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АНГЛИЙСКИЙ ЯЗЫК ДЛЯ АУДИТОРНЫХ ЗАНЯТИЙ И САМОСТОЯТЕЛЬНОЙ РАБОТЫ АСПИРАНТОВ

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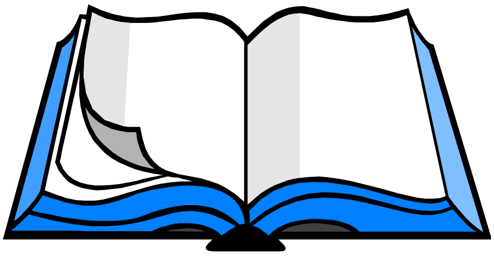
English for postgraduate students



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Учебное пособие представляет собой курс английского языка, основной целью которого является развития умений различных видов чтения и перевода, овладение общенаучной терминологией, а также формирование навыков монологической и диалогической речи, навыков аннотирования и реферирования научной литературы.

Пособие включает в себя основные тематические разделы, необходимые для подготовки к сдаче кандидатского экзамена по английскому языку.

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Предисловие

Предлагаемое учебное пособие адресовано аспирантам и научным работникам, готовящимся к сдаче кандидатского экзамена по английскому языку.

Пособие построено на базе Федерального государственного образовательного стандарта в соответствии с требованиями к структуре основной образовательной программы послевузовского профессионального образования (аспирантура).

Пособие имеет практическую направленность. Целью пособия является развитие умений различных видов чтения и перевода, овладение общенаучной терминологией, а также формирование навыков монологической и диалогической речи, навыков аннотирования и реферирования научной и специальной литературы. Материал разделов и задания к нему способствуют формированию у обучаемых УК-3 - готовности участвовать в работе российских и международных исследовательских коллективов по решению научных и научно-образовательных задач и УК-4 - готовности использовать современные методы и технологии научной коммуникации на государственном и иностранном языках.

Пособие состоит из восьми разделов, каждый из которых включает несколько оригинальных текстов по теме раздела, а также комплекс условно-речевых и речевых упражнений, образцы коммуникативных ситуаций диалогической и монологической речи, что отвечает принципам современной коммуникативной методики.

При отборе текстов авторы стремились к тому, чтобы каждый текст носил общенаучный характер и был насыщен лексикой, связанной с научной работой.

Учебное пособие предназначено как для аудиторных занятий, так и для самостоятельной работы.

UNIT 1
WHAT IS SCIENCE

1. See if you remember: to meet human needs; to refer to, to distinguish to encounter difficulties, to emerge; at great expense; search for truth; to point out.

2. Look through the text and write an outline, either in Russian or in English.

Text 1. What is science

1. It can be said that science is a cumulative "body" of knowledge about the natural world, obtained by the application of a peculiar method practised by the scientist. It is known that the word science itself is derived from the Latin «scire», to know, to have knowledge of, to experience. Fundamental and applied sciences are commonly distinguished, the former being concerned with fundamental laws of nature, the latter engaged in application of the know ledge obtained. Technology is the fruit of applied science, being the concrete practical expression of research done in the laboratory and applied to manufacturing commodities to meet human needs.

2. The word "scientist" was introduced only in 1840 by a Cambridge professor of philosophy who wrote: "We need a name for describing a cultivator of science in general. I should be inclined to call him a scientist. "The cultivators of science" before that time were known as "natural philosophers". They were curious, often eccentric, persons who poked inquiring fingers at nature. In the process of doing so they started a technique of inquiry which is now referred to as the "scientific method".

3. Briefly, the following steps can be distinguished in this method. First comes the thought that initiates the inquiry. It is known, for example, that in 1896 the physicist Henri Becquerel, in his communication to the French Academy of Sciences, reported that he had discovered rays of' an unknown nature emitted spontaneously by uranium salts. His discovery excited Marie Curie and together with her husband Pierre Curie she tried to obtain more knowledge about the radiation. What was it exactly? Where did it come from?

4. Second comes the collecting of facts: the techniques of doing this will differ according to the problem which is to be solved. But it is based on the experiment in which anything may be used to gather the essential data - from a test-tube to an earth-satellite. It is known that the Curies encountered great difficulties in gathering their facts, as they investigated the mysterious uranium rays.

5. This leads to step three: organizing the facts and studying the relationships that emerge. It was already noted that the above rays were different from anything known. How to explain this? Did this radiation come from the atom itself? It might be expected that other materials also have the property of emitting radiation. Some

investigations made by M. Curie proved that this was so. The discovery was followed by further experiments with "active" radio elements only.

6. Step four consists in stating a hypothesis or theory: that is, framing a general truth that has emerged, and that may be modified as new facts emerge. In July 1898, the Curies announced the probable presence in pitchblende ores of a new element possessing powerful radioactivity. This was the beginning of the discovery of radium.

7. Then follows the clearer statement of the theory. In December 1898, the Curies reported to the Academy of Sciences: "The various reasons enumerated lead us to believe that the new radioactive substance contains a new element to which we propose to give the name of Radium. The new radioactive substance certainly contains a great amount of barium, and still its radioactivity is considerable. It can be suggested therefore that the radioactivity of radium must be enormous?"

8. And the final step is the practical test of the theory, i. e. the prediction of new facts. This is essential, because from this flows the possibility of control by man of the forces of nature that are newly revealed.

9. Note should be taken of how Marie Curie used deductive reasoning in order to proceed with her research, this kind of "detective work" being basic to the methodology of science. It should be stressed further that she dealt with probability - and not with certainty - in her investigation. Also, although the Curies were doing the basic research work at great expense to themselves in hard physical toil, they knew that they were part of an international group of people all concerned with their search for truth. Their reports were published and immediately examined by scientists all over the world. Any defects in their arguments would be pointed out to them immediately.

3. Give Russian equivalents of: a cumulative body of knowledge, a peculiar method practiced by the scientist, manufacturing commodities to meet human needs.

4. Identify the words used by the author as equivalent to: направляя свой пытливый ум на . . .

5. Identify the words used by the author as equivalent to: doing so, a technique of inquiry.

Text 2. Scientific attitude

1. Read the text to yourself and be ready for a comprehension checkup:

What is the nature of the scientific attitude, the attitude of the man or woman who studies and applies physics, biology, chemistry or any other science? What are their special methods of thinking and acting? What qualities do we usually expect them to possess?

To begin with, we expect a successful scientist to be full of curiosity - he wants to find out how and why the universe works. He usually directs his attention towards problems which have no satisfactory explanation, and his curiosity makes him look for the underlying relationships even if the data to be analyzed are not apparently interrelated. He is a good observer, accurate, patient and objective. Furthermore, he is not only critical of the work of others, but also of his own, since he knows man to be the least reliable of scientific instruments.

And to conclude, he is to be highly imaginative since he often looks for data which are not only complex, but also incomplete.

2. Check up for comprehension:

1. What qualities do we expect to find in a successful scientist? 2. Why do we say that a successful scientist is full of curiosity? 3. Why is it difficult to see the underlying relationships? 4. Why is he critical of his own work? 5. Why is it necessary for him to be highly imaginative? 6. Give a Russian equivalent of the title and of *the data analyzed and the data to be analyzed*.

3. Read the text to yourself and suggest a title:

There is some reason in the belief that we are the masters of nature. Yet this very dominance of man over his environment has become the cause of ever-growing concern, on the part of scientists and general public, for what we are doing to the world we live in.

A century ago man had very limited powers to upset the balance of nature. Now this power is multiplied annually by the advance of technology. Thinking people cannot avoid the conclusion that, should present trends continue, we may make our planet physically and psychologically unsuitable for humanity.

In the face of this prospect many people take a defeatist view in the belief that one cannot put back the clock.

They do not realize that it is the compulsive need for quick profits, motivating capitalism, which causes the constant revolutionizing of the modes of production, without regard to the pollution and damage it is doing to the environment. They do not realize that it is the values and attitudes within any society that determine the way it handles nature and natural resources. And only through a radical change in these values and attitudes can we hope to cope with the environmental problem.

4. Check up for comprehension:

1. What is the subject under discussion? 2. What makes scientists and general public feel concerned about the way we handle nature? 3. Has the situation always been the same? 4. What is the change due to? 5. What do thinking people fear? 6. Can you explain what is meant by «defeatist view» and “put, back the clock”? 7. What is the actual cause of constant revolutionizing of the modes of production under capitalism? 8. What is meant by «values and attitudes»? 9. What is the author's hope for the solution of the environmental problem?

Text 3.

1. Read the text to yourself and be ready to do some exercises:

1. Should any one attempt a brief characterization of the present-day environment problems he would find it beyond the competence of an individual scientist. For the environmental situation has long become a subject of separate and joint research efforts of biologists, chemists, and biochemists who have to combine their knowledge with the information supplied by students of geology, oceanography and meteorology, with experts in sociology, psychology and philosophy hurriedly joining in. Yet, if stated briefly, one of the causes of the present-day environmental situation should be sought in the lack of a balanced development of particular fields of knowledge, and of an adequate picture of the intricately operating whole which is our planet. The rapid and ever-growing advances in certain highly specialized fields have brought mankind far ahead of our general fundamental knowledge of the long-range effect of some technological developments, spectacular though they may appear, especially of their interplay and interdependence. It is man's intervention in nature that has singled him out from the rest of the animal world since his early days. It is this very intervention that has landed him nowadays in this highly technological world of ours, with the rate of progress in particular applied fields being faster than that in our fundamental knowledge of the general operation of the Earth. It is precisely this discrepancy between the two rates which seems to be at the root of most of today's problems. This is by no means an exhaustive explanation, ignoring as it does, the social factor.

2. The threat to his environment is a second major problem man is faced with in the mid-20th century, the first being a menace of a nuclear catastrophe. What is so peculiar about the environmental problem when compared to the other one? Surely not its global character and everybody's involvement. A nuclear catastrophe, as seen nowadays by practically everybody everywhere, would inevitably involve every country, no matter how small or big it is, and would concern every individual, whatever secluded life he might be living. Should it happen, its inescapability is too obvious to be; disputed. So is its explosive character. In contrast to this, the environmental crisis is of a cumulative nature. It is just the obscure and intricate pattern of the interaction of all factors that makes it so dangerous. For no single action taken, or decision made, can bring about an immediate catastrophe, nor could there be the last straw or the last step that would set in motion an avalanche of irreversible and immediate events leading to the ultimate gloomy end. It is only step by step that we approach the critical point, were there such a thing as "point" in this context.

3. Consequently, what is needed first and foremost is that we realize the possible adverse impact of the long-range effects of our actions, however noble the motives may seem to us at present, on the entire human race. Out of this realization may come an entirely new approach to the problem, the new approach as proclaimed by Vernad-

sky of the biosphere governed and operated in accordance with the laws of the human mind. Next comes the urgent need for basic research to get more profound knowledge of the cause-effect relationship, the time factor necessarily taken into account, in the whole realm of human environment, both natural, man-disturbed and man-initiated. Fundamental and irreversible as they may often be, the changes in our environment are not likely to bring mankind to the brink of annihilation overnight. It would take us some time yet to reach there. So let us use the time for learning how to preserve our planet in good shape and in running order for an indefinitely long time.

2. Find the words equivalent to: недостаточно равномерное развитие конкретных областей знания и правильного представления о сложном взаимодействии процессов, происходящих внутри единого целого; невозможно скрыться от; характер постепенного нарастания; скрытый и сложный механизм взаимодействия.

3. Give Russian equivalents of: spectacular though they may appear, it is this very intervention that has landed him; ignoring as it does; no matter how small or big it is; first and foremost, however noble the motives may seem to us; to bring mankind to the brink of annihilation overnight; it would take us some time yet to reach there.

Text 4. The Origin of Science

1. Read and translate the text

For many thousands of years the earth was inhabited by creatures who lived and died without passing on their experiences to following generations. These early fish, reptiles, birds and mammals could only “talk” to each other through the roars, calls and screams of the jungle. Yet, somehow, from these prehistoric beings a more intelligent animal evolved with a brain able to form the controlled sounds of speech.

This human being began to use rocks and trees to fashion weapons to help him hunt for food. Stones and spears were probably the first tools used by humans as extensions of their own bodies – the spear could travel faster in flight than man could run – and this ability to invent tools and pass on knowledge gave man a growing control of his surroundings. His search for new ways to survive and to improve his way of life continued through the ages thus the story of man’s world of science and invention was shaped.

Writing is known to contribute much to man’s experience accumulation, books printing being his greatest brainchild. As knowledge grew and the art of writing developed, parts of the story were recorded – some in one book, some in another. No man could remember all there was to know and writers found it useful to classify their knowledge under separate headings – much like a library arranges its books in sections so that the reader will know where to look for each subject. Science became separated into various branches. But its progress began only when man started to search for natural laws and principles, and produced theories, applying to scientific methods, such as: observation, analysis, synthesis, induction, deduction, hypothesis and experimentation.

2. Match the words to their definitions

1) observation	a) a formal set of ideas that is intended to explain why smth. happens or exists.
2) induction	b) the process of using information or finding the answer to the problem.
3) deduction	c) a method of discovering general rules and principles from particular facts and examples.
4) analysis	d) an idea or explanation of smth. that is based on a few known facts but has not yet been proved to be true or correct.
5) synthesis	e) the act of watch smth. carefully for a period of time, esp. to learn smth.
6) hypothesis	f) the detailed study or examination of smth. in order to understand more about it.
7) experiment	g) the act of combining separate ideas, beliefs, styles; a mixture or combination of them.
8) theory	h) a scientific test that is done in order to study what happens and to gain new knowledge.

Text 5. Science

1. Read and translate the text

Science (from Latin scientia, meaning "knowledge") is an enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the world. An older and closely related meaning still in use today is that of Aristotle for whom scientific knowledge was a body of reliable knowledge that can be logically and rationally explained.

Since classical antiquity science as a type of knowledge was closely linked to philosophy. In the early modern era the words "science" and «philosophy» were sometimes used interchangeably in the English language. By the 17th century, natural philosophy (which is today called "natural science") had begun to be considered separately from "philosophy" in general, while, "science" continued to be used in a broad sense denoting reliable knowledge about a topic, in the same way it is still used in modern terms such as library science.

However, in modern use, "science" is still mainly treated as synonymous with natural and physical science, and thus restricted to those branches of study that relate to the phenomena of the material universe and their laws, sometimes with implied exclusion of pure mathematics. This is now the dominant sense in ordinary use. The word “science” became increasingly associated with the disciplined study of physics, chemistry, geology and biology. This sometimes left the study of human thought and society in a linguistic limbo, which was resolved by classifying these areas of academic study as social science.

In its turn the term “humanities” or “arts” refers to the subjects of study that are concerned with the way people think and behave, for example literature, language, history and philosophy (as it understood nowadays).

2. Какие из приведенных ниже предложений истинны (T), а какие ложны (F)?

1. The term “science” is applied only to natural science.
2. The word “knowledge” is derived from the negation “no”, meaning the path leading from ignorance to understanding the world.
3. Natural and physical sciences deal with testable explanations and predictions.
4. Aristotle studied the body of a human being and gained a reliable knowledge in this sphere.
5. There was a time when «science» and «philosophy» meant the same.
6. The word “science” and the word combination “natural and physical science” are looked upon as synonymous.
7. Pure mathematics is included into the notion «natural and physical science».
8. Library science naturally belongs to humanities.

Text 6. Science

Science [from Latin *scientia* from *scire* to know] is systemized knowledge derived through experimentation, observation, and study. In its widest sense it is formulated knowledge, a knowledge of structure, laws, and operations. The unity of human knowledge may be artificially divided into religion, philosophy, and science. Sometimes it is considered as a method of reaming about the world by applying the principles of the scientific method, which includes making empirical observations, proposing hypotheses to explain those observations, and testing those hypotheses in valid and reliable ways; also refers to the organized body of knowledge that results from scientific study.

Science and philosophy, as presently understood, have in common the quality of being speculative, as opposed to religion, which in the West is supposed to be founded merely on faith and moral sentiments. The present distinction between science and philosophy lies largely in their respective fields of speculation. What is known as modern science investigates the phenomena of physical nature and by inferential reasoning formulates general laws there from. Its method is called inductive and its data are so-called facts - i.e., sensory observations; whereas deductive philosophy starts from axioms. Yet a scientist, in order to reason from his data at all, must necessarily use both induction and deduction.

Fundamental science is the part of science that describes the most basic objects, forces, relations between them and laws governing them, such that all other phenomena may be in principle derived from them, following the logic of scientific reductionism. Fundamental science includes biology, chemistry, earth science and geology, physics, resource sciences, space and astronomy, biotechnology, engineering, computer and information technology.

The humanities are a group of academic subjects united by a commitment to studying aspects of the human condition and a qualitative approach that generally prevents a single paradigm from coming to define any discipline. Art, Communications, Counseling, Education, English, Foreign Languages (Italian, Spanish, French, German, Russian, Japanese, Chinese, others), Literature, Philosophy, Religious Studies, Speech, Theatre. Subjects such as English, philosophy, language, and literature as distinguished from fundamental sciences.

Scientific theories simplify reality to allow us to understand basic forces and laws of the nature and society. We can observe actions and their consequences.

Observation and description are not sufficient for understanding and ultimately predicting actions. Theory establishes relationships between cause and effect. We use it to interpret actions and outcomes so we can explain the process by which the actions were undertaken and the outcomes achieved. The purpose of theory in all scientific analyses is to explain the causes of phenomena we observe. To conduct analyses we frequently need to engage in abstraction.

This involves making assumptions about the environment that simplify the real world enough to allow us to isolate forces of cause and effect. Any theory is a simplification of actual relationships.

Text 7. Scientific Progress

1. *Read and translate the text*

Science is often distinguished from other domains of human culture by its progressive nature: in contrast to art, religion, philosophy, morality, and politics, there exist clear standards or normative criteria for identifying improvements and advances in science. For example, the historian of science George Sartor argued that “the acquisition and systematization of positive knowledge are the only human activities which are truly cumulative and progressive”, and “progress has no definite and unquestionable meaning in other fields than the field of science”.

However, the traditional cumulative view of scientific knowledge was effectively challenged by many philosophers of science in the 1960s and the 1970s, and thereby the notion of progress was also questioned in the field of science.

Debates on the normative concept of progress are at the same time concerned with axiological questions about the aims and goals of science. The task of philosophical analysis is to consider alternative answers to the question: What is meant by progress in science? This conceptual question can then be complemented by the methodological question: How can we recognize progressive developments in science? Relative to a definition of progress and an account of its best indicators, one may then study the factual question: to what extent, and in which respects, is science progressive?

2. В англо-русском словаре под редакцией В. К. Мюллера, приводятся следующие значения глагола «to challenge»:

1) вызывать, бросать вызов;
2) сомневаться, отрицать;
3) оспаривать, подвергать сомнению;
4) требовать (внимания, уважения и т. п.);
5) окликать (о часовом), спрашивать пароль;
6) (мор.) показывать опознавательные знаки;
7) (юр.) давать отвод присяжным;

3. Подходит ли хотя бы одно из указанных значений для перевода слова «challenge» в подчеркнутом предложении? Попробуйте дать свой вариант слова и всего предложения.

4. Переведите тексты 8 и 9 письменно.

Text 8. Scientific Literature

An enormous range of scientific literature is published. Scientific journals communicate and document the results of research carried out in Universities and various other research institutions, serving as an archival record of science. The first scientific journals began publication in 1665. Since that time the total number of active periodicals has steadily increased. By the end of the last century, one estimate for the number of scientific and technical journals in publication was 11,500. Today this figure is left far behind.

Most scientific journals cover a single scientific field and publish the research within that field; the research is normally expressed in the form of a scientific paper. Science has become so pervasive in modern societies that it is generally considered necessary to communicate the achievements, news, and ambitions of scientists to a wider populace.

Science books engage the interest of many more people. The science fiction genre, primarily fantastic in nature, engages the public imagination and transmits the ideas, if not the methods, of science.

Text 9. Pseudoscience, fringe science, and junk science

An area of study or speculation that masquerades as science in attempt to claim a legitimacy that would not otherwise be able to achieve is sometimes referred to as pseudoscience, fringe science, or alternative science. Another term, junk science, is often used to describe scientific hypotheses or conclusions which perhaps legitimate in themselves, are believed to be used to support a position that is seen not legitimately justified by the totality of evidence. There is a special sort of pseudoscience that has a formal trapping of science but lack a principle of scientific thought. Various types of commercial advertising, ranging from hype to fraud, may fall into these categories.

There also can be an element of political or ideological bias on all sides of such debates. Sometimes, research may be characterized as «bad science», research that is well-intentioned but is seen as incorrect, obsolete, incomplete, or over simplified expositions of scientific ideas. The term «scientific misconduct» refers to situations such as where researchers have intentionally misrepresented their published data or have purposely given credit for a discovery to the wrong person.

5. Сравните Ваш перевод с переводом представленным ниже. Как вам удалось преодолеть трудности, потенциально возможные в процессе перевода данного текста?

