

КАЗАНСКИЙ (ПРИВОЛЖСКИЙ) ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ

А.А. Кирпичникова  
Г.И. Сосновская

# Professional English for Biology and Medicine Students

*Учебное пособие*

Казань  
2017

**УДК 272.8:811.111**  
**ББК 81.2 Англ.-923**

*Печатается по рекомендации Учебно-методической комиссии  
Института международных отношений, истории и востоковедения  
Казанского (Приволжского) федерального университета  
(протокол № 2 от 29.11.17)*

**Составители:**

к.ф.н., ст. преп. кафедры иностранных языков  
для естественно-научного направления  
Института международных отношений, истории и востоковедения КФУ  
**А.А. Кирпичникова**

ст. преп. кафедры иностранных языков  
для естественно-научного направления  
Института международных отношений, истории и востоковедения КФУ  
**Г.И. Сосновская**

**Рецензенты:**

доктор химических наук, доцент,  
зав. кафедрой пищевой биотехнологии ФГБОУ ВО КНИТУ  
**Сысоева М.А.**

кандидат педагогических наук, доцент кафедры иностранных языков  
для естественно-научного направления  
Института международных отношений, истории и востоковедения КФУ  
**Сигал Н.Г.**

**Professional English for Biology and Medicine Students:** учебно-методическое пособие / сост. А.А. Кирпичникова, Г.И. Сосновская – Казань: Изд-во Казан. Ун-та, 2017 – 110 с.

Данное пособие предназначено для студентов второго курса, обучающихся по направлениям «Биология», «Лечебное дело», «Стоматология», «Фармация».

Основная его цель – познакомить студентов с лексическими, грамматическими особенностями профессионального английского языка в сфере медицины и биологии.

**УДК 272.8:811.111**  
**ББК 81.2 Англ.-923**

© Кирпичникова А.А., Сосновская Г.И., 2017

# The Content

Foreword in Russian.....	4
Foreword in English.....	5
I. Planning the career.....	6
II. Zoology.....	12
1. Animals on the brink of extinction.....	12
2. Amazing animals' abilities.....	17
III. Botany.....	22
1. Plants evolution.....	22
2. Amazing plants' abilities.....	28
IV. Physiology.....	33
1. The danger of strenuous exercise.....	33
2. People's health: serious and irreversible diseases.....	40
V. Molecular biology.....	45
1. Secrets of proteins.....	45
2. Chemical nature of genes.....	52
VI. Genetic-engineering technologies.....	57
1. Genetic engineering: changing animals and plants.....	57
2. Genetic engineering: changing people.....	63
VII. The Cardiovascular System.....	70
VIII. The Respiratory System.....	76
IX. The Nervous System.....	81
X. The Endocrine System.....	87
XI. The Urinary System.....	92
XII. The Digestive System.....	97
<b>Listening</b> .....	<b>103</b>
<b>References</b> .....	<b>109</b>

## ПРЕДИСЛОВИЕ

Пособие “Professional English for Biology and Medicine Students” предназначено для студентов второго курса, обучающихся по направлениям «Биология», «Лечебное дело», «Стоматология», «Фармация».

В пособии представлены тексты на биологическую тематику, упражнения на понимание текстов и отработку лексики, а также упражнения на развитие навыков говорения и аудирования. Кроме того, даются шесть уроков, каждый из которых посвящен одной из важнейших систем жизнедеятельности организма: «Сердечно-сосудистая система», «Дыхательная система», «Нервная система», «Мочевыделительная система», «Эндокринная система», «Пищеварительная система».

Основная цель данного пособия – познакомить студентов с лексическими, грамматическими особенностями профессионального английского в сфере медицины и биологии. Кроме того, оно направлено на формирование у студентов коммуникативной компетенции, умений участвовать в общении на профессиональные темы.

Данное пособие является актуальным, поскольку содержит только самые передовые научные данные и часто употребляемую лексику. Данное пособие поможет студентам овладеть словарным запасом, необходимым для чтения специальной литературы на английском языке и устного обсуждения представленных тем.

