**МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ
РОССИЙСКОЙ ФЕДЕРАЦИИ**

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Учебно-методическое пособие

"Biology + Other Sciences”

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Пояснительная записка

Учебно-методическое пособие “Biology + Other Sciences” предназначается для студентов 1-2 курсов биологических специальностей университетов. Его целью является формирование иноязычной коммуникативной компетенции в сфере будущей профессиональной деятельности студентов-биологов, что предполагает успешное овладение английским языком как средством их дальнейшего профессионального развития.

Предлагаемое учебно-методическое пособие ориентировано на создание условий для приобретения студентами опыта использования языковых знаний и умений в различных ситуациях общения, связанных с работой в лаборатории; развития творческого подхода к решению профессиональных задач; формирования умений самостоятельной работы; активного использования современных информационных технологий; коллективной познавательной деятельности; самоконтроля и оценки усвоения формируемых навыков и умений.

В пособии вводятся и закрепляются терминологические единицы, характерные для биологических специальностей, развиваются и совершенствуются коммуникативные навыки и стратегии автономного обучения.

Учебно-методическое пособие также содержит приложение, которое включает текстовую основу для прослушивания (script).

Типология используемых в пособии заданий разнообразна и представлена следующими рубриками:

Lead in – включает задания, имеющие своей целью выяснить фоновые знания, мнения, суждения студентов по обсуждаемой тематике.

Reading – предлагает задания на развитие навыков различных видов чтения, извлечение информации, понимание структуры, организации и содержания текста.

Listening – представляет собой аудиозапись монолога профессиональной

направленности и сопровождается заданиями, нацеленными на извлечение конкретной информации, развитие навыков конспектирования, переработки и передачи информации на английском языке.

Focus on language – акцентирует внимание на определенных грамматических аспектах, ключевых словах и словосочетаниях, включает задания на расширение общего и терминологического словарного запаса студентов.

Discuss – предлагает вопросы, позволяющие выявить отношение к прочитанному материалу и соотнести его с собственными знаниями, интересами и опытом.

Get real – предполагает использование умений поиска информации на интернет сайтах и в научно-популярных публикациях в условиях, максимально приближенных к ситуациям реальной учебной и профессиональной деятельности.

Speaking – предлагает задания, направленные на формирование умений диалогического, а также неподготовленного и подготовленного монологического высказывания.

Writing – предлагает различные задания, направленные на развитие умения фиксировать информацию на английском языке с использованием различных форм записи.

Summarizing – имеет своей целью формирование навыков аннотирования научно-популярных русскоязычных текстов на английском языке.

In the Realm of Science – включает дополнительный справочный материал, отражающий специфику естественнонаучных специальностей (общепринятые сокращения, символы и т.д.).

В данное пособие включены также специальные рубрики:

Study help – содержит полезные советы по использованию стратегий изучения английского языка, а также рациональные приемы работы над лексическим и грамматическим материалом и т.д.

Progress Monitoring – представляет собой задание, стимулирующее рефлексивную самооценку процесса изучения английского языка и позволяющее студентам последовательно и адекватно отслеживать свои учебные достижения, успешность продвижения в овладении иностранным языком.

Progress Test – представляет собой тест рубежного контроля, включающий задания на проверку, осмысление и закрепление изученного материала.

Учебно-методическое пособие разработано с использованием аутентичных материалов, основными источниками которых являются британские и американские академические и научно-популярные издания, Интернет, проспекты ведущих университетов англоязычных стран, энциклопедии, словари. При подборе учебных материалов учитывались такие характеристики, как новизна информации, ее познавательность, соответствие учебным и профессиональным потребностям студентов.

Для осуществления самооценки предполагается использование балльно-рейтинговой системы контроля знаний. Пособие включает таблицу итогового контроля, который предполагает полное и правильное выполнение ключевых заданий и теста рубежного. Выполнение заданий рассчитывается в баллах и оценивается по следующей шкале: оценка «5»-100-85%, оценка «4» - 84-70%, оценка «3» - 69-50%, оценка «2» - 49% и менее.

Biology + other sciences

"We are not students of some subject matter, but students of problems.
And problems may cut right across the borders of any subject matter or discipline."
-- Karl Popper, 1963

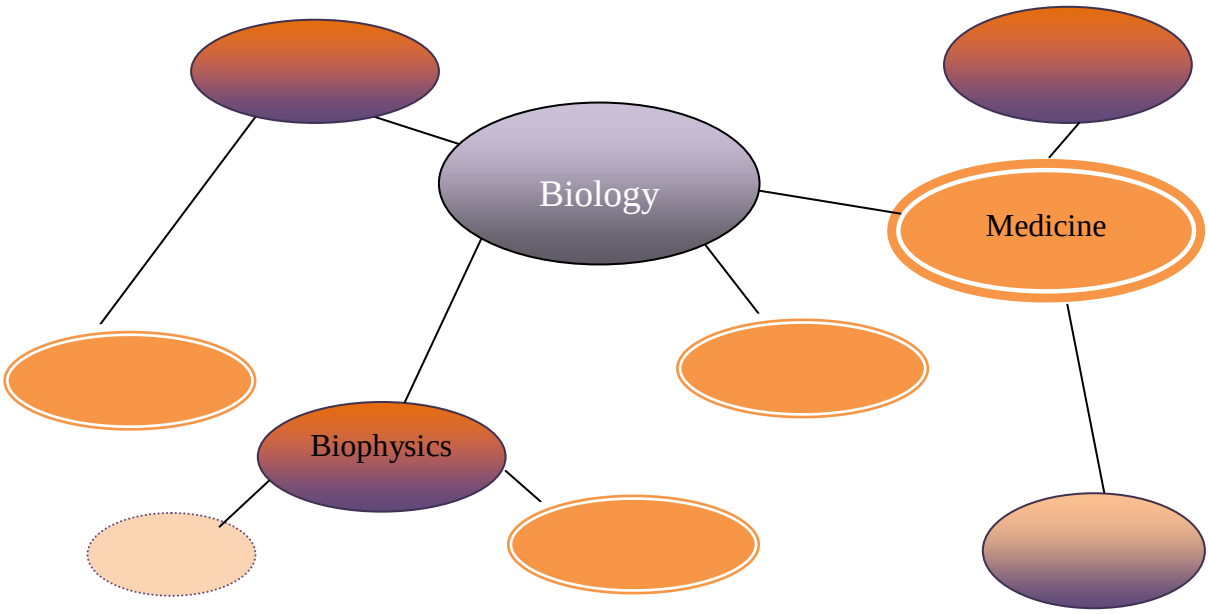
Learning Objectives:

- ✓ to learn new terms and general science words
- ✓ to revisit participle clauses
- ✓ to make a presentation on an interdisciplinary field of study in biology
- ✓ to learn how to present an oral report
- ✓ to do a project work
- ✓ to use a diagram for building background knowledge
- ✓ to make use of key words for efficient reading

Lead in

1. Work in small groups. Read the definition in the box. Fill in the diagram and comment on how biology contributes to other fields of knowledge.

> **Biology** is the science that studies living organisms, their structure, function, growth, origin, evolution, distribution and classification.



2. Are there any interdisciplinary departments (e.g. biophysics, …) at your faculty? What are they?
3. Would you like to specialize in any of these departments? Which one? Why?
4. Why is scientists' interest in interdisciplinary research constantly growing worldwide? Is it true for your faculty?

Reading

1. Read eight short texts (A-H). Define what interdisciplinary field each text deals with:

A. Bioinformatics(biology and informatics)

B. _____

C. _____

D. _____

E. _____

F. _____

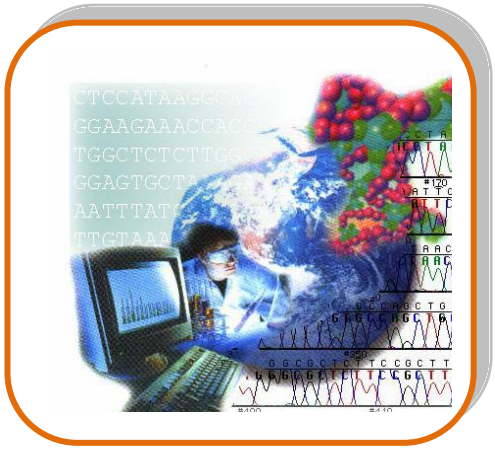
G. _____

H. _____

Study help
Follow these steps so that you can correctly define the subject area of each text:

- skim all the texts
- look for the topic sentences in each text
- select the key words to formulate the subject area of each text

A) Over the past few decades rapid developments in genomic and other molecular research technologies and developments in information technologies have combined to produce a tremendous amount of information related to molecular biology. The term bioinformatics was coined by Paulien Hogeweg in 1979 for the study of informatic processes in biotic systems. Bioinformatics now entails the creation and advancement of databases, algorithms, computational and statistical techniques and theory to solve formal and practical problems arising from the management and analysis of biological data. Major research efforts in the field include gene finding, genome assembly, drug design, drug discovery, protein structure prediction, etc.



B) For about 3.8 billion years the earth has been influenced by life and its interaction with non-living matter. The combination of geology and microbiology, geomicrobiology, can be regarded as closely related to microbial ecology, environmental microbiology, applied microbiology, and even astrobiology, but each of these fields has a slightly different emphasis. The field concerns the role of microbe and microbial processes in key geological and geochemical processes and vice-versa. Geomicrobiology is especially important when dealing with microorganisms in public drinking water supplies.

C) Originally, it was generally believed that life was not subject to the laws of science. It was thought that only living beings could produce the molecules of life. Then in 1828, Friedrich Wöhler proved that organic compounds can be created artificially. This work marked the emergence of a new field in biology – biochemistry. It is the study of the chemical processes in living organisms. It deals with the structures and functions of cellular components such as proteins, lipids and other biomolecules. Over the last 40 years biochemistry has become so successful at explaining living processes that now almost all areas of the life sciences from botany to medicine are engaged in biochemical research. Biochemistry has advanced, especially since the mid-20th century, with the development of new techniques such as chromatography, X-ray diffraction and electron microscopy. They allowed for the discovery and detailed analysis of many molecules and metabolic pathways of the cell, etc.

D) Biological systems are inherently nano in scale. Unlike nanotechnology, nanobiology is characterized by the interplay between physics, materials science, synthetic organic chemistry, engineering and biology. Interdisciplinary collaborations in this field are essential and disciplines converge. The amazing complexity of systems and the richness of the shapes and properties provided by the biological polymers offer to researchers an enormous range of stimulating problems. The physical sciences provide tools and strategies to obtain accurate measurements and simulate the information to allow comprehension of various biological systems and processes. Computational modeling will enhance the application of nanotechnology to key areas such as drug delivery and biomaterial design.