Лженаука, научный «мусор» и околонаучные исследования

Область исследований или размышлений, маскируемых под науку, в своих попытках достичь статуса научности, иначе для них не достижимого, иногда называют «лженаукой», околонаучными студиями или «альтернативной» наукой. Существует еще один термин – «джанк сайнс» (от англ. «junk» – ненужный хлам) – служащий для описания научных гипотез и выводов, которые, хотя сами по и себе являются обоснованными, служат, тем не менее, для защиты положений, не подтверждаемых корпусом необходимых доказательств. Имеется особый тип псевдонауки, с формальной точки зрения подводимый под соответствующую рубрику, но абсолютно лишенный принципов истинно научного мышления. Различные виды коммерческого рекламирования, начиная от его навязчивого варианта и заканчивая откровенным обманом, могут быть подведены под эту же категорию. В научных спорах по всем направлениям возможны также элементы политических или идеологических пристрастий. Иногда исследования признаются «плохими», если при всей их благонамеренности они представляют ошибочные, устаревшие, необдуманные или сверх- упрощенные научные идеи. Термин «научные правонарушения» соотносится с ситуациями, при которых исследователи преднамеренно искажают опубликованные данные, или на том же основании приписывают их другому лицу, нарушая тем самым авторские права.

Text 10.

1. What do you know about science and technology? Before you read Text "The Role of Science and Technology in Our Life", discuss these questions with your group mates.

2. Read Text to find out if you are right or wrong.

The Role of Science and Technology in Our Life

To understand and explore the importance of science and technology in our daily lives, let us first start by defining the terms *science* and *technology.* Science covers the broad field of knowledge that deals with observed facts and the relationships among those facts. Technology refers to the use of tools, gadgets and resources that help us control and adapt to our environment. The term also refers to the use of machines and utensils which make our daily lives simpler and more organized.

The scientific revolution that began in the 16th century was the first time that science and technology began to work together. Today, science and technology are closely related. Many modern technologies such as space flights or nuclear power depend on science and the application of scientific knowledge and principles. In turn, technology provides science with up-to-date instruments for its investigation and research. Science provides the basis of much of modem technology.

Science and technology are part of almost every aspect of our lives. Although we rarely think about it, they make extraordinary mgs possible. At the flick of a switch, we have light and electricity, lien we are ill, science helps us get better. Science and technology create ways to improve our future.

Modern science and technology have changed our lives in many dramatic ways. Airplanes, automobiles, communications satellites, computers, plastics, and television are only a few of the scientific and technological inventions that have transformed human life. Research by nuclear physicists has led to the development of nuclear energy as a source of power. Agricultural scientists have developed better varieties of plants and highly effective fertilizers. The development of antibiotics and other new drugs has helped to control many infectious diseases. And now we live in the information era when the computer network embraces the globe and connects not only the countries and space stations but a lot of people all over the world. All these things prove the power and the greatest progressive role of science and technology in our life.

Although scientific and technological achievements have benefited us in many ways, they have also created serious problems. The rapid growth of industrial technology, for instance, has resulted in such grave effects as environmental pollution and fuel shortages. Breakthroughs in nuclear research have led to the development of weapons of mass destruction. Some people fear that biological research will produce new disease-causing bacteria or viruses that resist drugs. People are also concerned that computerized information systems may destroy personal privacy.

But science itself is neither good nor bad. The uses that people choose to make of scientific knowledge determine whether that knowledge will help or harm society.

1. What do science and technology cover?
2. How are science and technology related?
3. Are science and technology part of every aspect of our lives?
4. How have science and technology changed our lives?
5. What are harmful effects of scientific and technological achievements?
6. What do the uses that people choose to make of scientific knowledge determine?

UNIT 2
SCIENCE IN DIFFERENT COUNTRIES

1. Read and discuss texts 1 and 2

Text 1. Science in Russia

The Russians made a great contribution to world science. Peter I founded the St. Petersburg Academy of Sciences as early as 1724. It is there that the great scientist Lomonosov worked in the fields of physics, chemistry, astronomy and the foundation of the Russian literary language. The peoples of our country produced many geniuses such as D.I. Mendeleyev who gave the world the Periodic Table of Elements, mathematicians like N.I. Lobachevsky who is known all over the world as “Copernicus of Geometry” and many others.

The peoples of Russia are rightly proud of scientists like A.S. Popov, who invented the radio, A.N. Lodygin, who produced the electric lamp, K.E. Tsiolkovsky, who was the founder of the modern theory of space rockets. Among the peominent scientists we must also mention the names of I.I. Mechnikov, N.N. Zinin, S.V. Lebedev, I.Z. Kondakov, Academician I.P. Pavlov and many others whose names are known far and wide.

Our scientists and inventors have enriched science and technology with many outstanding achievements which enable them to solve the most complex problems. Many inventions have not only brought fame to our science, but also rank among the greatest achievements of mankind.

The development of the theory of chain reactions is linked with the name of the Russian scientist N.N. Semyonov, a Nobel Prize winner, N.D. Zelynsky’s works formed the basis for the synthesizing of a large number of new chemical compounds.

Space research has opened a new era of scientific knowledge. It is in our country that the first artificial satellite for the research in outer space was launched. It was created by the Academician S.P. Korolev, and it was Yury Gagarin who accomplished the first space flight.

Academicians I.V. Koorchatov and G.N. Flerov made a great contribution to the development of the theory of the construction of the atom. It was in our country that the first atomic power station in the world was built and the first atom-powered icebreaker was launched. Our scientists, engineers and workers have done a lot in order to ensure that the energy of the atom should bring people well-being and prosperity instead of terror and death.

Text 2. Science and Society in the USA

Science on the scale that it exists and is needed today can, however, be maintained only with large amounts of public support. Large-scale public support will be provided only if science and technology are meeting the critical needs of society. Intellectual progress, as measured by advances in specific public disciplines, is not in itself sufficient to generate such support. Perhaps it should be, but it is not. Public support for science may be wise policy, but is not an entitlement.

The central problem is that the costs of meeting the needs of society are too high, and the time scale for meeting them is too long. Both the ideals and the pragmatics of American society are based on improvement in the quality of life. We expect better health care, better education, economic security. We expect progress towards the reduction, if not outright elimination of poverty, disease, and the environmental degradation.

Progress towards these goals has recently been frustratingly slow and increasingly expensive. The heavy costs of providing and improving health care and education are examples.

The situation has produced a volatility in public opinion and mood that reflects a lack of confidence in the ability of government and other sectors of society, including science and technology, to adequately address fundamental social needs.

If this mood hardens into a lack of vision, of optimism, of belief in the future, a tremendous problem for science will result. Science, in its commitment to innovation and expanding frontiers of knowledge, is a thing of the future.

The vistas of science are inspiring. Condensed matter physics is embarked on materials by design, nanotechnology and high temperature superconductivity, each containing the seeds of new industries as well as new scientific understanding. Molecular biology is in full bloom with a vast potential for further intellectual progress, betterment of human (and plant and animal) health, and commercialization. Neuroscience seems poised for dramatic progress.

Research into the fundamental laws of physics is aiming at a pinnacle. There is a candidate theory - the superstring theory – which is proposed as a unification of all the known fundamental forces in nature and which is supposed to give an account, complete in principle, of all physical phenomena, down to the shortest distances currently imaginable. At the largest scales of distance, observational astronomy is uncovering meta-structures which enlarge the architecture of the universe a deepening of the problem of cosmology preliminary to its resolution.

Underpinning much of this progress, and progress in countless other areas as well, has been the emergence of scientific computing as an enabling technology.

All this is first-rate science. All this is not enough – either to forestall change or to ensure adequate support for science in the present climate. Why it is not enough – and what else is required – are the subjects of a special inquiry.

Discussion

1. Are there statements in the text that you disagree with? What are they?
2. Are you aware of the latest achievements in your field of science? What are they?
3. Do you think the achievements of science are not sufficient to ensure adequate support for science?
4. If you were in power what would you do to support science in Russia?

1. Define the main idea of the texts

Text 3.

How British Science Is Organized

John B.S. Haldane

1. Read and translate the text

The British Association for the Advancement of Science was founded in 1831, and at that time almost every serious scientist in Britain belonged to it. There were so few of them that most of the year's work in a given branch of science could be discussed in a few days. In fact it merited title of «Parliament of Science» which is still bestowed on it by some newspapers.

Since then the situation has completely changed. At present there are a number of societies, for example the Royal Astronomical Society, the Chemical Society, the Genetical Society, the Geological Society and the Physiological Society which are composed of scientists only. Finally there is the Royal Society of London for Improving Natural Knowledge. This has 384 scientific fellows, 49 foreign members, and 15 British fellows. When it was founded nearly 300 years ago, it included every scientist in England, and many others, such as Samuel Pepys, who were interested in science. But now it only includes a small fraction of scientists, and its discussions are less lively than those of the societies concerned with individual sciences. On the other hand, the British Association is concerned with matters other than science. It has sections devoted to psychology, which is still only partially scientific, and to education and economics, which in this country at any rate are hardly so at all. So it has fallen away from its former scientific spirit to a certain extent.

But except for the Royal Society, the scientific societies have not the money to subsidize research. This is done by universities, the government, industrial firms, and endowed bodies. There is no organization of research on a national scale. Some of the government and industrial research is secret, and therefore of no value to science. For science means knowledge.

The British Association is able to spare a few hundred pounds yearly for grants in aid of research. But its main function now is discussion. New results are generally announced at meetings of smaller societies, and the public hears very little of them.

If science is to advance in this country as it should, we need more democracy in the laboratories, also more democratic control of expenditure on research. This will only be possible if the people are educated in science, and they are at present deliberately kept in the dark. For a knowledge of science leads to a realization of the huge amount of knowledge which could be applied to the public benefit if industry, agriculture and transport were organized for use and not for profit.

2. Answer the questions:

1. Who belonged to the British Association for the Advancement of Science in the 19th century?
2. Were there many scientists there at that time?
3. It merited title of "Parliament of Science", didn't it?
4. Has the situation changed since then?
5. Whom does the Royal Society of London for Improving Natural knowledge include?
6. What issues is the British Association concerned with?
7. It has fallen away from its former scientific spirit, hasn't it?
8. Do the scientific societies have the money to subsidize research?
9. There is no organization of research on a national scale, is there?
10. Does the public hear much of the research results?
11. What is necessary for the science to advance in Britain?

3. Give some facts from the text to prove the following:

The British Association is concerned with matters other than science.

4. Do you agree that "Science means knowledge"? Speak on the issue

5. Read the text for the information on a scientific institution in England. Use the information when doing the assignments that follow

UNIT 3
TAKING A POST-GRADUATE COURSE

Text 1

1. Read the text

1. Last year by the decision of the Scientific Council I took post-graduate courses to increase my knowledge in economics. I passed three entrance examinations – in History, English and the special subject. So now I am a first year post-graduate student of the Bryansk State University. I'm attached to the Statistics Department. In the course of my post-graduate studies I am to pass candidate examinations in philosophy, English and the special subject. So I attend courses of English and philosophy. I'm sure the knowledge of English will help me in my research.

2. My research deals with economics. The theme of the dissertation (thesis) is "Computer-Aided Tools for…". I was interested in the problem when a student so by now I have collected some valuable data for my thesis.

3. I work in close contact with my research adviser (supervisor). He graduated from the Moscow State University 15 years ago and got his doctoral degree at the age of 40. He is the youngest Doctor of Sciences at our University. He has published a great number of research papers in journals not only in this country but also abroad. He often takes part in the work of scientific conferences and symposia. When I encounter difficulties in my work I always consult my research adviser.

4. At present I am engaged in collecting the necessary data. I hope it will be a success and I will be through with my work on time.

2. *Read passage 2 and answer the following question*: What is the theme of your dissertation?

3. *Read passage 3 and speak about your research adviser according to the following plan:* 1. Doctor's degree. 2. Scientific publications. 3. Participation in the work of scientific conferences.

4. *Inform your colleague:*

a) what candidate examinations you have already passed;
b) what the theme of your dissertation is;
c) how many scientific papers you have published;
d) if you are busy with making an experiment.

Text 2

1. Before you read Text 1 "Postgraduate Degrees", discuss these questions with your group mates or teacher.

1. What does postgraduate education involve?
2. Does postgraduate education vary in different countries?

3. What is its organization in most countries?
4. Do postgraduate programs require any examinations?
5. What characteristics of Doctoral studies do you know?
6. What are the criteria for award of a Doctorate degree?
7. What is habilitation?
8. What is the structure of postgraduate education in Russia?
9. What degrees are the Russian postgraduate degrees of *kandidat nauk* and *doctor nauk* equivalent to as awarded in many countries?

2. Read and translate Text 21 Find out if your answers are right or wrong. Use the introductory phrases, like: Exactly. It's (partly) true. Just the opposite. I don't think so. That's right. That's wrong.

Text 2. Postgraduate degrees

Postgraduate education (or graduate education in North America) involves learning and studying for degrees or other qualifications for which a first or Bachelor's degree is generally required. The organization and structure of postgraduate education varies in different countries, and also in different institutions within countries.

In most countries, the hierarchy of postgraduate degrees is as follows:

1. *Master's degrees.* These are sometimes placed in a further hierarchy, starting with degrees such as the Master of Arts and Master of Science, then Master of Philosophy, and finally Master of Letters. Many Master's students will perform research culminating in a paper, presentation, and defence of their research. This is called the Master' thesis.
2. *Doctorates.* An academic doctorate can be awarded as a PhD (Doctor of Philosophy). In the context of academic degrees, the term *philosophy* does not refer solely to the field of philosophy, but is used in a broader sense in accordance with its original Greek meaning, which is *love of wisdom.*

Many postgraduate programs require students to pass one or several examinations in order to demonstrate their competence as scholars. In some departments, a comprehensive examination is often required in the first year, and is designed to test a student's background undergraduate-level knowledge. Most postgraduate students perform teaching duties.

Doctoral programs often require students to pass more examinations. Programs often require a Qualifying Examination, a PhD Candidacy Examination, or a General Examination, designed to students' grasp of a broad sample of their discipline, and/or one or several Special Field Examinations which test students in their narrower selected areas of specialty within the discipline. These exams must be passed to be allowed to proceed on to the thesis.

The criteria for award of Doctorates vary somewhat throughout the world, but typically require the submission of a substantial body of original research undertaken by the candidate. This may take the form of a single thesis or dissertation, and will usually be assessed by a small committee of examiners appointed by the university. Doctorates are awarded to students who have demonstrated:

- the creation and interpretation of new knowledge through original research of a quality to satisfy peer review, extend the forefront of the discipline, and merit publication;
- a systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of an academic discipline or an area of professional practice;
- the general ability to conceptualize, design and implement a project for the generation of new knowledge, applications or understanding at the forefront of the discipline;
- a detailed understanding of applicable techniques tor research and advanced academic enquiry.

In total, the typical Doctoral degree takes between three and eight years from entering the program to completion, though this time varies depending upon the department, thesis topic, and many other factors.

Habilitation (lat. habilis - *fit, proper, skilful*) is the highest academic qualification a scholar can achieve by his or her own pursuit in several European and Asian countries. Earned after obtaining a research Doctorate, such as a PhD, habilitation requires the candidate to write a professorial thesis/dissertation (often known as a Habilitation thesis/dissertation) based upon independent scholarship, reviewed by and defended before an academic committee in a process similar to that for the doctoral dissertation. However, the level of scholarship has to be considerably higher than that required for a research doctoral (PhD) dissertation in terms of quality and quantity, and a Habilitation dissertation must be accomplished independently, in contrast with a PhD dissertation typically directed or guided by a faculty supervisor.

Habilitation qualification (Habil. Dr.) exists in France, Switzerland, Germany, Austria, Denmark, Bulgaria, Poland! Portugal, Sweden, Finland, the Czech Republic, Slovakia, Hungary, Slovenia, Armenia, Azerbaijan, Latvia, Lithuania, Moldova, Kyrgyzstan, Kazakhstan, Uzbekistan, Ukraine, Belarus, and Russia (Doktor nauk). Those who have achieved habilitation can denote the fact by placing the abbreviation *Dr hab.* or *Dr habil.* before their names.

Many post-Soviet countries, including Russian Federation, have a two-stage research degree obtaining path, generally similar to the doctorate system in Europe. The first stage is named Kandidat nauk (literal translation means *Candidate of Sciences).*

According to par. 262 International Standard Classification of Education (ISCED) UNESCO 2011, for purposes of international educational statistics Candidate of Sciences is equivalent to Doctor of Philosophy (PhD) degree as awarded in many English-speaking countries. It allows its holders to reach the level of the Associate Professor (Docent). The Candidate of Sciences degree requires at least (and typically more than) three, four or five years of postgraduate research which is finished by defense of a dissertation or a thesis. Additionally, a seeker of the degree has to pass three examinations (a so-called Candidate minimum): in his/her special field, in a foreign language, and in the history and philosophy of science. After additional certification by the corresponding experts, the Candidate degree may be recognized internationally as an equivalent of PhD. The second stage is Doktor nauk (Doctor of Sciences). It requires many years of research experience and writing a second dissertation. The degrees of Candidate and Doctor of Sciences are only awarded by the special governmental agency (Higher Attestation Commission). A university or a scientific institute where the thesis was defended can only recommend awarding a seeker the sought degree.

3. Complete the following sentences with details from the Text.

1. ________Master's degree programs usually include ________.
2.________The degree of an academic doctorate is called_______.
3. Examinations are required to test_______.
4.Typically a doctorate degree takes ______to complete.
5.______ ______is earned after obtaining a PhD degree.

6. The first stage research degree in Russia is_________.
7. The second stage research degree in Russia is_______.

4. Locate the following details in the Text. Give the line numbers.

1. In which lines does the author explain the meaning of the term *philosophy* in the context of academic degrees?
2. Where in the Text does the author first mention the requirements for Doctoral degree programs?
3. Where in the Text does the author discuss what doctoral students are expected to demonstrate to be awarded a PhD degree?
4. At what point in the Text does the author discuss the level of scholarship required for habilitation?
5. In which lines does the author explain the equivalence of Russian postgraduate degrees to the ones recognized internationally?

5. Underline the detail that is NOT mentioned in the Text in each of the sentences below.

1. Postgraduate education includes Bachelor's degrees, Master's degrees, and Doctor's degrees.
2. Doctoral degree programs require students to pass a qualifying examination, a comprehensive examination, a special field examination, and a PhD candidacy examination.

3. Habilitation qualification exists in France, Austria, Denmark, Bulgaria, Great Britain, Poland, Russia and other countries.

6. Answer the following detail questions.

1. According to the Text, Master's degree students complete their research with
a) examinations.
b) the defense of a thesis.
c) a paper.
2. According to the Text, postgraduate students perform
a) work as assistants.
b) interviews for postgraduate candidates.
c) teaching duties.
3. According to the Text, a thesis is assessed by
a) an examiners' committee.
b) a professors' council.
c) an attestation committee.
4. According to the Text, a habitation thesis is accomplished
a) with the help of a faculty supervisor.
b) independently.
c) with the help of an academic committee.
5. According to the Text, what examinations do Candidate of Sciences degree seekers have to pass?
a) in a special field, science, and a foreign language
b) in a special field, local history, and a foreign language
c) in a special field, the history and philosophy of science, and a foreign language

7. Mark the main ideas of the Text and retell it in English.

8. Read the text carefully and find some differences and simile

Postgraduate Training Programs

All further education which comes after baccalaureate can be regarded as post-graduate education. It presupposes carrying a lot of research work, acquiring knowledge of new methodologies and new trends. It may lead to either a Master's degree (a three-year program of study) or PhD (usually a two-year course of study).

Postgraduate programmers are either research degrees or taught courses. ***Taught courses*** last one or more years and are either designed so that you deepen your knowledge gained from your first degree or for you to convert you expertise to another field of study. Examples of these include changing to law to become a solicitor and training to become a teacher.

Degrees by instruction are very similar to undergraduate courses in that most of the time is devoted to attending lectures. This may take up the first eight or nine months of the course and is followed by written examinations. A period of research lasting from two or three months usually follows and the results of it are presented in the form of a thesis. Finally, an oral examination is held, lasting perhaps an hour or two, to test the knowledge accumulated throughout the year. Most programmers, which involve classes and seminars, lead up to a dissertation.

Research course is quite a different type of study from a taught course. First of all it lasts longer, for about three years providing Master's or doctorate qualifications.

They allow you to conduct investigations into your own topic of choice and are of use in jobs where there are high levels of research and development.

The most well-known research qualification is the Doctor of Philosophy (PhD, a three-year study programmer). There is a shorter version called a Master of Philosophy (MPh) which takes the minimum amount of time of two years.

Both of these qualifications require the students to carry out a piece of innovative research in a particular area of study. Also possible is the research based on Master of Science (MSc.) and Master of Arts (MA) degrees. A recent development is the Master of Research (MRes), which provides a blend of research and taught courses in research methods and may be a taken as a precursor to a PhD.

It is a common practice for students to be registered initially for the MPhil and to be considered for transfer to the PhD after the first year of study, subject to satisfactory progress and to a review of the proposed research. All research degree programmers involve an element of research training designed to ensure that students are equipped with the necessary skills and methodological knowledge to undertake original research in their chosen field of study. The training programmer includes the development of generic skills relevant to the degree programmer and a future career. Although the training element is not a formal part of the assessment for the degree, it constitutes an important basis for research and may take up a significant part of the first year.

The start of a research degree involves a very extensive survey of all previous works undertaken in that area. At the same time, if a student is planning to carry out any practical experimentation, the necessary equipment must be obtained.

This preliminary part of the study can take up to six months, but it is important to note that the process of keeping up to date with other work going on in the subject must continue throughout the entire period of the research.