## FOREWORD

The Manual “*Professional English for Biology and Medicine Students*” is recommended for organization of the workshops and individual work of the second year students studying “Biology”, “Medical care”, “Stomatology”, “Pharmacy”.

There are texts on biological topics, reading comprehension exercises, vocabulary exercises and also listening and speaking exercises in the manual. Moreover, there are six lessons devoted to main human body systems: “The cardiovascular system”, “The respiratory system”, “The nervous system”, “The urinary system”, “The endocrine system”, “The digestive system”.

The aim of the Manual is to initiate students into the lexical, grammar peculiarities of professional English in the sphere of medicine and biology. Moreover, the aim is to form students’ communicative competence, abilities to participate in communication on professional topics.

The Manual is actual because it contains the most progressive research data and common terms. It can help students to learn words which can be useful during reading professional literature in English and communication on given topics.

## I. PLANNING THE CAREER



### Vocabulary notes:

branch – отрасль

aim - цель

protein - белок

investigate - исследовать

cell - клетка

environment – окружающая среда

applicant - кандидат, претендент

project summary - краткое содержание проекта

scholarship - стипендия

field - область

outstanding - выдающийся

aim to - преследовать цель, быть направленным на ...

however - однако

the initial phase – начальная фаза

the proposed research – предлагаемое исследование

indicate – указывает, показывает

salary – зарплата

### I. Read the given text and make your essential assignments

In its broadest sense, biology is the study of living things—the science of life. Living things come in an astounding variety of shapes and forms, and biologists study life in many different ways. They live with gorillas, collect fossils, and listen to whales. They isolate viruses, grow mushrooms, and examine the structure of fruit flies. They read the messages encoded in the long molecules of heredity and count how many times a hummingbird’s wings beat each second.

What makes something “alive”? Anyone could deduce that a galloping horse is alive and a car is not, but why? We cannot say, “If it moves, it’s alive,” because a car can move, and gelatin can wiggle in a bowl. They certainly are not alive. What characteristics do define life? All living organisms share five basic characteristics:

1. Order. All organisms consist of one or more cells with highly ordered structures: atoms make up molecules, which construct cellular organelles, which are contained within cells. This hierarchical organization continues at higher levels in multicellular organisms and among organisms.

2. Sensitivity. All organisms respond to stimuli. Plants grow toward a source of light, and your pupils dilate when you walk into a dark room.

3. Growth, development, and reproduction. All organisms are capable of growing and reproducing, and they all possess hereditary molecules that are passed to their offspring, ensuring that the offspring are of the same species. Although crystals also “grow,” their growth does not involve hereditary molecules.

4. Regulation. All organisms have regulatory mechanisms that coordinate the organism’s internal functions. These functions include supplying cells with nutrients, transporting substances through the organism, and many others.

5. Homeostasis. All organisms maintain relatively constant internal conditions, different from their environment, a process called homeostasis.

Biology is a fascinating and important subject, because it dramatically affects our daily lives and our futures. Many biologists are working on problems that critically affect our lives, such as the world’s rapidly expanding population and diseases like cancer and AIDS. The knowledge these biologists gain will be fundamental to our ability to manage the world’s resources in a suitable manner, to prevent or cure diseases, and to improve the quality of our lives and those of our children and grandchildren. Biology is one of the most successful of the “natural sciences,” explaining what our world is like. To understand biology, you must first understand the nature of science. The basic tool a scientist uses is thought. To understand the nature of science, it is useful to focus for a moment on how scientists think. They reason in two ways: deductively and inductively.

