occasions, and numerous quotes from von Braun show he was aware of the conditions, but felt completely unable to change them. (6)

Things were not always good for von Braun. The SS and the Gestapo had detained von Braun and arrested him for crimes against the state because he dared to talk about building rockets which would go into orbit around the Earth and perhaps even someday go to the Moon. Von Braun's rocket team had plans on their design boards of even larger rockets with a potential for orbital flight. The A-9 and A-10 were to be the world's first multistage rockets with first stage thrusts of 400,000 pounds and ranges of over 3000 miles. An A-11 was designed to launch a pilot or a satellite into orbit while an A-12 had the capability of launching a payload of 11 tons into high earth orbit, a feat that rocketry finds challenging today. His crime against the state was for the frivolity of these dreams rather than total concentration of building military rockets for the Nazi war machine. Dornberger convinced the SS and the Gestapo that without von Braun there would be no V-2 and that Hitler would have them all shot. The Gestapo released von Braun. (7)

Knowing that Germany was doomed, von Braun, upon arriving back at Peenemunde, immediately assembled his rocket team and asked them to decide to whom did they want to surrender. The Russians frightened most of the scientists; the French would treat them like slaves; the British did not have enough money to afford a rocket program; that left the Americans. After stealing a train with forged papers , von Braun led 500 people through war-torn Germany to surrender to the Americans while the SS had orders to kill the German engineers who built the V-2. Hiding their notes in a mine shaft, the German scientists evaded the SS in search for American soldiers. Finally, the entire German rocket team found an American

private and surrendered to him. The Americans immediately went to Peenemunde and Nordhausen, captured all of the remaining V-2s and V-2 parts before the Russians arrived. (8)

For fifteen years after World War II, von Braun worked with the U.S. Army in the development of ballistic missiles. As part of a military operation called Project Paperclip, he and his rocket team were scooped up from defeated Germany and sent to America where they were installed at Fort Bliss, Texas. Since they were not permitted to leave Fort Bliss without military escort, von Braun and his colleagues began to refer to themselves only half-jokingly as "PoPs", "Prisoners of Peace". There they worked on rockets for the U.S. Army, launching them at White Sands Proving Ground, New Mexico. In 1950 von Braun's team moved to the Redstone Arsenal near Huntsville, Ala., where they built the Army's Jupiter ballistic missile. (9)

As Director of the Development Operations Division[5] of the Army Ballistic Missile Agency (ABMA) [6], von Braun, with his team, then developed the Jupiter-C, a modified Redstone rocket. The Jupiter-C successfully launched the West's first satellite, Explorer 1, on January 31, 1958. This event signaled the birth of America's space program. (10)

In 1960, his rocket development center transferred from the Army to the newly established NASA and received a mandate to build the giant Saturn rockets. Accordingly, von Braun became director of NASA's Marshall Space Flight Center and the chief architect of the Saturn V launch vehicle, the superbooster that would propel Americans to the Moon. His dream to help mankind set foot on the Moon became a reality on July 16, 1969 when a Marshall-developed Saturn V rocket launched the crew of Apollo 11 on its historic eight-day mission. Over the course of the program, Saturn V rockets enabled six teams of astronauts to reach the surface of the Moon. (11)

Von Braun - while directing military rocket development in the real world - continued to entertain his engineer-scientist's dream of a future world in which rockets would be used for space exploration. One of them was the space station (to

be constructed using rockets with recoverable and reusable ascent stages) that would be a toroid structure, with a diameter of 250 feet (76 m), would spin around a central docking nave to provide artificial gravity, and would be assembled in a 1,075 miles (1,730 km) two-hour, high-inclination Earth orbit allowing observation of essentially every point on earth on at least a daily basis. More than a decade later, the movie version of 2001: A Space Odyssey would draw heavily on this design concept in its visualization of the orbital space station. The ultimate purpose of the space station would be to provide an assembly platform for manned lunar expeditions. Von Braun envisaged these expeditions as very large-scale undertakings, with a total of 50 astronauts travelling in three huge spacecraft (two for crew, one primarily for cargo), each 49 m long and 33 m in diameter and driven by a rectangular array of 30 jet propulsion engines. Upon arrival, astronauts would establish a permanent lunar base in the Sinus Roris region by using the emptied cargo holds of their craft as shelters, and would explore their surroundings for eight weeks. (12)

Von Braun developed and published his space station concept during the very "coldest" time of the Cold War, when the U.S. government for which he worked put the containment of the Soviet Union above everything else. The fact that his space station - if armed with missiles that could be easily adapted from those already available at this time - would give the United States space superiority in both orbital and orbit-to-ground warfare did not escape him. Although von Braun took care to qualify such military applications as "particularly dreadful" in his popular writings, he elaborated on them in several of his books and articles. (13)

In 1970, NASA leadership asked von Braun to move to Washington, D.C., to head up the strategic planning effort for the agency. He left his home in Huntsville, Ala., but in 1972 he decided to retire from NASA and work for Fairchild Industries of Germantown, Md. He died in Alexandria, Va., on June 16, 1977. (14)

So was he a Nazi or was he a scientist? Most would like to believe the later,

although many feel von Braun was indirectly responsible for the deaths of thousands. Admired and loved by many he worked with during projects Mercury, Gemini, and Apollo, he was yet hated by others because of his wartime efforts developing the V-2 for the Third Reich. Even if one feels his actions (or inactions) towards slave labor were reprehensible, the fact remains that Wernher von Braun was responsible for the space age becoming a reality in this century. Von Braun was named by Life magazine as one of the "100 Most Important Americans of the 20th Century," touting him as the man who "launched the greatest adventure of all, a journey to the Moon". But, others would ask—at what cost? (15)

(Adapted from the Internet sites)

- [1] генеалогия
- [2] высшее техническое училище
- [3] жидкостный ракетный двигатель
- [4] оружие возмездия
- [5] научно-исследовательский и опытно-конструкторский отдел
- [6] управление БР СВ

4 Read the text again and answer the following questions.

a) What is von Braun's main contribution?
b) How did he get interested in rocketry?
c) What periods his life and work can be divided into?
d) Why did he work for Nazi and what did he do?
e) What was von Braun's main ambition in life?
f) Why was von Braun arrested by the SS and the Gestapo? Why was he released?
g) What was von Braun's main reasons for the surrender to the Americans?
h) What was his American career like and what is his major contribution there?
i) What was his dream of the future space exploration?
j) How can you characterize von Braun?

Vocabulary

1 Match the words from A with the words from B as they were used in the text.

A	B
celestial	research
near-term	camp
space	station
to conduct	weapon
military	flight
orbital	rocket
multistage	gravity
concentration	body
ballistic	data
artificial	missile
orbit-to-ground	interest
to assimilate	test
liquid-fueled	warfare
rocket	engine

Make some other expressions with the words from A.