The next stage of a research course usually involves collecting information in some way. This might be through experimentation, in the case of arts, social sciences or humanities degree. The important thing is that something new must be found.

This second part of the procedure takes about two years in the case of a PhD.

The research is written up in the form of a thesis during the final six months of the three-year period. Typically, this will contain an introduction, methodology, results and discussion. As in the case with taught degrees, the research must then be examined orally. Occasionally, if the examiners are not completely happy with the work they may ask the candidate to rewrite parts of the thesis.

Hopefully, a good supervisor will make sure this does not happen! Different types of study require similar qualities from the people who undertake them. Both demand an inquisitive mind that will maintain the motivation to learn and discover new information.

They also both demand a high level of intellectual ability in order to cope with the pressures of understanding the possible complex arguments, facts or theories. Both require a high degree of organizational ability and time management, as so many different things need to be attended to.

UNIT 4
MY RESEARCH WORK AND ACADEMIC CAREER

1. Memorize the active vocabulary

degree – степень (ученая)
to award/confer a ~ – присвоить степень
to get/take/receive a ~ – получить степень
to hold/have a ~ – иметь степень
first ~ – диплом бакалавра наук
Bachelor's ~ – степень бакалавра
higher ~ – ученая степень
Master's ~ – степень магистра
Doctorate ~ (PhD) – степень кандидата наук
~ of Candidate of sciences (Candidate's degree) – степень кандидата наук
~ of Doctor (Doctor of sciences) – степень доктора наук
dissertation/ thesis – научная работа, диссертация
to defend one's ~ – защитить диссертацию
to submit a ~ for hearing at the session of the Academic Council – представить диссертацию для обсуждения на заседании Ученого совета
field of study – область исследований
to graduate from- окончить высшее учебное заведение
to graduate in economics - окончить эконом. факультет
a full-time (a part-time) post-graduate - аспирант-очник (заочник)
an applicant - соискатель
to take / have a post-graduate course - учиться в аспирантуре
to carry out (conduct) research in the field of... - проводить исследования в области...

to be published in the Proceedings of the Conference - быть напечатанным в сборнике материалов конференции
to work at one's thesis (dissertation) under the guidance (supervision) of ... - работать над диссертацией под руководством...
to work in collaboration with... - работать совместно с...
to submit one's thesis to public hearing in due time - представить диссертацию к защите в срок
to survey modern literature on the problem - делать обзор современной литературы по проблеме
the problem arises in connection with... - эта проблема встает в связи с...
We turn our attention to a new and more urgent problem - Мы обращаем внимание на новую и более насущную проблему
the problem of studying ... demands special care in using... -Проблема изучения... требует особого внимания к использованию...
We shall touch upon a question of...- мы коснемся вопроса...
The core of the problem is... - Суть проблемы заключается...
It would be instructive to examine in detail... - Было бы полезно детально изучить...
The object of our investigations is... - объектом нашего исследования является...
...is the subject of our research - ... является предметом нашего исследования
We are engaged in the study of... - Мы занимаемся изучением...
We shall make a thorough study of...- мы подвергнем тщательному изучению...
The aim of the paper is...- Цель данной работы заключается...
In the framework of... the first objective to achieve is... - В рамках... основной целью является...
The purpose of my work is to examine and investigate... - Цель моей работы заключается в изучении и исследовании...
The primary task is to study... - Первоочередной задачей является изучение...
The conventional approach to this problem is based on... - Обычный подход к этой проблеме основан на...
We shall turn to another trend. - Мы обратимся к другому направлению
It is worth analyzing precisely... - Стоит тщательно проанализировать...
One of the most promising problems is believed to deal with... - Считается, что одной из наиболее перспективных проблем является...
The problem became more acute, it took a new form. - Проблема стала более острой, она приобрела новую форму
It seems essential to emphasize that... - Представляется важным отметить, что...
So far we have discussed... - До сих пор мы обсуждали...
It provides a basis for - Это служит основой...

For (at) the moment... - В настоящий момент...
We are intended to conclude that... - Мы намерены заключить...
To sum up it should be noted that... - Подводя итог, следует отметить, что...
Degree of candidate of sciences; candidate's degree (less formal) - степень кандидата наук
to do academic work / research - / выполнять научную работу / исследование
to devote oneself to academic / research work - посвятить себя науке
a branch of knowledge - отрасль науки;
an academic work - научный труд
an academic approach - научный подход
department - кафедра
a research worker / a researcher - научный работник
topical - актуальный
analogous - аналогичный
academician - академик
post-graduate - аспирант
post graduate course- аспирантура
candidate of science - кандидат наук
doctor of science -доктор наук
assistant professor -доцент
Associate Professor at the Department of - доцент кафедры (конкретной)
head of the department - заведующий кафедрой
professor - профессор
rector - ректор
deputy rector - проректор
university administration - ректорат
scientific degree -ученая степень
academic rank -ученое звание
dean -декан
scientific field (branch) - научная область
research work - научно-исследовательская работа
scientific journal - научный журнал
exact sciences - точные науки
applied science - прикладные науки
agricultural sciences - с/х науки
natural sciences - естественные науки
to devote oneself to - посвятить себя науке
scientific experience - научный опыт

summary, abstract - реферат, аннотация
to get data (obtain) - получать данные
collect data on ... - собирать данные о
to make a research - проводить исследование
to solve a problem - решать проблему
to do (carry out, conduct) a research - заниматься (проблемой), проводить исследования
to draw up a study plan - составить план исследования
the aim of the research - цель исследования

2. Before you read Text “PhD Thesis”, discuss these questions with your group mates or teacher.

1. What is a PhD thesis?
2. What is the most important part of a PhD thesis?
3. Does a PhD thesis require approval?
4. What is the purpose of the review chapter?
5. What is the procedure of defending a PhD thesis?
6. What similarities and differences can you find between a PhD thesis and a ***kandidatskaya*** thesis?

3. Read and translate Text.

PhD thesis

The PhD thesis or dissertation is a monograph, i.e. a self- contained piece of work written solely by the PhD candidate and no-one else. It sets out a certain problem that the candidate has worked on, possibly within a larger team, under guidance of one or more academic advisors. It motivates and defines the problem, reviews existing approaches to the problem, identifies through critical analysis a clear gap for a possible novel academic contribution, and spells out a so-called hypothesis, which is a proposed explanation for the problem or a proposed solution to the problem. The thesis also explains in sufficient detail, and justifies the work undertaken to decide on the hypothesis (or hypotheses as the case may be). This work typically involves a combination of further literature studies, theoretical analysis, experimental design, data collection, carrying out the experiments, data analysis, and drawing conclusions. A good thesis also delineates the limitation of the work done or the conclusions drawn and outlines possible future research directions.

The format of a PhD thesis is not very different from any other formal research dissertation or study paper. However, a PhD thesis requires much more research and evaluation on the topic.

To start a PhD thesis, you will need to submit a written proposal in to your advisor. The length of this proposal will vary, and is dependent upon your advisor’s specifications and the topic that the paper is written on. The body of the proposal contains certain elements that must be included.

The most important part of your PhD proposal is coming up with a hypothesis for your research questions. This is where your successful for your research study will begin. In most cases this requires the researcher to do background work ahead of time in order to choose a direction for which his or her thesis should go, as well as the research will need to be done to prove his or her point.

The second stage of the process is actually beginning your PhD thesis. This requires approval of your proposal first. The first chapter will be the basic introduction to your subject, including the reasons why you decided on this topic for your research. The introduce on also takes a look at other work that a researcher has done that is pertinent to the PhD thesis, and what new achievements he or she is trying to do through the study.

The second chapter looks at the literature that deals with the same subject matter. Keep in mind that the literature should only be high quality, and include items such as journals and books. While the review chapter does not directly relate to the thesis work-itself shows the reader what the researcher was thinking when he or she began working on the research topic.

She third chapter looks at the research question with a detailed discussion of the PhD thesis statement. It will also include the information like the statement of the problem, and the hypothesis and predictions. It summarizes what the researcher is trying to accomplish through the course of the study.

The fourth chapter of your thesis takes a look at your research and the method that you used when coming up with the data. This chapter can be very different from one thesis to another, as it will depend on what method the research used, including comparative analysis, scientific technique, regression analysis and more. This chapter also includes information such as the variables that used, as well as why you used them and the theories you had behind choosing them.

The fifth chapter looks at the study that has been done so far and what results were obtained during this study. It also looks at what methodology was applied during the study.

The sixth chapter looks at the results in greater detail. It will also evaluate the results against the previous information already known or what the researcher has discovered. The limitations of the study are also discussed in this chapter, which includes the factors that the study did not look at or incorporate. It can also include the information about the research that the author discovered that was not related to the original thesis and hypothesis because it was not addressed with the original specifications of the variables.

The seventh chapter is the critical analysis. This includes the information that was discovered during the research, as well as the areas of the study that may be open to further research in the future.

The final chapter sums up the results of the research and allows the author to give his or her interpretations and thoughts on the study itself.

Writing your thesis is not the end of the study. You will also be required to put together a defense of your research, which entails being able to verify all of the information that is included in your thesis. To do this, you will be put in front of a panel of experts who will question your research. Therefore, you need to make sure that your evidence is accurate, proves what it needs to, is relevant to the issue, can be easily understood, and that it is convincing enough that the readers will believe what you have to say.

3. Complete the following sentences with details from the Text.

1. The PhD thesis sets out ________.
2. You will need _______ to begin a PhD thesis.
3. The introduction chapter studies ________.
4. The methodology you applied is discussed in _______.
5. The critical analysis chapter includes the information _______.

4. Locate the following details in the Text. Give the line numbers.

1. In which lines does the author explain what PhD dissertation writing involves?

2. Where in the Text does the author mention the statement of the problem in the dissertation?

3. At what point in the Text does the author discuss the research methods to be used in a PhD dissertation?

4. Where in the Text does the author explain what scientific evidence is characteristic of?

5. Underline the detail that is NOT mentioned in the Text in each of the sentences below.

1. A PhD dissertation motivates and defines the problem that the candidate has worked on independently, defines the hypothesis, and outlines future research directions.

2. The chapter studying the PhD thesis statement includes the hypothesis, predictions, and literature review.

3. The factors that the study did not incorporate and the results obtained are discussed in the sixth chapter.

6. Answer the following detail questions.

1. According to the Text, a hypothesis is

a) a possible academic contribution.

b) a proposed solution to the problem.
c) a theoretical analysis.
2. According to the Text, the length of a written proposal depends on
a) the number of certain elements to be included.
b) the topic specifications.
c) your advisor's recommendations.
3. According to the Text, what does the first chapter look at?
a) the reasons for choosing a particular topic for the research
b) the achievements the candidate has done
c) the details of the research
4. According to the Text, the second chapter relates to
a) the thesis work itself.
b) the information discovered during the research.
c) the researcher's ideas at the initial stage of the research.
5. According to the Text, what does the eighth chapter include?
a) the research methods applied
b) the research summary
c) the critical analysis

7. Answer the questions. Use the following cliché

CLICHÉ
(stereotype block of expressions and patterns)
for a research work story

1. I'm a postgraduate (research student)...	1. Я аспирант (соискатель)...
2. My scientific adviser (supervisor) is...	2. Мой научный руководитель...
3. The subject of my research is...	3. Предмет моего исследования...
4. The reasons for my choice are...	4. Причины моего выбора следующие...
5. My investigation has both theoretical and practical parts...	5. Моя научно-исследовательская работа включает в себя как теоретическую, так и практическую части...
6. I'm going to deal with...	6. Я планирую заниматься...
7. I'll make use of... methods...	7. Я собираюсь использовать ... методы...
8. My work requires the collection of a good deal of material...	8. Мне требуется собрать большое количество материала для моей работы...
9. Currently I'm busy with collecting theoretical data on my subject.	9. В настоящее время я занимаюсь подбором теоретических данных по моей теме.
10. I have to read articles (monographs, journals) of our and foreign authors.	10. Мне приходится читать статьи (монографии, журналы) наших и зарубежных авторов.

Продолжение таблицы

11. One of the main aims of my research work is...	11. Одной из главных задач моей научной работы является...
12. I'm going to analyze (to generalize) the common practice of...	12. Я собираюсь проанализировать (обобщить...)
13. As result of my research I plan to elaborate some practical recommendations for ... , to work out a new method (theory)...	13. В результате своих исследований я планирую разработать практические рекомендации по..., разработать новый метод (теорию)...
14. At present I'm busy with the survey of special literature	14. В настоящее время я занят обзором специальной литературы.
15. I have already completed my experiments on	15. Я уже закончил проведение экспериментов...
16. My next aim is to organize the data, to analyze the information; to examine the results; to evaluate the data; to summarize the results to ………	16. Моя ближайшая задача привести в порядок данные, проанализировать информацию, оценить данные, обобщить результаты, сделать необходимые расчеты...
17. I expect to be through with my research (to finish, to complete), my thesis in a year.	17. Я надеюсь закончить свои исследования (диссертацию) через год.
18. I believe (hope) my work will be of practical interest for	18. Я надеюсь, что моя работа будет представлять практический интерес для...
19. The subject of your research work.	19. Предмет вашего исследования.
20. The current interest in the problem in general.	20. Интерес к проблеме в целом.
21. Have there been any attempts made to study the problem before?	21. Изучалась ли данная проблема раньше, кем и насколько?
22. Results already achieved and the aim of your own research.	22. Цель вашей работы.
23. Materials, equipment, methods to be used.	23. Материалы, оборудование, методы, которые вы используете в процессе исследований.
24. The current stages of the research.	24. На какой стадии находится ваше исследование в данное время?
25. The results of your current research work, if there are any.	25. Если уже получены какие-либо результаты, то какие именно?
26. The remaining part (portion) of the work.	26. Сколько времени вам необходимо для завершения работы, что еще необходимо сделать?
27. Significance of your research work in case it is completed successfully.	27. Каково практическое значение конкретно вашей работы?

4. Read the three texts, do the tasks, and answer the questions.

Data, Evidence and Facts

Data

Data is a set of values of qualitative or quantitative variables. Data is measured, collected and reported, and analyzed, whereupon it can be visualized using graphs or images. Data as a general concept refers to the fact that some existing information or knowledge is represented in some form suitable for better usage or processing.

Raw data, i.e. unprocessed data, is a collection of numbers, characters. Field data is raw data that is collected in an uncontrolled *in situ* environment. Experimental data is data that is generated within the context of a scientific investigation by observation and recording.

The word ‘data’ used to be considered the plural of ‘datum’, and still is by some English speakers. Nowadays, though, ‘data’ is most commonly used in the singular, as a mass noun (like ‘information’, ‘sand’ or ‘rain’).

5. Translate from English into Russian the words and word combinations in bold.

6. Answer the questions:

1. What is data? What type of data do you plan to collect and analyse for your research?
2. What is the difference between raw and field data?
3. Will you use experimental data in your research?

Evidence

Evidence, broadly construed, is anything presented in support of an assertion. This support may be strong or weak. The strongest type of evidence is that which provides direct proof of the truth of an assertion. At the other extreme is evidence that is merely consistent with an assertion but does not rule out other, contradictory assertions, as in circumstantial evidence.

Scientific evidence consists of observations and experimental results that serve to support, refute, or modify a scientific hypothesis or theory, when collected and interpreted in accordance with the scientific method.

In scientific research evidence is accumulated through observation of phenomena that occur in the natural world, or which are created as experiments in a laboratory or other controlled conditions. Scientific evidence usually towards supporting or rejecting a hypothesis.

One must always remember that the burden of proof is on the person making a contentious claim. Within science, this translates to the burden resting on presenters of a paper, in which the presenters argue for their specific findings. This paper is placed before a panel of judges where the presenter must defend the thesis against all challenges.

7. Translate from English into Russian the words and word combinations

8. Answer the questions:

1. What is the difference between evidence and scientific evidence
2. How is evidence accumulated in scientific research?
3. What is a claim? How to prove a claim?

Facts

A fact is something that has really occurred or is actually the case. The usual test for a statement of fact is verifiability - that is, whether it can be demonstrated to correspond to experience. Standard reference works are to check facts. Scientific facts are verified by repeatable careful observation or measurement (by experiments or other means).

9. Read the statements below and decide if they are facts or opinions:

1. The Russian Department of Agriculture recommends that adults consume three to four cups of vegetables per day.
2. Playing team sports is the better way to lose weight.
3. Research shows that a diet low in salt helps people to lower pressure.
4. Home-cooked meal tastes better than meal in restaurants.
5. Research indicates that young people who ate meals with it did well academically.

10. Answer the questions:

List of questions

1. What institute did you graduate from and when?
2. What faculty did you study at?
3. What is your specialty?
4. Have you got a diploma with honors?
5. Are you a postgraduate or a research-student?
6. When did you decide to take a postgraduate course?
7. When did you enter (join) the postgraduate course?
8. Why are interested in research work?
9. What personal characteristics do you think are necessary for success in the chosen field?
10. Are you going to take a full time or a correspondence course?
11. Are there any scientists in your family or among you relatives?
12. What do you think will be more difficult for you – to write a theoretical or an experimental chapter? Why?
13. What is the subject of your research? What do you research? What do you study?
14. Do you work at your thesis already?
15. What is the subject of your thesis?
16. Is your research work individual or is it a group research?

17. Where do you take experimental material?
18. Do you know how many parts does a thesis consist of?
19. What candidate examinations have you already passed?
20. What scientific degree will you get?
21. Have you read your scientific supervisor's research papers? What are they about?
22. Do you think they will be useful for your dissertation?
23. Is your scientific supervisor helpful? How often do you get to see him?
24. How does your scientific supervisor help you in your research?
25. Have you got any publications? Tell us about the one that you think is the best.
26. Is your investigation (research work) an experimental or theoretical one?
27. Have you passed all the candidate examinations?
28. What candidate examinations have you passed?
29. When will you take you philosophy (specialty) examinations?
30. Has your investigation real practical value?
31. Where can the results of your investigations be applied at?
32. Do you use the Internet for your research? In what way?
33. What are the main problems in your area of research?

11. Read some sentences about the research work of a postgraduate student and give information about yourself

1. I am a postgraduate student of the department of microbiology and infectious diseases of OSAU. My specialty is Veterinary Microbiology, Virology, Epizootiology, Mycology and Immunology.
2. My supervisor is Candidate of Biological Sciences, assistant professor of microbiology and infectious diseases... .
3. The subject of my research is biological properties of antagonistically active enterococci isolates from animals.
4. The aim of my research is the study of the biological properties of enterococci isolated from the intestine of animals.
5. The main task is to identify the active antagonistic strains of enterococci.
6. The reasons for my choice are: first, probiotics are a good alternative to antibiotics, secondly, enterococci, showing antagonistic activity against a number of pathogens and non-virulence factors, can be used as a component of probiotic preparations.
7. My research work includes both theoretical and practical parts.
8. I plan to study the biological properties of bacteria of the genus Enterococcus.
9. I'm going to use the classical bacteriological and modern molecular genetics methods.
10. I want to collect a lot of material for my work.
11. I am currently involved in the selection of the theoretical data on my topic.
12. I have read articles, monographs, journals of our and foreign authors.

13. A major object of my work is to identify strains of enterococci with high antagonistic activity.
14. I'm going to analyze the presence of virulence factors in intestinal isolates of enterococci.
15. As a result of my research, I plan to develop practical recommendations for a new probiotic preparation based on strains of enterococci.
16. I am currently busy with the review of the literature.
17. I've already finished the experiments.
18. My immediate task is to arrange the data, analyze information, summarize results, make the necessary calculations.
19. I plan to finish my research (dissertation) in two years.
20. I hope that my work will be of particular interest for veterinarians and microbiologists.

12. Побеседуйте по-английски с коллегой о проводимых вами исследованиях. Используйте следующие вопросы и утверждения:

Use the following questions and statements:

1. What methods do you apply in your research? And why?
2. What are you going to prove in your research?
3. How can you formulate your hypothesis?
4. How do you plan your experiments?
5. How often do you record data during the experiment? (every hour, every two hours, etc).
6. What instruments and equipment do you use in your investigation? And why?
7. What views and data can your experiments (or research) prove or refute?
8. What illustrations are you preparing to demonstrate the results of your investigation?
9. What conclusions will you make if the results of your research are positive/negative?
10. What are the merits and demerits of the investigation that you have already carried out?
11. How will you continue your investigation? And why?
12. The hypothesis fits experimental data.
13. The research probes in the various aspects of the subject.
14. We experimented with the new materials.
15. We hope to find the answer to this problem.
16. The work was subjected to criticism.
17. Out of his work came a substantial knowledge.
18. The theory and the results are too extensive to be given here.

19. The experimental results were analyzed with the help of high-speed computing machines.
20. I am afraid I don't know for certain if there are any direct (adequate, reliable) data regarding ... I believe some information is available though I don't know what it is...
21. Yes, as far as we know there are some very interesting and, I dare say, very encouraging data about..., though at the moment I am not quite prepared to speak about them in detail.
22. Well, there must be rather adequate data at present since studies of the problem have been in progress for several years now (have long been under way)...
23. What is the problem you are investigating now (interested in)?
24. What does it deal with?
25. What is the core of the problem?
26. Is it sufficiently studied?
27. Does it involve certain difficulties?
28. What aspects does it include?
29. What kind of problem does it refer to?
30. Does the problem require a great deal of investigation?
31. Has it been discussed for a long time or is it a newly raised problem?
32. Is there a lot of information on this problem?
33. What foreign literature have you read on the problem?
34. Will it take much time to clear up all the aspects of the problem?

