МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
«САМАРСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ ИМЕНИ АКАДЕМИКА С.П. КОРОЛЕВА»
(САМАРСКИЙ УНИВЕРСИТЕТ)

Е.В. КОШАРСКАЯ, Е.С. ЛАПШОВА

GREAT MEN OF SCIENCE
ВЕЛИКИЕ ЛЮДИ НАУКИ

Рекомендовано редакционно-издательским советом федерального государственного автономного образовательного учреждения высшего образования «Самарский национальный исследовательский университет имени академика С.П. Королева» в качестве практикума для обучающихся по основным образовательным программам высшего образования по направлениям подготовки 01.03.02 Прикладная математика и информатика, 03.03.02 Физика, 04.03.01 Химия, 06.04.01 Биология, 44.04.02 Психолого-педагогическое образование и специальности 04.05.01 Фундаментальная и прикладная химия

С А М А Р А
Издательство Самарского университета
2022

УДК 811.111(075)
ББК 81.2Англя7
К76

Рецензенты: канд. пед. наук, доц. С. Г. М е н ь ш е н и н а,
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Кошарская, Екатерина Викторовна
К76 **Great men of science. Великие люди науки:** практикум **/** *Е.В. Кошарская, Е.С. Лапшова.* – Самара: Издательство Самарского университета, 2022. – 64 с.

ISBN 978-5-7883-1787-8

Данный практикум предназначен для обучения ESP (английскому для специальных целей) обучающихся (бакалавров и магистрантов), может использоваться на занятиях с аспирантами. Работа с материалом предполагает наличие у обучающихся исходной языковой подготовки среднего уровня (Intermediate Level, Upper Intermediate).

Практикум направлен в первую очередь на обучение чтению оригинальной литературы и формирует умение извлекать необходимую информацию и давать критическую оценку прочитанному, обосновывая свою точку зрения. Предлагаемые тексты и упражнения способствуют развитию у обучающихся навыков эффективной самостоятельной работы с профессионально-направленной литературой на английском языке.

УДК 811.111(075)
ББК ББК 81.2Англя7

ISBN 978-5-7883-1787-8

CONTENTS

INTRODUCTION

Цель практикума Great Men of Science – подготовить студентов работать с литературой по специальности: читать, осмысливать и интерпретировать профессионально-направленные тексты, вести беседу по научной тематике. Предлагаемый материал разработан на основе оригинальных текстов, знакомящих с эпохами, областями научного знания, а также биографическими данными известных ученых, их великими открытиями, представляющими интерес для студентов. Практикум Great Men of Science рекомендуется использовать в качестве дополнения к основным учебникам как в аудитории, так и во время самостоятельной работы студентов дома.

Практикум содержит 15 текстов, посвященных научным дисциплинам – биологии, химии, психологии и педагогике. Прилагаемые к текстам задания в этом разделе в первую очередь направлены на развитие навыков чтения, таких как извлечение базовой информации, ее обобщение и анализ содержания. К каждому тексту представлены упражнения для систематизации и закрепления лексического и грамматического материала. Авторы считают целесообразным начинать работу над текстом с изучения новой лексики (Vocabulary file). Выполняются упражнения, связанные с запоминанием слов и специализированных терминов: найти в тексте указанные эквиваленты русских или английских слов и выражений. Грамматические упражнения, построенные с использованием предложенных текстов, как правило, предполагают самостоятельное предварительное повторение грамматического материала (Revise grammar material). Работа над текстом завершается вопросами и заданиями, которые дают

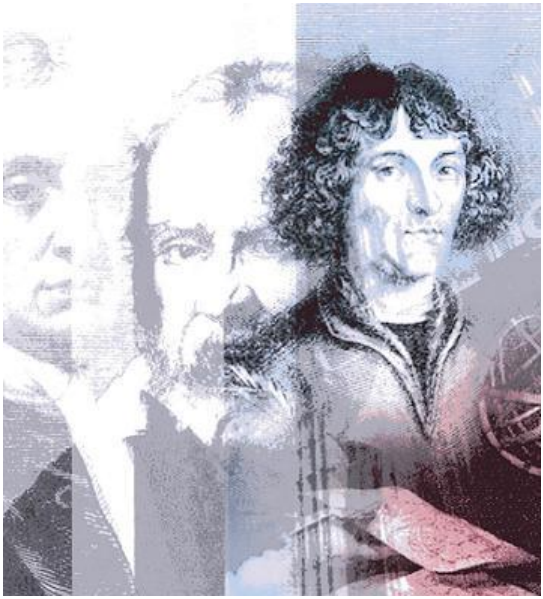
возможность преподавателю проконтролировать знание студентами изложенного материала (Comprehension check-up). Студентам предлагается найти необходимую информацию в тексте, выбрать правильный вариант ответа на поставленный вопрос, дать свой ответ на вопрос и так далее.

В практикуме заимствуются материалы (тексты) из следующих источников: Barret P. Science and theology since Copernicus, Weber A.S. Nineteenth Century Science, https://www.biography.com/, https://www.britannica.com/. Основанием использования следующих текстов является их открытый доступ в системе Интернет. Согласно статье 1274 ГК РФ Свободное использование произведения в информационных, научных, учебных или культурных целях допускается без согласия автора или иного правообладателя и без выплаты вознаграждения, но с обязательным указанием имени автора, произведение которого используется, и источника заимствования п.2 использование правомерно обнародованных произведений и отрывков из них в качестве иллюстраций в изданиях учебного характера в объеме, оправданном поставленной целью.

Heroes are essential to the improvement of society. They represent humankind at its best, a distillation of the diverse qualities that lead a person to behavior that teaches and inspires. In the modern world of media hype and investigative reporting, heroes are hard to find. Either they are suspected of being ordinary souls with good public relations agents or statuesque figures whose feet of clay will be exposed just, when schoolchildren are being asked to emulate them [7;265].

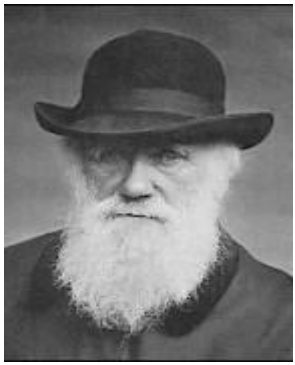
In this age of skepticism men who became heroes, who never disappointed their followers, and whose influence was consistent and increasing at the time of their death were Darwin, Schwann,

Lobachevsky, Mendeleev, Newton, Sakharov and others. And this volume of texts provides a brief overview of their scientific activity.



CHARLES DARWIN (1809–1882)

Charles Darwin was one of the most influential and prolific scientists of the nineteenth century. He has been written about so extensively by twentieth-century historians that a "Darwin industry" of secondary literature has arisen. His grandfather was the celebrated author Erasmus and his father Robert practised medicine very successfully in Shrewsbury. Darwin also studied medicine at Edinburgh from 1825–27, but finding his studies uncongenial, transferred to Cambridge to train as a clergyman. Adam Sedgwick and John Henslow (who suggested the Beagle Voyage) were early scientific influences on Darwin. To the dismay of his father, many of Darwin's activities at Cambridge clearly fell into the category of extra-curricular, including rat-catching, shooting, and beetle collecting: "I will give a proof of my zeal: one day, on tearing off some old bark, I saw two rare beetles and seized one in each hand; then I saw a third and new kind, which I could not bear to lose, so that I popped the one which I held in my right hand into my mouth. Alas it ejected some intensely acrid fluid, which burnt my tongue so that I was forced to spit the beetle out, which was lost, as well as the third one".



Darwin served as a naturalist aboard H.M.S. Beagle from 1831–36, visiting South America and the Pacific islands. Darwin collected specimens and observed variations in related species of birds and animals. He read the first edition of Charles Lyell's *Principles of Geology* on the voyage and became convinced of the immensity of geologic time, a time period which would allow natural selection to take place. Upon his return, he married his cousin Emma Wedgwood and published several volumes describing the scientific findings of the

Beagle voyage, including *The Zoology of the Voyage of the H.M.S. Beagle* (1839–43), *Journal of Researches into the Geology and Natural History of the Various Countries Visited by H.M.S. Beagle* (1839), *Geological Observations on the Volcanic Islands Visited During the Voyage of H.M.S. Beagle, Together With Some Brief Notices of the Geology of Australia and the Cape of Good Hope* (1844), and *Geological Observations on South America* (1846).

Darwin also advanced his original theory of the structure and distribution of *Coral Reefs* (1842), arguing that atolls developed by the deposition of polyp skeletons on gradually subsiding underlying strata, rather than on submerged volcanic craters at a fixed depth, as Lyell had proposed. He then spent eight years classifying the subclass Cirripedia, or the barnacles. At this time, Darwin began to suffer from the mysterious recurrent illness — perhaps Chagas' disease, hypochondria, overwork, or a neurological disorder — which forced him into a reclusive life at Downe in Kent. He eventually sought relief in hydrotherapathy. Through observation of the similarities between extinct and related living species in South America, Darwin began to question the orthodox position that species had remained unchanged since first placed on earth by God. In 1837, Darwin started the first of a series of Transmutation *Notebooks* on the species question which later evolved into the 1842 and 1844 drafts of an essay which Darwin called "my big book" on species, later to be rewritten as *The Origin of Species*, with the first two chapters eventually forming *The Variation of Animals and Plants Under Variation* (1868).

Darwin's reading of Thomas Malthus's *Essay on Population* demonstrated to him that population growth would always outstrip food supply, inevitably resulting in competition for limited resources. Those individuals possessing the traits, produced by random variation, which best allowed the organism to survive would pass these traits to their offspring, ensuring the survival of these traits and thereby slowly modifying the species to the extent that intermediate varieties would

supplant or exterminate the parent type. For this process, Darwin adopted Herbert Spencer's phrase "survival of the fittest," although the fit should not be seen as qualitatively "better" than other individuals, but simply as those which are naturally selected by the environment to leave more offspring. As Robert Young has shown, Darwin was led to the idea of natural selection by the example of artificial selection of domestic animals in which breeders selected animals for specific desirable traits. In Darwin's scheme, nature simply acts as an unconscious and more perfect selector. Darwin investigated artificial selection in his *The Variation of Animals and Plants Under Domestication* (1868); he also bred pigeons himself, joined breeding societies, and like his cousin Francis Galton, circulated questionnaires to plant and animal breeders.