2 Look back in the text and make a list of terms related to rocketry and space exploration.

3 Look back in the text and find words that have a similar meaning to:

1) to coordinate (2)
2) to fail (3)
3) fireworks(3)
4) to prohibit (4)
5) to take part (4)
6) to reach the best (5)
7) to know (6)
8) to let go (7)

9) changed and developed (9) 11)space vehicle (11)

10)to drive (10)

4 Complete the following sentences with the prepositions if necessary.

a) Von Braun quickly joined the VfR, and was soon participating … rocket experiments.

b) But in 1932 Adolf Hitler was … power.

c) His dissertation dealt … the theoretical and practical problems of liquid propellant rocket engines.

d) The A1 would eventually evolve … the A2 and A3.

e) Numerous quotes from von Braun show he was aware … the conditions, but felt completely unable to change them.

f) Even before he graduated, von Braun was busy …conducting his first rocket tests at Kummersdorf .

g) He dared to talk about building rockets which would go … orbit around the Earth and perhaps even someday go to the Moon.

h) The structure, with a diameter of 250 feet (76 m), would spin … a central docking nave to provide artificial gravity.

5 Explain the italicized part of the sentence in your own.

a) Wernher von Braun decided at 10 years of age that he would "*turn the wheel of time.”*

b) *In this capacity,* he would work for Captain Walter Dornberger.

c) His crime against the state was *for the frivolity of these dreams rather than total concentration of building military rockets* for the Nazi war machine.

d) His dream to help mankind *set foot on the Moon* became a reality on July 16, 1969.

6 Give the English equivalents to the following words and word combinations:

ассоциироваться с исследованиями космоса, принимать участие в

экспериментах с ракетами, рассматривать теоретические и практические проблемы, проводить испытания, жидкое топливо, достигать наилучшего результата, орбитальный полет, запуск, обреченный, сдаваться, баллистический снаряд, достичь поверхности, многоразовый, создавать искусственную силу тяжести, пилотируемая экспедиция на Луну, груз.

Grammar

1 Rewrite the sentences to emphasize the words in bold. Use **when**, **that**, **who**, **in which**, etc. Translate the sentences.

Study help
When you translate the emphatic sentences and structures you are to analyze the context to understand properly the key word that is underlined in the sentence.

Model: **After reading** Hermann Oberth's "Rocket into Interplanetary Space" **and receiving** a telescope from his mother, he decided to become a space pioneer and physicist. - **It was after reading** Hermann Oberth's "Rocket into Interplanetary Space", he decided to become a space pioneer. – ***Именно после того, как*** *он прочитал роман Германа Оберта «Ракета в межпланетных полетах, он и решил стать пионером в исследовании космоса.*

a) **The A1** would eventually evolve into the A2 and A3.
b) **There** they worked on rockets for the U.S. Army, launching them at White Sands Proving Ground, New Mexico.
c) **On June 14 1822** Babbage's computing career began.
d) **Turing** made the critical conceptual breakthrough, almost as an aside in a paper he wrote while in his 20s.
e) **During this time** Turing began to explore the relationship between

computers and nature.

f) **Here** Tesla's disagreement with Edison over direct current versus alternating current began and soon led to the war of the currents.
g) **Tesla** figured out why a generator worked.
h) In the **work** "The Mathematical Theory of Communications" Shannon first introduced the word "bit".

2 Rewrite the sentences according to the model paying attention to the part in bold. Translate them into Russian.

Model: **Admired and loved** by many he worked with during projects Mercury, Gemini, and Apollo, he was yet hated by others because of his wartime efforts developing the V-2 for the Third Reich.– **He was admired and loved** by many he worked with during projects Mercury, Gemini, and Apollo, he was yet hated by others because of his wartime efforts developing the V-2 for the Third Reich. –***Хотя им восхищались и его любили (Будучи…, Когда …, при …, если …, как только …)*** *многие их тех, кто работал с ним над проектами Меркюри, Гемини, и Аполлон, также многие его и ненавидели за его военные разработки по созданию ракет Фау-2 для Третьего Рейха.*

a) **Co-authored** by Nathan Myhrvold and Peter Rinearson, The Road Ahead held № 1 spot on the New York Times' bestseller list for seven weeks.
b) **Built** from his original plans, not only did Difference Engine work, it worked exceptionally well.
c) **Seriously disappointed** in the mathematical instruction at Trinity College, Babbage and his friends formed the Analytical Society to bring the modern continental mathematics to Cambridge.
d) **Guided** by a belief that the personal computer would be a valuable tool on every office desktop and in every home, Gates and Allen began developing software for PCs.

e) **Dismissed** as a crackpot during his own lifetime, Babbage has been relegated to the footnotes of history.

f) **Amazed** at the range and potential of Tesla's achievements, the industrialist and inventor George Westinghouse suggested Nikola Tesla a partnership in further development of alternating current systems.

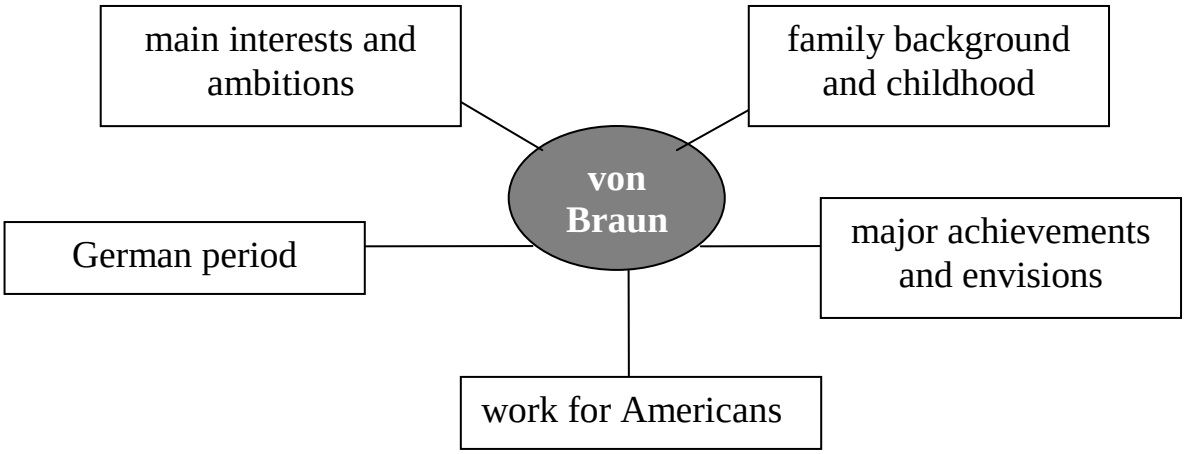
g) **Determined** to prove that wireless waves were not affected by the curvature of the Earth, Marconi used his system for transmitting the first wireless signals across the Atlantic between Cornwall, and Newfoundland.

h) **Educated** by his father, Norbert Wiener benefited much form Leo's wide range interests.