13. Read the following dialogues in parts

Dialogue 1

Peter: Hallo, Mike!

Mike: Oh, Peter! Haven‘t seen you for ages! What are you doing here in Orenburg? I know you live in Orsk.

Peter: You are quite right. But this year I have become a post-graduate student of the Orenburg State University. Do you remember that I was interested in research work when a student?

Mike: Oh, yes, I do. And, of course, you want to carry on research in applied statistics. Am I right?

Peter: Absolutely right you are. I have a particular interest in this field of knowledge.

Mike: That‘s fine! I congratulate you on a good beginning. They say: «Well begun is half done». I wish you success in your research.

Peter: Thanks a lot.

Dialogue 2

Post-graduate: What is your opinion of my last article?

Professor: There is a great deal in it that is new, and a great deal that is true …

Post-graduate: Do you really mean …?

Professor: … but it, unfortunately, happens that those portions which are new are not true, and those which are true are not new.

Dialogue 3

Post-graduate: I hear you said my new article was the worst I ever wrote.

Professor: No, I didn't. I said it was the worst article anybody ever wrote.

Text 3.

1. **Read the text and compare your answers.**

What is an Academic Career?

(Information about different routes into an academic career)

There are three main routes you could consider when following an academic career. These are:

- Research-only role, where the bulk of your time is spent conducting research with limited or no teaching commitment
- Teaching-only role, where majority of your time is for teaching with little or no time specifically allocated for research
- Research and teaching position, i.e. a lectureship, where you will be expected to both teach and conduct research.

In reality, most people will progress through a number of these roles when pursuing an academic career. The route you take will depend on your interests, the funding and opportunities in your subject area, and the job market at certain points in your career. It tends to be more common to have a long-term research-only career in the sciences as at present there is more funding available for research-only positions.

You should try to be clear about where your interests lie and what opportunities are available in your subject area. Many academic jobs will be a balance of research, teaching and administration but the percentage of time spent on each will vary greatly. Factors that will affect how you spend your time include:

- Your role, e.g., if you are employed as a research or teaching fellow
- Your level of experience, as junior lecturers will often have a greater teaching load than more senior lecturers
- The type of institution as lecturers at research-intensive universities may be expected to spend more time on research than those employed in teaching- focused institutions.

Some of the activities you may be expected to contribute to during an academic career are as follows:

Research

As a PhD student you will be familiar with the range of activities that come

- identifying suitable funding bodies and preparing proposals to apply for funding
- conducting research (reading, collection and interpretation of data, gathering of information from relevant sources, etc.)
- disseminating research findings through publishing

- speaking at conferences
- supervising postgraduate research students
- managing resources (research budget and possibly research staff).

Teaching

You may already have had some experience of teaching or tutoring. As an academic member of staff teaching responsibilities can include:

- design of courses and development of curricula
- preparing notes and material for lectures
- delivering lectures to undergraduates and postgraduates
- preparing for and facilitating discussion at small group tutorials
- marking / assessing students work
- supervising Honours students' dissertation research.

Administration

Some examples of the types of administrative roles academic staff may undertake include director of studies, admissions tutors, course organizer, or open-day coordinator / school liaisons officer.

Academics are also often members of several committees both within their department or school (e.g., staff-student liaison, health & safety), their college (e.g., library, equality and diversity, undergraduate studies) and/or across the university (e.g., quality, scholarships and student funding, recruitment and admissions strategy).

Administrative tasks associated with these roles include:

- writing the course handbook
- designing exam questions and answers (and getting these validated through the relevant committees)
- preparing a schedule of talks for visiting prospective students
- writing references for students seeking employment or further study
- screening applications for admission to postgraduate courses
- reading papers relevant to your committee membership and submitting your comments for discussion at meetings.

2. Before you read the Text 2 "Jobs for Postgraduates", discuss these questions with your group mates or teacher.

1. What are the advantages for recruiting those with postgraduate qualifications?
2. What employers of postgraduates do you know?
3. What do academic and non-academic postgraduate jobs include?
4. What are lecturers responsible for?
5. Where can you find information on postgraduate jobs?

3. Read and translate Text 2.

Text 2. Jobs for postgraduates

More and more employers are recognizing the advantages of recruiting those with postgraduate qualifications. These range from multinational organizations to small and medium enterprises. The UK Graduate Program Study “What do PhDs do?” has found that a number of employers value PhD graduates for their maturity, independence, problem-solving skills, determination and innovative thinking. Although most employers do not have a specific postgraduate recruitment process, there are a number of opportunities requiring postgraduate qualifications. Higher education institutions are the largest employers of postgraduates in the region, offering a wide range of opportunities in a diverse range of subject areas. The universities within Yorkshire and Humber regularly recruit those with postgraduate qualifications. There are eight universities and three higher education colleges in the region.

Types of academic postgraduate jobs include a lecturer, a research associate, a research assistant, a research fellow, and a journal editor/ assistant.

Lecturers within higher education institutes are responsible for teaching academic courses at both undergraduate and postgraduate level, which, depending upon subject area, involves lectures, seminars, field work and practical demonstrations. Many lecturers pursue their own research outside of their teaching duties and contribute to other research activities in their department. Lecturers are often required to support other research projects and supervise PhD students and other post-doctorates. There is also a large amount of administration involved in lectureship posts.

A research associate is an. academic research post requiring postgraduate qualifications to PhD level. Research associates are required to work on projects funded by employers in industry or a research council; therefore they do not have the opportunity to pursue their own research. These posts are usually on a fixed-term basis, lasting between one and three years.

Universities often advertise research assistant posts which do not carry as much responsibility as research associates. These posts usually require candidates to have obtained at least a Master’s level qualification.

Research fellowships allow post holders to engage in their own individual research project. These posts are usually full-time with no teaching duties although post holders may have responsibility for supervising students.

Many departments within Yorkshire Universities publish internationally recognized academic journals which require editors and assistants who are responsible for dealing with submissions, organizing publication and attending international conferences for promotional purposes.

Students who have just spent four years earning a Bachelor’s degree plus two, three or more years earning a graduate degree might prefer a job that is not academically oriented. Working in a job that develops administrative, writing and organizational skills might benefit postgraduate students and help them gain experience needed to succeed in defending a dissertation or interviewing for a tenure-track position. Some postgraduates, especially those who do not intend to become university professors, might prefer to try something completely different from their field of study, such as retail, clerical, restaurants, the creative arts, publishing or even manual labour. This sort of a break from academics might help postgraduates hone in on abilities and skills they previously never realized they had.

Types of non-academic postgraduate jobs include: Arts and Humanities (journalist/broadcaster, journal/professional magazine editor, policy and research manager, policy adviser, project manager); Business and Finance (business adviser, marketing/market researcher, project manager, senior manager); Languages (project manager, translator); Science, Technology and Engineering (research associate, design engineer, development engineer, project manager, research and development scientist, scientific researcher, senior lab technician, senior scientist).

The UK Graduate and Research Council Program provides information and personal development programs to help PhD students gain the necessary skills for work outside of academia.

*4.*________________________ ***Complete the following sentences with details from the Text.***

1. Multinational organizations and_____ are recognizing the advantages of recruiting postgraduates.
2. Lecturers_____PhD students and _____ research projects.
3. Research assistants do not carry as much responsibility as_____.
4. Editors and assistants of internationally recognized academic journals are responsible for organizing publication, _____ and attending international conferences.
5. Students spend four years earning a Bachelor's degree and ____ years earning a graduate degree.

5. Locate the following details in the Text. Give the line numbers.

1. In which lines does the author explain the opportunities requiring postgraduate qualifications?
2. Where in the Text does the author first mention a research associate post?
3. Where in the Text does the author discuss research fellowships?
4. At what point in the Text does the author explain the functions of the UK Graduate and Research Council?

6. Underline the detail that is NOT mentioned in the Text in each of the sentences below.

1. Many employers are recognizing the advantages of recruiting those with undergraduate and postgraduate qualifications.

2. Research associates usually work on projects funded by employers in industry and education or a research council.
3. Some postgraduates prefer to try something different from their field of study, such as retail, clerical, business or manual labour.

7. Answer the following detail questions.

1. According to the Text, who do the universities often recruit?
   a. those with undergraduate qualifications.
   b. those with postgraduate qualifications.
   c. those with a university diploma
2. According to the Text, what academic degree is a research associate required to have?
   a. a Bachelor's degree
   b. a Master's degree
   c. a PhD degree
3. According to the Text, research associates hold their posts
   a. permanently.
   b. temporally.
   c. for five years.
4. According to the Text, working in an administrative job may help postgraduate students
   a. gain experience.
   b. defend a dissertation.
   c. have a successful job interview.
5. According to the Text, a break from academics may be
   a. useless for postgraduates.
   b. helpful for postgraduates.
   c. unnecessary for postgraduates.

8. Underline or mark the main ideas of the Text and retell it in English.

UNIT 5
ACADEMIC CONFERENCES

1. Read the following polylogue:

2. Советы участнику научной конференции, работающему над письменным текстом своего доклада. Краткость, ясность, простота, конкретность – вот к чему, как считают, следует стремиться автору научного сообщения.

- 'Keep sentences short. On the average, most sentences should be shorter than 25 words. But sentences should vary in length and structure.

- Prefer the simple to the complex sentences and phrases. Write “try to find out” rather than “endeavor to ascertain”.
- Prefer the familiar word but build your vocabulary. If a reader doesn’t understand your words, he can miss your meaning. But you may want to use long words in some cases – to clarify your point.
- Avoid words you don’t need. Extra words weaken writing. Make every word carry its own weight.
- Put action into your verbs. Passive verbs tire the reader. Write “we intend to write clearly” not “Clarity in composition is our intention”.
- Use terms your reader can picture. Choose short, concrete words your reader can visualize, not abstract terms. Don’t say “industrial community” when you’re describing a “factory town”.
- Tie in with your reader’s experience. The reader probably won’t get your new idea unless you link it with an old idea he already understands. If you’re describing how a new pump works, compare its operation with that of an old, standard pump.
- Write the way you talk, or at least try for a conversational tone. People rarely use business jargon when they talk.
- Make full use of variety. Vary the length of words and sentences and arrange them in different ways. Avoid monotonous patterns of writing.
- Write to Express, not to Impress. Don’t show off your vocabulary by using needlessly complex words.

3. Фрагмент статьи о выступлении на научной конференцию. Автор подчеркивает, что докладчик всегда должен помнить об аудитории и ее интересах и, исходя из этого, строить свое сообщение.

“Are you taking yourself too seriously? Sure, your world is great and you’re fantastic, but what about the other guy? Don’t forget, your purpose is to tell him what you know. To do that you need to get his attention and you need to keep it.

Where most of us have trouble is in orally presenting a published paper. It is easy to forget that you are dealing with two entirely different audiences.

Think about it. People reading your article have many devices and motions available to them. They can underline, put aside, reread, laugh out loud at, and (horrors!) cross out. Put those same people in an audience and all of those reactions (or all except the yawns) must be subordinated. They are in effect your captives – which also makes them your responsibility.

Avoid charts and graphs and prints of scopes (unless they are simple, simple, simple, and big, big, big). Most papers have a certain idea. Find it and make it the subject of your report. Paraphrase the paper. If lengthy explanations appear important, put them into a handout. After all if there is interest the paper has already been read or will be read in detail at a more leisurely pace later.

A ten-minute talk with detailed handouts (or the published article itself) will be remembered. A one-hour talk requiring close listening will primarily be remembered for its discomfort. Have you ever thought that an uncomfortable audience does? It criticizes the speaker, that's what the audience does. After all, somebody is at fault for making the audience uncomfortable, and that somebody is you!"

4. Use the following phrases in speech:

Руководитель (конференции, заседания, совещания)

1. I give the floor to...
2. I am afraid your time is up
3. Are there any questions or comments on... ?
4. I would like the speakers to be brief...
5. I would like to summarize...
6. Let me just interrupt you for a minute...
7. In order to open the discussion on this subject I would like to start with questions...
8. May I have your attention, please...
9. Speak from your place, please.
10. Take the floor, please...
11. Would you speak a little bit louder, please...
12. Speak to the point.
13. The answer is not full.

1. Я предоставляю слово ...
2. Боюсь, что Ваше время закончилось
3. Имеются ли вопросы или замечания по поводу...?
4. Мне бы хотелось, чтобы выступающие были кратки ...
5. Мне бы хотелось подвести итог...
6. Позвольте мне прервать Вас на минуту...
7. Чтобы открыть дискуссию по этой теме, я хотел начать с вопросов
8. Прошу вашего внимания ...
9. Пожалуйста, говорите с места ...
10. Пожалуйста, говорите
11. Вы не могли бы говорить чуть громче, пожалуйста
12. Говорите по существу
13.Ответ неполный.

Публичное выступление (доклад, лекция, сообщение)

5. Use the following phrases in speech:

Начало выступления

In my paper I want to highlight...

The subject of my lecture (talk) is ...

I'm going to be talking about...
Let me begin with ...
My introduction is going to be very little. I give you one or two sentences.
В своем докладе я хочу осветить ...
Тема моей лекции (моего выступления) ...
Я собираюсь рассказать (поговорить) о ...
Позвольте мне начать с ...
Мое выступление будет очень кратким. Я изложу его вам в одном-двух предложениях.
Выделение важного
It should be said that....
It is interesting (= of interest) to note that...
That's one thing I'd like to stress very heavily.
I want to reinforce the following.
The following is terribly informable (terribly well / badly needed)
I want to call (to draw / to invite) your attention to ...
It should be kept in mind that...
First (ly)... / Second (ly)... Third (ly).../ Fourth(ly)...
Следует сказать, что ...
Интересно отметить, что...
На одну вещь мне хотелось бы обратить особое внимание.
Я хочу подчеркнуть следующее
Следующее представляется необычайно важным (информативно полезным, необходимым)
Хочу привлечь (обратить / направить) ваше внимание к (на)...
Следует помнить, что (Не следует забывать, что)...
Во-первых,.../Во-вторых ...В-третьих, .../В-четвертых,...
Переход от данной мысли к другой
Now l come to ...
I'm coming on now to speak about...
Now we may pass to the next item (on the agenda)
Here we can say ...
We may pass these details.
Теперь я перехожу к ...
А теперь я перехожу к рассказу о ...
Теперь мы можем перейти к следующему пункту (в повестке дня)
Здесь можно сказать ...
Мы можем опустить эти детали.

Выражение личного мнения о высказываемом
I (don't) think...
I (don't) believe...
In my opinion...
In my view...
What I say (am saying) is that...
I dare say...
I am far from thinking (asserting) that...
It's no exaggeration to say that...
I'm sorry to say that...
Я (не) думаю ...
Я (не) считаю ..
По моему мнению ...
На мой взгляд...
Как я считаю (по-моему)...
Осмелюсь утверждать, что...
Я далек от того, чтобы думать (утверждать), что ...
Не будет преувеличением сказать, что ...
К сожалению, я должен сказать, что ...
Осуществление обратной связи с аудиторией
Any other points?
Is that clear?
Have I made my point clear?
If there's anything you don't understand, please ask me.
Будут другие мнения?
Это ясно (понятно)?
Я выразился (достаточно) ясно?
Если вам что-то не ясно, пожалуйста, спрашивайте.
Как избежать категоричности в своих высказываниях
As far as I know ...
If I am not mistaken ...
If my memory serves me well (doesn't fail me)
As far as I remember ..
Насколько мне известно... Если я не ошибаюсь ... Если мне не изменяет память... Насколько я помню ...
Пояснение и дополнение к сказанному
I mean_ to say that...
In other words ...
That is to say ...

To all this must be added that...
As I have already mentioned ...
I have forgotten to say that...
The following speaks for itself
Этим я хочу сказать, что ...
Другими (иными) словами...
Иначе говоря...
Ко всему этому следует добавить, что ...
Как я уже упомянул ...
Я забыл (а) сказать, что ...
Следующее говорит само за себя.

Завершение выступления и выводы из сказанного

I close with the words ...
The last part of my talk will be devoted to ...
Now I'm going to sum up what has been said
Summing up all that has been said ...
Hence, it follows that...
This brings us to the conclusion that...
I thank the audience for your kind attention.
Я заканчиваю словами...
Последняя часть моего выступления будет посвящена ...
А теперь я собираюсь резюмировать сказанное.
Суммируя все, что было сказано...
Из этого следует, что...
Это позволяет нам сделать вывод о том, что...
Благодарю присутствующих за внимание.

6. ***Побеседуйте с коллегой по-английски об участии в научных конференциях и о своих публикациях. Включите в свои высказывания следующие вопросы*** (***Talk to a colleague in English about participating in scientific conferences and about your publications. Include the following questions in your comments***)***:***

1. At what scientific conferences (symposia, congresses) did you take part? ... and (are you going to participate)?
2. When and where were they held (will be held)?
3. What was the most noteworthy paper presented at that scientific meeting?
4. How long did/will that conference (congress, symposium) last?
5. How many simultaneous sessions were usually held on the same day?
6. What paper did/will you present at the scientific meeting?
7. How did your colleagues treat your report?

8. Were there any discussions of general interest held during that scientific forum?
9. What are the main ideas of your report?
10. What is your general impression of the scientific forum or assembly?
11. What articles have you already published?
12. What material are you going to publish?
13. Where and when were your articles, abstracts, etc, published?
14. What are the exact titles of your published papers?
15. What problems do you deal with in those papers?
16. Who are your published papers addressed to?
17. What do you give much (little; no) attention to in your published materials?
18. What is of particular interest in your papers?
19. What did you fail to describe or demonstrate adequately?
20. How many parts does your (longest) paper consist of?
21. What do you treat in your introductory part?
22. What do you say in conclusion?
23. What are the purposes of your publications?

7. Read the following dialogue:

A Spanish scientist, Dr.Alvarez Lopez, meets Professor Platonov and asks him about their mutual acquaintance:

Lopez: Dr. Platonov, I heard you say that Alexander Nalimov is working on his doctoral dissertation now. Did I get it all right?

Platonov: Quite. He was a Candidate of Science (Technology) and now, after submitting it to public hearing (защита), he will certainly be awarded Doctor's Degree *(Don't forget that the gradation of degrees in Russia is different, 'doctorate' is one degree higher than Ph.D (Doctor of Philosophy) in Britain, for example).*

L.: I see. Quite forgot it. And what roughly corresponds to Ph.D? Is it you degree of candidate?

P.: Yes, it is usually received after doing a post-graduate course of three years, passing special exams and submitting a thesis.

L.: You should have written two theses, then?

P.: Quite right, too. The subject of my first thesis was "Some Problems of Numerical Control". Then, for my doctorate, I submitted one more thesis.

L.: Dr. Platonov, who was your scientific adviser when you were working on your candidate dissertation?

P.: Professor, now Academician, Tomsky.

L.: Really? One of my colleagues worked under his guidance. He was a postgraduate student at the Russian Academy of Sciences.

P.: Then he must got a very thorough schooling.

8. You are accompanying Professor Platonov to the session. He introduces you to Professor Lopes. Tell him about your path in science:

What (institute, university, academy) did you graduate from?

I graduated from ...

What is your speciality? What are you specialized in?

My speciality is... I am specialized in ...

What scientific problems are you interested in?

I am interested in ...

When did you get interested in this problem?

I got interested in this problem two years ago.

You are taking a post-graduate course, aren't you?

Yes, I am, I am taking a post-graduate course now.

What kind of post-graduate are you: a full-time post graduate, a part-time post graduate, an applicant?

I am a full-time post graduate.

What is the subject (the theme) of your research?

The subject (the theme) of my research is...

What does the problem you are working on deal with?

The problem I am working on deals with ...

Has this problem been studied?

No, this problem hasn 't been studied yet.

What Master's degree examinations have you passed?

I have passed my Master's degree examination in Philosophy, in speciality

What mark did you get?

I got an excellent mark.

Who is your supervisor (scientific adviser)?

My supervisor is...

Did you participate in any conferences (in our country, abroad)?

I took part in ...

Have you published any abstracts and articles? Have you got published abstracts, articles ?

Two of my articles *are published in the academic periodical, and the abstracts will be published in the Proceedings of the Conference soon.*

Would you tell us about your research work?

When will you take your Master's degree examination in speciality?

I'll take my Master's degree examination in speciality next year.

When will you submit your theses to public hearing?

I'll submit my thesis to public hearing in a year...

What are you engaged in now? What is you task now?

My task now is to survey modern literature on the problem.

9. Read the following dialogues:

Dialogue 1

A: Let me introduce myself. I am Akatov, a full-time post-graduate from Moscow Physical Engineering Institute

B: Pleased to meet you. I'm D. Cooper, Master of Physics. How do you do? A: How do you do? I'm happy to see you here, in Moscow. I've read some of your articles. There is much interesting to discuss.

B: Certainly, there is. Would you like to meet tomorrow at five? A: Yes, that'd be nice. Thank you. Good-bye

Dialogue 2

A: As far as I know you are conducting experimental study, aren't you?

B: Quite so. I am testing the main installation (unit) new. But there is some problem with the most suitable technique. It is open to question.

A: As I know a usual routine is taking the reading (показания) of the apparatus, writing down the measurements, carrying out observations.

B: Right you are. But the data obtained didn't completely confirm (correlate with) our previous assumption (предсказания).

A: Then you'd better consult the adviser

B: I quite agree with you. I'll just meet him tomorrow, at 11 a.m.