Deductive reasoning applies general principles to predict specific results. Over 2200 years ago, the Greek Eratosthenes used deductive reasoning to accurately estimate the circumference of the earth. At high noon on the longest day of the year, when the sun’s rays hit the bottom of a deep well in the city of Syene, Egypt, Eratosthenes measured the length of the shadow cast by a tall obelisk in Alexandria, about 800 kilometers to the north. Because he knew the distance between the two cities and the height of the obelisk, he was able to employ the principles of Euclidean geometry to correctly deduce the circumference of the earth. This sort of analysis of specific cases using general principles is an example of deductive reasoning. It is the reasoning of mathematics and philosophy and is used to test the validity of general ideas in all branches of knowledge. General principles are constructed and then used as the basis for examining specific cases. Inductive Reasoning Inductive reasoning uses specific observations to construct general scientific principles. Webster’s Dictionary defines science as systematized knowledge derived from observation and experiment carried on to determine the principles underlying what is being studied. In other words, a scientist determines

principles from observations, discovering general principles by careful examination of specific cases.

Inductive reasoning first became important to science in the 1600s in Europe, when Francis Bacon, Isaac Newton, and others began to use the results of particular experiments to infer general principles about how the world operates. If you release an apple from your hand, what happens? The apple falls to the ground. From a host of simple, specific observations like this, Newton inferred a general principle: all objects fall toward the center of the earth. What Newton did was construct a mental model of how the world works a family of general principles consistent with what he could see and learn. Scientists do the same today. They use specific observations to build general models, and then test the models to see how well they work

**II. Answer the questions:**

1. What are the characteristics of living things?
2. What is the difference between deductive and inductive reasoning?

**III. Watch the video *Career profile: biology* and answer the following questions:**

1. Why is he interested in biology?
2. What type of personality must you have to be a successful biologist?
3. What are the advantages of the career?

**IV. Complete the chat using the information from the video and give your own ideas about advantages and disadvantages of the career in biology**

Career profile: biology

Advantages	Disadvantages

**V. Read the notes below. What area / areas of modern biology would you like to choose?**

*Modern biology is an enormous subject that has many branches. Specialists in some branches include:*

- *molecular biologists and biochemists who work at the chemical level, with the aim of revealing how DNA, proteins, and other molecules are involved in biological processes;*
- *geneticists who study genes and their involvement in inheritance and development;*
- *cell biologists who study individual cells or groups of cells, often by culturing them outside organisms; they investigate how cells interact with each other and their environment;*
- *physiologists who find out how organ systems work in a healthy body;*
- *pathologists who study diseased and dysfunctional organs;*
- *ecologists who study interactions between organisms and their environment. Some focus their attention on whole organisms; others study populations, individuals of the same species living together at one location.*

*There are also biologists who specialize in particular groups of organisms; for example, bacteriologists study bacteria, botanists study plants, and zoologists study animals.*

Biologists are employed in many fields including conservation and wildlife management, industry, health care, horticulture, agriculture, zoos, museums, information science, and marine and freshwater biology. In addition, many biologists are employed as teachers, lecturers, or research workers.

**VI. Read the following extract from the website and then answer the following questions:**

1. Can an organization apply for this scholarship?
2. Would you be interested in applying for SARF? Why/ why not?
3. What information might you need to include on your application form?
4. What are the advantages of attracting scientists with “future potential for leadership in their field” to a country?

*The Sheridan Australian Research Fellowship (SARF) aims to develop science in Australia by attracting outstanding scientists in their field to continue their research in Australian university or research institution. SARF fellowships are awarded to individual scientists with future potential for leadership in their field. Successful applicants receive a five-year grant covering salary, travel and relocation costs.*

**VII. If you want to apply for SARF you must fill in an application form. Look at the list of sections of the form and match them with the notes:**

### **APPLICATION FORM**

1. Applicant
2. Current appointment and address
3. Location of proposed study
4. Sponsor's recommendation
5. Departmental support
6. Project title
7. Project summary
8. Details of proposed research
9. Budget
10. Nominated referee with personal knowledge of applicant