3 Translate paragraphs 2 and 12 into Russian.

Speaking

1 Sum up the text using the following mind map:



2 Comment on the following statements:

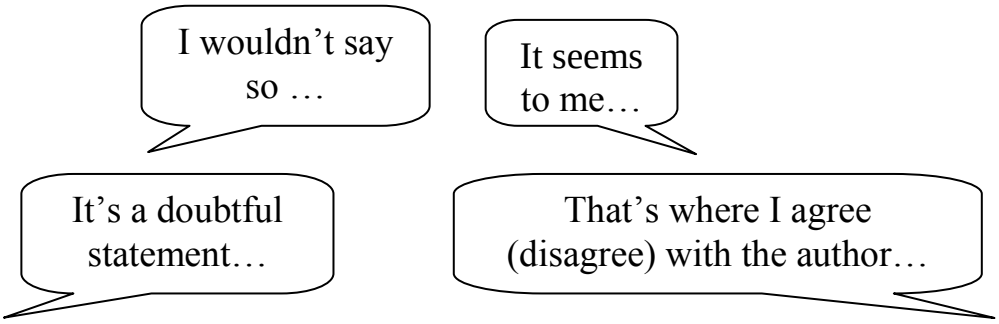
a) Von Braun is a controversial personality.

b) The scientist who could never fight the warfare challenges.

c) Von Braun was the person who used all means to achieve the goal.

d) Von Braun managed to make his child dream of space travels come true.

3 Comment on von Braun's quotations using the following openings:



a) "For me, the idea of a creation is not conceivable without invoking the necessity of design. It would be an error to overlook the possibility that the universe was planned rather than happening by chance."
b) "Religion and science are sisters: the one seeks knowledge of creation and the other of the Creator."
c) "If the world's ethical standards fail to rise with the advances of our technological revolution, the world will go to hell."
d) "All of man's scientific and engineering efforts will be in vain unless they are performed and utilized within a framework of ethical standards commensurate with the magnitude of the scope of the technological revolution. The more technology advances, the more fateful will be its impact on humanity."

4 Work in groups of 3-4. Make a list of things you would like to know about Wernher von Braun. Choose one, find information and make a poster presentation. (Read instruction in **Module 5** task 2)

Points for reflection

1 Have you learnt anything about von Braun from the text?
2 What makes the greatest impression on you?
3 Has anything amazed you?

4 Did you like the text? Why? /Why not?

Progress Test

Choose the correct answer a, b or c. There is one point for each correct answer.

1) Von Braun's ambition throughout his life was
   d) to create the vengeance weapon.
   e) to take Americans to the Moon.
   f) to make interplanetary space flights possible.

2) The orbital space station concept that von Braun envisioned, was
   a) to give the Americans space superiority in warfare.
   b) to make a large-scale lunar expedition possible.
   c) to visualize the design for the movie version of 2001: A Space Odyssey.

3) He dared to talk about and design larger rockets with a potential for ……. flight.
   a) orbit b) orbiting c) orbital

4) In 1969 man set foot on another celestial ……. .
   a) body b) object c)planet

5) A Marshall-developed Saturn V rocket launched Apollo 11 on its historic mission and *pushed* it to the Moon.
   a) propelled b) pulled c) delivered

6) His work dealt … the theoretical and practical problems of liquid propellant rocket engines.
   a) on b) with c) at

7) It was after launching the West's first satellite, America's space program was born.

a) Это было после запуска первого западного спутника, когда зародилась космическая программа Америки.

b) Американская космическая программа появилась после запуска первого западного спутника.

c) Именно после запуска первого западного спутника и появилась американская космическая программа.

8) Assembled in the orbit, the station allowed observation of essentially every point of the planet.

a) Собираясь на орбите, станция позволяла наблюдать практически любую точку планеты.

b) Будучи собранной на орбите, станция позволяла наблюдать практически за любой точкой на планете.

c) Когда станцию собрали на орбите, она позволила наблюдать практически за любой точкой на планете.

Credit points

Tasks	Maximum score	Your scores
Reading		
1	2	
2	2	
3	2	
4	2	
Vocabulary		
1	2	
2	2	

3 4 5 6	2 2 2 2	
Grammar 1 2 3	 4 4 6	
Speaking 1 2 3 4	 6 8 8 10	
Points for reflection	2	
Progress test	8	
Total	76	

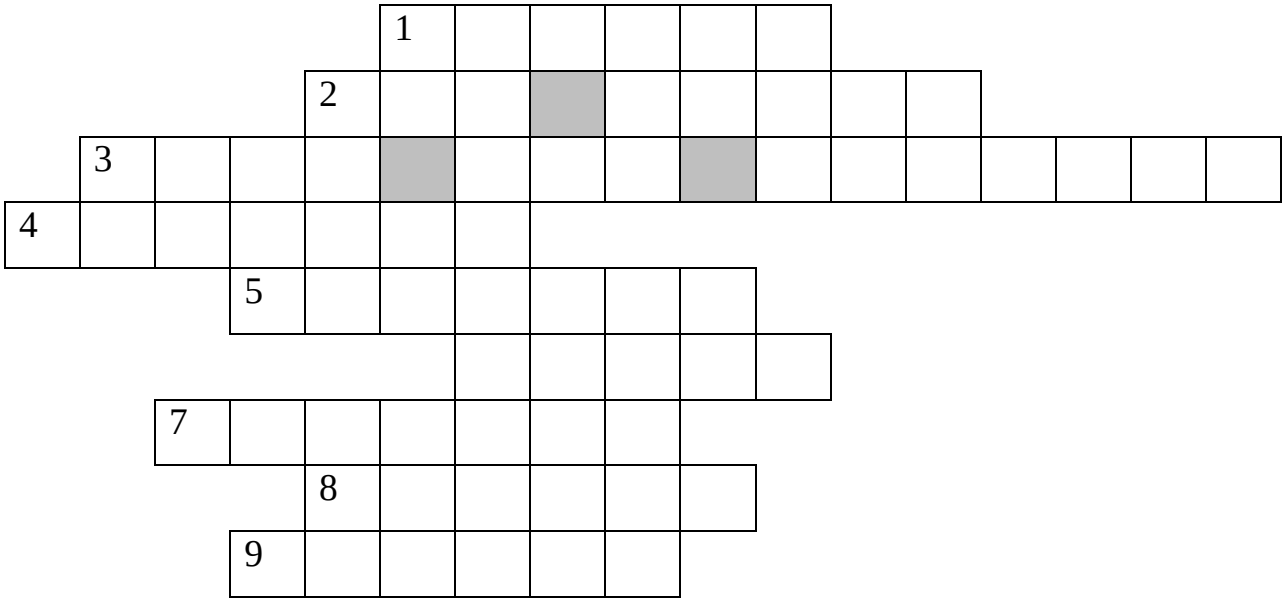
Module 10 Follow Up Activities

1 Match the scientists and their achievements.

Thomas Edison	cybernetics
Nikola Tesla	the Difference Engine
Guglielmo Marconi	alkaline battery
Norbert Wiener	the Theory of Information
Charles Babbage	the Automatic Computing Engine
Alan Turing	terrestrial stationary waves