Dialogue 3

A: How do you do, B.?

B: How do you do, A? I'd like to know what the main concern of your group is.

A: Microelectronics is our main concern. And what are you doing now?

B: We have a very interesting research programmer to fulfill. It's mainly concerned with introducing computer sciences achievements into production. We do it in collaboration with several research centers.

A: And, by the way, who is your scientific supervisor (adviser)?

B: Professor N. is

A: Oh, if I am not mistaken, he has got a large number of publications of late (за последнее время)

B: You are quite right. One of his papers was published in Japan

A: I wish you further success in your work

B: Thank you. The same to you. (I wish you the same)

Dialogue 4

A: What's the subject of your thesis?

B: Well, the problem I am working at is concerned with using electro physical fields. And what about you?

A: As for me, it is connected with membrane technology

B: Oh, there is much in common, I should say. And when are you going to complete your work and submit (present) your thesis to public hearing?
A: I hope, I'll do it in a year
B: But I haven't passed my Master's degree examination in speciality
A: You see. I'm busy with writing an essay now. I'll send it to one of the scientific periodicals
B: Good luck to you. Bye-bye
Dialogue 5
A: I've heard the Conference to be help on September 25-26 in Prague. Am I not mistaken?
B: Exactly so. I've got the first circular containing preliminary information on the conference. They ask to see the title and the abstracts of the paper to show your intention to participate in the conference
A: Oh, am I not late?
B: Not at all. After that you'll be informed of the acceptance of your paper. And you'll receive a registration form.
A: I'd like to know what official languages of the Conference are?
B: Well, they are English and Russian
A: I see. I'll try to deliver my paper in English, if it is accepted.
B: I believe you'll be a success.

1. Название статьи, автор, стиль.

The article I'm going to give a review of is taken from… - Статья, которую я сейчас хочу проанализировать из…
The headline of the article is - Заголовок статьи…
The author of the article is… - Автор статьи…
It is written by - Она написана …
The article under discussion is … - Статья, которую мне сейчас хочется обсудить, ….
The headline foreshadows… - Заголовок приоткрывает

2. Тема. Логические части.

The topic of the article is… - Тема статьи
The key issue of the article is… - Ключевым вопросом в статье является
The article under discussion is devoted to the problem… - Статью, которую мы обсуждаем, посвящена проблеме…
The author in the article touches upon the problem of… - В статье автор затрагивает проблему….
I'd like to make some remarks concerning… - Я бы хотел сделать несколько замечаний по поводу…
I'd like to mention briefly that… - Хотелось бы кратко отметить…

I’d like to comment on the problem of… - Я бы хотел прокомментировать проблему…
The article under discussion may be divided into several logically connected parts which are…- Статья может быть разделена на несколько логически взаимосвязанных частей, таких как…

3. Краткое содержание.

The author starts by telling the reader that - Автор начинает, рассказывая читателю, что
At the beginning of the story the author - В начале истории автор
describes - описывает
depicts - изображает
touches upon - затрагивает
explains - объясняет
introduces - знакомит
mentions - упоминает
recalls -вспоминает
makes a few critical remarks on - делает несколько критических замечаний о
The story begins (opens) with a (the)
description of - описанием
statement - заявлением
introduction of - представлением
the mention of - упоминанием
the analysis of a summary of - кратким анализом
the characterization of - характеристикой
(author’s) opinion of - мнением автора
author’s recollections of - воспоминанием автора
the enumeration of - перечнем
The scene is laid in … - Действие происходит в …
The opening scene shows (reveals) .. - Первая сцена показывает (раскрывает) …
We first see (meet) … (the name of a character) as … - Впервые мы встречаемся с (имя главного героя или героев)
In conclusion the author
dwells on - останавливается на
points out - указывает на то
generalizes - обобщает
reveals - показывает
exposes - показывает
accuses/blames -обвиняет
mocks at - издевается над
gives a summary of -дает обзор

4. Отношение автора к отдельным моментам.

The author gives full coverage to… - Автор дает полностью охватывает…

The author outlines… - Автор описывает

The article contains the following facts…./ describes in details… - Статья содержит следующие факты …. / подробно описывает

The author starts with the statement of the problem and then logically passes over to its possible solutions. - Автор начинает с постановки задачи, а затем логически переходит к ее возможным решениям.

The author asserts that… - Автор утверждает, что …

The author resorts to … to underline… - Автор прибегает к …, чтобы подчеркнуть …

Let me give an example… - Позвольте мне привести пример …

5. Вывод автора.

In conclusion the author says / makes it clear that…/ gives a warning that… - В заключение автор говорит / проясняет, что … / дает предупреждение, что …

At the end of the story the author sums it all up by saying … - В конце рассказа автор подводит итог всего этого, говоря …

The author concludes by saying that../ draws a conclusion that / comes to the conclusion that - В заключение автор говорит, что .. / делает вывод, что / приходит к выводу, что

6. Выразительные средства, используемые в статье.

To emphasize … the author uses… - Чтобы акцентировать внимание … автор использует

To underline … the author uses… Чтобы подчеркнуть … автор использует

To stress… - Усиливая

Balancing… - Балансируя

7. Ваш вывод.

Taking into consideration the fact that - Принимая во внимание тот факт, что

The message of the article is that /The main idea of the article is - Основная идея статьи (послание автора)

In addition… / Furthermore… - Кроме того

On the one hand…, but on the other hand… - С одной стороны …, но с другой стороны …

Back to our main topic… - Вернемся к нашей основной теме

To come back to what I was saying… - Чтобы вернуться к тому, что я говорил

In conclusion I'd like to… - В заключение я хотел бы …

From my point of view… - С моей точки зрения …

As far as I am able to judge… - Насколько я могу судить .

My own attitude to this article is… - Мое личное отношение к

I fully agree with / I don't agree with - Я полностью согласен с/ Я не согласен с

It is hard to predict the course of events in future, but there is some evidence of the improvement of this situation. - Трудно предсказать ход событий в будущем, но есть некоторые свидетельства улучшения.
I have found the article dull / important / interesting /of great value - Я нахожу статью скучной / важной/ интересной/ имеющую большое значение (ценность)

Text 1. Preparing research presentation

Presenting research results is a vital aspect of postgraduate work. It is an exciting time in a postgraduate student's degree program because it represents the culmination of many hours of hard work. The communication of research findings provides a valuable opportunity to inform others of a current investigation and it can lead to future speaking opportunities at conferences, grants for future research projects, school and business meetings and offer natural connections to new job opportunities.

Presenting academic material requires careful preparation and planning to effectively communicate to your audience. It is important to consider the diversity of expertise within a group of educators. Audiences will usually contain people who are experts in your subject area, others who have a general knowledge of the topic and the remainder who have basically little or no knowledge. How do you plan to effectively reach such a wide range of knowledge levels within one group? A popular communication strategy is to directly address the experts while integrating relevant and interesting illustrations and ideas into the presentation that make the results accessible to entire audience. It is a multidimensional speaking technique that demonstrates respect for those who attend your presentation. Some essential elements for research presentations are as follows.

Problem description and documentation. The problem statements should be presented in descriptive language that the audience can easily understand. The presentation should include several key studies from the literature review to provide solid support for the rationale for pursuing your research problem. There is a real temptation to share a host of studies but it tends to distract people who generally are more interested in understanding why an individual has undertaken a particular study.

Solution strategy. Presenting possible solutions to the problems under study is a vital part of the research process. It is important to present information in a concise manner. Therefore, stress three or four aspects that will help you keep your presentation focused and reduce potential resistance to your ideas.

Analysis of results (anticipated and otherwise). Interpretation of qualitative and quantitative data is always a very challenging task. Reviewing your results in light of the concepts of significance, generalizability, reliability and validity is recommended. The generalizability of a research project requires you to ask specific questions which examine the degree of broader applicability of your particular study.

Recommendations for change. As you prepare your presentation, take the time to consider the questions for those who might be skeptical of your findings, and share recommendations for changes. A research project may:

- address gaps in knowledge by investigating an area of research that fills a void in existing information;
- expand knowledge by extending research to new ideas and practices;
- replicate knowledge by testing old results with new participants or new research sites;
- add voices of individuals to knowledge, individuals whose perspectives have not been heard or whose views have been minimized in our society.

Solicitation of audience feedback. The audience can be a good resource for advice and feedback on your presentation and a forum to enhance professional knowledge and practices. Naturally, researchers are somewhat anxious about the personal risks involved having their project being scrutinized by others. Audience feedback can help individuals identify shortcomings or flaws in their research project which can be addressed in a future journal article or in future investigations. Dialogue over research results can provide the basis for a deeper understanding about current interpretations of educational practices and theories. Postgraduate students should be encouraged by the fact that their presentations will give others the opportunity to publicly affirm the positive elements and educational contributions of your work. The research project can be a good resource for sharing valuable knowledge with the academic community. It is wise to investigate potential speaking opportunities at your school, national and international conferences. Today's technology and educational conferences often provide websites with specific details about their expectations for papers. As you explore various speaking opportunities, it is a good time to examine publication of your research results in journals, magazines and newsletters (print and online).

Research presentations are excellent opportunities to demonstrate originality and inform others of valuable investigation findings. Contemporary educators appreciate quality work because it encourages improvement in educational practices and refinement of research skills [Muirhead, 2004].

1. Complete the following sentences with details from the Text.

1. Presenting research results provides valuable information for others, some speaking skills at conferences, and_____.
2. Audiences usually contain people who have a general knowledge of your subject area,______, and those who have little or no knowledge of the same.
3. It is recommended that you should review your research findings in terms of reliability, validity, and ______.
4. Audience feedback can help researchers identify ______shortcomings, and some risks to be involved.

5. It is important to study potential speaking opportunities at international and national conferences, and ______.

2. Underline the detail that is NOT mentioned in the Text in each of the sentences below.

1. The audience can be a good forum to enhance professional knowledge, practices, and experience.
2. Postgraduate students' presentations give others the opportunity to affirm the educational contributions, developments and positive elements of your research.
3. Research presentations are good opportunities to inform others of valuable investigation findings and demonstrate originality and novelty of your study.

3. Answer the following detail questions.

1. According to the Text, the presentation should include the literary review

    a. to do your research.

    b. to provide support for the audience.

    c. to support your research problem.

2. According to the Text, the information should be presented

    a. in full.

    b. to the point.

    c. in a wordy manner.

3. According to the Text, the generalizability of a research project requires you to ask specific questions which examine

    a. the use of research results.

    b. the significance of your research.

    c. the qualitative and quantitative data of your research.

4. According to the Text, the research project can be a good resource for sharing valuable knowledge with

    a. your school.

    b. international conferences.

    c. academia.

5. According to the Text, contemporary educators appreciate quality work because it improves

    a. research skills

    b. practices in education

    c. investigation findings.

UNIT 6
ABSTRACT AND SUMMARY

An abstract is a condensed version of a longer piece of writing that highlights the major points covered, concisely describes the content and scope of the writing, and reviews the contents of the writing in abbreviated form. People write abstracts when submitting articles to journals, applying for research grants, writing a proposal for a conference paper, completing a Ph.D./Master’s degree thesis or dissertation, etc.

1. Read the information about some specific features of writing an abstract for a research paper.

The key elements to be included in the abstract.

- Background: A simple opening sentence or two placing the work in context.
- Aims: One or two sentences giving the purpose of the work.
- Method (s): One or two sentences explaining what was (or will) be done.
- Results: One or two sentences indicating the mam findings (or what you hope to accomplish with the project).
- Conclusions: One sentence giving the most important consequence of the work - What do the results mean? How will they be used?

Words of advice:

1. For the first draft, don’t worry about length. Just try to cover all the important components that are required in the abstract. Use all the information that you highlighted and identified as you read through the article.
2. Take a word count before you begin to edit.
3. Begin editing by deleting words, phrases and sentences that are less important or provide more explanation than necessary.
4. Look for places where sentences can be combined to omit extra words or condense ideas.
5. Delete unnecessary background information.
6. Do not use jargon, abbreviations, direct quotes or citations.
7. Avoid writing in the first person (I). Rather than saying, “In this essay I discuss...”, try a more formal approach by starting your abstract with as opening similar to:
   - This paper discusses the effects of... .
   - This paper reports on ... .
   - Specifically, this paper investigates ....
   - This article examines how ....
   - The present paper attempts to answer the question ...
8. Write to the required word count. Abstracts are typically 150 to 250 words. If a 200 word abstract is required, get as close to the required number of words as possible.

2. Read some examples of abstracts.

a) Qualifying Urban Landscapes

Thomas Juel Clemmensen, Tom Nielsen *University of Oregon School of Architecture, USA*

Abstract

The article presents an attempt to develop alternatives to the dominant planning and design principles used in building and rebuilding the contemporary urban landscape. The basic idea is that the 'forces of modernization' driving current development might result in a broader and more interesting palette of places and spaces if supplementary principles of design and organization could be developed. The idea of formulating a normatively oriented theory for practice is based on an 'almost all right' approach but moves beyond the purely 'non-judgmental' attitude to contribute at a generic level to the task of constructing and improving things. With this goal, a set of objectives based in important insights from recent urban theory are formulated constituting the normative spine of the analysis of a number of found situations as basis for formulating eight generic concepts of qualification for contemporary urban landscape design practice.

b) Gothic Design

Michael Reeds University of London, UK

This paper discusses interior design during and after the Gothic revival of the late eighteenth century, noting that true Gothic architecture originally developed from the Romanesque style, emerging in the twelfth century. The paper examines some key pieces of architecture such as Notre Dame, the Abbey Church of St. Denis and the Cathedral of Sense and the paper contains images and pictures as illustrations. According to the paper, this style dominated until the beginning of the Renaissance in the fifteenth century. Gothic architecture is noted for its size and elaborate decoration. However, Gothic architecture is first defined in terms of a change in Romanesque church architecture when diagonal ribs were added to the groin-vault, as is first seen at the Abbey Church of St. Denis near Paris.

The Summary

The headline of the article I have read is "Kleinwort Wins Rosneft Price Tender". This article is written by Jeanne Whalen and it was published in "The Moscow Times" on the 3rd of March, 1998.

The aim of the article is to provide the reader some information on the tender for Rosneft which will take place in March. A tender is the privatization auction with many sellers and one buyer which can conduct the evaluation for the ware.

The author begins with telling the reader that German investment bank "Dresden Kleinwort Benson" has won the right to evaluate the worth of Rosneft before the company is sold in the privatization auction later this year. Sergei Perevizentsev, a spokesman for the Privatization Ministry said that Kleinwort Benson offered to conduct the evaluation for $ 650.000, underbidding its closest competitor by about $

1.000.000 in a tender decided on Saturday. This bank has worked as an adviser for Gaspromand helped arrange $3 billion syndicated loan and a $ 1.2 billion bridging loan for Rosneft and the bank will bid on Rosneft in alliance with Royal Dutch/Shell and LUKoil.

Alexandr Agibalov, an oil analyst with Russian brokerage Aton said that this company had a good reputation and to ruin it by giving some information for Gasprom was not in its interest. Then the author writes that there were many other companies competed in the tender, for example: “Robert Fleming Securities”, “Deutsche Morgan Grenfell”, “Analyze”, etc.

The author replies that Russia’s federal government didn’t want any auditor affiliated with a Rosneft bidder to conduct the valuation. In order to do it, the government chose to hire an independent auditor to value the worth of Rosneft and to recommend starting prices. The author reports that once the auditor determines Rosneft worth, it is up to the tender commission, consisting of seven people, to set up starting prices.

Then the author tells us that other bidders for Rosneft are an alliance between British Petroleum and Uneximbank’s Sidako, Yuksi, the oil company soon to be created in merger between Yukos and Sibneft. Agibalov said that the commission will set the prices higher, if the government sells 75-percent-plus-one-share of Rosneft. The author further says that the format of this tender is more desirable for bidders. He added if the government chooses to sell only 50-percent-plus-one-share of Rosneft, Gasprom and Uneximbank groups will be less interested in bidding because this scheme will not allow the winner to exercise full control over the company.

In conclusion I can say that I found this article very interesting and very important not only for me, but for everybody in Russia. This situation tells us that Russia is in an economic crisis now and the government wants to earn some money by selling Russian companies to foreign firms in order to stabilize our economy. I think that this approach is erroneous, but what is done cannot be undone.

My opinion is that the Russia’s government mustn’t sell out our companies to foreign bidders even though it hasn’t enough money. But the government must do something to make Russia’s economy and industry function, if it wants Russia to become the greatest and the wealthiest country in the world the way it was.

Scientific Attitudes

The methods and skills used by scientists are intimately connected to a set of attitudes common in the practice of science. A scientific attitude is a disposition to act in a certain way or a demonstration of feelings and/or thoughts. Studies of the actions of scientists have led to lists of scientific attitudes such as displayed below. Some attitudes such as honesty would be expected in any human endeavor, but other attitudes such as tolerance of uncertainty are more characteristic of scientists. Note that scientific attitudes are different from attitudes about/towards science. Also note the exercises available in the top of the left frame on this webpage.

Scientific Attitude	**Characteristics**
critical-mindedness	· looks for inconsistencies · consults a number of authorities · challenges the validity of statements
suspended judgment (restraint)	· recognizes the restrictions in generalizations and theories · generalizes only to the degree justified by available evidence
respect for evidence	· looks for evidence (empirical approach) to support or contradict statements · demands interpretations that fit the evidence · collects as much evidence as possible
honesty	· reports all evidence even when it contradicts hypothesis or expectations · acknowledges the work of others
objectivity	· considers all pros and cons · considers all evidence available · considers and evaluates statements by others
willingness to change opinions	· recognizes all hypotheses, generalizations and theories as being tentative · evaluates evidence which contradicts prediction · alters hypotheses when necessary to accommodate empirical evidence
open-mindedness	· considers several possible options when investigating a problem · considers and evaluates ideas presented by others
questioning attitude	· looks for inconsistencies · challenges the validity of unsupported statements · asks many questions starting with who, where, when and how
tolerance of uncertainty	· accepts that there is always some uncertainty · strives for greater and greater certainty

NEWSPAPER ABSTRACT

1. The title of the article is «Banks turning to the real sector».
2. The article is written by ...
3. The article is published in the newspaper «Moscow News», number 12, 1998.
4. The article deals with changes in the banking sector of Russia over the recent year.
5. It is pointed out that the net assets have increased in absolute terms from $74 to $ 110 billion.
6. But it's noted that the share of banking system in the national economy it still small about 25 percent of GDP, that is Gross Domestic Product.
7. It is stressed that the foreigner's share in the Russian banking system's aggregate capital is from 5.3 to 5.8 percent.
8. By world standards these figures are insignificant, so, for example, in Hungary the figure exceeds 50 percent.
9. Low share of foreigners in our bank's capital is explained by shortage of cash, non-payments, use of bills, notes, bonds instead of real money.
10. It should be noted that 1997 was characterized by a slower growth of lending institutions, so in 1996 there were 26 new lending institutions while in 1997 only 12 lending institutions were registered Oust 5 banks).
11. The consider instability in a government and corporate securities markets over the last five months is forcing the banks to reorient their policy and work with the real sector of economy.
12. The authors pay attention to the fact that banks cannot hope to get fast and high profits in the real sector of economy.
13. Thus, banks develop their lending activity in the real sector very slowly, because Russia's industry is in depression and most of industrial enterprises are insolvent.

1) The title of the article is Adaptive genetic variation in Scots pine (Pinus sylvestris L.) in Scotland.
2) It is published by the University of Edinburgh in 2011.
3) The author of the article in Matti J. Salmela.
4) The article deals with the ability of plants to adapt to local growing conditions.
5) The article is devoted to the studies of patterns of local adaptation.
6) The article stresses that the main motivation for these experiments was to find the best-growing seed sources for different sites.
7) It should be noted that experiments in long-lived trees are laborious, time-consuming, expensive and thus, normally established only for species of commercial importance.
8) The author pays special attention to the fact that transfer trials established for commercially important tree species such as Scots pine and lodge pole pine have in-

dicated that populations often grow best in their home environments and that transfers along environmental gradients influence survival and growth.
9) The author sums up, that the acquisition by plants of various adaptive traits depends on factors such as soil, moisture and temperature of the environment, the presence of pests or herbivores.
10) In conclusion, studies of patterns of local adaptation in plants have a long history due to the importance of many species in agriculture or forestry.

1. The title of the article is «Enterococci in foods a conundrum for food safety».
2. It is published in «International Journal of Food Microbiology», number 88, 2003.
3. The authors of the article are Charles Franz, Michael E. Stiles, Karl Heinz Schleifer and Wilhelm H. Holzapfel.
4. The article deals with the problem of enterococci, which are considerable members of the community in the intestines of many animals and opportunistic pathogens that cause millions of infections each year.
5. The article suggests that Enterococci are important in the environment, food and clinical microbiology. These bacteria can play an important beneficial role in the production of various fermented food products and can be used as probiotics.
6. The authors stress that opportunistic enterococci cause a number of questions on their safety for use in foods or as probiotics.
7. It should be noted that the probiotic bacterial strains must meet certain requirements.
8. The authors pay special attention to two important criteria: ability to survive in the gastrointestinal tract and an antagonistic effect against pathogenic bacteria.
13. Thus, the needs of studying the biological properties of strains of enterococci have antagonistic activity against pathogenic microorganisms, including determination of the presence of potential virulence factors, to establish a new basis for their probiotic preparations.