- a. *An explanation of how you will do the research and why it is important*
- b. *A short description of what you will research*
- c. *A statement from a senior researcher explaining why you are a suitable applicant*
- d. *How much you plan to spend on your research*
- e. *The job you do now*
- f. *The name of someone who support your application*
- g. *What you will call your research*
- h. *Permission your head of faculty to use his/ her resources*
- i. *Where you plan to study*
- j. *Your personal info*

**VIII. The most difficult part of an application form is the project summary of your research proposal. Read the example of the project summary and complete it using the correct word or phrase from the box.**

aims to	however	the initial phase	the proposed research	the study
will indicate				

Consumer interest in wines produced in organic vineyards has increased significantly in the last few years. (1) \_\_\_\_\_, to date it is unclear whether these production methods actually improve soil or grape quality. (2) \_\_\_\_\_ will be the first phase of a long-term study on a New Zealand vineyard. These results (3) \_\_\_\_\_ whether methods of viticulture improve grape quality.

The research (4) \_\_\_\_\_ investigate the effects of organic agriculture on soil and grape quality. (5) \_\_\_\_\_ will consist of two treatments, organic and conventional (the control), each replicated four times in a randomised, complete block design. All organic practices will follow the standards set out by the Food Standards Australia New Zealand (FSANZ).

(6) \_\_\_\_\_ will assess soil quality using physical, chemical and biological indicators over six years. The next phase will then assess the physiology of the vines.

**IX. Write a short project summary of about 150 words for the research on the field you chose in Exercise III. Use the plan:**

1. State the aim of the research
2. Define what the problem is
3. Explain why your topic is worth researching
4. Say what the expected outcomes of the research are
5. Outline the procedure you will follow
6. Outline how you will limit your investigation

## II. ZOOLOGY

### 1. Animals on the brink of extinction



#### Vocabulary notes:

predator – хищник

hatched nestlings - вылупившиеся птенцы

prey - жертва

birdfeeder – кормушка для птиц

urban ecosystems – городская экосистема

American robins – странствующий дрозд

Northern Cardinals – виргинский кардинал (красный кардинал)

species - вид

extinction - вымирание

entire - целый, полный

fossilized - ископаемый, окаменелый

aridity - засушливость

humidity - степень влажности

deprive - лишить

assumption - утверждение

vulnerable - уязвимый, ранимый

intricacy - сложность, запутанность

assess - определять

natural shelter - естественное укрытие

#### I. Discussion:

1. What do you know about the Red Book, or IUCN Red List? What animals or plants mentioned in this book do you know?

2. What is it necessary to do to save some rare and evading animals?

## **II. Listen to the podcast *Bird Feeders Attract Bird Eaters, Too* and complete the text with missing words.**

More than half of U.S. households provide food for birds. It's a billion dollar industry. Now a study asks whether the same feeders that attract birds also attract predators that eat the eggs and \_\_\_\_\_ of those birds.

There are a couple different effects on relationships between nest predators and their \_\_\_\_\_.

On the one hand, food might be attracting \_\_\_\_\_ to certain areas, and that could increase nest predation risk. However, predators may be exploiting these food resources, and if you've got a good, predictable food resource on the landscape that's easy for predators to access, you could imagine that they could switch to those anthropogenic, or those human-provided foods, like bird feeders.

Malpass and her team looked at the nests of American robins and Northern Cardinals in seven Ohio neighborhoods. It was shown that the survival of Northern Cardinal nestlings did not seem to be related to the presence of these nest predators or even to \_\_\_\_\_.

Homeowners have been feeding wild birds for a long time, but only now are scientists finally beginning to understand just how that affects \_\_\_\_\_.

## **III. Read the given text and make your essential assignments**

### **Did a Changing Climate Wipe Out the Giant Kangaroo?**

**New research suggests that as weather patterns changed some 30,000 years ago in Australia, megafauna went extinct.**

The landscape of present-day Australia once was home to 500-pound kangaroos, tapirs as big as horses, giant wombat-like creatures and 8-foot turtles.

Now new research indicates that climate change could have been the cause of these large species' extinction some 30,000 years ago.