Claude Shannon	space rocket
Wernher von Braun	radio

2 Do the crossword to write the word in bold.



1) The Jew who was a pacifist but had to wear a uniform during the World War II.
2) A scientist and inventor who was responsible for the space age becoming a reality in the 20th century.
3) The mathematician who has given his name to modern computers.
4) An inventor whose amazing ideas were ridiculed by contemporaries but have been viable by modern scientists and engineers.
5) The mathematician whose work saw application in the disciplines in which a language is a factor.
6) An American of Serbian ancestry who never put a sketch on paper until the whole idea of a device was worked out mentally.
7) The most famous “looser” awarded the Nobel Prize.
8) The mathematician who is credited with breaking the Enigma machine codes.
9) The inventor who said: “Genius is 1 percent inspiration and 99 percent perspiration”.

3 Every scientists/inventor has his/her own peculiarities, e.g.: Alfred Nobel is known as a man of contrasts. What would you say about the scientists and inventors you have read. Give reasons for your opinion.

E.g.: Nikola Tesla - a man out of time

Alan Turing - the man who knew too much

4 Work in groups to complete the Webquest on greatest scientists.

Greatest Scientists of Computer Science WebQuest

An Internet WebQuest on Greatest Scientists

Introduction

Emerson wrote that every age has its geniuses, its masterminds who propel humanity in a new direction, for good or evil – though of course, he said, you need circumstances to bring them out. One can hardly underestimate the role of the particular personalities in science. They have made a great contribution into the progress and revolutionized science. To honor these scientists, the University decided to devote the week of science to the 5 most influential personalities at each faculty. Your faculty will focus on Computing and Telecommunications. In the following WebQuest, you will use the power of teamwork to learn all about Greatest Scientists. Each person on your team will become an expert on some aspect of Greatest Scientists and then you will come together at the end to share and get a better understanding of the topic as a whole.

Task

"It is not possible to be a scientist unless you believe that the knowledge of the world, and the power that this gives, is a thing which is of intrinsic value to humanity, and that you are using it to help in the spread of knowledge, and are willing to take the consequences."

Robert Oppenheimer November 1945

Your team has been assigned a specific role to choose 5 scientists, who are the most interesting from the point of view of the biography, work or their impact. You will use the links provided to become experts on your roles. You and your team will work together to create a Group Report that presents your team's answer to the Quest(ion). By completing this WebQuest, you should achieve the following goals: 1) develop an interest in the study of Greatest Scientists; 2) use the power of the Internet for advanced exploration; 3) learn information about key aspects of Greatest Scientists; 4) realize that complex topics can be looked at from various perspectives; 5) formulate and support an opinion based on your roles; and 6) work with teammates to determine a combined action plan.

Process

You will be working together as a group exploring the selected web sites. You should start with the pages that are labelled 'Background Information' before dividing into groups. Each group has their own Task to complete and a separate set of web sites to use. There is a task organizer and an evaluation rubric in Background Information to guide your work.

Phase 1 - Background Information

These sites are important because they will provide basic information about the history of computing and telecommunications. Everyone should explore these sites before starting your Task. It will help you choose the scientists you are most interested in or the most influential period in the history of computing.

Answer the questions:

Why have you chosen this particular period?

What are the greatest scientists of this period?

What are the greatest discoveries of this period?

What was their impact on the development of the science?

- **http://66.249.93.104/search?q=cache:MPeRvmA8oPEJ:www.historyofscience.com/Intro_Christies_Cat.pdf+history+of+computing+and+telecommunications&hl=ru&gl=ru&ct=clnk&cd=3**
- **http://web.mit.edu/invent/iow/i-archive-ct.html**
- **http://en.wikipedia.org/wiki/Computer_science**

Phase 2 - Roles

You split into the groups of 6. Each of you has been assigned a particular role with links and instructions below. Here are the general instructions for all of you. Please see your specific instructions and questions below.

INSTRUCTIONS:

1. Two members from each WebQuest team will explore one of the roles below.
2. Read through the files designated for your group. You can print out pages and underline the parts that you feel are important or cut and paste from the webpage into a word processor.
3. Remember to include the URL of the page you take information from so you can return to it and use it as a citation.
4. Focus what you've learned into one main opinion that answers the Big Quest(ion) or Task.

`Historian`:

You are to study the discoveries and scientists of the chosen period from the point of view of HISTORY.

Use the links below to answer the following questions:

1) How important is the chosen scientist and invention for the history of computing?

2) How did it revolutionize the science?

3) How did it change the life of people?

Links:

- **http://web.mit.edu/invent/iow/i-archive-ct.html**
- **http://ei.cs.vt.edu/~history/TMTCTW.html**
- **http://inventors.about.com/library/blcoindex.htm?once=true&**
- **http://en.wikipedia.org/wiki/List_of_prominent_pioneers_in_computer_science**
- **http://ei.cs.vt.edu/~history/people.html**

Biographer:

You are to study the discoveries and scientists of the chosen period from the point of view of Biography.

Use the links below to answer the following questions:

1) How interesting is the chosen scientist biography ?

2) What are the most important facts of the biography?

3) What periods can the life of the scientist be divided into and why?

4) Characterize each period?

Links:

- **http://web.mit.edu/invent/iow/i-archive-ct.html**
- **http://ei.cs.vt.edu/~history/TMTCTW.html**
- **http://inventors.about.com/library/blcoindex.htm?once=true&**
- **http://en.wikipedia.org/wiki/List_of_prominent_pioneers_in_computer_science**
- **http://ei.cs.vt.edu/~history/people.html**

Scientists:

You are to study the discoveries and scientists of the chosen period from the point of view of COMPUTER SCIENCE.

Use the links below to answer the following questions:

1) How important is the chosen scientist and invention for computing?

2) How did it revolutionize the science?