CLICHÉ
for making a summary of a newspaper article

1. The title of the article is... The article is headlined	Название статьи ...
2. It is published in «Moscow New» number... dated ...	Она опубликована в газете «Москоу Ньюс» номер ... от...
3.The article is written by ... The author of the article is ...	Статья написана ... Автор статьи ...
4.The article deals with ... The article is devoted to the anal-	В статье говорится о ... Статья посвящена анализу обстановки в ...

yses of the situation in ... - to the question (problem) of... - to the description of	 вопросу о... описанию...
5.The article (author) discusses... - expresses the view that... - concentrates on, focuses the reader's attention on... - highlights... - points out... - stresses that... - suggests that... - sums up, summarizes ... - (strongly) criticizes... - condemns - reveals - reviews - considers - comes out against... - comes out in support	В статье обсуждается ... (автор обсуждает) выражается точка зрения о .. концентрируется внимание на ... освещается... указывается на ... подчеркивается, что ... говорится, что ... подводится итог, суммируется... (остро) критикуется ... обсуждается ... вскрывается ... рассматривается ... дается обзор ... выступает против ... выступает в поддержку ...
6. It should be noted that	Следует отметить, что ...
7. The author pays special attention to the fact...	Автор обращает особое внимание на тот факт, что ...
8. To sum up ... In conclusion...	В заключение...

Texts and exercises

1. Read the text and find the answers to the following questions

a) What are invited and contributed papers?

b) What is the difference between an abstract and a summary of the presentation of the paper?

c) Do you have any papers published in a Diges?

Call for Contributed Papers

The conference will contain both invited and contributed papers. A number of contributed papers covering original unpublished work on the meeting subjects will be accepted for presentations. Each author will be expected to submit the following material on the paper supplied:

- A 50-word abstract of the paper for the meeting program;
- A summary of the presentation. This summary of up to four pages will be reproduced from the material submitted by the author.

Summaries of all accepted papers will be printed as submitted in a Digest of the meeting which will act in a lieu of a conference proceeding. The Digest is to be distributed at the Conference.

Completed abstracts and summaries must be received by the Organizing Committee by June 1, 2005.

Additional material for reading

Professional conference organizers see great hope in the use of computers to facilitate making contacts at conferences. This new technology can help both the young and the more established scientists find people with similar interests.

Conference participants reregister their specific areas of interest and indicate their preferences for meeting in small groups or on a one-to-one basis. Each participant can also indicate the times he or she is available. The computer then matches parties with the same interests and schedule contacts.

Conferences can be computerized by using a message processing system.
Groups of terminals could be set up at the conference site with assistance available to help participants use them. To retrieve your messages, you would simply type your name and registration number. All messages for you would either appear on the terminal's screen or be printed out. Simple messages like "You left your coat in my car" could be stored. But, more important, a graduate student could ask, for example, if anyone at the conference would like to discuss his or her thesis topic. Or you could ask a question on a particular speaker that you didn't have a chance to ask during the session. The speaker could answer the question some time later. You would find the answer when you interrogated the terminal the next day. This could help young scientists participate more fully since they are often reluctant to ask questions from the conference floor… In the meantime, young scientists should try to discard their assumptions that eminent people are unapproachable. In my experience, I have always found that leading scientists were willing to talk for at least a few minutes.

UNIT 7
RESEARCH METHODS

Text 1. Questions and hypotheses

Questions and hypotheses are testable explanations that are proposed before the methodology of a project is conducted, but after the researcher has had an opportunity to develop background knowledge (e.g., the literature review). Although research questions and hypotheses are different in their sentence structure and purpose, both seek to predict relationships. Deciding whether to use questions or hypothesis depends on facts such as the purpose of the study, the approach and design of the methodology, and the expected audience for the research proposal.

A research question proposes a relationship between two or more variables. Just as the title states, it is structured in form of a question. There are three types of research questions:

- A descriptive research question seeks to identify and describe some phenomenon.

For example: *What is the ethnic breakdown of patients seen in the emergency room for non-emergency conditions.*

- A differences research question asks if there are differences between groups on some phenomenon.

For example: *Do patients who receive massage experience more relief from sore muscle pain than patients who take a hot bath*?

- A relationship question asks if two or more phenomena are related in some systematic manner.

For example: *If one increases his level of physical exercise, does muscle mass also increase*?

A *hypothesis* represents a declarative statement, a sentence instead of a question, of the cause-effect relationship between two or more variables. Make a clear and careful distinction between the dependent and independent variables and be certain they are clear to the reader. *Be very consistent in your use of terms.* If appropriate, use the same pattern of wording and word order in all hypotheses.

While hypotheses come from the scientific method, to see how political scientists use hypotheses, imagine how you might use a hypothesis to develop a thesis for this paper: Suppose that we asked «How are presidential elections affected by economic conditions? » We could formulate this question into the following hypothesis: «When the national unemployment rate is greater than 7 percent at the time of the election, presidential incumbents are not reelected. »

Hypotheses can be created as four kinds of statements.

1. **Literary null -** a "no difference" form in terms of theoretical constructs.

*For example, "*There is no relationship between support services and academic persistence of nontraditional-aged college women" or "There is no difference in school achievement for high and low self-regulated students".

2. Operational null - a "no difference" form in terms of the operation required to test the hypothesis.

For example, "*There is no relationship between the number of hours nontraditional-aged college women use the student union and their persistence at college after their freshman year"* or *"There is no difference between the nr grade point averages achieved by students in the upper and lower quartiles of distribution of the Self-regulated Inventory".*

The operational null is the most used form for hypothesis-writing.

3. Literary alternative - a form that states the hypothesis you will accept the null hypothesis is rejected, stated in terms of theoretical constructs. In ot words, this is usually what you hope the results will show.

For example, "*The more that nontraditional-aged women use support semi the more they will persist academically"* or *"High self-regulated students achieve more in their classes than low self-regulated students."*

4. Operational alternative - Similar to the literary alternative except I the operations are specified.

For example, *"The more that nontraditional-aged college women use the student union, the more they will persist at the college after their freshman ye* or *"Students in the upper quartile of the Self-regulated Inventory distribution achieve significantly higher grade point averages than do students in the lo quartile."*

Regardless of which is selected, questions or hypotheses, this element of research proposal needs to be as specific as possible in whatever field of study you are investigating. It should be realistic and feasible, and be formulated with time and resource constraints in mind.

1. Before you read the Text "The Practice of Science", discuss these questions with your group mates or teacher.

1. What is scientific research?
2. What scientific methods do you know?
3. What are they characteristic of?
4. What does the choice of research methods depend on?
5. Are research methods interconnected?
6. How can scientific theories be strengthened?

Text 2

1. Read and translate Text

The practice of science

When some people think of science, they think of formulas and facts to memorize. Many of us probably studied for a test in a science class by memorizing the names of the four nucleotides in DNA (adenine, cytosine, guanine, and thymine) or by practicing with one of Newton's laws of motion, like $f = m\,a$ (force equals mass times acceleration). While this knowledge is an important part of science, it is not all of science. In addition to a body of knowledge that includes formulas and facts, science is a practice by which we pursue answers to questions that can be approached scientifically. This practice is referred to collectively as scientific research and while the techniques that scientists use to conduct research may differ between disciplines, the underlying principles and objectives are similar. Whether you are talking about biology, chemistry, geology, physics, or any other scientific field, the body of knowledge that is built through these disciplines is based on the collection of data that is then analyzed and interpreted in light of other research findings. How do we know about adenine, cytosine, guanine, and thymine? These were not revealed by chance, but through the work of many scientists collecting data, evaluating the results, and putting together a comprehensive theory that explained their observations.

Scientific research is a robust and dynamic practice that employs multiple methods towards investigating phenomena, including experimentation, description, comparison, and modeling. Though these methods are described separately here, many of these methods overlap or are used in combination. For example, when NASA scientists purposefully slammed a 370 kg spacecraft named ***Deep Impact*** into a passing comet in 2005, the study had some aspects of descriptive research and some aspects of experimental research. Many scientific investigations largely employ one method, but different methods may be combined in a single study, or a single study may have characteristics of more than one method. The choice of which research method to use is personal and depends on the experiences of the scientists conducting the research and the nature of the question they are seeking to address. Despite the overlap and interconnectedness of these research methods, it is useful to discuss them separately to understand their principal characteristics and the ways they can be used to investigate a question.

Experimentation. Experimental methods are used to investigate the relationship (s) between two or more variables when at least one of those variables can be intentionally controlled or manipulated. The resulting effect of that manipulation (often called a treatment) can then be measured on another variable or variables. The work of the French scientist Louis Pasteur is a classic example. Pasteur put soup broth in a series of flasks, some open to the atmosphere and others sealed. He then measured the effect that the flask type had on the appearance of microorganisms in the soup broth in an effort to study the source of those microorganisms.

Description. Description is used to gather data regarding natural phenomena and natural relationships and includes observations and measurements of behaviours. A classic example of a descriptive study is Copernicus's observations and sketches of the movement of planets in the sky in an effort to determine if the Earth or the Sun is the orbital center of those objects.

Comparison. Comparison is used to determine and quantify relationships between two or more variables by observing different groups that either by choice or circumstance is exposed to different treatments. Examples of comparative research are the studies that were initiated in the 1950s to investigate the relationship between cigarette smoking and lung cancer in which scientists compared individuals who had chosen to smoke of their own accord with non- smokers and correlated the decision to smoke (the treatment) with various health problems including lung cancer.

Modeling. Both physical and computer-based models are built to mimic natural systems and then used to conduct experiments or make observations. Weather forecasts are an example of scientific modeling that we see every day, where data collected on temperature, wind speed, and direction are used in combination with known physics of atmospheric circulation to predict the path of storms and other weather patterns.

These methods are interconnected and are often used in combination to folly understand complex phenomena. Modeling and experimentation are ways of simplifying systems towards understanding causality and future events. However, both rely on assumptions and knowledge of existing systems that can be provided by descriptive studies or other experiments. Description and comparison are used to understand existing systems and examine the application of experimental and modeling results in real-world systems. Results from descriptive and comparative studies are often used to confirm causal relationships identified by models and experiments. While some questions lend themselves to one or another strategy due to the scope or nature of the problem under investigation, most areas of scientific research employ all of these methods as a means of complementing one another towards clarifying a specific hypothesis, theory, or idea in science. Scientific theories are clarified and strengthened through the collection of data from more than one method that generate multiple lines of evidence. Take, for example, the various research methods used to investigate what came to be known as *the ozone hole* [Carpi, Egger, 2008].

1. Complete the following sentences with details from the Text.

1. Scientific knowledge includes facts, formulas, and ______.
2. The scientific methods are applied in______.
3. ______is the resulting effect of the manipulation of some variables.
4. A classic example of using descriptive methods is ______.
5. An example of using modeling methods is ______.
6. Experimental and modeling methods rely on _______ and_____ of existing systems.

2. Locate the following details in the Text. Give the line numbers.

1. In which lines does the author explain the structure of scientific knowledge?
2. Where in the Text does the author first mention different types of research methods?
3. At what point in the Text does the author discuss the example of overlapping some scientific methods?
4. Where in the Text does the author explain the use of descriptive and comparative methods in combination?

UNIT 8
THE USE OF COMPUTERS IN RESEARCH

1. Before you read Text "The Role of Computers in Research" discuss these questions with your group mates or teacher.

1. How have computers changed the world?
2. What do you know about the first computers?
3. What are modem computers like?
4. What can you say about such uses of computers as data storage and analysis, scientific simulations, instrumentation control, and sharing knowledge through the Internet?
5. What other computer applications in scientific research do you know?

2. Read and translate Text.

The role of computers in research

Computers play a major role today in every field of scientific research from genetic engineering to astrophysics research. This text is a brief overview of the role that computers have played in research and the ways in which they are helping unravel several scientific mysteries. While they are still far away from that supreme ideal of being able to think for themselves as artificially intelligent machines the brute force of their ability to calculate and process information at phenomenal speeds powers research in every field of human endeavor. In fact, computers have changed the way in which information, or more precisely, knowledge is disseminated around the world.

The first computers developed were mere calculators, with the ability to carry out simple arithmetic operations. Advancement in electronics, the development of the vacuum tube-based transistors and the devising of digital logic gates led to the development of the first digital computer which could perform more advanced logical operations.

These early machines took up whole multistory buildings and were operated through punch cards. All this changed after the development of semiconductor-based transistors which led to the extreme miniaturization of integrated circuits, which made the development of the first personal computers possible.

Since then, computer technology has advanced by leaps and bounds to bring extreme computing power into the hands of the common man. Today computers are ubiquitous, with applications in every field of human endeavor. To no field have computers contributed as much as scientific research. From predicting weather to running astrophysical simulations, computers are the scientist's prime analytical tool in unraveling the mysteries of nature.

It is truly impossible to capture the whole range of computer applications in scientific research. Here is a bird's-eye view of the role of computers in scientific research, where four of their most important applications are discussed.

Data storage and analysis. Experimentation is the cornerstone of scientific research. Every experiment in any of the natural sciences generates a lot of data which need to be stored and analyzed to derive important conclusions, to validate or disprove hypotheses. Computers attached with experimental apparatuses directly record data as they are generated and subject them to analysis through specially designed software. Analyzing tons of statistical data is made possible using specially designed algorithms that are implemented by computers. This makes the extremely time-consuming job of data analysis to be a matter of a few minutes. In genetic engineering, computers have made the sequencing of the entire human genome possible. Data from different sources can be stored and accessed via computer networks set up in research labs, which makes collaboration simpler.

Scientific simulations. One of the prime uses of computers in pure science and engineering projects is the running of simulations. A simulation is a mathematical modeling of a problem and a virtual study of its possible solutions. Problems which do not yield themselves to experimentation can be studied through simulations carried out on computers. For example, astrophysicists carry out structure formation simulations, which are aimed at studying how large-scale structures like galaxies are formed. Space missions to the Moon, satellite launches and interplanetary missions are first simulated on computers to determine the best path that can be taken by the launch vehicle and spacecraft to reach its destination safely.

Instrumentation control. Most advanced scientific instruments come with their own on-board computer, which can be programmed to execute various functions. For example, the Hubble Space Craft has its own onboard computer system which is remotely programmed to probe the deep space. Instrumentation control is one of the most important applications of computers.

Knowledge sharing through the Internet. Lastly, in the form of the Internet, computers have provided an entirely new way to share knowledge. Today, anyone can access the latest research papers that are made available for free on websites like *ArXiv.org*. The sharing of knowledge and collaboration through the Internet has made international cooperation on scientific projects possible.

Through various kinds of analytical software programs, computers are contributing to scientific research in every discipline, ranging from biology to astrophysics, discovering new patterns and providing novel insights. When computers are granted with the ability to learn and think for themselves, future advances in technology and research will be even more rapid. If we survive human strife and manage not to self-destruct our civilization, future is going to be an exciting time.

3. Complete the following sentences with details from the Text.

1. Computers play an important part in the dissemination of _____and knowledge.

2. The first computers were operated through______ .

3. The data obtained from experiments need ______ and ______ .

4. One of the main applications of computers is______.

5. Computers are contributing to __________ in every discipline.

4. Locate the following details in the Text. Give the line numbers.

1. In which lines does the author discuss the subject of this text?

2. Where in the Text does the author first mention different computer applications?

3. At what points in the Text does the author explain the use of computers in genetic engineering and astrophysics?

4. Where in the Text does the author discuss the use of instruments in research?

5. Underline the detail that is NOT mentioned in the Text in each of the sentences below.

1. Advancement in electronics, logical operations, and the development of the vacuum tube based transistors led to the development of the first digital computer.

2. Data from different sources can be analyzed, accessed, stored and implemented by using computer networks.

3. The sharing of knowledge, collaboration, and new ideas via the Internet has made international cooperation possible.

6. Answer the following detail questions.

1. According to the Text, computers are the scientists' main analytical tool in

a) using integrated circuits.

b) developing punch cards.

c) contributing to scientific research.

2. According to the Text, experiments are the cornerstone in scientific research because they

a) store a lot of information.

b) produce a lot of data.

c) validate or disapprove hypotheses.

3. According to the Text, how can the problems which do not yield themselves to experiments be solved?

a) through mathematical modelling

b) through engineering projects

c) through designing algorithms

4. According to the Text, what can websites like *ArXiv.org* provide?

a) a new way to share knowledge

b) an access to research articles

c) collaboration through the Internet

5. According to the Text, future progress in research will be more rapid due to

a) different types of analytical software programs.

b) technology development.

c) artificial intelligence advances.

How to use a computer for research

As technology continues to advance, increasing numbers of tasks will be done by computer. An example is in the area of research. Computer research has its flaws, but by learning how to do it properly, you will be able to get information efficiently.

Instructions.

1. Choose a computer with high-speed Internet service. A broadband connection will allow you to surf the web faster and get more research done. Go to a library if you do not have a high-speed connection at home.

2. Take notes right on the computer. Open a blank document, using Microsoft Word for instance, and type your notes rather than hand-write them, which can be faster and more legible. You can also copy and paste text from a site right into your notes to save time and ensure accuracy.

3. Look at the Internet sources with a critical eye. Although the web offers a vast amount of useful knowledge, it also contains a lot of inaccurate, biased material. The majority of your research should be from credible sources and professional texts. The Internet sources that link back to a text are sometimes more credible.

4. Save your documents often. Press the "Ctrl" key and the "S" key simultaneously to save documents and prevent losing data due to a computer crash or error.

5. Do not get distracted. Close all social networking sites and instant messaging programs, as it is easy to lose focus while on the computer. By doing this, you may be able to research more efficiently.

As computers become more sophisticated, researchers have more tools at their disposal to conduct their research.

Solving Mathematical Equations. Scientific research often requires that complex mathematical equations be solved in order to determine if data is valid or if a certain structure of molecules will remain stable. Computers are integral to this calculation process since scientists can write software programs specifically to provide answers to such questions. This removes the element of human error, which can cost research institutions millions of dollars in fixing a product that was created with even the smallest amount of flawed data.

Database Technology. Computing has advanced the way researchers conduct literature searches, the initial process of finding existing research on the investigator's subject. Instead of thumbing through bound texts in a library, databases allow researchers to quickly locate articles about their research from multiple disciplines from anywhere they can access the Internet.

Library Research. Most sizable library systems now have their information online. Rather than using the card catalog to locate a specific book, library patrons can now find and reserve books via a computer account linked to their library card. Libraries also offer links to specific research sites that patrons may not otherwise be aware of. Access to dictionaries, encyclopedias and other research aids are also options via library websites that have reduced the need to travel to the library in search of a particular piece of information.

Climate Models. Climate scientists use computers to create complex models of the earth's environment, helping to predict both short term weather and long term climate trends. By inputting historical data and extrapolating future trends, scientists can predict the climate for both the short and long term.

Product Testing. Determining the toxicity of products can be difficult, but computers can make it easier. Scientists have built computer models that mimic the body's reaction to pharmaceutical drugs and environmental toxins, streamlining the approval of lifesaving drugs and helping to assess environmental damage.

Looking at the Stars. Astronomers have been using computer technology for many years to look at the heavens and explore the world around us. Astronomers feed raw data into large supercomputers and use those data to determine the position of stars and even check the atmospheric composition of faraway planets.

Modeling Human Behaviour. Social scientists also make use of computer technology. This computer technology is used to model the behaviour of large groups of people, helping scientists understand why people behave the way they do.

Computers are used for many different reasons and are very valuable in many aspects of research. Whether you are using CD ROM programs, the Internet or your own statistics, computers can be crucial when you want to start or finish a research program**.**

7. Complete the sentences choosing the best variant corresponding to the contents of the text.

1. You should use the Internet resources critically because they..

a) contain a vast amount of useful knowledge.

b) may have a lot of inaccurate information.

c) are credible.

2. Computers are used for solving mathematical equations as ...

a) they can do it very fast.

b) they remove some human mistakes.

c) some software programs are written by scientists.

3. Computer database allow researchers ...

a) to access the Internet.

b) to thumb through texts in a library.

c) to find any information they need.
4. Most big libraries have ...
a) their websites and information online.
b) a card catalog online.
c) no links to research sites.
5. Astronomers use computers ...
a) to create complex models of the earth's environment.
b) to model behaviour of large groups of people.
c) to explore stars and planets.

SUPPLEMENTARY READING

ELECTRICAL ENGINEERING

Text 1. DEFINITE PURPOSE MOTORS FOR HIGH PERFORMANCE DRIVES

by M.J. Melfi, R.T. Hart

General Considerations

The first task is to design a basic motor configuration which is matched to the general needs of adjustable frequency power and variable speed operation. Second, the design must be adaptable to match the specific needs of many different drive applications. Third, by relaxing inappropriate constraints associated with fixed frequency, fixed voltage, fixed speed applications the design can be tailored to meet the performance objectives by making typical design tradeoffs. Also, when the controller design is known, more subtle techniques which include the controller can be used. An example is the use of a lower than usual voltage at the low speed end of a region of constant horsepower, so that the flux level (hence, peak load capability) at the highest speeds can be maximized to produce sufficient torque without having to oversize the motor. Of course, this must be weighed against the increased current required of the controller at the low speed.

There are many design compromises that can be made within the motor to provide optimum performance for a given application. The following paragraphs will discuss issues that are commonly raised in discussions of variable frequency applications.