In 1858, the English naturalist Alfred Russel Wallace sent Darwin an essay from Malaysia entitled "On the Tendency of Varieties to Depart Indefinitely from the Original Type". Darwin immediately recognized his own views on species transmutation in Wallace's work. Subsequently, Joseph Hooker and Charles Lyell arranged a meeting of the Linnean society at which Wallace's and Darwin's ideas were jointly presented. A year later, Darwin published his *Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life.* The book sold out instantly and at the 1860 Oxford meeting of the BAAS, Thomas Huxley defended Darwin's views against Bishop Samuel Wilberforce and the theologians who were shocked by the implication (not stated by Darwin) that man and apes shared a common origin and that Paley's natural theology with its purposeful creator was no longer tenable.

Darwin eventually applied his evolutionary views to mankind in *The Descent of Man* (1871), stating clearly that man had evolved from lower life forms. It must be pointed out that Darwin had no clear conception of how characters were transmitted from parent to offspring, as knowledge of genetic inheritance had to wait until the twentieth

century with the rediscovery of the work of Gregor Mendel. By 1900, Darwin's theories were being disputed from a number of quarters and his pangenesis theory of blending inheritance had to be abandoned in the twentieth century in favour of particulate inheritance by genes. Darwin's *Descent of Man, and Selection in Relation to Sex* introduced the concept of sexual selection — an intra-species mechanism operating between males and females — which like natural selection modified species over time and produced sexual dimorphism, to the extent, as Darwin points out, that sometimes males and females of the same species had been assigned to different genera by various naturalists. The topic of sexual selection has recently been of great interest, and Nancy Etcoff's *Survival of the Prettiest* (1999) provides a bibliography of scientific and popular writings on the evolutionary role of beauty and the factors believed to be involved in mate selection in humans and animals, Carl Jay Bajema has in addition compiled an anthology of pre-1900 essays on *Evolution by Sexual Selection Theory Prior to 1900* (1984) which supplements Bernard Campbell's edition of modern essays entitled *Sexual Selection and the Descent of Man, 1871–1971* (l972).

Darwin's final works include *On the Various Contrivances by which British and Foreign Orchids are Fertilized by Insects (*1862), *The Expression of the Emotions in Man and Animals* (1872), *Insectivorous Plants* (1875), *The Movements and Habits of Climbing Plants* (1875), *The Effects of Cross and Self Fertilization in the Vegetable Kingdom* (1876), *The Different Forms of Flowers on Plants of the Same Species* (1877), *The Power of Movement in Plants (1880), and The Formation of the Vegetable Mould Through the Action of Worms* (1881). Darwin's complete works have been edited by Paul H. Barrett and R.B. Freeman for Pickering and Chatto. Darwin's Autobiography, with deleted passages restored by Nora Barlow, remains a classic of scientific biography.

In spite of continuing bouts of poor health, Darwin lived out another decade in his country home in Kent, enjoying being with his family and working on further minor biological projects. When he died in April 1882, there was a remarkable outpouring of tributes from far and wide and the science community in London quickly arranged, with the family's eventual consent, that Darwin be buried in Westminster Abbey, beneath the monument to Newton. Was he not the greatest Englishman since Newton? Had he not given exactly the same stir, the same direction, to all that is most characteristic in the intellectual energy of the nineteenth century, as did Locke and Newton in the eighteenth?

EXERCISES

I. Vocabulary file.

Say what is meant by *remarkable, dismay, a reclusive life, traits, tenable, descent, offspring, random variation, orchid, bouts of poor health, the same stir.*

II. Revise grammar material.

Put the following sentences into the Passive Voice.

1. From 1831–36, visiting South America and the Pacific islands, Darwin observed variations in related species of birds and animals.

2. Upon his return, he published several volumes describing the scientific findings of the Beagle voyage.

3. Darwin called this essay "my big book" on species.

4. Darwin investigated artificial selection in his *The Variation of Animals and Plants under Domestication.*

5. In 1858, the English naturalist Alfred Russel Wallace sent Darwin an essay from Malaysia entitled "On the Tendency of Varieties to Depart Indefinitely from the Original Type".

III. Comprehension check-up.

1) Answer the following questions.

1. What education did Charles Darwin get?

2. What was the greatest event of his life, lasting from December 1831 to October 1836? Why?

3. When was Darwin's main work on species published?

4. Where did he present the topic of sexual selection?

5. What are the weak points in Darwin's theory *Descent of Man*?

2) Choose the statement you think to be correct.

1. Darwin was born
   a) in the family of brilliant lawyers;
   b) in the family of notable doctors;
   c) in the family of a poor leather worker.
2. Darwin suffered from
   a) hypochondria;
   b) cancer;
   c) tuberculosis.
3. In *Variation of Animals and Plants under Domestication* Darwin investigated
   a) the structure and distribution of coral reefs;
   b) artificial selection;
   c) the physical laws of muscle contraction.

3) Divide the text into logical parts and state the general idea of each part.

CARL LINNAEUS (1707–1778)

Linnaeus was Sweden's greatest naturalist in the 18th century and the father of modern biological taxonomy — the classifying of living things, plant or animal. He identified every organism by two names, the first representing its *genus* and the second its *species.* In his lifetime he achieved wide fame for this simple taxonomic scheme, which is known to be flawed in some of its criteria of classification but is still the starting point for modern versions. His *Systema Naturae* was first published in 1735 and in his lifetime went through another eleven editions of ever increasing length.

In 1732 he journeyed to Lapland, an unhospitable and largely uncharted region, returning with many new species of plants and a great enthusiasm for the task of identifying and classifying them. After a three year spell in Holland (with visits to France and England) he was appointed to a chair of medicine at Uppsala University where he spent the remainder of his career teaching natural history. Students flocked to his lectures. Many travelled widely and brought back botanical specimens. Naturalists from all over the world came to see him and for the last twenty years of his life Uppsala became the centre for European botany. When he died all Sweden mourned, and many regretted the purchase of his fabulous collection of specimens and books by the English naturalist Sir Joseph Banks. This treasure formed the basis on which London's Linnaean Society was founded in 1788, the venue at which Charles Darwin's theory of biological evolution was to be announced.

Linnaeus was a firm believer in the biblical doctrine of the creation. He pictured the original Garden of Eden as a small island near

the equator and saw a close parallel between his own work of naming species and the task given to Adam in the book of Genesis. Observing the receding of tide levels around Sweden he imagined this to be a worldwide feature that had allowed the original animals to multiply and migrate. He believed firmly in the fixity of species — the notion that all species had remained constant since the creation — commenting that there are as many species in existence as were brought forth by the Supreme Being in the beginning ... and consequently there cannot be more species now than at the moment of creation.

However, when confronted with evidence of a plant which had deviated from one class into another, he acknowledged the possibility that new species could come into existence within the plant kingdom. But he made no concession to the notion of natural mutability between species of animals. His work of classifying and naming generally hardened the belief in the unchangingness of God-created life forms. Some biologists, however, regarded such classifications and divisions as rather artificial. They looked at the 17th century notion of a Great Chain of Being and saw in it the minute differences between neighbouring elements rather than separate categories. They criticized too the morphological basis of his scheme — using bodily form as the guiding principle (the form of the sexual organs in the case of plants) — which made it seem bleak and static. From the University of Uppsala the scene now changes to the Jardin du Roi in Paris where Linnaeus' contemporary critic and rival, Le Comte de Buffon, held sway.

EXERCISES

I. Vocabulary file.

Find the English equivalents for the following Russian phrases:

новые виды, быть назначенным, устойчивость видов, укрепить мнение, заслужить известность, являться источником для современных версий, твердо верить, сокровище.

II. Revise grammar material.

Write the interrogative and negative forms of the following sentences.

1. In 1732 he journeyed to Lapland.
2. At Uppsala University he spent the remainder of his career teaching natural history.
3. Linnaeus was a firm believer in the biblical doctrine of the creation.
4. Linnaeus believed firmly in the fixity of species.
5. Some biologists regarded such classifications and divisions as rather artificial.

III. Comprehension check-up.

1) Make up 5 questions to the text and ask your partner to answer them.

2) Find the facts in the text to prove that:

1. Carl Linnaeus is considered to be the father of modern biological taxonomy – the classifying of living things.
2. Uppsala University became the centre for European botany.
3. Linnaeus was a firm believer in the biblical doctrine of the creation.
4. However, Linnaeus' work of classifying hardened the belief in the unchangingness of God-created life forms.

3) Make theses to the text.

THEODOR SCHWANN (1810–1882)

Theodor Schwann is credited along with Matthias Schleiden with developing the cell theory. William Coleman emphasizes the importance of this theory for the subsequent development of biology: "After mid-century the cell had become for the great majority of biologists the essential structural reference point for the interpretation of organic form". It is difficult to imagine a time when the idea that plants and animals are composed of cells was not common, but staining techniques in the early nineteenth century were not thoroughly developed and the poor resolution of microscopes did not allow researchers to distinguish microcellular structures clearly, even though cork cells (cavities) had been observed by Robert Hooke and blood corpuscles by Swammerdam as early as the seventeenth century. Even when the cell was recognized as an elementary structure, few physiologists in Schwann's day imagined that cellular growth, structure, and metabolism played such a dominant role in the general functioning of an organism.

Because of his retiring and modest disposition, there is not a great deal of biographical information on Theodor Schwann: from an early age he became aware of his extreme timidity and introspective nature. In 1826, Schwann entered the Jesuit College at Cologne known as the Tricoronatum. He came under the influence of the religious doctrines of Wilhelm Smets and remained extremely pious throughout his life. In 1829 he studied at the University of Bonn with Johannes Miiller. Schwann eventually followed Miiller to Berlin in 1833 as his doctoral student. Schwann investigated quantitatively the physical laws of muscle contraction and also discovered the digestive enzyme pepsin. He was also the first to identify the glial cells surrounding the axons of

neurons. These cells serve to facilitate nerve transmission and are now known as Schwann cells.