Links:

- **http://web.mit.edu/invent/iow/i-archive-ct.html**
- **http://ei.cs.vt.edu/~history/TMTCTW.html**
- **http://inventors.about.com/library/blcoindex.htm?once=true&**
- **http://en.wikipedia.org/wiki/List_of_prominent_pioneers_in_computer_science**
- **http://ei.cs.vt.edu/~history/people.html**

Phase 3 - Reaching Consensus

You have all learned about different parts of Greatest Scientists of Computer Science. Now group members come back to the larger WebQuest team with expertise gained by searching from one perspective. You must all now complete the Task as a group. Each of you will bring a certain viewpoint to the answer: some of you will agree and others disagree. Use information from the web sites you explored to convince your teammates that your viewpoint is important and should be part of your team's response. Your WebQuest team should write out an answer that everyone on the team can live with - who is the greatest scientist in the history of computer science.

Conclusion

Now you all know a lot more. Nice work. You should be proud of yourselves! I hope the exploration of this topic teaches you to appreciate the people and group mates and yourself, fulfilling some projects and investigations. Nobody knows what this investigation will lead you to.

Content by Elena Sytnikova, sitnikova-elena@yandex.ru

Word list

Module 1 Thomas Alva Edison

alkaline battery
alternating current
arithmetic
carbonized
communication
current
development laboratory
device
direct current
distribution
dynamo
efficiency
electric
electric light
electric propulsion
electric vehicles
equipment
experimental work
exploitation
filament
gasoline
improve
incandescent lamp
lead-acid storage batteries
manufacturing concerns
manufacturing facility
methods
model
motor
operate
patent
power
power station
project
provide
record (v)
record player
reproduce
research
revolution
signal
steam
storage battery
technical
telegraph
tin foil phonograph
transmit
vote recorder

Module 2 Guglielmo Marconi

adjacent station
affect
assemble
beam system
broadcast
collaborator
conduct

continuous waves
coupled circuits
curvature
detector
determine
equip
era
erect
frequency
fundamental
generate
give a demonstration
horizontal
increase
intensive
interfere
investigation
launch
link
long-distance
magnetic
means of communication
microwave
navigation
objective
part
permanent
point out
principle
propagation
prove
radar
radio beacon
radiotelephone
range
receiver
recipient
science-based
short waves
short-distance
simultaneous
test
transmission
trials
tuned
waves
wire
wireless
wireless telegraphy

Module 3 Nikola Tesla

aerospace specialty
antenna
attack vehicle
automation
coil
conductor
construction
cyclic
demonstration

designed
diagram
distribution lines
dynamo
electric motor
electrical engineer
electrical powerhouse
electricity
energize
experiment
explain
fluorescent light
generate
generator
give off (magnetic field)
high voltage
hypotheses
improvement
induction motor
inefficiency of
intend
intense
interplanetary communication
invalid
inventor
laser beam
magnet
magnetic field
magnifying transmitter
measurements
mediate
minimize
multiple waves
operate
operate
point out
polyphase principle
power loss
promote
prototype
remote control
responsive
reverse
robotics
rotating
run the prototype
satellite
schematic
sketch
solar energy
spark
specialize (in)
stationary waves
step-down transformer
step-up transformer
television set
terrestrial
torpedo
transformer
tuning fork

turbines
vacuum wireless light
vibration
visualize
work out
X-rays

Module 4 Charles Babbage

addition
advancement
analytical
automate
black-box recorder
calculation
calculus
central processor
compressed air
concept
controversy
cryptography
digital computer
eclipses
envisage
ergonomic paper
general-purpose computer
groundbreaking
inaccuracy
limitation
logarithm
loop
metallurgy
method of differences
obtain
ophthalmoscope
originator
paradox
precise
printing out
programmable
realization
seismograph
sequence
statistics
steam-powered
submarine
successive
visionary (n)

Module 6 Claude Shannon

affinity
analog computer
analyzer
application
artificial intelligence
basis
binary digit
binary system
bit
brain
charge with the task

closed switch
coin the term
combine
complement
complex
compressed file
cybernetics
degree of randomness
differential
digital communication
discipline
distortion
drive (v) the gears
efficient
elaborated upon
electrical engineering
electrical part
emulate
ensure
equate to one
equation
equivalent
error-correcting code
extend
farming machinery
formulate
gear
imitate
information content
information entropy
information science
information theory
information transmitting method
integrity of the data
lay at the core
manipulate
mechanical computer
motor
off position
on position
open switch
operation
relay circuit
relay switches
reliability
series
shaft
shortage
sophisticated
spectrum of areas
switching circuit
symbolic logic
terminology
theorize
thermodynamics

Module 7 Norbert Wiener

applied mathematics
automatic aiming
automation

axiomatic foundations
ballistics
biophysics
Brownian motion
cognitive science
computer control
computer science
conduct studies
contribute
control system
deepen (v)
electronics
feedback
findings
formalize
Fourier integral
harmonic analysis
nervous system
neuropsychology
noise process
notion
nuclear weapons
pioneer (v)
strengthen (v)
theorems
user interface

Module 8 Alan Turing

algorithm
argument
break down the problem
breakthrough
changing code
computer program
conceptual
contribute
decoding
determine
explore
extrapolate
identical
keyboard
limited
logician
mimic
morphogenesis
multy–purpose computer
operating manual
particular
purpose
range of purposes
replicate
revolutionise
sequence
series of ones and zeros
Turing Machine
Turing Test
via

Module 9 Wernher von Braun

assemble
assembly platform
ballistic missile
cargo
cargo hold
celestial body
central docking nave
conduct rocket tests
construct
crew
deal with
design concept
diameter
exploration
fire liquid-fueled engine
interplanetary
jet propulsion engine
liquid propellant rocket engines
lunar base
manned lunar expedition
military weapon
mission
multistage rocket
observation
orbit
orbital flight
orbit-to-ground warfare
participate in
planet
potential
propel
provide artificial gravity
reach the surface
recoverable and reusable ascent stages
rocket experiment
rocket program
rocketry
satellite
space
space ship
space station
spacecraft
spin around
to launch
toroid structure
V-2 rocket
vehicle

KEYS

Module 1 Thomas Edison

Reading

4

electric vote recorder, “Universal Stock Printer”, tin foil phonograph, created Menlo Park laboratory (the model of laboratories of the future), a practical incandescent electric light, methods for the distribution of electricity, electric railway, lead-acid storage battery, method of transmitting telegraphic signals from moving train, different types of automobiles, an alkaline battery, motion pictures

Vocabulary

1

verb	**noun**	**adjective**	**adverb**
to demonstrate	**demonstration**	**demonstrative**	demonstratively
to invite	invitation	inviting	**invitingly**
to invent	**invention**	**inventive**	inventively
to develop	**development**	**developing** **developed**	----------
to telegraph	telegraph	**telegraphic**	**telegraphically**

2 a) developed b) demonstration c) inventive
d) inviting e) telegraph/telegraphy

3

nouns	both	verbs
belief	staff	merge
device	patent	improve
	tour	receive

4

a) proficient
b) intended for
c) expanded
d) reproduce sound
e) astonished
f) merged
g) tremendous
h) was marred
i) possessed
j) a motion pictures

5 a) - b) as c) on d) on, to e) to

6 to take a job, to reproduce sound, self-improvement, to bring international fame, to make a recording, a curious child, to attend school, to spend much of his time reading scientific and technical books, to give a chance, to start a family, bankers

investment, competitor, to teach oneself much, to set up one's laboratory

Progress Test

1) c 2) b 3) a 4) b 5) c 6) b 7) b 8) b

Module 2 Guglielmo Marconi

Reading

3 a) 3 b) 3 c) 3 d) 2 e) 2 f) 1

Vocabulary

1.