E) Paleontology is the study of prehistoric life, including organisms' evolution and interactions with each other and their environments (their paleoecology). As a "historical science" it tries to explain causes rather than conduct experiments to observe effects. Paleontological observations have been documented as far back as the 5th century BC. The science became established in the 18th century as a result of Georges Cuvier's work on comparative anatomy, and developed rapidly in the 19th century. Paleontology lies on the border between biology and geology, and shares with archaeology a border that is difficult to define. It now uses techniques drawn from a wide range of sciences, including biochemistry, mathematics and engineering. As knowledge has increased, paleontology has developed specialized subdivisions, some of which focus on different types of fossil organisms while others study ecological and environmental history, such as ancient climates.

F) Systems biology aims at system-level understanding of biology. This means an examination of the structure and dynamics of cellular and organismal function, rather than the characteristics of isolated parts of a cell or organism. Prominent examples for biological systems are the immune system or the nerve system, which already have the word system included. Nowadays numerous centers devoted to Systems Biology are opened worldwide, and other research collaborations bringing together expertise in mathematics, information science and biology are funded.

G) The transfer of technology between lifeforms and manufactures is, according to proponents of bionic technology, inevitable because evolutionary pressure typically forces living organisms to become highly optimized and efficient. In 1958 Jack E. Steele coined the term bionics, meaning ‘like life’ for the application of biological methods and systems found in nature to the study and design of engineering systems and modern technology. Examples of bionics (also known as biomimetics) in engineering include the hulls* of boats imitating the thick skin of dolphins; sonar, radar, and medical ultrasound imaging imitating the echolocation of bats. In chemistry the observation that the surface of the lotus flower plant is practically unsticky for anything led to the development of dirt- and water-repellent paint (coating) - so called the lotus effect. In the field of computer science, the study of bionics has produced artificial neurons, artificial neural networks, and swarm intelligence*. Evolutionary computation was also motivated by bionics ideas but it took the idea further by simulating evolution in silico and producing well-optimized solutions that had never appeared in nature.

hull – корпус
swarm intelligence - роевый интеллект

H) Astrobiology is the study of the origin, evolution, distribution, and future of life in the universe. Earth is the only known inhabited planet in the universe to date. However, advancements in the fields of astrobiology, observational astronomy and discovery of large varieties of extremophiles with extraordinary capability to thrive in harshest environments on Earth, have led to speculation that life may possibly be thriving on many of the extraterrestrial bodies in the universe. This interdisciplinary field encompasses the search for habitable environments in our Solar System and habitable planets outside our Solar System, the search for evidence of prebiotic chemistry, laboratory and field research into the origins and early evolution of life on Earth, and studies of the potential for life to adapt to challenges on Earth and in outer space. Astrobiology makes use of physics, chemistry, astronomy, biology, molecular biology, ecology, planetary science, geography and geology to investigate the possibility of life on other worlds and help recognize biospheres that might be different from the Earth's. A particular focus of current astrobiology research is the search for life on Mars due to its proximity* to Earth and geological history. There is a growing body of evidence to suggest that Mars has previously had a considerable amount of water on its surface.

proximity – близость, соседство

2. Answer the following questions.
   a) Who introduced the term bioinformatics? What studies does it encompass?
   b) What sciences gave birth to geomicrobiology? What does it explore?
   c) What revolutionary idea underlies the emergence of biochemistry?
   d) Which traditional sciences take advantage of biocmemical studies?
   e) What contributions to nanobiology does physics make?
   f) Does paleontology investigate remains of plants and animals?
   g) What kinds of systems does bionics apply?
   h) What does astrobiology study?
   i) What sciences contribute to astrobiological research?
   j) What is systems biology aimed at?

3. Expand your diagram in Task 1 Lead in section on page 7. What would you add? Why? What subject areas for interdisciplinary research in biology are of particular interest for you?

4. Find in the text words and word combinations which are similar in meaning to the following.

a) fast
b) huge
c) advocate
d) plant/animal remains
e) involves
f) stress
g) attempts
h) unavoidable
i) brain
j) human-made
k) naturally
l) flourish
m) join
n) assumption
o) severe
p) include
q) great
r) proof

5. Look back in the text and find adjectives that are similar in meaning to the word ***important.*** Complete the wordweb. What other words do you know? Check in the dictionary the difference in their meanings.

6. Match the verbs in column **A** with the nouns in column **B** to make phrases used in the texts.

A	**B**
1) to solve	a) attention
2) to coin	b) a border
3) to focus	c) processes
4) to adapt to	d) problems
5) to explain	e) collaborations
6) to share	f) effects
7) to observe	g) tools and strategies
8) to provide	h) a term
9) to produce	i) challenges
10) to fund	j) information

Focus on language

1. Study the rules in the box below and translate the sentences into your native language. Pay attention to the words in bold.
   - *Bioethics is the philosophical study of the ethical controversies* ***brought about*** *by advances in biology and medicine.*
   - *Technological advances in such diverse areas as organ transplantation and end-of-life care, posed novel questions* ***regarding*** *when and how care might be withdrawn.*

Participle clauses

A clause is a part of a sentence.

- *Advances in physics and mathematics have been responsible for many breakthroughs* ***made in life sciences over the past half century****.*

We use ***-ing*** clauses to say what sb\sth is or was doing at a particular time.

- *Only science can solve many of the impending problems* ***facing*** *our society nowadays such as global warming, overpopulation, etc. (A lot of problems* ***are facing*** *our society nowadays).*

When we talk about things, we can use ***–ing*** clause for permanent characteristics.