In the 1835 he carried out experiments on infusoria and fermentation. By 1836 Schwann was convinced that alcoholic fermentation was caused by a living being (yeast) rather than by oxidation, as the prevailing theory of putrefaction suggested. In a satirical article of 1839, Friedrich Wohler and Justus von Liebig ridiculed Schwann's views on fermentation; Liebig's own theory of chemical ferments activated by oxygen and acting on vegetable sugars held immense power in scientific circles until challenged by Pasteur. Schwann was turned down for a requested teaching post in physiology at the University of Bonn, undoubtedly due in part to the hostility to his ideas from Germany's established scientists; he instead occupied the chair of anatomy at the University of Louvain, Belgium from 1839–48.

Matthias Jakob Schleiden (1804–81), drawing on the work of the "globulist" theorists as well as Robert Brown, who described the cell nucleus in 1832, theorized that plants were composed of cells possessing a nucleus which precedes the formation of the cell. After Schwann noticed similar structures in a variety of animal cells, it was a logical step for him to argue in *Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants* that all animal tissues were composed of cells just like plants. Schwann invited Schleiden to the operating theatre and demonstrated to him the resemblance between plant nuclei and nuclei in cells of the chorda dorsalis (notochord). This meeting represented a turning point in Schwann's development of the cell theory: "from that moment all my efforts were directed to prove the pre-existence of the nucleus in the cell".

Schwann, expanding Schleiden's ideas, further hypothesized that all animal tissues essentially consisted of nucleated cells, formed not from pre-existing cells, but within a fluid "cytoblastema" through a process of accretion and deposition beginning with the appearance of a

nucleolus, a nucleus, and then a cell wall. Schwann further suggested that cell production was analogous to the inorganic process of crystallization. Schwann and Schleiden's cell theory also stated that cells develop according to the same universal laws which govern molecular interactions, not from a unifying life force. Rejecting the vitalism of Muller, Schwann argued that cells were formed by natural and material laws resulting from an internal physical principle, not a generalized vital force in the organism. Rudolf Virchow and Johannes Muller in his work on tumours extended cell theory into medical practice by developing the area of cellular pathology. Schwann was awarded the Royal Society's Copley Medal for 1845 for his cell work.

From 1848–80, Schwann occupied the chair of anatomy at the University of Liege. There he became involved in designing equipment for use in the mining industry. At the 1876 Health and Safety Exposition in Brussels, Schwann demonstrated a closed circuit breathing apparatus employing compressed air with hydrated calcium oxide to absorb respired carbon dioxide. The device anticipated modern breathing apparatus such as SCUBA as well as scientific instruments, including Leon Fredericq's oxygenographe, for measuring basal metabolism. Technology for the reabsorption of respired CO_2 — important in anesthesiology as well as in the life support systems of space craft — has benefitted from Schwann's pioneering research. He began work on an unpublished extension of the *Mikroskopische Untersuchungen* in an attempt to unify his scientific, religious, and philosophical reflections on life, but died before its completion.

EXERCISES

I. Vocabulary file.

Give Russian equivalents to the following words, word combinations from the text: *pioneering research, occupied the chair of*

anatomy,an attempt to unify, the physical laws of muscle contraction, the poor resolution of microscopes, remained extremely pious, the glial cells, precedes the formation, accretion.

II. Revise grammar material.

Change the following general questions into disjunctive ones.

1. Did Schwann study at the University of Bonn?

2. Did he carry out experiments on infusoria and fermentation?

3. Was Schwann turned down for a requested teaching post in physiology at the University of Bonn?

4. Did he notice similar structures in a variety of animal cells?

5. Did Schwann occupy the chair of anatomy at the University of Liege from 1848–80?

III. Comprehension check-up.

1) Ask questions to which the following could be answers.

1. In 1826 Schwann entered the Jesuit College at Cologne.

2. Schwann also discovered the digestive enzyme pepsin.

3. Collaboration with Schleiden represented a turning point in Schwann's development of the cell theory.

4. Schwann found out that cells develop according to the universal laws which govern molecular interactions.

5. At the 1876 Health and Safety Exposition in Brussels, Schwann demonstrated a closed circuit breathing apparatus employing compressed air with hydrated calcium oxide to absorb respired carbon dioxide.

2) Agree or disagree with the following statements.

1. Schwann was the leading French naturalist of his day.

2. Schwann's theory of cells was influenced by Schleiden's ideas.

3. He was the first to identify the glial cells surrounding the axons of neurons.

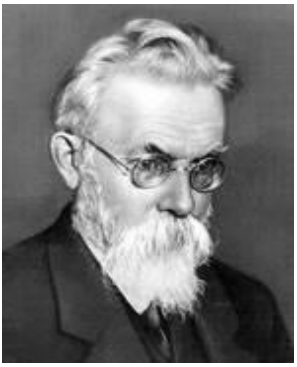
4. Schwann was awarded the Royal Society Copley Medal for his theory of putrefaction.

5. Before his death Schwann published extension of the *Mikroskopische Untersuchungen.*

3) Give a short summary of the information.

VLADIMIR IVANOVICH VERNADSKY (1863–1945)

Throughout the entire history of mankind there have been few thinkers who could equal the Russian scientist Vladimir Ivanovich Vernadsky. He was an outstanding mineralogist, geochemist, crystallographer, theoretical geologist and the founder of many scientific establishments. He managed to see Earth from outer space fifty years before the first space flight. He saw it not only as one of the bodies in the solar system, but distinguished continents and oceans, rocks and living things, humans, minerals, atoms and molecules; he saw that "humans for the first time are becoming a geological force, capable of changing the face of our planet."



V.I. Vernadsky was born on March 12, 1863 in the family of a political economy professor. He spent his early childhood in Kharkov. He entered grammar school in 1873. In 1876 the family moved to Petersburg. The teaching faculty of Petersburg University at that time included D.I. Mendeleyev, V.V. Dokuchayev, and others. These prominent scientists were to play a particularly important role in Vernadsky's becoming an outstanding scientist. The thirst for knowledge, the joy of being free of the musty grammar school

pushed Vernadsky to lectures not only in the natural sciences branch of the physical-mathematical department but in other departments as well. In 1885 V.I. Vernadsky graduated from the university and was given a job as a custodian of the mineralogical department. His independent work began. Many of Vernadsky's achievements have not become outdated with the passage of time; indeed they have become more relevant. Vernadsky spoke of turning the biosphere into a new entity, an area on the planet where human will, reason, and labour would prove themselves in a radical way (making a noosphere — a sphere of reason).

According to Vernadsky, human knowledge is not only a personal and social phenomenon but also a kind of a planetary phenomenon adjoined to the field of life. "Being part of the biosphere, man can judge the world order only by comparing the phenomenon which he can see in it." Our current concept of the biosphere is based mainly on Vernadsky's theories. After 1917 Vernadsky's scientific activity broadened. He took up new, highly difficult problems, put forward new ideas, wrote new books and articles on the history of minerals, on natural waters, on the circulation of the Earth's substances and gases, on space dust, geometry, the problem of time in modern science and on geochemical activity of living matter. In 1927 he organized a biogeochemical laboratory. In 1937 he addressed the international geological congress on "the significance of radioactivity for modern geology."

Till the very last days of his life Vernadsky remained on the frontiers of science: he pondered on the basics of the new teaching of the noosphere, directed the work of the committee on meteorites, researched isotope applications and worked a lot on the uranium problem. Owing to him, this country started to take measures to create an atomic industry and the raw materials basis for it. He attributed great significance to the use of nuclear energy for peaceful and creative purposes, for the creation of the noosphere. At the age of almost 82 the

scientist continued to work. The difficult war years, the newspaper reports about nazi atrocities seriously affected his health. He died on January 6, 1945. He was an inspired truth-seeker. "There is nothing stronger than the thirst for knowledge, the force of doubt...", he claimed. We know just a small part of nature, just a tiny particle of that puzzling, murky and all-enveloping enigma, and everything that we know we have learned thanks to the dreams of the dreamers, fantasy-seekers and learned poets.

EXERCISES

I. Vocabulary file.

Read and memorize the following words and word combinations:

to distinguish – отличать, различать
relevant – уместный
entity – сущность, реальность
will – воля
reason – разум
to prove oneself – проявлять себя
to ponder – обдумывать
to attribute great significance – придавать большое значение
atrocity – жестокость, зверство
thirst – жажда
to take measures – принять меры

II. Revise grammar material.

Give the four forms of the following verbs: *to see, to distinguish, to spend, to prove, to judge, to put, to adjoin, to ponder*. Write 8 sentences using the following verbs in different tense forms.

III. Comprehension check-up.

1) Number the events in the correct order.

- V.I. Vernadsky was taken on the staff of the mineralogical department.
- He also excelled himself as the organizer of a biogeochemical laboratory.
- Vernadsky went with his family to Petersburg.
- The difficult war years had a great influence on his health.
- Vernadsky's major achievements of this period were books and articles on the history of minerals, on natural waters, on the circulation of the Earth's substances and gases, on space dust, geometry, the problem of time in modern science and on geochemical activity of living matter.

2) Choose the right answer.

1. Why did Vernadsky attribute great significance to the use of nuclear energy?

a) it served for peaceful and creative purposes, for the creation of the noosphere;

b) it provided "the equalizer" between the superpowers and produced an era of relative world peace at that time;

c) it increased the power of his country.

2. What was the contents of Vernadsky's work till the very last days of his life?

a) he developed a new theory of the origin of petroleum;

b) he worked a lot to create a safe electric system;

c) he worked a lot on the uranium problem.

3. What is a noosphere according to Vernadsky?

a) it is the source of the extraordinary radiation;

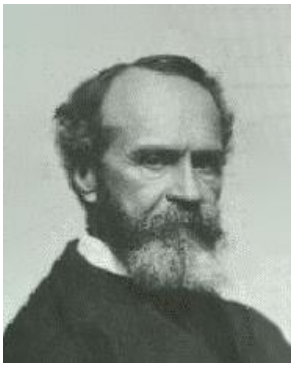
b) it is a part of modern geology;

c) it is a sphere of reason.

3) Render the contents of the text in 10 sentences.