According to a study published in the journal *Paleobiology*, as weather patterns in the region changed, the land started to dry out and affect the animals' food supply. Many were unable to adapt, and entire species — known as megafauna — died out as a result.

“In general, species have three options with any sort of change in climate: they can adapt, they can move or they can go extinct. Unfortunately, this was a scenario where the climate was changing at a rate that was much slower than what's happening today — and yet, the animals went extinct,” said Larisa DeSantis, an assistant professor with Vanderbilt University and author of the study.

DeSantis and her colleagues came to this conclusion by studying fossilized megafauna teeth from Cuddie Springs in southeastern Australia. The oxygen and carbon isotopes present in the remains provided them with records of temperature and humidity levels during the period. This is a technique that scientists have

tested out on modern-day kangaroos, as well, and have discovered that the chemical composition of the teeth is a good proxy to judge humidity.

“This makes them ideally suited for tracking changes in aridity over time,” said DeSantis.

They were also able to draw conclusions about what the megafauna were eating by examining small scratches on the teeth, and realized that as the climate got drier and drier, the animals were shifting away from their regular plant resources. The inability to find adequate food, as well as the lack of water, likely contributed to the extinction. Moving away from the region was also difficult because in Australia, cooler climates could be found only high up in the mountains, in areas that the large animals couldn't access easily.

“What we saw was this increase in aridity and decrease in resources. If the landscape is getting drier, water availability is also more limited and the water content in plants is lower. So you have these animals having to compete with one another for fewer resources — there are these negative consequences, which make the animals more stressed,” she explained.

The findings of the study are part of a much larger, fiercer debate within the scientific community over the megafauna extinction. Many researchers attribute the extinction to human causes — that is, they believe the animals were hunted and deprived of habitat until they died out.

While DeSantis does not rule out the possibility that human activity might have contributed, she pointed out that there's no empirical evidence that they did.

“And if it is climate that played a role, whether a small role or a decisive one, that suggests we seriously need to think of the consequences of current climate change,” she added.

“This new study, based on hard evidence, makes it clear that changes in late Pleistocene climate had a major impact on the late Pleistocene megafauna of Australia, adding even more evidence to challenge the imaginative a priori assumption that 'blitzkrieg' by early humans caused the extinction of this continent's lost megafauna,” said Michael Archer, a paleontologist with the University of New South Wales.

Scientists still have a lot to learn about megafauna, DeSantis said, including the intricacies of their ecology and biology.

“Some animals might have been particularly vulnerable to climate change because of their biology and others less so. It's really important that we study them to get a better understanding of vulnerabilities, and what characteristics make certain animals more or less resilient,” she added.

#### **IV. Answer the questions**

1. What kind of animals lived in the territory of present-day Australia many years ago? Why did they die out?
2. What can animals do during the change of climate?

3. Which conclusions were made about climate after examining fossilized megafauna teeth from Cuddie Springs in southeastern Australia?

4. Did human activity have an impact on climate change? Give your ideas and explain them.

5. What do scientists know about megafauna?

**V. Complete the chart**

Verb	Noun
	development
extinct	
change	
	activity
	suggestion
conclude	
	assessment

*What suffixes can we use to make up nouns?*

**VI. Complete the text with the words from the previous exercise**

Judging the effects of climate change on (*extinction, to extinct*) may be easier than previously thought, according to a new article. Although widely used (*to assess, assessments*) of threatened species, such as the IUCN Red List, were not (*developed, development*) with the effects of climate change in mind, a study of 36 amphibian and reptile species endemic to the US (*conclusion, has concluded*) that climate change may not be fundamentally different from other extinction threats in terms of identifying species in danger of extinction.

**VII. Complete the text with the words from the box.**

predators (2), seed-hungry, surviving,  
bird feeder, bird-hungry, natural shelter

The two main things to keep in mind when deciding where to place your-  
\_\_\_\_\_ are: can you see the feeder well, and is the feeder in a safe location. The first of these is easy, but the second takes a bit more planning. You will want to make sure the feeder is in a place that's relatively safe from window collisions and from \_\_\_\_\_.