- *Technological advances in such diverse areas as organ transplantation and end-of-life care, posed novel questions* ***regarding*** *when and how care might be withdrawn. (The questions* ***regard*** *when and how care might be withdrawn).*

We use ***-ed*** clauses to say that sb\sth was exposed to some kind of activity or action.

- *Bioethics is the philosophical study of the ethical controversies* ***brought about*** *by advances in biology and medicine. (These controversies* ***were brought about*** *by advances in biology and medicine).*

2. Rewrite the sentences. Each time use the information in brackets to make ***–ing*** or ***–ed*** clauses. Translate these sentences into your native language.

a) Bioinformatics has been primarily used since at least the late 1980s in some areas of genomics. (These areas involve large-scale DNA sequencing)

b) In 1828, Friedrich Wöhler published a paper on the synthesis of urea. (This paper proved that organic compounds can be created artificially)

c) Since the 1990s fossils have provided new information about the earliest evolution of animals, early fish, dinosaurs and the evolution of birds and

mammals. (These fossils were found in China)

d) A number of animals feed on plants. (They live in the soil)

e) Research is not usually organized along disciplinary lines. (It is conducted by industry and government)

f) Significant advances in the natural sciences and engineering increasingly involve a number of diverse fields. (These fields include those in the social sciences, humanities and health sciences)

g) Despite the obvious benefits of interdisciplinary research, scientists often face daunting obstacles and disincentives. (A lot of scientists are interested in interdisciplinary research)

h) The World Wide Web has tremendously changed our way of life. (It was originally developed for high-energy physicists)

3. Go back to the texts (**A-H**) on pages 8-10 and pick up more examples of ***–ing*** and ***–ed*** clauses. Translate them into your native language.

4. Study the list of words and classify them under the headings below:

computational biology	biophysics	chemistry
biology	metabolism	human virology
ecology	biomechatronics	mathematics
geophysics	animal behavior	astronomy
physical chemistry	medicine	food microbiology
biological variation	protein biochemistry	bioeconomy

Disciplinary science: biology

Interdisciplinary science: geomicrobiology

Disciplines of biological sciences: biodiversity

5. Go back to the texts (A-H) on pages 8-10 and pick up more words to add to the lists under each heading in Task 1. Look up the dictionary for their pronunciation and meaning.

Get real

Search the Internet and/or popular science magazines to find out more about cutting edge interdisciplinary research in biology. Choose the one you find most interesting and make a Power Point presentation about it. Make use of the guidelines (and the Functional language box below):

- what is being investigated
- who is doing the research
- what is the purpose and novelty of the research

Functional language		
…… (field)	is a science / study	of …….
	studies deals with encompasses entails concerns	……. (problem) …….. (scope)
……. (name/term)	was coined is credited means	by …… (person) to …… (person)
…… (field)	became established has advances has become	in ……. (time) at …… (place)
	has led	to … (further research)
	uses utilizes applies provides bridges blends boundaries	……. (theory, methods, tool, approach, concept) …….. (other fields of study) with …(other fields of study)
	includes has developed	…… (subdivisions)

Listening

Listen to the interview with two Stanford graduate students, Paul and Sue, talking about their experience of interdisciplinary studies. Complete the tasks below.

1. Listen to an interview with Paul Miller and complete the chart.

1) Name of the interdisciplinary programme (first subject area + second subject area)	
2) Advantages of doing interdisciplinary research	
3) Personal qualities of people who choose to do interdisciplinary study	
4) Job opportunities	
5) Advice to potential interdisciplinary students	

2. Listen again and fill in the gaps in the extract below.

… I am pursuing my 1) _____ dissertation to develop an interdisciplinary graduate program in 2) _____ and management because I firmly believe that no 3) _____ is perfect and no real world problem comes in a packet.

... Working at the frontier of two fields rather than only one can be particularly 4)_____ but it provides the perfect training ground for thinking out of the box and developing the ability to make links between seemingly unrelated 5)_____. Besides success in interdisciplinary fields also requires the development of a 6)_____ scientific vocabulary. But I'm absolutely sure that if knowledge creation has 7) _____ and sustain its relevance to practice then interdisciplinary education and research are inevitable.

3. Listen to an interview with Sue Stampe and answer the questions.
   - What does Sue think of having training in an interdisciplinary field?

- What advantages and disadvantages of interdisciplinary studies does she discuss?
- What conclusion does she come to at the end of the talk?

4. Choose the correct word from the box to fill in the gaps in the extract below.

supervisors	value	proper	opportunity	boundaries
tenure-track	versus	viability	disciplinary	

... I have tenure[1] in a polytechnic state university but it took me close to ten years to get my first 1) _____ job and I would have made different choices if I'd known that would be the result of working across fields. I have taught in liberal arts[2] colleges that 2) _____ breadth, but they typically do not provide any 3) _____ to continue an active research program.

... Besides young scholars are quite often discouraged by their disciplinary 4) _____ from engaging in interdisciplinary research projects until they have first qualified for and obtained positions in their 5) _____ field. As a result it is much harder for a student to find 6) _____ supervision in an interdisciplinary than in a disciplinary area.

... The key point to take away from this talk is to see your future not as disciplinary 7) _____ interdisciplinary, but rather as one of disciplinary *and* interdisciplinary. Maintain your grounding[3] in your sub discipline while reaching out to applications across disciplinary 8) _____. Doing so will not only increase the 9) _____ of your research career; it will make it much more interesting.