WILLIAM JAMES (1842–1910)

William James's grandfather, William James of Albany (1771–1832), amassed a considerable fortune as a merchant and land speculator in New York, which allowed his son Henry James, Sr. the leisure to study philosophy and Swedenborgian theology. Thus Henry's son William James the younger grew up in an atmosphere of independent wealth in which art, literature, and philosophy were liberally cultivated. These early influences, along with his own struggle to define himself, led to James's deep interest in human behaviour, the nature of the self, and psychological motivation, interests he shared with his expatriate brother, the novelist Henry James, Jr.



James agonized over a future career before beginning the study of chemistry at Harvard in 1861, later switching to medicine in 1864. While at Harvard, he accompanied Louis Agassiz on his 1865 Amazon journey, but his obvious impatience with the natural sciences is revealed in this passage from a letter back home: "although several bushels of different things have already been collected, *nothing* has been done which could not have been done just as well from Boston". After his return from Brazil, he often joined Chauncey Wright, and Charles S. Pierce in Cambridge for philosophical discussions. James obtained his M.D. in 1869 from Harvard after a series of illnesses, with periods of depression and self-doubt which led to a serious spiritual crisis and near suicide in the late i86os and early 18703. In 1873, he began teaching physiology at Harvard. James's seemingly erratic career at Harvard from professor of physiology in 1876 to professor of psychology in 1880, and then finally to professor of philosophy in 1885 parallels the restless movement of his most important book, *The*

Principles of Psychology (1890). James consciously set out to define the problems of mental functioning from both biological and philosophical perspectives in the *Principles*, although he admitted to the impossibility of experimentally testing some psychological phenomena. Although psychology — literally 'knowledge of the soul' — only first arose as a separate discipline from philosophy, medicine, or theology in the nineteenth century, the questions which James analyzes in the *Principles* had been examined in detail since classical times in treatises entitled *De anima* and later by theologians and philosophers such as Locke, Hume, Kant, Stewart, and Hartley.

The *Principles* is unique from earlier attempts at codifying the field of psychology. James's *Principles* does provide the best summary and critique of previous work in the field written up to his time. James examined three prevalent theories of psychology in the *Principles: i)* the mind-stuff theory — or complete mechanical materialism, stating that ideas act like material atoms; 2) associationism, defined below; and 3) transcendentalism, which believed in a knowing "Ego" or the traditional immortal soul as the source of mental states. In his critique of psychology, James dissented from the prevailing British associationist psychology of John Locke, David Hume, David Hartley, and John Stuart Mill which viewed mental functioning as a series of individual ideas, originating in sensation and strung together in the mind usually in some sort of logical or even mechanical pattern. In associationism, simple ideas "built up" or added together formed complex ideas. Without abandoning associationism, James argued that these connections among thoughts were not necessarily uniform, simple, or even rational. James on the other hand emphasized the continuity and totality of mental experience and impressions, and employed the terms "stream of thought" and "stream of consciousness" to characterize the state of the working mind.

In *Pragmatism: A New Name for Some Old Ways of Thinking* (1907), James, borrowing from the terminology of C.S. Pierce, brought

forth a theory of reality grounded in actual processes and experience, although not necessarily in opposition to metaphysics in the way empiricism traditionally has been. The central idea of pragmatism, implicit in many of James's earlier works, is that concepts and truths must be evaluated according to how effectively they operate in the world. James examined religion closely in his 1902 book *The Varieties of Religious Experience,* concluding similarly that religious faith must be judged according to its efficacious effects.

James's later writings blurred his original belief in the dualism (mental states/physical objects; mind/ body; Subject/ Object) which he believed essential for philosophy and psychology, and in the posthumously published *Essays in Radical Empiricism* (1912) he discussed the philosophy of radical empiricism, suggesting that consciousness could be reduced to "pure experience." The monism of radical empiricism suggests that for James mind and body both formed part of a more primary unitary essence, "pure experience." The complete works of James have appeared from Harvard University Press under the direction of Frederick H. Burkhardt, Fredson Bowers, and Ignas K. Skrupskelis (1975–88).

EXERCISES

I. Vocabulary file.

Say what is meant by *land speculator, agonized over, erratic career, consciously, set out, mechanical materialism, immortal soul, emphasized the continuity, borrowing from the terminology, idea of pragmatism, posthumously published, radical empiricism, unitary essence.*

II. Revise grammar material.

Read the following sentences and ask special questions on them:

1. James examined religion closely in his 1902 book *The Varieties of Religious Experience.*

2. William James grew up in an atmosphere of independent wealth in which art, literature, and philosophy were liberally cultivated.

3. In 1873 he began teaching physiology at Harvard.

4. James's *Principles* does provide the best summary and critique of previous work in the field written up to his time.

5. James examined three prevalent theories of psychology in the *Principles.*

III. Comprehension check-up.

1) Agree or disagree with the following statements.

1. William James's father amassed a considerable fortune as a merchant and land speculator in New York, which allowed his son Henry James, Sr. the leisure to study philosophy and Swedenborgian theology.

2. James agonized over a future career before beginning the study of chemistry at Harvard in 1862, later switching to medicine in 1865.

3. The *Principles* is unique from earlier attempts at codifying the field of psychology.

4. The complete works of James have appeared from Harvard University Press under the direction of Adrian Forbs and Ann Phillips.

2) Say as much as you can on:

a) William James's personal life;

b) erratic career;

c) James's *Principles;*

d) *Pragmatism.*

3) Divide the text into logical parts and state the general idea of each part.

SIGMUND FREUD (1856–1939)

Sigmund Freud was born on May 6, 1856, in a small town — Freiberg — in Moravia. His father was a wool merchant with a keen mind and a good sense of humor. His mother was a lively woman, her husband's second wife and 20 years younger. She was 21 years old when she gave birth to her first son, her darling, Sigmund. Sigmund had two older half-brothers and six younger siblings. When he was four or five — he wasn't sure — the family moved to Vienna, where he lived most of his life. A brilliant child, always at the head of his class, he went to medical school, one of the few options for a bright Jewish boy in Vienna those days. There, he became involved in research under the direction of a physiology professor. Freud was very good at his research, concentrating on neurophysiology, even inventing a special cell-staining technique. He got *a* grant to study, first with the great psychiatrist Charcot in Paris, then with his rival Bernheim in Nancy. Both these gentlemen were investigating the use of hypnosis with hysterics. After spending a short time as a resident in neurology and director of a children's ward in Berlin, he came back to Vienna, married his patient Martha Bernays, and set up a practice in neuropsychiatry, with the help of Joseph Breuer. Freud's books and lectures brought him both fame and ostracism from the mainstream of the medical community. He drew around him a number of very bright sympathizers who became the core of the psychoanalytic movement.

Freud didn't exactly invent the idea of the conscious versus unconscious mind, but he certainly was responsible for making it

popular. The conscious mind is what you are aware of at any particular moment, your present perceptions, memories, thoughts, fantasies, feelings, what have you. Working closely with the conscious mind is what Freud called the preconscious, what we might today call "available memory:" anything that can easily be made conscious, the memories you are not at the moment thinking about but can readily bring to mind. Now no-one has a problem with these two layers of mind. But Freud suggested that these are the smallest parts. The largest part by far is the unconscious. It includes all the things that are not easily available to awareness, including many things that have their origins there, such as our drives or instincts, and things that are put there because we can't bear to look at them, such as the memories and emotions associated with trauma. According to Freud, the unconscious is the source of our motivations, whether they be simple desires for food or sex, neurotic compulsions, or the motives of an artist or scientist. And yet, we are often driven to deny or resist becoming conscious of these motives, and they are often available to us only in disguised form. Freud emigrated to England just before World War II when Vienna became an increasing dangerous place for Jews, especially ones as famous as Freud. Not long afterward, he died of the cancer of the mouth and jaw that he had suffered from for the last 20 years of his life.

EXERCISES

I. Vocabulary file.

Find the English equivalents for the following Russian phrases:

Скрытая форма, являться источником мотиваций, челюсть, организовать практику, нейрофизиология, костяк психоаналити-

ческого движения, восприятие, подсознательное, иметь хорошее чувство юмора, изгнание.

II. Revise grammar material.

Write out all sentences in the Passive Voice and express the following sentences in the Active.

III. Comprehension check-up.

1) Ask 5–6 questions on the text.

2) Choose the right answer.

1. When was Sigmund Freud born?
   a) January 10, 1856;
   b) April 6, 1855;
   c) May 6, 1856.
2. How old was Sigmund Freud's mother when she gave birth to her first son?
   a) 22;
   b) 20;
   c) 21.
3. Who became Sigmund Freud's wife?
   a) his patient;
   b) his teacher;
   c) his doctor.

3) Give the key points of Freud's theory of conscious and unconscious mind.

LEV SEMYONOVICH VYGOTSKY (1896–1934)

Lev Semyonovich Vygotsky, a Russian psychologist, was born in 1896 in Western Russia (Belorussia). Vygotsky was tutored privately by Solomon Ashpiz. Later, he attended the Institute of Psychology in Moscow (1924–34), where he worked extensively on ideas about cognitive development, particularly the relationship between language and thinking. His writings emphasized the roles of historical, cultural, and social factors in cognition and argued that language was the most important symbolic tool provided by society. Vygotsky died of tuberculosis in 1934, leaving a wealth of work that is still being explored.

Being a pioneering psychologist, Vygotsky was also a highly prolific author: the collection of his major works contains 6 volumes written over roughly 10 years. Vygotsky's interests in the fields of developmental psychology, child development, and education were extremely diverse. His innovative work in psychology includes several key concepts such as: *psychological tools*, *mediation*, and *internalization*; the *zone of proximal development* and covers such diverse topics as the origin and the psychology of art, development of higher mental functions, philosophy of science and methodology of psychological research, the relation between learning and human development, interrelation between language and thought development, play as a psychological phenomenon, the study of learning disabilities and abnormal human development, etc.

Vygotsky investigated child development and how this was guided by the role of culture and interpersonal communication. He observed how higher mental functions developed through social interactions with significant people in a child's life, particularly parents. Through these

interactions, a child came to learn the habits of mind of her/his culture, including speech patterns, written language, and other symbolic knowledge through which the child derives meaning and affected a child's construction of knowledge. This key premise of Vygotskian psychology is often referred to as cultural mediation. The specific knowledge gained by a child through these interactions also represented the shared knowledge of a culture. This process is known as internalization.