-able/ible	-al	-ic	-ful	-ive	-ous
remarkable	historical	historic	successful	intensive	continuous
charitable	commercial	electric	stressful	expensive	ridiculous
responsible	practical	magnetic	eventful	creative	various
breakable	directional			explosive	famous
believable	national				dangerous
	physical				
	electrical				
	continental				
	structural				

2 1c 2a 3f 4e 5d 6b

day-light effect
science-based industry
wireless communication industry
long-distance telegraphy
radio telephone link,
high-powered family

3 a) a baby (to take) b) a leg (to raise) c) a building (one storey) d) hotel (grand) e) flowers (to gather)

5 a) for b) for c) in d) in e) with f) in

6 an unstoppable will to succeed, to transmit radio signal, was educated privately, took a keen interest in, a system of wireless telegraphy, erected permanent station, possibilities of wireless communication, had been equipped with, patented several new inventions, aerial, collaborators, radio beacon, the recipient of many honorary awards, was decorated with, fundamental discovery, to pursue an objective, to establish new science-based industry

Grammar

1

a) **First** the shorter-distance public service of wireless telegraphy was established between Italy and Montenegro. **Then** the opening of the first transatlantic commercial service between Glace Bay and Ireland took place.
b) **First** Tesla's patents expired. **Then** the military understood the usefulness of remote-controlled vehicles.
c) **First** he foretold the coming of radar in New York in 1922. **Then** he gave a practical demonstration of its principles.
d) **First** Marconi received his Nobel Prize in Physics. **Then** Tesla refused to receive his.

e) **First** the world came to regard radio as a commodity not a miracle. **Then** he died and left that world behind him.

f) **First** Edison invented a little machine capable of recording sound. **Then** in 1877 he made the first recording.

Progress Test

1) a 2) b 3) c 4) c 5) a 6) b 7) c 8) a

Module 3 Nikola Tesla

Reading

4 rotating magnetic field, induction motor, principle of alternating current, polyphase alternating current system of generators, motors, transformers (alternating current dynamo, step-up and step-down transformers, A.C. motor), Tesla coil, fluorescent light, laser beam, wireless communications, wireless transmission of electrical energy, remote control and robotics (remote operation of robotic devices), Tesla's turbines and vertical take off aircraft, radio (radio transmitter), modern electrical transmissions systems, X-ray tubes, terrestrial stationary waves, wireless transmission of electricity, remote-controlled attack vehicles and torpedoes (automation)

Vocabulary

1

disconnect	irresponsible	illiterate	infinite
illogical	disadvantage	careless	unfinished
impossible	incomplete	unproductive	misunderstood
unfortunate	impatient	dislike	unreal
useless	mistake	unpublished	inaccuracy

3

a) fascinated with (1)
b) intended to (1)
c) operated (2)
d) visualized (2)
e) improving (3)
f) led to (3)
g) supplied by (4)
h) foresaw (6)
i) attempted (7)
j) spark (8)
k) conceived (11)
l) expired (14)

4 a) with b) - c) for d) on e) with f) –

5 to specialize in a field of science; to visualize a device; to design dynamo; inefficiency of lamps; severe disadvantage; to minimize power loss; perfect partnership; to figure out the principle; to foresee interplanetary communication; to announce a discovery, to proclaim priority; terrestrial stationary waves, man-made lightning; to mentally work out; to make improvements to/to improve a device; to draw a sketch; to conceive an invention; to refuse a prize

Grammar

1

a) Tesla published schematic diagrams of the radio transmitter **describing** all its basic elements later used by Marconi.
b) During the World War II, Claude Shannon was interested in the possibility of building a machine that could imitate the human brain **working** with Alan Turing for a few months.
c) In 1909 Marconi received the Nobel Prize for physics **sharing** it with Ferdinand Braun.
d) Wiener changed the way everyone thought about computer technology **influencing** several later developers of the Internet.

e) Edison had very little formal education as a child **attending** school only for three months.
f) Tesla organized elaborate dinners **inviting** to dinners famous people who later witnessed spectacular electrical experiments in his laboratory.

2

a) Tesla worked out the whole idea of any device mentally **before** putting the sketch of the device on paper. // **After** working out the whole idea of any device mentally Tesla put the sketch of the device on paper.
b) **After** completing a small difference engine Babbage announced his invention to the Royal Astronomical Society.
c) **After** graduating from MIT in 1940 Shannon spent a year as a National Research Fellow at Princeton University.
d) Marconi he demonstrated his microwave radio beacon for ship navigation **after** beginning research into the propagation characteristics of still shorter waves in 1931.
e) **After being** awarded a BA in mathematics in 1909 at the age of 14 Norbert Wiener began graduate studies in zoology at Harvard. And in 1910 he transferred to Cornell to study philosophy.
f) 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.

Progress Test

1b 2c 3a 4b 5a 6c 7b 8a

Module 4 Charles Babbage

Reading

1 the Difference Engine, the Analytical Engine, the ophthalmoscope, the cowcatcher found on the fronts of locomotives, the black-box recorder (for trains), a submarine automated by compressed air, a seismograph for measuring earthquakes, a "coronagraph" for generating artificial eclipses, a pen that drew dotted lines (for mapmaking), ergonomic paper (green ink on green paper), and a pair of shoes designed to let the wearer walk on water, field of operational research

Vocabulary

1

action	activity/result of action	person/device	characteristic
think	**thought**	thinker	**thoughtful**
originate	**origin**	**originator**	original
advise	**advice**	**advisor**	**-**
advance	advancement	**advancer**	**advanced**
analyze	**analysis**	**analyst**	analytical
graduate	**graduation**	**(under)**graduate	**graduated**
apply	**application**	**applicator**	**applicable**
operate	**operation**	**operator**	operational
govern	government	**governor**	**governing/ governmental**
construct	**construction**	**constructor**	**constructive**
envision/visualize	**vision**	visionary	**visible/visionary**

2

adjective+noun	noun+participle I	noun+participle II	adverb+participle	noun+adjective