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[1] пребывание в должности
[2] sugуманитарные науки
[3] базовые знания

5. Match the idioms from the Listening task with their meanings and give equivalents in your native language.

1) to come in a packet	a) to make use of an opportunity
2) to think out of the box	b) to decide that somebody belongs to a particular group without thinking deeply about it and considering what other qualities they might have//to categorize, label sb
3) to pigeonhole sb	c) to go in the same direction as somebody
4) to take advantage of sth	d) to think about sth, how to do sth, in a way that is new, different
5) to follow sb's path	e) to have started
6) to be under way	f) to be available or exist in a particular way

Discuss

In a small group discuss the questions below and share your ideas with the class.

- Do you agree with Paul in the listening task saying: "No discipline is perfect and no real world problem comes in a packet that's why interdisciplinary education and research is inevitable."? Why/Why not?
- Is it true for your faculty/ university that it is much harder for a student to find a proper supervision in an interdisciplinary than in a disciplinary area?
- Are employment opportunities as good in interdisciplinarity as in disciplinary fields in your country?
- How do you understand the message of the picture? Comment on it.

Reading

1. Read the text and highlight the advantages of interdisciplinary research.

Realizing Benefits from Interdisciplinary Research

For much of the last century the route to success for most scientists involved identifying a subfield within a discipline and then becoming an expert in it. For many scientists this approach still works. Discipline-based research continues to provide the core of our knowledge about the universe and has led to many fundamental breakthroughs in science.

But today, many of the exciting problems in science are too complex to to be solved by a discipline-based approach only. They require the contributions of scientists from a number of different fields, each bringing their expertise into interdisciplinary research.

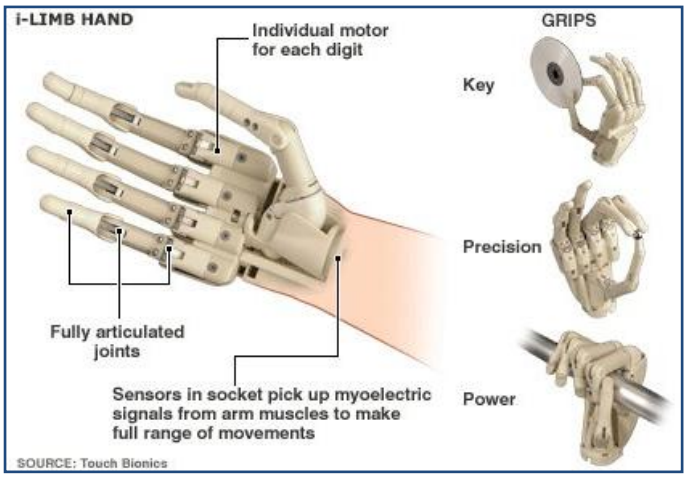
Interdisciplinary research is a means of research by teams or individuals that integrates information, data, techniques, tools, concepts, and/or theories from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the limits of a single discipline or field of research.

In interdisciplinary biology, tools or questions *aimed* at one *level* of biological organization are used to inform our understanding at another level of organization. For example, just as phylogenetic approaches to genomic data can be used to understand the evolution of species, so can these data throw new light on functional traits of an organism's genome.

Besides consider the rapidly developing field of "smart" or "intelligent" materials and structures. Here, investigators with backgrounds in biology, physics, chemistry, materials science, mathematics, computers, and engineering cooperate in developing human-made artifacts which sense and respond to their environment by learning, adapting, and repairing themselves.

One great advantage of interdisciplinary science is that it allows people in

different fields to work together towards a common objective. Multidisciplinary programs are now under way at many research institutions across the world. At Stanford University alone there are over 22 interdisciplinary research centers, including the recently established BioX program. This project combines the work of investigators from biology, physics, chemistry, engineering, and medicine in such areas as tissue engineering; single molecule analysis and molecular structure; cognitive and systems neurosciences; imaging from molecules to humans; and biocomputation. With the growth of the Web, many interdisciplinary programs have gone global, making them both cross-cultural as well as cross-disciplinary.



(http://www.cap.ca/pic/archives/59.2(2003)/editorial.html)

1. Mark the statements below **T** for 'true' or **F** for 'false'. Correct the false ones and expand on the true ones.

   a) For centuries discipline-based research has been the way to success for most scientists.
   b) Only discipline-based approach can lead to outstanding breakthroughs in science.
   c) At present scientific research is becoming more interdisciplinary.
   d) An interdisciplinary research draws on knowledge from different disciplines but stays within the limits of one primary field.
   e) The field of 'smart' materials and structures is a good evidence of successful cooperation among researchers with backgrounds in different sciences.

f) Despite its significance interdisciplinary research is still not globally developed.

g) World Wide Web helps interdisciplinary projects to affect the whole world and cover cross-cultural issues.

Focus on language

1. Find in the text a synonym for each group of words given in the list below.
   a) way, path, direction
   b) essence, focus, heart
   c) knowledge, skills, competence
   d) purpose, aim, goal
   e) benefit, gain, pro
   f) researchers, scientists, explorers
   g) education, knowledge, experience
   h) progress, develop, evolve

2. Match the words in **A** with their definitions in **B**.

A	**B**
1) approach	*a) a particular way of doing sth, especially one in which you have to learn special skills*
2) strategy	*b) a particular way of doing sth*
3) method	*c) a method, style or manner of doing sth*
4) technique	*d) an action, an object or a system by which a result is achieved; a way of achieving or doing sth*
5) way	*e) a way of dealing with sb/sth; a way of doing or thinking about sth such as a problem or a task*
6) means	*f) a plan that is intended to achieve a particular purpose*

3. Complete the sentences with the words in the box.

strategy	ways	means	technique	approaches	method

a) The first step of the scientific _____ involves making an observation about something that interests you.

b) Sampling _____ are powerful, and have extensive applications in ecology.

c) There are two major _____ of obtaining data, through measurement and observation.

d) Systems Biology covers intra- and inter-cellular dynamics, using systems- and signal-oriented _____.

e) The core of this _____ is to use the genetic information arising from many sources.

f) Synthetic biology is a _____ for the exploitation of whole-genome sequence information.