Lesser known is his research on play, or child's game as a psychological phenomenon and its role in the child's development. Through play the child develops abstract meaning separate from the objects in the world which is a critical feature in the development of higher mental functions.

Perhaps Vygotsky's most important contribution concerns the inter-relationship of language development and thought. This concept, explored in Vygotsky's book *Thinking and Speaking*, establishes the explicit and profound connection between speech (both silent inner speech and oral language), and the development of mental concepts and cognitive awareness. Vygotsky described inner speech as being qualitatively different than normal (external) speech. Although Vygotsky believed inner speech to develop from external speech via a gradual process of internalization, with younger children only really able to "think out loud", he claimed that in its mature form it would be unintelligible to anyone except the thinker and would not resemble spoken language as we know it. Hence, thought itself develops socially.

EXERCISES

I. Vocabulary file.

Say what is meant by *cognitive development, symbolic tool, a highly prolific author, key concepts, learning disabilities, interpersonal*

communication, key premise, contribution concern, to think out loud, mental concepts, awareness, explicit connection between, zone of proximal development.

II. Revise grammar material.

Fill in the blanks with prepositions.

1. Vygotsky was tutored privately … Solomon Ashpiz.
2. Vygotsky died … tuberculosis … 1934
3. … these interactions a child came to learn the habits of mind.
4. This process is known … internalization.
5. The collection of his major works contains 6 volumes written … 10 years.

III. Comprehension check-up.

1) Answer the following questions.

1. Where was Vygotsky born?
2. What is considered to be the key premise of Vygotsky's psychology?
3. What concept did Vygotsky explore in his book *Thinking and Speaking*?
4. How did Vygotsky describe *inner speech*?
5. What is *internalization*?

2) Choose the facts from the text that may help you characterize:

a) Vygotsky's education;
b) Key concepts of Vygotsky's innovative work in psychology;
c) Vygotsky's research on play;
d) The inter-relationship of language development and thought.

3) Make up a plan of the text.

ABRAHAM MASLOW (1908–1970)

Born in Brooklyn, New York, Maslow was the first of seven children of Jewish immigrants from Russia. His parents were uneducated, but they insisted that he should study law. At first, Abraham acceded to their wishes and enrolled in the City College of New York. However, after three semesters he transferred to Cornell, then back to New York. In 1928 he married his first cousin, Bertha Maslow and moved to Wisconsin to attend the University of Wisconsin from which he received his B.A. (1930), his M.A. (1932), and his Ph.D. (1934) in psychology. While in Wisconsin, Maslow studied with Harry Harlow, who was known for his controversial experiments on rhesus monkeys and attachment behavior. A year after graduation, Maslow returned to New York to work with E. L. Thorndike at Columbia.

Maslow began teaching full time at Brooklyn College. During this time he met many leading European psychologists, including Alfred Adler and Erich Fromm. In 1951, Maslow became the chairman of the psychology department at Brandeis University, where he began his theoretical work. There, he met Kurt Goldstein, who introduced him to the idea of self-actualization. He retired to California, where he died of a heart attack in 1970, aged 62, after years of ill health.

Maslow's primary contribution to psychology is his Hierarchy of Needs (Maslow's Diagram). Maslow contended that humans have a number of needs that are innate. Maslow postulated that needs are arranged in a hierarchy in terms of their potency. Although all needs are instinctive, some are more powerful than others. The first four layers of the pyramid are what Maslow called "deficiency needs" or "D-needs:"

the individual does not feel anything if they are met, but feels anxious if they are not met. Needs beyond the D-needs are "growth needs," "being values," or "B-needs."

The base of the pyramid is formed by the physiological needs, including the biological requirements for food, water, air, and sleep. Once the physiological needs are met, an individual can concentrate on the second level, the need for safety and security. Included here are the needs for structure, order, security, and predictability. The third level is the need for love and belonging. Included here are the needs for friends and companions, a supportive family, identification with a group, and an intimate relationship. The fourth level is the esteem needs. This group of needs requires both recognition from other people that results in feelings of prestige, acceptance, and status, and self-esteem that results in feelings of adequacy, competence, and confidence. Lack of satisfaction of the esteem needs results in discouragement and feelings of inferiority. Finally, self-actualization sits at the apex of the original pyramid.

In 1970 Maslow published a revision to his original 1954 pyramid, adding the cognitive needs (first the need to acquire knowledge, then the need to understand that knowledge) under the need for self-actualization, and the aesthetic needs (the needs to create and/or experience beauty, balance, structure, etc.) above the cognitive needs. However, not all versions of Maslow's pyramid include these levels.

Maslow's theory of human needs draws strongly on the pioneering work of Henry Murray (1938). This provides the basis for wide-ranging and extensively validated work relating to achievement, affiliation, power and ambition. "We move toward self actualization". This quote brings in Maslow's theory of motivation, tying along with the growth, happiness and satisfaction of every person. He believes to be motivated that it is not driven by reducing tension or avoiding frustration that people look for a positive view.

EXERCISES

I. Vocabulary file.

Find the English equivalents for the following Russian phrases and words: *спорные эксперименты, заведующий кафедрой, врожденный, интимные отношения, физиологические потребности, предсказуемость, признание, потребность в уважении, потребность в безопасности, вершина пирамиды, познавательные потребности.*

II. Revise grammar material.

Read the following sentences, make them negative and ask general questions on them.

1. The base of the pyramid is formed by the physiological needs.
2. Humans have a number of innate needs.
3. Harry Harlow was known for his controversial experiments.
4. This group of needs requires both recognition from other people.
5. In 1970 Maslow published a revision to his original pyramid.

III. Comprehension check-up.

1) What happened at these times?

In 1934

In 1970

In 1928

In 1951

In 1954

2) Spot the mistakes.

a) Abraham Maslow entered the City College of New York to study medicine.

b) The base of the pyramid is formed by the aesthetic needs.

c) Abraham Maslow died of tuberculosis in 1970.

d) The cognitive needs are the needs for structure, order, security, and predictability.

3) Render the contents of Maslow's theory of human needs in 10 sentences.

HEINRICH PESTALOZZI (1746–1827)

Born in Zurich, Pestalozzi was brought up by his mother after his father died when the boy was five years old. This experience started his view, central to educational outlook, of the importance in early education of mother and home. Strongly influenced by the writings of Rousseau, Pestalozzi abandoned ideas of entering the ministry and later the law and became a farmer though not a successful one.

An industrial school for 20 orphans, which he set up and in which work and learning were to be combined, was a financial failure. He turned to writing. The work, that made the most powerful impact, was a novel of village life "Leonard and Gertrude which he described a form of home instruction where learning was based on immediate observation by children. For example they began arithmetic by counting the panes in the window. His work attracted great attention, and made it influential in the development of educational ideas.

In 1798 Pestalozzi was briefly in charge of a school of orphans in Stanz, in Switzerland, and afterwards, his ideas sharpened by experience, he was appointed head of a teachers training college at

Bergdorf. In 1805 he set up the Institute of Yverdon, a magnet for teachers and pupils from many European countries. Pestalozzi's most important book "How Gertrude Teachers Her Children" (1801) was based on his experience at Bergdorf.

Essentially, Pestalozzi believed with Rousseau that the primary concern of education is with the individual approach, and that a true method of education must be based on a firm, understanding of the way in which children develop. Like Rousseau he believed that the life and operation of school should resemble those of a family, but unlike Rousseau he did not feel that the success of the home or the school called for exceptional parents or teachers or for ideal circumstance. And though he shared Rousseau's concern for individuality, he recognized that a child depends a great deal on his social role for the full development of his powers.

Pestalozzi's approach to method initiated the first modern view of learning now widely followed: that it must being in experience and lead to ideas and that it must be always within a child's grasp. There must be progress from the near to the distant, from the simple to the increasingly complex.

EXERCISES

I. Vocabulary file.

Give Russian equivalents to the following words, word combinations from the text: *educational outlook, to abandon ideas, to set up a school, to combine learning and work, a financial failure, immediate observation, to attract attention, the primary concern, a true method of education, a firm understanding, ideal circumstances, a great deal, within a child's grasp, from the near to the distant.*

II. Revise grammar material.

Write an adjective formed from these nouns: *education, importance, success, industry, finance, power, exception.*

III. Comprehension check-up.

1) Answer the following questions.

1. Pestalozzi believed that mother and home were very important in early education, didn't he?

2. What did Pestalozzi become after abandoning ideas to enter the ministry and the law?

3. What school did he set up? Was it a financial failure?

4. When did Pestalozzi turn to writing?

5. When did Pestalozzi set up the Institute of Yverdon?

6. What was Pestalozzi's idea of school operation?

7. Whose concern for individuality did he share?

2) Ask questions to which the following sentences could be answers.

1. Pestalozzi was influenced by the writings of Rousseau.

2. He set up an industrial school for 20 orphans.

3. Yes, he did. He turned to writing.

4. Pestalozzi described his teaching experience.

5. Pestalozzi's most important book was "*How Gertrude Teaches her Children*".

6. No, he didn't. Unlike Rousseau he believed that success of the school did not call for exceptional teachers.

7. According to Pestalozzi a child's development depends a great deal on his social role.

3) Give a short summary of the information.

KONSTANTIN DMITRIEVICH USHINSKY (1823–1871)

K.D. Ushinsky was in the fullest sense of the word, the founder of the Russian primary school and pedagogical training for teachers. His contribution to Russian education was great. Ushinsky's pedagogical ideas outstripped his time in many ways and were implemented only in socialist society. His works are not only of a historical value today but greatly assist the Bourse of the genuinely people's education that was the lifetime dream of the outstanding pedagogue, patriot and citizen.