			II	
general-purpose wireless communication high voltage binary digit	life-threatening error-correcting life-saving	steam-powered science-based man-made radio-controlled household	well-stocked well-disposed remotely-controlled properly-designed	lifelong worldwide brand-new

3 a) with b) on c) - d) for e) of f) –

4 to credit smb. with an invention; to receive instruction from; to prompt one's love of smth.; a dislike for a subject; to be disappointed in the mathematical instruction; to write a remarkable deep work; to graduate with honours; inaccuracy of calculations; the method of differences; to carry our complex operations; to envisage a completely new machine/device; to recognize one's insights; to suffer from ridicule; to revile for careless spending of public funds; to dabble in smth.; a viable model

Grammar

1

a) **In spite of producing** unconventional answers**, Turing** won almost every possible mathematics prize at school.

b) Modern scientists have stated that Babbage's Analytical Engine was a viable model **although** the limitations of Newtonian physics prevented its realization at the time.

c) For the first time Turing was able to find someone with whom he could share his thoughts and ideas. **However**, his friend Morcom died in February 1930.

d) **Although** Edison knew he would hear his own words when experimenting with tin foil phonograph**,** he was astonished when they were spoken back to him.

e) **Despite use of** Edison's name in the title of electric company – Edison General **Electric, Edison** never controlled this company.

f) With the development of gasoline powered cars electric vehicles were becoming less common. **However,** the Edison alkaline battery still proved to be useful.

g) **Although** Babbage is often credited with developing the first general-purpose **computer,** he never actually built any of them.

Progress Test

1a, c, f 2c 3c 4b 5a 6b 7c 8b

Module 5 Follow Up Activities

1 Crossword

Across	**Down**
2 spark	1 electricity
6 lightning	3 receiver
8 filament	4 wave
9 telegraph	5 detector
10 current	6 laboratory
11 seismograph	7 fluorescent
15 transmitter	12 engine
17 conductor	13 phonograph
18 radio	14 patent
20 dynamo	16 transformer
	19 incandescent

Module 6 Claude Shannon

Reading

5

a) True
b) True
c) False
d) False
e) False
f) True
g) False
h) True
i) True

Vocabulary

1

-ment	-ship	-tion	-ism
encouragement	*relationship*	*application*	*mechanism*
development	scholarship	graduation	criticism
measurement	partnership	introduction	
		emulation	
		information	
		motivation	
		operation	
		generation	
		definition	

-ance/-ence	-er/-or	-ty
appliance	*inventor*	*possibility*
significance	farmer	reliability
conference	computer	
intelligence	conductor	
existence	cryptographer	
distance	generator	

appearance		

3 1) c 2) d 3) j 4) f 5) g 6) e 7) a 8) I 9) h 10) b

4

a) received
b) conducting
c) eventually
d) put forth
e) charged with
f) brand-new
g) significance
h) field
i) plenty of

4 a) from b) with c) of d) at e) in f) up, with g) in

6 mathematically precocious, received scientific encouragement, showed an affinity for, graduated from university, conduct scientific research, eventually, coin the term, put forth theories, paper, doctorate in mathematics, error-correcting code, according to, binary digit, set the stage, lie at the core, scientific contribution, artificial intelligence, application

Grammar

1

a) It happened that entropy was equivalent to a shortage in the information content in a message.
b) It seemed that he has spent much of his free time reading scientific and technical books.
c) It was said that he has taught himself to read in three weeks and has shown an early affinity for numbers and puzzles.
d) It is often considered that Alan Turing is the father of modern computer science.
e) Moreover it proved that a signal was sent without distortion.

f) It was known that he was an expert juggler who was often seen juggling three balls while riding a unicycle.

Progress test

1a 2b 3b 4b 5b 6c 7c 8b

Module 7 Norbert Wiener

Reading

5

1c 2b 3a 4e 5d

Vocabulary

1

-en	-ize	en-
deepen	*realize*	*entitle*
strengthen	sympathize	encourage
shorten	militarize	ensure
widen	formalize	enrol (l)
	visualize	enclose
	theorize	encounter
	minimize	envisage
	maximize	
	realize	
	specialize	
	criticize	
	organize	

3 Brownian motion, the Fourier integral, Dirichlet's problem, harmonic analysis, mathematical logic, the Tauberian theorems

4 to accumulate flowers, to arrange ideas, sophisticated abilities, to accept a letter

6 a) on b) – c) to d) from e) from f) into

7 to formalize; the organization of society; amateur; to earn one's living; to break out; to be rejected for a position; to be a Nazi sympathizer; to keep in a secret; scientific research team; the brightest researchers; hypersensitive personality; the premature end; to improve the standard of living; to overcome economic underdevelopment; political interference; nuclear weapons; heart attack, to accumulate a personal library, the founder of cybernetics, to refuse to accept any government funding

Grammar

1

a) **After Leo had arrived to New Orleans in 1880,** he tried his hand at various jobs in factories and farms.
b) **After Babbage had leaved the academy**, he continued to study at home, having an Oxford tutor to bring him up to university level
c) **After Wiener had returned to Harvard next year,** he still continued his philosophical studies.
d) **After Wiener had won the US National Medal of Science in 1964,** he published one of his last books called "God and Golem, Inc.: A Comment on Certain Point Where Cybernetics Impinges on Religion."
e) **After Shannon had reduced information to a series of ones and zeros**, he noticed that it could be processed by using on-off switches.
f) **After Tesla had constructed an instrument to receive radio waves in 1896**, he experimented with this device and transmitted radio waves from his laboratory to the hotel he lived in.

Progress Test

1c 2b 3a 4c 5c 6a 7b 8c 9a

Module 8 Alan Mathison Turing

Vocabulary

1

action	activity/result of action	person/device	characteristic
publish	**publication**	**publisher**	**public**
process	**process**	processor	**-**
generalize	generality	**general**	**general**
compute	**computation**	computer	**computational**
program	**program**	**programmer**	**programmed**
create	**creation**	**creator**	creative
criticize	criticism	**critic**	**critical**
educate	**education**	educator	**educated**
generate	**generation**	**generator**	**generated**
contribute	**contribution**	**contributor**	contributed
experiment	experiment	**experimentalist**	**experimental**

2

a) Turing Machine, Fourier integral, Touberian theorem, Brownian motion, Direchlet's problem, Nobel Prize
b) amateur interest
c) amateur interest, computer buffs, education problems
d) tin foil phonograph, , gold medal
e) anti-aircraft gun, step-up transformer, acid storage batteries, control system, vote recorder, code breaker,

f) fluorescent light, radio wave, microwave device, incandescent lamp, alkaline battery, nuclear weapon, cellular phone, wireless message

5

a) awkward
b) creation
c) civil
d) genius
e) educated
f) explicit
g) to fail
h) unwillingness
i) break
j) particular
k) artificial
l) forbidden
m) permanent

6 a) with b) at c) - d) into e) of f) for

Grammar

1

a) He envisioned a machine that **could do** anything, something that we **took** for granted today.
b) He truly believed that machines **would be created** by the year 2000 that **could replicate** the human mind.
c) Guglielmo Marconi determined to prove that wireless waves **were** not affected by the curvature of the Earth.
d) Shannon believed that information **was** no different than any other quantity and therefore **could be manipulated** by a machine
e) Shannon theorized that according to a binary system a switch in the on position **would equate** to one and in the off position, it **would be** a zero.
f) Edison knew that he **would hear** his own words.