Project work

Work in groups of four.

1. Collect information about six interdisciplinary fields in biology. Share and summarize the information you have collected and present your findings as a one-page poster.

   Using your group poster conduct a survey to find out which of these fields biology students would like to specialize in. (Decide which group you will interview - junior or senior students, undergraduate or graduate). Note down the reasons they give in favour of a particular field and the most

Study help

When you present your oral reports, follow this procedure:

a) one student introduces the group and gives an introduction of the work conducted by the group;
b) the next few students present one or two of the points and some interesting comments;
c) the last student concludes the presentation by summarizing and interpreting the information.

interesting comments.

2. Analyse your findings and make a bar chart like the one on the right reflecting your survey results and prepare an oral report to present to the class. Make use of the Study help box and Functional language box.

Functional language: ***Presenting somebody's opinion***
It surprised us to learn that most students/professors, etc…
The majority of students/people think that …
A few students/of my friends have got mixed feelings about…
A number of students/people are in favour of ...
What we find really astonishing (about) … is …,etc.

Writing

Write a group report on the results of your survey. Make use of the Survey Report Form below.

'A survey: …..

Introduction & Objective
……
……

Survey takers
……
……

Questions & Findings
……
……
……

Conclusions
……
……
……

Visual representation of the statistical data (a table/bar chart/graph)

Name ……..

Date ……

Study help: A survey report
To write a survey report, follow these steps:

1. Outline the purpose of performing your survey - detail why this survey was developed, who developed this survey and what outcome you expected.
2. Define how the survey was performed - fully describe how you chose your survey takers, questions asked and any other relevant information.
3. Gather your statistical information and organize this into a table, bar chart or graph that can be visually understood by the reader.
4. Write a conclusion that sums up your findings.

Summarizing

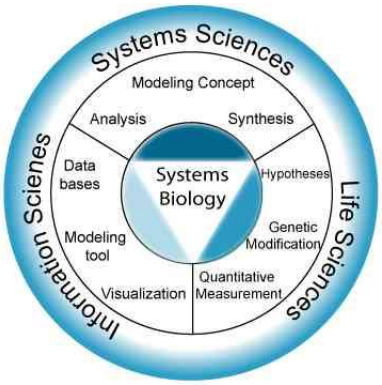
1. Read the text below to find the Russian equivalents to the following English word combinations.
   1) complex and diverse
   2) to study/understand sth in terms of biology
   3) high-quality breakthroughs
   4) to be emerging
   5) at the frontier of traditional disciplines
   6) to produce information
   7) to be closely connected with sth
   8) interdisciplinary research
   9) interaction of sciences
   10) methods and techniques of research
   11) the mainstream route
   12) a united science of the future

На стыке наук

Окружающий нас мир сложен и многогранен. Познать его невозможно с позиций только биологии, только физики, только химии и т.д. Качественные прорывы в решении проблем науки возможны при использовании знаний и методов многих традиционных дисциплин. Таким образом возникают всё новые и

новые науки на «стыке» традиционных дисциплин.

Биология — комплекс наук о живой природе. Она охватывает строение, жизнедеятельность, происхождение живых существ, их взаимоотношения между собой и с окружающей средой.



В зависимости от предмета изучения биологию делят на отдельные науки. Так, микробиология дает знания о бактериях; ботаника изучает жизнедеятельность и строение растений; зоология исследует животных, а генетика имеет дело с закономерностями изменчивости и наследственности.

Прогресс биологии как науки тесно связан с успехами других естественных и точных наук, таких как физика, химия, математика, информатика и др. Биология активно использует их достижения. На стыке наук возник целый ряд новых, таких как биофизика, биохимия, бионика и другие. Так, химический состав организмов и пути взаимопревращения веществ являются предметом изучения биохимии, а взаимоотношения организмов между собой и с окружающей средой — экологии.

В настоящее время наиболее перспективными считаются исследования на стыке наук. Возникают новые направления и науки: биоинженерия, бионика, биоинформатика, биоэкономика, системная биология, и т.д. Это яркий пример интеграций наук.

Один из важных путей взаимодействия наук - взаимообмен методами и приемами исследования, т.е. применение методов одних наук в других.
Многие специалисты считают, что наиболее быстрого роста и важных открытий сейчас следует ожидать как раз на участках "стыка", взаимопроникновения наук и взаимного обогащения их методами и приемами исследования. Этот процесс объединения усилий различных наук для решения важных практических задач

получает все большее развитие. Это магистральный путь формирования «единой науки будущего».

Add new vocabulary to your vocabulary notebook. ✍

2. Read the text again and summarize it in English. Make use of the phrases for summarizing in the box.

Phrases for summarizing	
The article discusses / considers…	The article informs / presents information about…
It is reported /said /stated that…	It is pointed out / claimed that…
Actually; In fact; In particular; For example; Also; Moreover; etc.	