Ushinsky was born in 1824 in Chernigov gubernia in the family of a well-to-do landowner. He learned very early to study independently and, after making a fine record in the gymnasium, Ushinsky enrolled in Moscow University at the age of 16. He graduated from the University with high honors when he was 20 years old. Two years later, despite his youth, Ushinsky was appointed professor of Jurisprudence at the Demidov Lycee in Yaroslavl. His lectures were an immediate success for they were based upon his already considerable erudition. It was then that Ushinsky started criticizing the present educational system in Russia and was forbidden by the Ministry of Education to teach even in elementary school. In 1855 many teachers who had lost work before could find jobs again. In 1859 Ushinsky was appointed inspector at Smolny Institute in St. Petersburg. In 1860 Ushinsky became editor of the Journal of the Ministry of Education and in two years completely changed its character. Under his editorship its focus was centered upon real problems of teaching, theories of pedagogy and psychology, accounts of educational activities and criticism of current pedagogical literature. Smolny Institute became a laboratory to which were directed the eyes

of everyone interested in education. Ushinsky's name became popularly known throughout Russia and at the end of his three years of work there he was already well-known as one of the foremost teachers and guides of educational movement in Russia and as a teacher of teachers. Ushinsky was not only concerned with Russian affairs but was a devout patriot. One of the basic principles of his pedagogical system is the inculcation of a feeling of patriotism in the young. In his early articles he expressed this view and never changed his basic concept that "education must be based on patriotism". Ushinsky thought that this could be done best with the help of native language, taught at school.

One of his most famous works "Rodnoe Slovo" (Native Word) was a series of readers for Russian children designed to give them greater love and respect for their national literature. Ushinsky believed that education should devote itself primarily to the formation of character. Here a special attention should be paid to the development in the pupil of the habit of work. According to Ushinsky, "life without serious work can neither be worthy nor happy". Ushinsky underlined the personal influence of the teacher as an educational force. He put forward the idea of setting up teachers seminars to train teachers for their important and responsible work. Ushinsky was interested in foreign educational systems. He made trips to Germany, Switzerland, France, Italy and Belgium to observe school organization there. His first impressions after visiting Swiss institutions were published in the Journal of the Ministry of Public Education in 1862–1863 in seven letters as "Pedagogical Travels in Switzerland". These letters are not only valuable material for Comparative Education but are literary masterpieces of the Russian language. Ushinsky analyzed merits and defects of foreign educational systems always comparing them with actual conditions in Russia. After coming back to Russia from abroad in 1867 Ushinsky devoted his energies to St. Petersburg Pedagogical Society. He traveled, lectured, held conferences and interviews and continued his research and writing. Such a program was too much for

his already weakened health. Ushinsky's death in 1870 was mourned not only by teachers, but by all progressive people in Russia, not only in the capital but in the most distant corners of the country.

EXERCISES

I. Vocabulary file.

Find the English equivalents for the following Russian phrases: *начальная школа, вклад, историческая ценность, заканчивать университет, несмотря на, педагогическая система, формирование характера, выдвигать идею, первые впечатления.*

II. Revise grammar material.

Combine the words into sentences. Translate them into Russian:

1. 16 the **Ushinsky** in Moscow enrolled of University at age.
2. it in was that educational **Ushinsky** started criticizing then the present system Russia.
3. **In** became the 1860 Ushinsky Education editor of the Journal of Ministry of .
4. **Education** be must based on patriotism.
5. be **Life** without nor serious can neither worthy work happy.
6. **Ushinsky** interested was in educational foreign systems.
7. St. Petersburg **Ushinsky** devoted Society to his energies Pedagogical.

III. Comprehension check-up.

1) What happened at these times?

In 1824

In 1855

In 1859

In 1860

In 1862–1863
In 1867
In 1870

2) Complete the sentences from the text:

1. K. D. Ushinsky was in……
2. Ushinsky was born in 1824 in Chernigov gubernia……..
3. Two years later, despite his youth, Ushinsky……..
4. Under his editorship its focus was centered upon…….
5. Ushinsky was not only concerned with Russian affairs but……..
6. He put forward the idea of setting up teachers' seminars…….
7. Ushinsky was interested in……

3) Divide the text into logical parts and state the general idea of each part.

MARIA MONTESSORI (1870–1952)

Maria Montessori was an Italian educator and originator of the educational system that bears her name. The Montessori system is based on belief in the creative potential of children, their drive to learn, and the right of each child to be treated as an individual.

After graduating in medicine from the University of Rome in 1896 — the first woman in Italy to do so — Montessori was appointed assistant doctor at the psychiatric clinic of the University of Rome, where she became interested in the educational problems of intellectually disabled children. Between 1899 and 1901 she served as

director of the State Orthophrenic School of Rome, where her methods proved extremely successful. From 1896 to 1906 she held a chair in hygiene at a women's college in Rome, and from 1900 to 1907 she lectured in pedagogy at the University of Rome, holding a chair in anthropology from 1904 to 1908. During these years she continued her studies of philosophy, psychology, and education.

In 1907 Montessori opened the first Casa dei Bambini (*"Children's House"*), a preschool for children age's three to six from the San Lorenzo slum district of Rome, applying her methods now to children of normal intelligence. Her successes led to the opening of other Montessori schools, and for the next 40 years she travelled throughout Europe, India, and the United States lecturing, writing, and establishing teacher-training programs. In 1922 she was appointed government inspector of schools in Italy, but left the country in 1934 because of the Fascist rule. After periods in Spain and Ceylon (now Sri Lanka), she settled in the Netherlands.

Montessori scorned conventional classrooms, where "children, l ike butterflies mounted on pins, are fastened each to his place." She sought, instead, to teach children by supplying concrete materials and organizing situations conducive to learning with these materials.

She discovered that certain simple materials aroused in young children an interest and attention not previously thought possible. These materials included beads arranged in graduated-number units for premathematics instruction; small slabs of wood designed to train the eye in left-to-right reading movements; and graduated series of cylinders for small-muscle training. Children between three and six years old would work spontaneously with these materials, indifferent to distraction, for from a quarter of an hour to an hour. At the end of such a period, they would not seem tired, as after an enforced effort, but refreshed and calm. Undisciplined children became settled through such voluntary work. The materials used were designed

specifically to encourage individual rather than cooperative effort. Group activity occurred in connection with shared housekeeping chores.

A large measure of individual initiative and self-direction characterized the Montessori philosophy, and self-education was the keynote of the plan. The teacher provided and demonstrated the special "didactic apparatus" but remained in the background, leaving the child to handle it for himself. In the Montessori system biological and mental growth are linked. "Periods of sensitivity," corresponding to certain ages, exist when a child's interest and mental capacity are best suited to the acquisition of certain specialized knowledge.

Montessori's methods are set forth in such books as *Il metodo della pedagogia scientifica* (1909; *The Montessori Method*, 1912), *The Advanced Montessori Method* (1917–18), *The Secret of Childhood* (1936), *Education for a New World* (1946), *To Educate the Human Potential* (1948), and *La mente assorbente* (1949; *The Absorbent Mind*, 1949).

EXERCISES

I. Vocabulary file.

Give Russian equivalents to the following words, word combinations from the text: *intellectually disabled children, a preschool, to establish teacher-training programs, to apply the methods, to be arranged in, an enforced effort, undisciplined children, to encourage, in connection with, biological and mental growth, periods of sensitivity.*

II. Revise grammar material.

Write the questions to which the underlined words are the answers.

1. ***Maria Montessori*** was an Italian educator and originator of the educational system.

2. Montessori was appointed ***assistant doctor*** at the psychiatric clinic of the University of Rome.

3. During these years she continued her studies of philosophy, psychology, and education.

4. A large measure of ***individual initiative and self-direction*** characterized the Montessori philosophy.

5. ***Self-education*** was the keynote of the plan.

6. She settled in ***the Netherlands.***

7. ***In 1922*** she was appointed government inspector of schools in Italy.

III. Comprehension check-up.

1) Number the events in the correct order.

- She was appointed government inspector of schools in Italy.
- She lectured in pedagogy at the University of Rome.
- Montessori was appointed assistant doctor at the psychiatric clinic of the University of Rome.
- She held a chair in hygiene at a women's college in Rome.
- She served as director of the State Orthophrenic School of Rome.
- Montessori opened the first Casa dei Bambini ("Children's House"), a preschool for children ages three to six from the San Lorenzo slum district of Rome, applying her methods now to children of normal intelligence.
- She settled in the Netherlands.

2) Find information about Montessori:

a) her publications;

b) results of work.

3) Render the contents of the text in 7 sentences.

FREDRICH FROEBEL (1782–1852)

Friedrich Froebel**,** Froebel also spelled Fröbel, in full Friedrich Wilhelm August Froebel, a German educator who was founder of the kindergarten and one of the most influential educational reformers of the 19th century.

Froebel was the fifth child in a clergyman's family. His mother died when he was only nine months old, and he was neglected as a child until an uncle gave him a home and sent him to school. Froebel acquired a thorough knowledge of plants and natural phenomena while at the same time beginning the study of mathematics and languages. After apprenticeship to a forester, he pursued some informal university courses at Jena until he was jailed for an unpaid debt. He tried various kinds of employment until he impulsively took a teaching appointment at a progressive model school in Frankfurt run by Anton Gruner on lines advocated by the Swiss educator Johann Heinrich Pestalozzi. Froebel became convinced of his vocation as a teacher at the school.

After two years as assistant to Gruner, Froebel went to Yverdon, Switz., where he came into close contact with Pestalozzi. Though he learned much at Yverdon, he quickly discovered the weakness of organization that characterized Pestalozzi's work. In 1811 Froebel entered the University of Göttingen, where military service in the Napoleonic Wars soon interrupted his studies. During the campaign of 1813 he formed a lasting friendship with H. Langenthal and W. Middendorff, who became his devoted followers and who joined him at a school he opened at Griesheim in Thuringia in 1816. Two years later the school moved to Keilhau, also in Thuringia, and it was there that Froebel put into practice his educational theories. He and his friends

and their wives became a kind of educational community, and the school expanded into a flourishing institution. During this time Froebel wrote numerous articles and in 1826 published his most important treatise, *Menschenerziehung* (*The Education of Man*), a philosophical presentation of principles and methods pursued at Keilhau.