Progress test

1 c) 2 b) 3 b) 4 a) 5 b) 6 a) 7 b) 8 a)

Module 9 Wernher von Braun

Vocabulary

1

1 h	6 e	11 m
2 k	7 f	12 i
3 c	8 b	13 n
4 a	9 j	14 l
5 d	10 g	

2

celestial body, planet, space, interplanetary, rocket, space ship, rocketry, liquid propellant rocket engines, fire engine, liquid-fueled, orbital flight, multistage rocket, to launch, pilot, satellite, orbit, ballistic missile, space program, propel, crew, Apollo, mission, astronauts, space station, ascent stages, spin around, docking nave, artificial gravity, assembly platform, manned lunar expedition, jet propulsion engine, lunar base.

3

a) to conciliate
b) to flunk
c) skyrockets
d) to ban
e) to participate
f) to accomplish
g) to be aware
h) to release
i) modified
j) to propel
k) spacecraft

4

a) in b) in c) with d) into e) of f) – g) into h) around

6

to be identified with space exploration, to participate in rocket experiments, to deal with theoretical and practical problems, conduct tests, liquid fuel, accomplish the best, orbital flight, launching, doomed, surrender, ballistic missile, reach the surface, reusable, to provide artificial gravity, manned lunar expedition, cargo

Grammar

1

a) **It was the A1 that** would eventually evolve into the A2 and A3.
b) **It was there, where** they worked on rockets for the U.S. Army, launching them at White Sands Proving Ground, New Mexico.
c) **It was on June 14 1822 when** Babbage's computing career began.
d) **It was Turing who** made the critical conceptual breakthrough, almost as an aside in a paper he wrote while in his 20s.
e) **It was during this time when** Turing began to explore the relationship between computers and nature.
f) **It was here where** Tesla's disagreement with Edison over direct current versus alternating current began and soon led to the war of the currents.
g) **It was Tesla who** figured out why a generator worked.
h) **It was in the work** "The Mathematical Theory of Communications" **where** Shannon first introduced the word "bit".

2

a) **The book** The Road Ahead **was co-authored** by Nathan Myhrvold and Peter Rinearson **and** held № 1 spot on the New York Times' bestseller list for seven weeks.
b) **The Difference Engine was built** from his original plans **and** not only did it work, it worked exceptionally well.

a) **Babbage was seriously disappointed** in the mathematical instruction at Trinity College **and with** his friends formed the Analytical Society to bring the modern continental mathematics to Cambridge.
b) **Gates and Allen were guided** by a belief that the personal computer would be a valuable tool on every office desktop and in every home **and/when they** began developing software for PCs.
c) **Babbage was dismissed** as a crackpot during his own lifetime **and** was relegated to the footnotes of history.
d) **The industrialist and inventor George Westinghouse was amazed** at the range and potential of Tesla's achievements **and** suggested Nikola Tesla a partnership in further development of alternating current systems.
e) **Marconi was determined** to prove that wireless waves were not affected by the curvature of the Earth **and** used his system for transmitting the first wireless signals across the Atlantic between Cornwall, and Newfoundland.
f) **Norbert Wiener was educated** by his father **and** benefited much form Leo's wide range interests.

Progress test

1) c 2) b 3) c 4) a 5) a 6) b 7) c 8) b

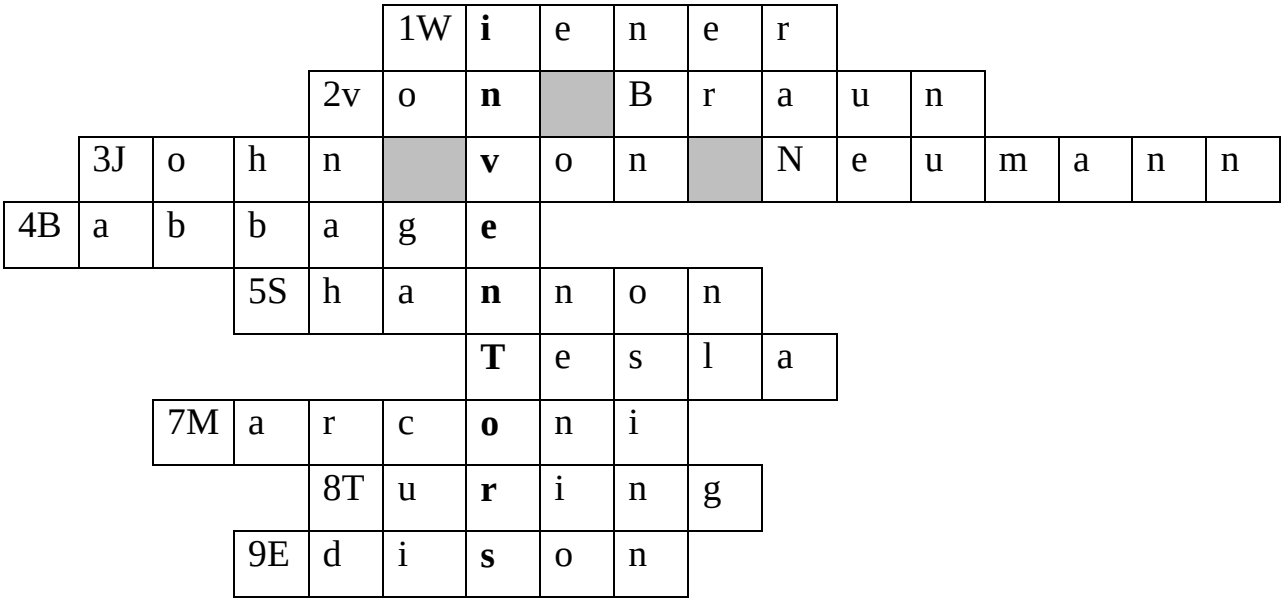
Module 10 Follow Up Activities

1

Thomas Edison	alkaline battery
Nikola Tesla	terrestrial stationary waves
Guglielmo Markoni	radio
Norbert Wiener	cybernetics
Charles Babbage	the Difference Engine
Alan Turing	the Automatic Computing Engine

Claude Shannon	the Theory of Information
Wernher von Braun	space rocket

2 Do the crossword to write the word in bold



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