In the Realm of Science

1. The words below can be useful when you speak about interdisciplinary sciences and research. Find their proper equivalents in your native language.

Discipline	an area of knowledge or field of study, is a branch of knowledge that is taught and researched at the college or university level.
Disciplinary	refers to knowledge associated with one academic discipline or profession.
Multidisciplinary	refers to knowledge associated with the mixture of academic disciplines in that each discipline retains its methodologies and assumptions without change or development from other disciplines
Interdisciplinary	refers to new knowledge or one single discipline resulted from combining of two or more academic fields. An interdisciplinary field crosses traditional boundaries between academic disciplines or schools of thought, as new needs and professions have emerged.
Transdisciplinary	refers to a research strategy that crosses many disciplinary boundaries

	to create a holistic approach. It applies to research efforts focused on problems that cross the boundaries of two or more disciplines, such as research on effective information systems for biomedical research (see bioinformatics), and can refer to concepts or methods that were originally developed by one discipline, but are now used by several others, such as ethnography, a field research method originally developed in anthropology but now widely used by other disciplines.
Crossdisciplinary	refers to knowledge that explains aspects of one discipline in terms of another. Common examples of crossdisciplinary approaches are studies of the physics of music or the politics of literature.

Progress Monitoring

In this unit you have worked on the following vocabulary on the topic: "Interdisciplinary Biology". Tick (***V***) the points you are confident about and cross (***X***) the ones you need to revise.

- [ ] 1. an interdisciplinary/cross-disciplinary field
- [ ] 2. the scope of a discipline
- [ ] 3. to bring one's expertise into sth
- [ ] 4. the route to success
- [ ] 5. to take advantage of sth
- [ ] 6. to entail/encompass areas of study
- [ ] 7. to share borders
- [ ] 8. essential/key/significant/major
- [ ] 9. to coin the term
- [ ] 10. to provide research and training for sth
- [ ] 11. a growing body of evidence
- [ ] 12.interaction\interplay of sciences

13. at the frontier of traditional disciplines
14. to gain perspective into sth
15. to prove relevance to practice
16. to identify a subfield within a discipline
17. approach / method / technique
18. to bring new insights to sb
19. to work together towards a common objective
20. to be under way

Progress Test

1. Cross out the odd word.
   a) advances, factors, breakthroughs, insights
   b) theory, technique, method, approach
   c) ecology, biophotonics, system biology, botany
   d) cutting-edge, revolutionary, progressive, evolutionary
   e) to integrate, to work together, to require, to cooperate
   f) tenure, viability, job, employment
   g) argument, discourage, controversy, debate
   h) key, essential, powerful, considerable

2. Cross out the word that does not collocate with the word ***interdisciplinary.***

interdisciplinary

a) research
b) studies
c) programme
d) intelligence
e) field
f) education

Add more words to this list.

3. Give English equivalents to the following Russian word combinations.
   a) искуственные сети
   b) передовые исследования в области нанобиологии
   c) не думать шаблонами
   d) характеризоваться взаимодействием физики, химии, биологии и техники
   e) выполнять междисциплинарное исследование
   f) работать совместно для общей цели
   g) на стыке традиционных дисциплин
   h) выходить за рамки одной дисциплины
   i) осуществляемый в данное время
   j) ввести новый термин

4. Write the word and the Russian equivalent next to each transcription.

a) *[ɪntər'ækʃn]*	*interaction*	*взаимодействие, взаимопроникновение*
b) ['frʌntɪə(r)]		
c) [ˌɪntə'dɪsəplɪnəri]		
d) [rɪ'sɜːtʃ]		
e) [ˌɑːtɪ'fɪʃl]		
f) ['evɪdəns]		
g) [ɪn'telɪʤens]		
h) [i'nevitəbəl]		
i) ['tenjuə]		
j) ['suːpəvaizə]		

5. Rewrite the sentences using ***–ing*** or ***–ed*** clauses.
   a) One of the problems a new journal explores is how synthetic biology can lead to an understanding of the principles that underlie natural genetic circuits.
   b) “Bio” is a collection of cutting-edge research papers in the field of computational and systems biology that are contributed by leading researchers from across the globe.
   c) We use these methods to address questions that range from genomics and molecular evolution to ecology, evolution, and behavior.
   d) The lab is a confederation of independent scientists, who pursue their own ideas and interests, offering plenty of interaction and opportunity for collaboration.
   e) School covers a broad spectrum of areas that varies from molecular biology to evolutionary biology, and has a strong focus on interdisciplinary research.
   f) The topics which are discussed in the book are in bioinformatics, computational biology, environmental sciences, and their related interdisciplinary fields.
   g) Systems biology at the University of Glasgow brings together specialists who work across fields as diverse as applied mathematics, molecular biology, theoretical computer science and medicine.
   h) Bioinformatics has developed powerful tools to handle the huge and rapidly developing amount of data which is stored in databases.
   i) In structural biology efforts have been made to predict the 3D structure of proteins and DNA that are based on homology and de novo.

Credit Points

Tasks	Get real	Project work	Writing	Summarizing	Progress test	Total
Maximum score	10	10	10	10	40	80
Your scores						
%						

Script

Speaker #1-Paul Miller

Interviewer: I know that Stanford University has recently created some Interdisciplinary Graduate Fellowship programmes to provide funding for doctoral students interested in interdisciplinary fields.

Paul: Yes, that's correct. And I think this is a powerful statement from a powerful institute about the trends and opportunities in interdisciplinary studies.