In 1831 Froebel left Keilhau to his partner and accepted the Swiss government's invitation to train elementary school teachers. His experiences at Keilhau and as head of a new orphan asylum at Burgdorf in Switzerland impressed him with the importance of the early stages of education. On returning to Keilhau in 1837 he opened an infant school in Blankenburg, Prussia, that he originally called the Child Nurture and Activity Institute, and which by happy inspiration he later renamed the Kindergarten, or "garden of children." He also started a publishing firm for play and other educational materials, including a collection of *Mother-Play and Nursery Songs*, with lengthy explanations of their meaning and use. This immensely popular book was translated into many foreign languages. Froebel insisted that improvement of infant education was a vital preliminary to comprehensive educational and social reform. His experiments at the Kindergarten attracted widespread interest, and other kindergartens were started. Unfortunately, because of confusion with the socialist views of Froebel's nephew, the Prussian government proscribed the kindergarten movement in 1851. The ban was not removed until after 1860, several years after Froebel's death in 1852.

One of Froebel's most enthusiastic disciples, the Baroness of Marenholtz-Bülow, was largely responsible for bringing his ideas to the notice of educators in England, France, and the Netherlands. Later they were introduced into other countries, including the United States, where the Froebelian movement achieved its greatest success. There John Dewey adopted Froebel's principles in his experimental school at the University of Chicago. Kindergartens were established throughout

Europe and North America and became a standard educational institution for children of four to six years of age.

Froebel was influenced by the outstanding German idealist philosophers of his time and by Jean-Jacques Rousseau and Pestalozzi. He was a sincerely religious man who, because of his belief in the underlying unity of all things, tended toward pantheism and has been called a nature mystic. His most important contribution to educational theory was his belief in "self-activity" and play as essential factors in child education. The teacher's role was not to drill or indoctrinate the children but rather to encourage their self-expression through play, both individually and in group activities. Froebel devised circles, spheres, and other toys — all of which he referred to as "gifts" or "occupations" — that were designed to stimulate learning through play activities accompanied by songs and music. Modern educational techniques in kindergarten and preschool are much indebted to him.

EXERCISES

I. Vocabulary file.

Find the English equivalents for the following Russian phrases: *основатель, священник, детский сад, отвечать за, достигать, вера, вклад в, дополнительные факторы, поощрять, быть обязанным*, *обучение.*

II. Revise grammar material.

Write the interrogative and negative forms of the following sentences.

1. Froebel was the fifth child in a clergyman's family.
2. Froebel became convinced of his vocation as a teacher at the school.
3. In 1837 he opened an infant school in Blankenburg.

4. The ban was removed after 1860.

5. Modern educational techniques in kindergarten and preschool are much indebted to him.

III. Comprehension check-up.

1) Ask 5–6 questions on the text.

2) Spot the mistakes.

a) Friedrich Froebel was an Italian educator.

b) He was one of the most influential educational reformers of the 18th century.

c) In 1831 Froebel left Keilhau to his partner and accepted the Swiss government's invitation to train high school teachers.

d) In 1837 he opened an infant school in Blankenburg, Russia.

e) Froebel influenced on the outstanding German idealist philosophers of his time and on Jean-Jacques Rousseau and Pestalozzi.

3) Make up a plan of the text.

ROBERT BOYLE (1627–1691)

The Honourable Robert Boyle has been described as the father of modern chemistry and a man of remarkable piety — a member of the Church of England who was very much a Puritan at heart. At the age of twenty-one he experienced a deep spiritual crisis in which he resolved to spend the rest of his life in dedication to the service of God.

In his early adult years, Boyle was a member of a group in Oxford who were passionate believers in Bacon and his Experimental Philosophy and although he appreciated the importance of mathematics and regretted his lack of it, he believed that the fundamental task in natural philosophy was to broaden its experimental basis — to inquire into the ways of nature empirically without being drawn too soon into forming hypotheses. Indeed the contemporary Dutch scientist, Christian Huygens, came to remark that in relation to the vast amount of experimental work that Boyle had recorded, he had made very few important discoveries and generalizations. Nevertheless, he was to make his mark in the histories of both chemistry and natural theology. The most important of his scientific writings was entitled *The Sceptical Chymist*, in which he laid bare the shortcomings of Aristotle's doctrine of 'substantial forms' — that all substances comprise in varying proportions a combination of the four basic elements of earth, water, air, and fire — and attacked the alchemists' scheme in which all matter is characterized by combinations of the three basic principles of sulphur, salt, and mercury. In this seminal work he helped to lay the foundations of modern chemistry, even if it took another century to place the science of chemistry on its feet.

Despite his reluctance to formulate hypotheses about the processes of nature, Boyle was drawn to the corpuscular view of the universe that had been promoted by Bacon and developed by Gassendi and Descartes. This mechanical philosophy, as he often called it, constituted the framework for his understanding of the universe as mechanical at all levels, from particles to planets, explicable in terms of the three underlying principles of matter, motion, and rest. Here matter was regarded as capable of being reduced to extremely small particles, indivisible except in one's imagination or by divine power. He envisaged these prima naturalia as coalescing into 'primitive concretions or clusters', too small to be observed, seldom broken apart, and sufficiently varied to explain the different characteristics of

physical bodies, including their colour, taste, and smell. He suggested that sweetness or sourness depended on the absence or presence of sharp edges in the corpuscular constituents of the material being tasted. Or again, matter was fluid when its corpuscles touched one another over a relatively small surface area, easily gliding along each other.

The understanding of the universe as mechanism formed an integral part of Boyle's religious outlook. Indeed he made a profound synthesis of science and faith, seeing his scientific work as a matter of religious obligation and even as a form of worship, requiring purification from earthly desires.

Despite the link in that period between Puritanism and early modern science, Boyle felt it necessary to defend his synthesis of science and Christian belief. Among his apologetic writings is an essay on *The Christian Virtuoso,* explaining how it is that 'a great esteem of (scientific) experience and a high veneration for religion should be compatible in the same person'. In another work entitled *A Disquisition about the Final Causes of Natural Things,* he asserts the importance of the search for final causes, that is, the *ends* for which the constituent items and systems in nature show design. Here he is critical of Descartes who, in establishing his anti-Aristotelian position, excluded all final causes from his world-view, allowing God simply the role of First Cause.

The natural theology that grew in late 17th century England, and continued well into the 19th century, concentrated on the argument for the existence of a beneficent God from the evidences of design in nature. In the early years of this development, Boyle was a key figure, not only for his direct influence but also through his endowment of the Boyle Lectures. These were intended, he wrote, for proving the Christian religion against notorious infidels, (that is) atheists, theists (deists), pagans, Jews, Mahometans, not descending lower to any controversies that are among Christians themselves. They were to be delivered annually by a member of the clergy. With their

pointers to stability, unchanging truth and eternal certainty, they met a need in the restless English society of that time and strengthened the programme for Christian apologetics espoused by their founder.

It has been argued that the ultimate purpose of the Boyle Lectures was to underpin both the established Church and the social order, forming the cornerstone of a liberal, tolerant, and highly philosophical version of Christianity, a natural religion based upon reason and (Newtonian) science. It is also strongly counter-argued that there is little unambiguous evidence for this sociological judgment. We should assume rather that the primary purpose — however misguided — was to use science to defend a faith under threat. By the time the Lectures were launched, Newton's ground-breaking scientific work had been published, giving a great boost to the Enlightenment idea of 'man the measure of all things'.

EXERCISES

I. Vocabulary file.

Say what is meant by *to experience deep spiritual crisis, dedication, reluctance, a profound synthesis, eternal certainty, corpuscular view, divine power, to lay the foundations of modern chemistry.*

II. Revise grammar material.

Open the brackets, using the correct form in the Passive Voice.

1. Robert Boyle (to describe) as the father of modern chemistry.

2.The most important of his scientific writings (to entitle) *The Sceptical Chymist.*

3. Boyle (to draw) to the corpuscular view of the universe.

4. Matter (to regard) as capable of being reduced to extremely small particles, indivisible except in one's imagination or by divine power.

5. All final causes (to exclude) from Descartes' world-view.

III. Comprehension check-up.

1) Choose the facts from the text that may help you characterize:

a) Boyle's dedication to the service of God;

b) early adult years of a scientist;

c) his work *The Skeptical Chemist;*

d) another writing entitled *A Disquisition about the Final Causes of Natural Things.*

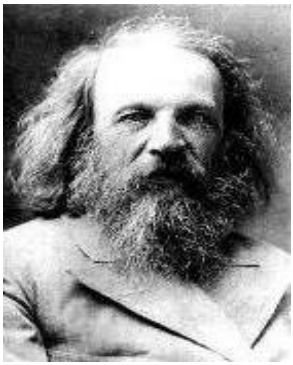
2) Give examples to support this point of view:

Boyle was drawn to the corpuscular view of the universe.

3) Make up a plan of the text.

DMITRII IVANOVICH MENDELEEV (1834–1907)

Mendeleev's father Ivan directed the gymnasium in Tobolsk, Siberia. When Ivan Mendeleev lost his sight, his wife Maria



Dmitrievna supported the family by running a glass factory. Dmitrii was sent east to study at St. Petersburg in the Pedagogical Institute. As a student, he suffered from tuberculosis, which claimed his sister. After teaching appointments in the Crimea and Odessa, he became private decent at the University of St. Petersburg. In 1859–60, Mendeleev established a chemical laboratory in Heidelberg after collaboration with Robert Bunsen. He participated in the chemical congress at Karlsruhe in 1860, which met to establish international standards in

terminology, chemical formulae, and measurement. He was appointed professor of chemistry at St. Petersburg in 1867. Mendeleev's areas of research included thermal expansion of liquids, specific gravities of aqueous solutions of alcohol, and gas elasticity, but his primary contribution to chemistry was the construction of the periodic chart of the elements. He also advanced his "hydrate" theory of chemical solutions, arguing that solutions do not simply consist of static mechanical mixtures, but rather constitute combinations of solutes and solvents in constant dynamic equilibrium.