Starting Characteristics

Since adjustable frequency controllers typically accelerate a motor and load by slewing the motor voltage and frequency in such a way as to remain in a region of operation above "breakdown RPM", the usual constraints of fixed voltage, fixed frequency starting and acceleration do not apply. Starting torque and current are no longer functions of the 1.0 per unit slip characteristics of the motor but are limited by the overload capability of the control. Thus, the controller can be matched to the motor in such a manner as to produce the appropriate starting torque based on a torque/amp ratio equal to that under full load conditions. By evaluating the drive as a motor and control “package”, the motor designer can take advantage of this to enhance the level of starting torque as well as overload torque per amp.

Peak Currents

In addition to the RMS current level, an important rating point for a transistor (typically used in adjustable frequency controllers) is the peak current capability. The high frequency transient current which results from the electronic switching of the control output voltage is inversely proportional to the leakage inductance of the motor. The leakage inductances can be increased by altering the design of the windings and the magnetic cores in the motor. The use of an electromagnetic design specifically for adjustable frequency power can significantly reduce the peak current required for a given level of power output. This will not only improve the reliability of the drive, but often can prevent costly over sizing of the AC controller and provide the most cost effective solution.

Motor Heating

One of the more obvious sources of increased stress on an induction motor insulation system is higher operating temperature when run on variable frequency controllers. The higher operating temperatures are the result of increased motor losses and often reduced heat transfer as well. As a result, many standard efficient, fixed frequency design motors will not achieve their nameplate rating when operated on an adjustable frequency control at 60 Hz while remaining within temperature limits. While these elevated temperatures may not lead to an immediate insulation failure they will result in a significantly shorter life. In most modem insulation systems, a 10 degree Celsius increase in operating temperature will result in a 50% reduction in expected life. This is one of the reasons why “High Efficient” designs, which have inherently greater thermal reserves, are often recommended for operation on adjustable frequency controls.

When an induction motor is run with voltage and current waveforms, the deviation from the ideal sinusodial waveshapes create additional losses without contributing to steady state torque production. The higher frequency components in the voltage waveform do not increase the fundamental air gap flux rotating at synchronous speed. They do, however, create secondary “hysteresis loops” in the magnetic steel, which along with high frequency eddy currents produce additional core losses and raise the effective saturation level in the lamination material. As another consequence of these higher frequency flux variations there are higher frequency currents induced in the rotor bars which generate additional losses. Appropriate electromagnetic design, including rotor bar shape can minimize these added losses.

Motor Cooling

As has been well documented in the literature, when AC motors are run across a wide speed range their heat transfer effectiveness will vary a great deal. Cooling fans whose rotation is directly supplied by the motor are subject to high windage losses and noise at high speeds. Modern AC controllers are capable of operating across a very wide frequency range, often up to several hundred hertz. While this provides great flexibility in the control, it places the motor cooling fan well above its fixed frequency design operating point which often leads to inefficient air flow and objectionable noise. In low speed operation the fan's effectiveness falls off with the motor's speed. In variable torque applications this reduction in cooling air often stays in balance with the reduction in motor losses as the load is reduced with speed. However, in constant torque applications the motor's temperature limits will likely be exceeded. An independently powered blower can provide an essentially constant heat transfer rate. Although not a standard fixed frequency motor feature, depending on the load/speed profile required by the application, this can be a very effective choice and is often specified for high performance applications.

In addition to fan speed, the operating temperature of the motor is determined by how effectively the heat generated in the motor can be conducted to surfaces which are in contact with the cooling medium (generally air) and the ability to transfer this heat via convection to the cooling medium. In a conventional totally enclosed fan cooled motor the heat must be transferred from the laminated steel stator core to the cast iron frame and finally to the air. Since the fan is located opposite the drive end of the motor, there is generally greater air flow and heat transfer at one end of the motor than the other. Square laminated frame AC motors have been offered by a variety of manufacturers as a method to improve heat transfer. The laminated frame design eliminates the stator-to-frame interface and provides a more direct and effective heat transfer path to the cooling air while integral cooling ducts trap the air in contact with the frame along the motor's length. This laminated frame construction has been common in variable speed DC motors for over twenty years.

Noise

Operation of standard industrial AC induction motors on adjustable frequency power over a speed range often results in unacceptable sound power levels as well as an annoying tonal quality. While the actual sound power level has proven to be unpredictable due to the large number of possible motor and controller designs, the increase in sound level is typically in the range of 7 to 10 db. There has been some success in reducing these sound levels by pushing the variable frequency controller's carrier frequency above the motor structure natural frequency spectral band. However, there are also motor design considerations which will improve sound levels.

One source of acoustic noise is the air noise caused by running shaft driven fans above their design speed to achieve a wider speed range. A separately powered, unidirectional, constant speed cooling fan will provide a consistent level of air noise independent of motor speed and eliminates annoying sound level changes as the motor accelerates and decelerates.

A second source is the magnetic noise from flux harmonics which are driving the magnetic core steel into a saturated condition. A well planned design will use lower than nominal flux levels with particular emphasis on avoiding localized regions of higher flux density or “pinch points”. Air gap length and rotor slot bridge thickness, which reduce saturation in localized areas are two contributing areas where additional reductions in sound power level can be achieved.

Conclusions

Providing high performance variable speed drives for maximum process productivity has always required complex engineering considerations. A rapid improvement in AC control technology, combined with the ready availability of standard fixed frequency AC motors has increased the number of possible solutions. However, a component approach will not lead to an optimal solution in many cases. In order to utilize the present (and next) generation of adjustable frequency controllers to meet application needs equal to or better than DC motors have in the past, a definite purpose AC motor is required. A square laminated-frame configuration with integral feet on the end brackets and adaptable electromagnetic designs is one approach that meets this objective.

MATERIALS ENGINEERING

Text 2. MANUFACTURING SOLUTIONS FOR CONCRETE PERFORMANCE

by L. Hills, F. Tang

Introduction

Concrete producers expect cement to remain versatile, maintaining a consistent and predictable performance with all types of concrete mixes. Concrete workability problems can be costly and affect concrete producers and users alike. Stiffening properties can arise from false setting or from stiffening due to aluminate control problems (also known as flash setting). Sulfate and aluminate characteristics are often the key to understanding the cause of these stiffening properties.

Premature stiffening of a mix can also result from incompatibility among concrete components. The addition of fly ash will be discussed briefly in this paper, since fly ashes containing high amounts of aluminate or alkalies can affect the proper sulfate balance. Chemical admixtures can also disrupt control of the early aluminate hydration by the sulfates, but this topic is too broad to be covered in this paper. It should be remembered, however, that many cement parameters can play a role in such incompatibility, including grain size (clinker mineralogy) and amount of C_3A; the content, chemical form and fineness of sulfate bearing phases; alkali and free lime contents; fineness and pre-hydration of cement.

Hydration reactions and concrete properties

Sulfate is added to cement to control aluminate hydration and to enhance C_3S hydration, promoting improved strength development. The amount, form, and fineness of sulfate dictate its solubility and therefore its effect on aluminate hydration. This interaction between the sulfate and clinker phases is important to understand, as it influences concrete properties, such as workability, strength, setting time, drying/shrinkage, and expansion. The total $S0_3$ content is a common QA/QC factor used at the cement plant. While that value provides some information, it does not reveal the entire picture of the available sulfate. The examples here are only a few situations that can affect how much sulfate is needed and what is available.

What is ideal sulfate?

Optimum sulfate can be discussed in terms of both strength development and setting properties. The amount of sulfate in solution needed to achieve the desired early hydration reactions in a cement paste depends on the properties of the clinker and cement (aluminate content and size, alkali aluminate content, particle size distribution), and the properties of sulfate (amount, form, particle size) present in the cement. In a concrete mix, chemical and mineral admixtures play a role in the reactions. The cement sulfate requirement for use in field concrete when admixture is used may be higher than for ASTM paste tests, often by 0.5 - 1.0% $S0_3$. In order to determine the "ideal" sulfate conditions or analyze setting problems, diagnosing the reactions of a particular cement or cement/admixture combination is critical.

Diagnosis of reactions

There are several helpful tests to determine what is going on in the cement itself, and in the resulting paste:

- Thermal Analysis can be used to quantify the amount of gypsum and plaster in the cement. Methods include Differential Scanning Calorimeter (DSC), Thermo gravimetric Analysis (TGA), and Differential Thermal Analysis (DTA).
- Particle size analysis combined with chemical extractions can determine the fineness of the gypsum particles. Microscopic techniques can also be used to identify large gypsum particles.
- The Conduction Calorimeter measures heat produced by a sample versus time; cement hydration reactions can be monitored starting upon introduction of water through a period of several days.
- Mini-slump cone tests performed on cement pastes determine early stiffening properties. Paste is prepared in a high shear blender using mixing speeds that closely simulate conditions during concrete mixing. The paste is consolidated into a mini-

slump cone, and at 2 min the cone is lifted to allow the paste to slump. The remaining paste is further mixed, after which 5-, 15-, 30-, and 45-min tests are carried out. The workability, or flow property, of the cement paste is demonstrated in the size of the pat formed after slumping, i.e. the larger the area of pat, the more workable is the paste. Pat size at 5-min and 15-min tests, which are taken after the paste is remixed, has been shown to correlate better with flash or false set in the field compared to current ASTM methods (larger pat size after remixing indicates false set; smaller size indicates flash set).

Optimization of sulfate

Establishing the reactions for a particular cement or concrete mix using the above tests will help identify where improvements to optimize sulfate can be made. Plant personnel are best able to determine the appropriate action from there. Here are some examples:

- If the ratio of gypsum to plaster is too low, the most feasible alternative at the plant is to decrease the mill temperature and thus minimize the formation of plaster. Another option is to use water spray to cool the mill and increase mill relative humidity. Increasing the ease of clinker grinding should decrease retention time and prevent excess gypsum dehydration. Another alternative may be the substitution of some of the gypsum with natural anhydrite.
- Cases of insufficient soluble sulfate may require several improvements. The total sulfate content may need to be increased, and/or the solubility of the sulfate present adjusted. Some plants using anhydrite as part of the gypsum source may need to minimise its addition due to its slow dissolution rate, and increase the amount of more soluble sulfate, such as plaster.
- In the case of coarse gypsum particles, a new source of softer- grinding gypsum may be needed. Or, if clinker is pre-ground before the finish mill, a method of pre-grinding the gypsum should help prevent gypsum particles from being too coarsely ground in the final product. Pre-grinding gypsum may be especially useful for plants operating finish mills equipped with high efficiency separators.

Conclusion

This paper has described some important considerations when it comes to sulfate. Specifics of sulfate additions may sometimes be overlooked, but the resulting stiffening properties of the cement usually are not. Total sulfate is a common measurement at the cement plant lab; however, it does not provide a complete picture of available sulfate. The balance of sulfate form and amount, with respect to reactive aluminate components in the cement and other materials, is an important relationship. Essential components of this relationship include: sulfate content, sulfate form, sulfate particle size, grain size and amount of clinker aluminate phase, and cement (and other cementations material) alkali content. In concrete mixes with fly ash, the amount of C_3A, or alkalies can affect the balance. Aside from rheological properties, conditions for controlling early stiffening are also linked to other performance characteristics, such as strength and durability, as have already been noted.

Flash set and poor strength development can result from insufficient sulfate, whether due to a cement with a low ratio of sulfate to aluminate content, a concrete mix with high C_3A fly ash, or poor distribution of sulfate ions from large gypsum particles. Without sufficient sulfate ions in solution to control aluminate hydration, voluminous hexagonal aluminate hydrates will form, resulting in flash set and poor strength development.

False set can result from too much sulfate in the form of plaster. Since plaster goes into solution more quickly than gypsum, many calcium and sulfate ions are available to control aluminate reactions, therefore less C_3A is reacted; the plaster will form crystals of secondary tabular gypsum particles, which interlock and cause false setting. False set is generally less of a problem than flash setting, as it can be overcome by continuing to mix concrete through the stiffening phase for a proper length of time. If a short mix cycle is used in the field and this setting problem occurs, water is often added to the concrete to attempt improve the workability; however, this "remedy" may reduce concrete strength and durability. Identifying the sulfate properties is a first step in preventing or resolving stiffening issues. Once the cause of cement behaviour is determined, proper manufacturing solutions can be implemented. Solutions involve finish mill temperature or humidity, type and grindability of sulfate added, and even clinker grindability.

MECHANICAL ENGINEERING

Text 3. PLASTIC GEAR PAY-OFF: ELIMINATING NOISE, WEIGHT AND WEAR PROVES VALUABLE IN 2012

by M. Jaster

The only plastic gear applications mentioned in Darle Dudley's *Handbook of Practical Gear Design* - originally published in 1954 - involved items like toy trains, film projectors and cash registers. Thanks to energy efficient manufacturing as well as a desire to cut down on costs, the plastic gear has significantly evolved. Opportunities readily available to plastic gear manufacturers today include automotive, business and printing machines, lawn and garden equipment and medical applications - and business is booming. "I can't speak about other segments of gear manufacturing, but plastic molded gears still seem to be the focus in the industry for improved performance and cost savings," says Rod Kleiss, president of Kleiss Gears, Inc., located in Grantsburg, Wisconsin. "We are stretched to keep up with demand." Andrew Ulrich from Thermotech, located in Hopkins, Minnesota adds, "Though we are not acutely aware of how the machined gear market is doing, we can say the molded gear market is strong and growing." "Especially from a custom gear/gear tooth perspective," adds Bruce A. Billmeyer, president/owner, Plastic Power Drive Products, LLC, located in Elk Grove Village, Illinois. "Although a portion of the U.S. molded gear market does come from foreign sources, the innovation still resides here in the United States. This innovation comes in the form of materials, gear combinations with other components and gear assembly techniques."

ABA-PGT, Inc. specializes in both external and internal spur and helical plastic gears in addition to worm, face and bevel. Glenn Ellis, senior gear engineer, ABA-PGT, says, "Plastic gears have a place in the industry just as metal gears do. They both have their own marketplace, this being size, strength, weight and even the quantity required."

There's always a push for reducing cost and weight and that continues to increase the interest in plastic gearing, according to David Sheridan, senior design engineer at Ticona. "Certainly lately, with all the bells and whistles added to automobiles outside of the drive train, we're seeing huge gains in automotive applications. Many plastic gear applications were once found only in luxury car models, but these features are now being integrated into standard models as well." "We're not back to pre-recession numbers but business is good," adds John Winzeler, president of Winzeler Gear in Harwood Heights, Illinois. "Today there are more opportunities for plastic gears, especially where both sound and cost reduction are a factor. More and more, we're getting interest in transmitting power, not just motion."

A Tale of Two Segments

Plastic gears can be cut like their metal counterparts and machined for high precision with close tolerances. Plastic cut gears can also be utilized for the development of prototypes. Injection molded plastic gears are fast, economical and can cost significantly less than machined, stamped or powder metal gears. When determining which type to consider for a specific application, costs, quantity, quality and performance must be considered.

"Historically, molded gear advantages have been considered to be lightweight, quiet, resistant to corrosion, and may be used without external lubrication. While they held these properties, plastic gears were also considered to be less accurate and flimsy. There has been significant progress on many fronts to address these disadvantages," Ulrich at Thermotech says. "First, considerable work developing engineering materials and the understanding of the mechanical properties of these materials has been completed. Secondly, computer programs have been developed along with routine tooth proportion management to leverage the ability to build molds without restriction to standard steel gear manufacturing tooling." Kleiss adds, "Cut plastic gears can replace metal with plastic. This can be a solution to a specific problem if materials replacement is the answer. Molded plastic gears offer a few more opportunities. The gear design can be easily optimized for the specific application. We use a method we call shape forming to fit the needs of the transmission. The molded solution offers unique part characteristics outside of the gear itself that would be difficult - if not impossible - to build into in cut gears."

"High production is much easier on molded gears, which leads to a lower price point. With a quality mold, the repeatability is very high," Ellis says. "Once the mold has been qualified, the future production runs should not have much variation. The potential quality of a cut gear is still higher than the molded gear. One of the things a designer must know is what quality is required for their application. Why request and pay for a quality higher than needed?"

In the end, both methods have advantages and disadvantages and it's up to the customer to determine what plastic gear solution will best fit their specific application.

Overcoming the Limitations of Plastic

The limitations in plastic gearing remain fairly straightforward. "Quite simply, plastic gears are weaker than metal. They can't operate at the same high temperatures. The most precise plastic gear will not be as accurate as the most precise metal gear, unless we start talking about micro-gears, which can be much smaller and more accurate than their cut metal counterparts," Kleiss says. "I think a bright spot for plastics is PEEK (polyetheretherketone), and its derivatives are promising much improved performance at high temperatures and high loads. New compositions of nylons are hitting the market now with improved properties. I expect even further material improvements in the coming years."

"The biggest limitation is strength, especially for higher RPM and horsepower requirements," adds Billmeyer. "The future does hold some intriguing solutions with metal plastic hybrids, or over-molded metal frameworks. Some of the new high-temperature combination plastics such as nylon with phenylpolysulfone look promising."

Load capacity at temperature, is the most significant limitation according to Sheridan. "The automotive transmission is all metal for obvious reasons. There needs to be more done in the future to challenge life expectancy and critical failures. Most plastic gears don't run continuously, but I believe new materials will become available in the future that will address strength, wear and friction modifications."

Plastic Gear Lubrication

How has the lubrication evolved in plastic gearing? Plastic gear manufacturers believe that many factors affect the compatibility between lubricants and plastics.

"Plastic gears can be internally lubricated. Anything from silicone to Teflon can be molded into the material for self-lubrication. Most engineering plastics are inherently low friction. Unfilled nylon is a particularly good example. In addition, external lubricants can be used to good effect in specific applications," Kleiss says.

"Some plastics do not require any lubrication because they are internally lubricated. However even some of these will work better if a break-in grease is used. Some other plastics work best if they are well greased," Ellis says. "Caution must be taken as some plastic will react with certain lubricants."

"External lubrication does not have to be a challenge. Start with the basic soap-based products and escalate from there. Care must be taken to ensure all of the ingredients in the lube are compatible with the molding material," Ulrich at Thermotech says.

Spreading the Plastic Gospel

The AGMA Plastic Gearing Committee evaluates materials, design, rating, manufacturing, inspection and application of molded or cut- tooth plastics gearing. They recently conducted a meeting in Michigan to discuss the test methods for plastic gears, the inspection of molded plastic gears and the identification of plastic gear failures.

"AGMA's Plastics Gear Committee works on various documents to assist design engineers with the unique aspects of the design, manufacture and metrology of plastic gears. With the release of these documents, designers and manufacturers will have more uniform knowledge and understanding for the application of plastic materials into the gear industry," McNamara at Thermotech says.

"I am not aware of any real focused effort on the part of AGMA to understand or further develop the potential for molded gears or for truly bracketing the molded accuracy of a plastic gear," Kleiss adds. "This would require a different kind of inspection analysis than has proved successful for cut metal gears. We use our own internal software for everything, from the design to the Inspection and testing of molded gears and their transmissions. Perhaps there are other ways to promote technological solutions in plastics. Education is one area that has proven successful for Winzeler Gear.

"Our Ultra-Light Urban Vehicle project, in cooperation with Bradley University, continues to evolve," Winzeler says. "This project has given us knowledge of power transmission in small vehicles and allows us the opportunity to present the benefits of plastic gearing from a weight, friction reduction and sound quality perspective. The project continues to grow, as well as the interest from transmission manufacturers."

If meetings and educational collaborations can't get the job done, Sheridan at Ticona turns to the tried and true initiatives of other areas of gear manufacturing. "Gear Expo is always a great venue to start discussions on the latest in plastic gear technology. We also hold in house training sessions as well as webinars to provide as much assistance as we can to our customers now and in the future."

An Alternative to the Alternative

For several issues of this magazine, *Gear Technology* has considered plastics to be an alternative form of gear manufacturing along with powder metals and forging. Can the argument be made that plastics are no longer on the outside of gear manufacturing looking in?

"It is actually becoming the other way around these days," Kleiss says. "Metal is considered as a possible alternative manufacturing method, but only if every possible solution in plastic has been rejected. We promote performance as the key goal. Performance is cost-effective. Cost-effective means dollars saved and a better product."

"Molded plastic gearing has considerable potential still. With new molding materials continuously entering the market, coupled with the ability to design and build highly accurate mold tooling and injection molding machines capable of producing and maintaining a consistent process shot after shot, injection molded gears are replacing machined gears at a higher rate than ever before. It still remains the most economical method of producing high volumes of gears," Ulrich says.

"We are continually trying to research and develop higher temperature materials that behave more like conventional gear materials," Winzeler says. "The challenge is that we see very little R&D activity outside of advanced product design. Most R&D has a timetable and there's no extra time to experiment. Metal gears have had years of knowledge and once plastic gearing can attain the same levels of research and development, more and more plastic applications will become available to us." [Gear Technology, March/April 2012]

POWER ENGINEERING

Text 4. STEAM TURBINE REHABS DELIVER GREATER OUTPUT AND LONGER LIFE

by R. Ray

A large chunk of America's coal-fired power plants will be phased out in favor of cleaner-burning gas-fired generation. The transition to gas is being driven by low gas prices, stricter emission standards and a tough economy. But the vast majority of U.S. coal-fired generation will survive as power producers spend billions to bring these aging units into compliance with new emission limits on a wide range of pollutants. These old coal-fired units, upgraded with new pollution control technology, will remain online for another 20 years, providing the bulk of America's power supplies for years to come.