Interviewer: Paul, you are one of those graduate students, aren't you? Why did you choose to do interdisciplinary research?

Paul: Well, I am pursuing my doctoral dissertation to develop an interdisciplinary graduate program in engineering and management because I firmly believe that no discipline is perfect and no real world problem comes in a packet.

Interviewer: But is it possible to become a really good expert in two or more fields?

Paul: Well, definitely working at the frontier of two fields rather than only one can be particularly challenging but it provides the perfect training ground for thinking out of the box and developing the ability to make links between seemingly unrelated phenomena. Besides, success in interdisciplinary fields also requires the development of a common scientific vocabulary. But I'm absolutely sure that if knowledge creation can prove and sustain its relevance to practice then interdisciplinary education and research is inevitable.

Interviewer: Really? And what kind of students tend to be attracted to interdisciplinary programmes?

Paul: Well, in the first place - they are probably individuals with a wide variety of interests, maybe free spirits who don't want to be limited in the scope of study or by a degree title. I think interdisciplinary programmes are attractive for creative, intellectually eclectic and generally curious people.

Interviewer: And how about employment opportunities for interdisciplinary graduates? Do you find them good?

Paul: Hmm, it's hard to say. I suspect what happens to many graduates from interdisciplinary studies is that they end up teaching in liberal arts somewhere, in which a broad scope of knowledge and teaching skills can be applied. I also suspect many of these graduates end up as consultants, contractors, entrepreneurs, writers, etc. where they don't have to be pigeonholed. But I personally think that enrolment for interdisciplinary programs will increase only if employment options become more visible.

Interviewer: What would be your advice to young people who are hesitating whether or not to enrol in an interdisciplinary programme?

Paul: Well, you should take advantage of the fact that your university, by definition, is a place where research is under way simultaneously in many different fields. Look for ways to make contacts with scientists in fields outside of your particular specialty. The best way to start is via the Internet. Then take some time to simply wander around your campus, poke your head in the buildings, classrooms, offices, and laboratories of other science departments. Moreover attend several classes and seminars in other departments. It'll be a good way to start socializing with colleagues in other fields. If you find this process exciting and enjoyable then there is no reason to hesitate. Do your interdisciplinary research!

Interviewer: Thanks a lot for sharing your ideas and interesting experiences about interdisciplinary studies.

Paul: You are welcome. It was my pleasure.

Speaker#2-Sue Stampe

Interviewer: Sue, Looking at your educational background I see that you took the interdisciplinary course.

Sue: Yes, right. I was trained in an interdisciplinary program and I continue to do such work, but I would not advise a student to follow my path.

Interviewer: Really? Why?

Sue: In my own department I hear comments that someone cannot really muster two disciplines because it is hard enough to study one. When you cross disciplines, you are generally considered to be incompetent in both, - not creative or synthetic, or any other positive qualities.

Interviewer: But you don't share such opinions, do you?

Sue: Of course, not. It takes a certain kind of flexibility of mind to acquire jargon in multiple fields and relate theories to each other when terminology, methods and evidence differ. Cross-fertilization can lead to breakthroughs in my opinion, but we're not nourishing the people who want to do that work.

Interviewer: What do you mean?

Sue: OK, let's look me, for example. I have tenure in a polytechnic state university but it took me close to 10 years to get my first tenure-track job. I would have made different choices had I known that would be the result of working across fields. I have taught in liberal arts colleges (visiting appointments) that value breadth, but they typically don't provide any opportunities to continue an active research program.

Interviewer: And obviously, such a situation can't generate any enthusiasm for initiatives that only lead people into this kind of trouble.

Sue: Exactly. Besides, young scholars are often discouraged by their disciplinary supervisors from engaging in interdisciplinary research projects until they have first qualified for and obtained positions in their primary field. As a result it's much harder for a student to find proper supervision in an interdisciplinary area than in a disciplinary area.

Interviewer: As I understand it, Sue, you would definitely discourage young people from taking interdisciplinary programmes. Right?

Sue: No, not exactly. The key point to learn from all this is to see your future not necessarily as disciplinary versus interdisciplinary, but rather as one of disciplinary and interdisciplinary. Maintain your grounding in your subdiscipline while branching out across disciplinary boundaries. Doing so will not only increase the viability of your research career; it will make it much more interesting as well.

Interviewer: Thanks so much for your time, Sue.

Sue: It's been a pleasure.

Reference materials

1. Global environmental challenges of the twenty-first century: resources, consumption, and sustainable solutions by David E. Lorey Rowman & Littlefield, 2003// Google books. Retrieved from http://books.google.com
2. WiseGEEK website. Retrieved from http://www.wisegeek.com/science.htm
3. Marie D'Iorio, Gary W. Slater// Realizing Benefits from Interdisciplinary Research Retrieved from http://www.cap.ca/pic/archives/59.2(2003)/editorial.html
4. Что может ожидать человека в будущем?// Мир вопросов (http://han-samoilenko.narod.ru/questions/human/026.htm)

Dictionaries

1. ABBY Lingvo 9.0 Электронный словарь. ABBY Software 2003
2. Cambridge International Dictionary of Idioms © Cambridge University Press 1998
3. Oxford Advanced Learner's Dictionary, 7th edition, Oxford University Press, 2005
4. Longman Language Activator, New edition, Pearson Education Limited, 2002

Internet resources

1. Wikipedia The free online encyclopedia http://en.wikipedia.org/wiki/
2. Think exist.com http://thinkexist.com/quotes/with/keyword/