After visiting the Pennsylvania oilfields in 1876, Mendeleev developed a new theory of the origin of petroleum based on the chemical action of water on metal carbides rather than the now more widely accepted hypothesis involving compression and decomposition of organic matter. He acted as an industrial consultant in the 1860s to the growing Russian oil industry and published *The Petroleum Industry in Pennsylvania and in the Caucasus* (1877). Mendeleev also became involved with educational issues, publishing *Remarks on Public Education in Russia* (1901). He insisted on more natural science training in Russian schools and opposed the traditional classics-based Russian curriculum: "commenting on Lomonosov's famous pronouncement that the time was approaching when Russia would produce its own Platos and Newtons, Mendeleev stated that Russia would do much better if it forgot all about the Platos and doubled its search for Newtons" (Vucinich 160). Mendeleev resigned from his professorship at St. Petersburg in 1890 after troubles over his sponsorship of a student petition presented to the conservative Minister of Education. He had been turned down for a post at the Imperial Academy of Sciences in 1880 for similar political reasons. After his university career, he proceeded to the Bureau of Weights and Measures in 1893.

Mendeleev's *Osnovy Khimii* or *Principles of Chemistry* (1868–71) laid the foundation of the "Periodic Law" which forms the basis of the modern periodic table. On March 6, 1869 Mendeleev stated in a lecture at the Russian Chemical Society that if the elements are arranged according to atomic weights, they exhibit a repetition or periodicity of chemical properties and that extrapolating from gaps in this arrangement we must expect the discovery of unknown elements. He also presented his first periodic table at the meeting. In the same year, Julius Lothar Meyer in Germany published a similar representation of the elements arranged by periodicity.

Through his periodic law, Mendeleev predicted the existence and weights of gallium (discovered 1875), scandium (discovered 1879), and germanium (discovered 1886), which he had prophetically designated with empty spaces in his chart as eka-aluminium, eka-boron, and eka-silicon respectively. On the basis of the periodic table, chemists were also able to correct some chemical formulae as well as erroneous atomic weights such as beryllium. Klaus Danzer observes that "the time was simply ripe for a revolutionary generalization such as the periodic system of the elements represented". Mendeleev was foreshadowed in his great generalization by De Chancourtois's helix of elements of 1863, J.A.R. New-lands's "law of octaves" (1864–5) — which uncovered periodicity in the 8th elements of his chemical groupings — and W. Odling's work, which suggested that recurrent chemical properties in elements arranged according to atomic weight could not be accidental. In 1882, Mendeleev won the Davy medal from the Royal Society; in 1889 he received the Faraday Medal from the Chemical Society, and in 1905 he was awarded the Copley Medal by the Royal Society. The modern periodic chart still in use today follows Mendeleev's model, except that elements are arranged not by their atomic weight, but by their atomic *number* (reflecting the number of protons in the nucleus), a more reliable indicator of periodicity, as it corresponds to the number of each element's electrons, which primarily determine chemical activity.

EXERCISES

I. Vocabulary file.

Give Russian equivalents to the following words, word combinations from the text: *to claim, measurement, to constitute combinations of solutes and solvents, to double search, respectively, revolutionary generalization, to be foreshadowed, accidental, to designate, prophetically, a reliable indicator.*

II. Revise grammar material.

Fill in the blanks with prepositions.

1. Maria Dmitrievna supported the family … running a glass factory.
2. Mendeleev established a chemical laboratory in Heidelberg after collaboration … Robert Bunsen.
3. Mendeleev developed a new theory … the origin of petroleum.
4. He also presented his first periodic table … the meeting.
5. The elements are arranged … their atomic weight

III. Comprehension check-up.

1) Answer the following questions.

1. What kind of family was Mendeleev born in?
2. What was the foundation of the "Periodic Law"?
3. When did Mendeleev start to develop a new theory of the origin of petroleum?
4. What elements did Mendeleev designate with empty spaces in his chart?
5. Were there any other scientists' attempts to find a system to order the elements?

2) Find information about Mendeleev:

a) his awards;

b) his educational background;

c) his role in chemistry;
d) the beginning of his career.

3) Write in 10–15 sentences what new information about Mendeleev you have learnt.

MARIE SKLODOWSKA CURIE (1867–1934)

The remarkable story of the discovery of radium began with Henri Becquerel's discovery in 1896 of the spontaneous emission of ionizing radiation (later identified as α-, β-, and γ- rays) from uranium and its compounds. Rontgen in Germany had described X-rays a few months earlier. Curie, who had married the French physicist Pierre Curie in 1895, began an investigation of the properties of these "uranium" or "Becquerel" rays for her doctoral thesis.

Marie Sklodowska's marriage to Pierre Curie initiated one of the greatest scientific collaborations of the nineteenth and early twentieth centuries. As their daughter Irene (who also married and worked with a nuclear physicist, Frederic Joliot) later wrote: "during the eleven years of their life together, they never left each other's side, neither during their work nor on their vacations". Marie or "Manya" was the daughter of a Polish school teacher. She had endured great hardships, working as a governess, in order to save money to study at the Sorbonne in France. Her perseverance under difficult conditions, both personal and scientific, was characteristic of her entire life and career.

Curie began her study of uranium rays by measuring a number of elements, minerals, and compounds for ionizing activity with a sensitive electrometer designed by Jacques and Pierre Curie, the quartz piezo-electroscope. She studied thorium, which also emitted Becquerel rays, and proposed the term "radioactivity" for the optical and magnetic properties observed by Becquerel, which were unaffected by chemical combination with other elements. Curie examined such minerals as clevite, chalcolite, carnotite, and autunite and determined that those which displayed significant radioactivity commonly contained either uranium or thorium. She also discovered that a uranium-bearing ore, pitchblende, released up to 4 times more radioactivity than uranium oxide and suspected an unknown element. With several tons of ore obtained from the Austrian government, Curie, joined by Pierre, began the laborious process of chemically isolating the source of the extraordinary radiation. They extracted an unstable substance in 1898 and proposed the name "polonium," after Curie's homeland. A second substance was isolated and spectroscopic measurement (each element absorbs and emits a characteristic spectrum of light) by Eugene Demarcay indicated that this was not a known element. They suggested the name "radium" for the new element. In 1902 the Curies isolated a decigram of pure radium chloride by fractional crystallization and received substantial funds from the French Academy of Science for the extraction of radioactive elements. In the meantime, Andre Debierne had isolated another previously unknown radioactive element, actinium, from pitchblende in 1900. The actual discovery of radium, therefore, consisted of a mixture of brute determination, intuition, and an hypothesis with very few supporting facts, as Curie later explained: "our research method could only be based on the radioactivity of the hypothetical substance, because we were ignorant of any other of its properties".

The Curies shared the 1903 Nobel Prize with Becquerel for their work on radium and radioactivity. After Pierre Curie was fatally

mangled by a passing carriage in 1906, Curie was offered the chair at the Sorbonne which had been created for her husband. Curie continued her efforts to determine an accurate atomic weight for radium. Radium, which had quickly become the most expensive substance in the world, would soon become medically and commercially valuable with the development of radiotherapy, or curietherapy as it was called in France, for cancer. Like many new pharmaceuticals introduced into western culture, such as opium, tobacco, and cannabis, radium was hailed as a panacea for an astonishing number of diseases, before the devastating effects of large doses of it were illustrated by the deaths of watch dial painters in the 19205 exposed to radium-based paints.

Curie was awarded a second Nobel Prize in 1911 for her continuing work on radium. Several days later, she was denied membership in the Academie des Sciences, demonstrating the considerable professional obstacles encountered by women scientists during the period. French public sentiment concerning this foreign-born and unconventional woman was ambivalent, especially after the publication of letters in 1911 exposing an affair between Curie and Paul Langevin, who was married at the time.

In 1912, construction began on the Institut du Radium in Paris. During World War I, Curie organized a fleet of trucks with portable x-ray units for field use and later wrote *Radiology and War* (1921). Marie Meloney, a U.S. journalist, organized a donations campaign to produce a gram of radium for Curie's laboratory. In 1921, President Warren G. Harding personally presented Curie with the key to a lead-lined casket for housing the gift. Curie raised two daughters, the writer Eve and the physicist Irene Joliot-Curie, who along with her husband Frederic made important advancements in artificial radioactivity and nuclear fission. In 1934, Curie died from complications from the years of radiation exposure to the element which she had discovered.

EXERCISES

I. Vocabulary file.

Read and memorize the following words and word combinations:

to initiate – положить начало
collaboration – сотрудничество
perseverance – стойкость, упорство
thorium – торий
ore – руда
substantial funds – значительные денежные средства
pitchblende – уранит
devastating effects – разрушительные последствия
radiation exposure – воздействие радиации
fission – расщепление

II. Revise grammar material.

Change the following sentences into Indirect Speech.

1. Irene wrote: "during the eleven years of their life together, they never left each other's side, neither during their work nor on their vacations".

2. The author said: "Curie begins her study of uranium rays by measuring a number of elements, minerals, and compounds for ionizing activity".

3. The scientists stated: "The name for the new element will be radium".

4. Curie later explained: "Our research method is based on the radioactivity of the hypothetical substance".

5. The author writes: "Curie died from complications from the years of radiation exposure to the element which she had discovered".

III. Comprehension check-up.

1) What happened at these times?

In 1895

In 1898

In 1903

During 1903–1911

In 1921

2) Which of the following sentences characterize M.Curie?

- Her husband was the French physicist.

- Marie was the daughter of a Polish bookseller.

- Marie and Pierre extracted an unstable substance and suggested the name "polonium" for it.

- She found out that such minerals as clevite, chalcolite, carnolite and autunitecommonly didn't contain uranium or thorium.

- Curie received the Nobel Prize for the work on uranium and radioactivity.

- She died from complications from the years of radiation exposure to the element which she had discovered, fifty-six years old.

3) Make up a plan of the text.

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Учебное издание

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GREAT MEN OF SCIENCE
ВЕЛИКИЕ ЛЮДИ НАУКИ

Практикум

Техническое редактирование: *А.С. Никитина*
Компьютерная верстка: *А.С. Никитина*

Подписано в печать 13.09.2022. Формат 60×84 1/16.
Бумага офсетная. Печ. л. 4,0.
Тираж 25 экз. Заказ . Арт. 2(Р2ПР)/2022.

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
«САМАРСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ ИМЕНИ АКАДЕМИКА С.П. КОРОЛЕВА»
(САМАРСКИЙ УНИВЕРСИТЕТ)
443086, САМАРА, МОСКОВСКОЕ ШОССЕ, 34.

Издательство Самарского университета.
443086, Самара, Московское шоссе, 34.