Coal will remain the dominant source of power generation in the U.S. through 2040, according to the Department of Energy's Annual Energy Outlook. Coal will account for 35 percent of the nation's power in 2040, while gas will supply 30 percent, the report showed.

The problem is this: The average age of a coal-fired power plant in the U.S. is 38 years. To remain online, many of these plants will require a major steam turbine rehabilitation. Worn and tattered after decades of operation, many of the rotating components in a steam turbine must be replaced to extend the life of the unit.

The market for steam turbine rehabs is strong, as power producers spend billions on a wide range of pollution control equipment, including scrubbers and dry sorbent injection systems, to comply with stricter emission limits and preserve their coal-fired assets.

"If they decide this is a plant they want to keep online for 20 more years, they need to look at the rotating equipment and evaluate its condition," said Kent Rockaway, manager of strategic marketing for Mitsubishi Power Systems Americas Inc. "The problems will often be with the blade path. The rotating stationary blades can reach an end-of- life situation where the amount of erosion makes low-cost repairs no longer feasible. The objectives for most steam turbine rehabs are longer life, increased output and greater efficiency. To justify the expense, they need to see performance improvement. Their goal is to have the performance improvement pay for the upgrade. To increase the steam output, you would accommodate it with more efficient blading. If you have a 1970s vintage turbine, then going with a totally new blade path will get you overall heat rate improvement for the plant," he said.

Mitsubishi is now rehabilitating two 40-year-old units of an unnamed plant at its Savannah Machinery Works facility, a service and manufacturing center for steam turbines, gas turbines and generators in Savannah, Ga. The project calls for upgrading each unit's high pressure/ intermediate pressure turbines and replacing some of the blading on the low pressure (LP) turbine of each unit. Both units have a capacity of 250 MW each. "The existing blades were showing signs of fatigue," Rockaway said. "For the long-term safety and reliability of the units, a decision was made to replace them." Unit 1 is scheduled to be installed this fall, while Unit 2 will be installed in the fall of 2014.

Adding emission control technology to a coal-fired power plant can cause a meaningful reduction in power production, as much as 20 percent in some cases. Much or all of that lost output can be recovered through efficiencies achieved with a steam turbine rehab. "By rehabbing, you can help offset the lost output," Rockaway said.

In April 2012, Alstom completed a steam turbine upgrade at Dominion Power's two-unit, 1,863 MW North Anna Power Station in Louisa County, Va. The project entailed a new high pressure (HP) and two new low pressure rotors for each nuclear generating unit in order to enable the 140-ton units to handle increased steam output. The rotors installed were among the first produced at Alstom's new Chattanooga, Tenn. turbomachine manufacturing facility.

Alstom also increased the blade length on North Anna's LP rotors from 48 to 57 inches to maximize energy capture from the steam flow. "The advent of computational fluid dynamics has allowed us to accelerate our technology and blades," said Charlie Athanasia, vice-president of thermal services, North America. "That not only allows tor more efficiency and more power outfit, it prolongs the life."

Alstom's retrofit work at North Anna units 1 and 2 resulted in a power output capacity increase of 60 MW per unit. Previous to the North Anna upgrade, Alstom completed a similar project at the Surry Power Station in southeastern Virginia. The uprate was completed in June 2011 for Surry Unit 2, and the Surry 1 uprate was completed in December 2010. Prior to the uprates, each Surry Unit was rated at 799 net MW. After the uprates, they are each rated at 838 net MW.

While the efficiency increase is welcomed, Alstom's focus during its steam turbine upgrades is not simply on ramping up the turbine; but rather optimizing the entire shaft line and accessory system configuration, often potentially including balance of plant. With each upgrade comes an added cost. However, Alstom has developed a cost solution for its upgrades. Instead of conducting extensive turbine maintenance at one time, Alstom's spreads out the implementation and cost of maintenance over a long period of time. "As we continue to advance technology, we look at component design options to prolong lifetime and thus outage periods," Athanasia said. "In doing so, customers get much higher value and return on their maintenance costs."

In addition to implementing a unique cost mechanism, Alstom is focusing much attention on lowering the costs of steam turbine upgrades in an effort to keep coal competitive with natural gas generation. Although the market is perceived "suppressed" for new steam turbines in conventional coal-fired generation, the need for new gas turbines and steam turbines in combined-cycle configuration plants is increasing.

Therefore, options for both new and/or retrofitted steam turbines must be considered. "Alstom is looking at how to better position steam turbine technologies, application and service capabilities and capacity for what we see as a coming surge in the gas turbine driven combined- cycle application," Athanasia said.

Additionally, steam turbine upgrades at nuclear plants, such as those performed by Alstom at North Anna and Surry, allow nuclear facilities to produce even more megawatts. By undergoing a steam turbine upgrade, both nuclear and coal-fired facilities can gain significant results in efficiency and reliability.

COMPUTER ENGINEERING

Text 5. COMPUTER ENGINEERING: FEELING THE HEAT

by Ph. Ball

A laptop computer can double as an effective portable knee- warmer - pleasant in a cold office. But a bigger desktop machine needs a fan. A data centre as large as those used by Google needs a high- volume flow of cooling water. And with cutting-edge supercomputers, the trick is to keep them from melting. Current trends suggest that the next milestone in computing - an exaflop machine performing at 10^{18} flops - would consume hundreds of megawatts of power (equivalent to the output of a small nuclear plant) and turn virtually all of that energy into heat.

Increasingly, heat looms as the single largest obstacle to computing's continued advancement. The problem is fundamental: the smaller and more densely packed circuits become, the hotter they get. "The heat flux generated by today's microprocessors is loosely comparable to that on the Sun's surface," says Suresh Garimella, a specialist in computer- energy management at Purdue University in West Lafayette, Indiana. "But unlike the Sun, the devices must be cooled to temperatures lower than 100 °C" to function properly," he says.

To achieve that ever more difficult goal, engineers are exploring new ways of cooling - by pumping liquid coolants directly on to chips, for example, rather than circulating air around them. In a more radical vein, researchers are also seeking to reduce heat flux by exploring ways to package the circuitry. Instead of being confined to two-dimensional (2D) slabs, for example, circuits might be arrayed in 3D grids and networks inspired by the architecture of the brain, which manages to carry out massive computations without any special cooling gear. Perhaps future supercomputers will not even be powered by electrical currents borne along metal wires, but driven electrochemically by ions in the coolant flow.

Go with the flow

The problem is as old as computers. The first modern electronic computer - a 30-tonne machine called ENIAC that was built at the University of Pennsylvania in Philadelphia at the end of the Second World War - used 18,000 vacuum tubes, which had to be cooled by an array of fans. The transition to solid-state silicon devices in the 1960s offered some respite, but the need for cooling returned as device densities climbed. In the early 1990s, a shift from earlier "bipolar" transistor technology to complementary metal oxide semiconductor (CMOS) devices offered another respite by greatly reducing the power dissipation per device. But chip-level computing power doubles roughly every 18 months, as famously described by Moore's Law, and this exponential growth has brought the problem to the fore yet again. Some of today's microprocessors pump out heat from more than one billion transistors.

That is why computers have fans. Air that has been warmed by the chips carries some heat away by convection, but not enough: the fan circulates enough air to keep temperatures at a workable 75 °C or so. But fan also consumes power - for a laptop, that is an extra drain on the battery. And fans alone are not always sufficient to cool the computer arrays used in data centres, many of which rely on heat exchangers that use liquid to cool the air flowing over the hot chips. Still larger machines demand more drastic measures. As Bruno Michel, manager of the advanced thermal packaging group at IBM in Switzerland, explains: "An advanced supercomputer would need a few cubic kilometres of air for cooling per day." That simply is not practical, so computer engineers must resort to liquid cooling instead.

Water-cooled computers were commercially available as early as 1964, and several generations of mainframe computers built in the 1980s and 1990s were cooled by water. Today, non-aqueous, non-reactive liquid coolants such as fluorocarbons are sometimes used, coming into direct contact with the chips. These substances generally cool by boiling - they absorb heat and the vapour carries it away. Other systems involve liquid sprays or refrigeration of the circuitry.

Super MUC, an IBM-built supercomputer housed at the Leibniz centre, became operational in 2012. The 3-petaflop machine is one of the world's most powerful supercomputers. It has a water-based cooling system, but the water is warm - around 45 °C. The water is pumped through microchannels carved into a customized copper heat sink above the central processing unit, which concentrates cooling in the parts of the system where it is most needed. The use of warm water may seem odd, but it consumes less energy than other cooling methods, because the hot water that emerges from the system requires less chilling before it is reintroduced. The use of hot-water outflow for heating nearby office buildings results in further energy savings.

Michel and his colleagues at IBM believe that flowing water could be used not just to extract heat, but also to provide power for the circuitry in the first place, by carrying dissolved ions that engage in electrochemical reactions at energy-harvesting electrodes. In effect, the coolant doubles as an electrolyte "fuel". "The idea is not entirely new. It has been used for many years in thermal management of aircraft electronics, which are cooled by jet fuel," says Yogendra Joshi, a mechanical engineer at the Georgia Institute of Technology in Atlanta.

Delivering electrical power with an electrolyte flow is already a burgeoning technology. In a type of fuel cell known as a redox flow battery, for example, two electrolyte solutions are pumped into an electrochemical cell, where they are kept separate by a membrane that ions can flow through. Electrons travel between ions in the solutions in a process known as a reduction-oxidation (redox) reaction - but they are forced to do so through an external circuit, generating energy that can be tapped to provide electrical power.

Salty logic

Redox-flow cells can be miniaturized using microfluidic technology, in which the fluid flows are confined to microscopic channels etched into a substrate such as silicon. At small scales, the liquids flow without mixing, so there is no need for a membrane to separate them. With this simplification, the devices are easier and cheaper to make, and they are compatible with silicon-chip technology.

Michel and his colleagues have begun to develop microfluidic cells for powering microprocessors, using a redox process based on vanadium ions. The electrolyte is pumped along microchannels that are 100 - 200 micrometres wide and similar to those used to carry coolant flows around some chips. Power is harvested at electrodes spaced along the channel, then distributed to individual devices by conventional metal wiring. The researchers unveiled their preliminary results in August, at a meeting of the International Society of Electrochemistry in Prague. But they remain some way from actually powering circuits this way. At present, the power density of microfluidic redox-flow cells is less than 1 watt per square centimetre at 1 volt - two or three orders of magnitude too low to drive today's microprocessors. However, Michel believes that future processors will have significantly lower power requirements. And, he says, delivering power with microfluidic electrochemical cells should at least halve the power losses that occur with conventional metal wiring, which squanders around 50% of the electrical energy it carries as resistive heating.

Becoming brainier

Electrochemical powering could help to reduce processors' heat dissipation, but there is a way to make a much bigger difference. Most of the heat from a chip is generated not by the switching of transistors, but by resistance in the wires that carry signals between them. The problem is not the logic, then, but the legwork. During the late 1990s, when transistors were about 250 nanometres across, "logic" and "legwork" accounted for roughly equal amounts of dissipation. But today, says Michel, "wire energy losses are now more than ten times larger than the transistor-switching energy losses". In fact, he says, "because all components have to stay active while waiting for information to arrive, transport-induced power loss accounts for 99% of the total".

This is why "the industry is moving away from traditional chip architectures, where communication losses drastically hinder performance and efficiency", says Garimella. The solution seems obvious: reduce the distance over which information-carrying pulses of electricity must travel between logic operations. Transistors are already packed onto 2D chips about as densely as they can be. If they were stacked in 3D arrays instead, the energy lost in data transport could be cut drastically. The transport would also be faster. "If you reduce the linear dimension by a factor of ten, you save that much in wire- related energy, and your information arrives almost ten times faster," says Michel. He foresees 3D supercomputers as small as sugar lumps.

What might 3D packaging look like? "We have to look for examples with better communication architecture," Michel says. "The human brain is such an example." The brain's task is demanding: on average, neural tissue consumes roughly ten times more power per unit volume than other human tissues - an energy appetite unmatched even in an Olympic runner's quadriceps. The brain accounts for just 2% of the body's volume, but 20% of its total energy demand.

The brain is fantastically efficient compared to electronic computers. It can achieve five or six orders of magnitude more computation for each joule of energy consumed. Michel is convinced that the brain's efficiency is due to its architecture: it is a 3 D, hierarchical network of interconnections, not a grid-like arrangement of circuits.

Smart build

This helps the brain to make much more efficient use of space. In a computer, as much as 96% of the machine's volume is used to transport heat, 1% is used for communication (transporting information) and just one-millionth of one per cent is used for transistors and other logic devices. By contrast, the brain uses only 10% of its volume for energy supply and thermal transport, 70% for communication and 20% for computation. Moreover, the brain's memory and computational modules are positioned close together, so that data stored long ago can be recalled in an instant. In computers, by contrast, the two elements are usually separate. "Computers will continue to be poor at fast recall unless architectures become more memory-centric", says Michel. Three- dimensional packaging would bring the respective elements into much closer proximity.

All of this suggests to Michel that, if computers are going to be packaged three-dimensionally, it would be worthwhile to try to emulate the brain's hierarchical architecture. Such a hierarchy is implicit in some proposed 3D designs: stacks of individual microprocessor chips are stacked into towers and interconnected on circuit boards, and these, in turn, are stacked together, enabling vertical communication between them. The result is a kind of "orderly fractal" structure, a regular subdivision of space that looks the same at every scale.

Michel estimates that 3D packaging could, in principle, reduce computer volume by a factor of 1,000, and power consumption by a factor of 100, compared to current 2D architectures. But the introduction of brain-like, "bionic" packaging structures, he says, could cut power needs by another factor of 30 or so, and volumes by another factor of 1,000. The heat output would also drop: 1-petaflop computers, which are now large enough to occupy a small warehouse, could be shrunk to a volume of 10 litres.

If computer engineers aspire to the awesome heights of zetaflop computing (10^{21} flops), a brain-like structure will be necessary: with today's architectures, such a device would be larger than Mount Everest and consume more power than the current total global demand. Only with a method such as bionic packaging does zetaflop computing seem remotely feasible. Michel and his colleagues believe that such innovations should enable computers to reach the efficiency - if not necessarily the capability - of the human brain by around 2060. That is something to think about [Nature, No. 492, December, 2012].

AUTOMATION ENGINEERING

Text 6. ADVANCED CONTROL SYSTEMS FOR CEMENT PLANTS

by K. Nakase, T. Aizawa

Interest in the automation of the Japanese cement industry has increased enormously in recent years following the diversification of customer needs, intensification of international price competitively, a slow-down in the level of energy saving benefits and rises in employees' wages. In this report, the outline of Onoda's plant modernization is explained along with the results of recent developments, such as real time quality prediction systems, kiln controls, an optimizing control system for ball mills, cement fineness on-line control system.

In this paper, we will report on the outline and the vision for our plant modernization project and the recent results concerned with automation. The most important component of the project is ensuring the use of high capacity production facilities, introducing a complete centralized control system by the use of DCS (Distributed Control System) and superseding the process computer. We will also build management systems, such as production management system, quality control system, maintenance management system and decision-making support system through the plant host computer. It is thus our intention to build CIM (Computer Integrated Manufacturing).

Process Control Level

The process control computers take charge of stabilization and optimization of unit process control such as raw meal composition control, kiln control and so on. In our system, the process computer can freely access the DCS through the gate-way. If we install a new control programme in the process computer, it is not necessary to make an input/ output programme between the DCS and scheduling programme. We need to enter those parameters into our system. Also, we can maintain all process computers installed in the plants from our central head office by the use of a standardized network system.

The DCS and PC units are able to communicate with each other and likewise, the process computer can access PC via DCS. On this level, we emphasize that for the startup/shutdown and emergency control of the plant, the process computer can access all information, such as thermal trip, breaker off, local mode, detection of clogging etc. By such information, the reliability of the automatic procedure increases

Real Time Quality Prediction System.

In order to make the process control much more effective in the cement industry, it is necessary to combine it with the quality control system. The framework of the real time quality prediction system is based on the Ono-method. The estimated value is calculated by formula, and shown as an average of a half hour data on CRT in the control room. The procedure to produce a prediction formula for clinker strength is described as follows. The relation between the estimated siren clinker and actual values of process variables is analyzed by the multi-variable regression analysis. Without the Ono-method one would have to wait a month for the quality test results, during which time a quality prediction system could not be established. The estimation formula which took in NOx, kiln drive torque and clinker temperature at the kiln outlet was judged to be applicable with the contribution at more than 60 per cent. The completion of the quality prediction system made it possible to establish an integrated system which unites the unit process control systems.

Kiln Control System

The kiln control system consists of the supervisor programme and subsystems such as steady state control, non-steady stale c cement type changing control and an emergency support system manipulates kiln fuel feed rate, set-point of the bottom c raw meal temperature control, raw meal feed rate, kiln revolution IDF revolution. This system was installed in all kilns in our plan has been operating satisfactorily up to now.

The supervisor programme has the right to select the outputs, are requested at the same time from both the steady state und steady state programmes. The processing of the supervisor IK very complicated, for example, when the plural non-steady stale at the same time. For that reason, we do not use procedural language for programming this system. The supervisor is programmed production rules on OPS83. The programme is very clear and the extension of system becomes very easy.

Steady State Control System

The steady state control is based on the feedback of bf condition such as the kiln outlet clinker temperature and the kiln torque. However, as the cement rotary kiln process is slow to respond, we cannot control it only with a simple feedback. We used a model prediction control system on the background of a heat balance. Cement production via a rotary kiln is a non-linear process, but in the steady state control, the linear system model, which is linearized near the operating point, is used. For the prediction of the states (the heat transmitted to the raw meal in the kiln), the state transition equation is used. We can use state feedback control theory and calculate the feedback gains by use of optimal regulator method. Our control system has a high robustness to the process fluctuations and moreover it is easily accepted by operators.

Non-Steady State Control System

In poor operational conditions, resulting from coating ring fall, ect. or in a severely weak kiln condition, we must control the kiln by logic different from that of above mentioned steady state control, until kiln recovers to the steady state. For this purpose, we developed a non-steady state control system. This system is programmed with a production rule system on OPS83. When the system judges the kiln state be recovering, it takes a backward action. When it judges the kiln state to be returning to the steady state, it gives the control hegemony to the steady state control system.

The control for changing the type of cement is based on sequential control of raw meal feed rate, kiln fuel feed rate and set point of minor control loop for bottom cyclone raw meal temperature. The standard patterns for all types are set in the system, and they are automatically modified on the actual conditions when the changing procedure starts, reference trajectories of the kiln outlet clinker temperature and the kiln drive torque are also made automatically, and if they turn aside from these lines during changing control, the sequential pattern is revised.

Optimizing Control for Ball Mills

For the operation of ball mills, constant-value feedback control generally adopted to increase productivity and secure quality. This control system is based on the principal that grinding efficiency of ball mills is the highest at a certain value of the bucket elevator power or mill sound level. Therefore if the set point deviates from optimum setting，maximum efficiency is not assured. In fact, there are many factors, which disturb the grinding process, such as fluctuation of grindability, particle size distribution and moisture of raw meal, abrasion of grinding media and so on. These disturbances bring about a shift of the optimum point.

A hill-climbing method was used in this system whereby the set point automatically changed at a certain time interval and the next direction change in the set point is decided according to the comparison between the mill grinding efficiency before and after changing the set point. But we should be very careful in applying this method to an actual process. If the control parameters, such as the step width and the speed of the set point change, do not match the property of the process, the optimizing control does not work effectively. To cope with the problem, we have developed a simulation programme for parameter matching as a support system and obtained very good results.

Cement Fineness Control

Various systems for automatic measurement of cement fineness have been announced up to the present. But these systems have not had widespread use in spite of their great importance for an efficient quality and production control. The reasons seem to be difficulties of quantification of the effectiveness and realization of the reliability at proper cost. We installed a dry powder laser granulometer and developed an on-line cement fineness measurement and control system. The sampling and conveyance system is very simple; therefore the whole system is more reliable.

The measurement equipment is MICRO-TRAC Model made by Leeds & Northrup Instruments in the USA. The cement powder is sampled by a screw feeder, transported by a pneumatic system and then measured in the dry condition. The samples of AJS are sampled manually in synchronization with the on-line measurement. The process computer receives the fineness data from MICRO-TRAC, calculates the set-point of separator speed and then output it to the DCS.

Automation of Silo Process

Automation of the grinding process and the kiln process are not strictly complete until the automation of silos located before and behind these processes is also established. Namely, we can only start-up the mills on condition that the conveying equipment to the silo is operating. We developed an automatic-cement silo input control system with a rule- based system. In this system we made use of progressive AI technology and our experience in roller mill startup/shutdown system. Namely we adopted the method changing KS (Knowledge Source) sequentially as progress of interface (i.e. level management, product kinds management and so on). This method made it easier to adapt this system to the change in the production environment.

Conclusions

The ultimate target of automation is a no-man operation. There are many remaining problems concerning automation. The optimization system of production planning has not reached a satisfactory level. The plant emergency control system must also develop. The reliabilities of sensors and automation systems have to be further improved. It seems that these systems need better developed technology but this is not so easy. Hardware technology, particularly micro-electronics, exhibits continuous rapid progress while software development is acquiring great importance to the automation engineer. It is vital that we research and develop automation systems - but always with an eye to the future [World Cement, October, 2009].

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