Perhaps counter intuitively, feeders are safest when they are closest to windows—because if a bird takes off from the feeder and hits the window, it will not be going at top speed and has a better chance of \_\_\_\_\_. Place feeders closer

than 3 feet to a picture window (or even affixed to the glass or window frame), or farther than 30 feet from a window. Window glass kills at least 100 million birds every year in the United States, according to estimates.

Feeders close to \_\_\_\_\_ such as trees or shrubs offer resting places for birds between feeding bouts and a quick refuge if a hawk flies through. Evergreens are ideal—their thick foliage buffers winter winds and offers year-round hiding places from \_\_\_\_\_.

Be careful not to locate your feeder too close to cover, though. Nearby branches can provide jumping-off points for \_\_\_\_\_ squirrels and hiding places for \_\_\_\_\_ cats. A distance of about 10 feet seems to be a good compromise, but try experimenting.

**VIII. Give Russian equivalents to the following English terms:**

chemical composition of the teeth	
oxygen and carbon isotopes	
increase in aridity and decrease in resources	
fiercer debate within the scientific community	
intricacies of their ecology and biology	
switch to those anthropogenic, or those human-provided foods	
presence of these nest predators	
regular plant resources	
evergreens	

**IX. Make up a monologue on the topic *How to protect birds and animals in danger***

## 2. Amazing animals' abilities



### Vocabulary notes:

outperform – превосходить

comparative genomics – сравнительная геномика

mammal – млекопитающее

encounter – 1. встреча

2. встретить

outwit - перехитрить

fennec fox – фенек

theory of mind – теория сознания

cognitive buffer hypothesis – гипотеза когнитивного «буфера»

social brain hypothesis - теория социального познания

counterpart – двойник, аналог

mob – стая, стадо

demand - требование

carnivores - плотоядные

### I. Discussion:

1. What the most amazing animals do you know?
2. What interesting facts about animals do you know?

### II. Read the given text and make your essential assignments

#### **What Hyenas Can Tell Us about the Origins of Intelligence**

**A long-running project in Africa challenges “the social brain hypothesis”**

Physical similarities aside, we share a lot in common with our primate relatives. For example, as Jane Goodall famously documented, chimpanzees form lifelong bonds and show affection in much the same way as humans. Chimps can also solve novel problems, use objects as tools, and may possess “theory of mind”—an understanding that others may have different perspectives than oneself. They can even outperform humans in certain types of cognitive tasks.

These commonalities may not seem all that surprising given what we now know from the field of comparative genomics: we share nearly all of our DNA with chimpanzees and other primates. However, social and cognitive complexity is not unique to our closest evolutionary cousins. In fact, it is abundant in species with which we would seem to have very little in common—like the spotted hyena.

For more than three decades, the Michigan State University zoologist Kay Holekamp has studied the habits of the spotted hyena in Kenya's Masai Mara National Reserve, once spending five years straight living in a tent among her oft-maligned subjects. One of the world's longest-running studies of a wild mammal, this landmark project has revealed that spotted hyenas not only have social groups as complex as those of many primates, but are also capable of some of the same types of problem solving.

This research sheds light on one of science's greatest mysteries—how intelligence has evolved across the animal kingdom. According to the *social brain hypothesis*, intelligence has evolved to meet the demands of social life. The subject of many popular articles and books, this hypothesis posits that the complex information processing that goes along with coexisting with members of one's own species—forming coalitions, settling disputes, trying to outwit each other, and so on—selects for larger brains and greater intelligence. By contrast, the *cognitive buffer hypothesis* holds that intelligence emerges as an adaption to dealing with novelty in the environment, in whatever form it presents itself.

The social brain hypothesis is well-supported in research on primates: the more social a primate species, the bigger its brain and the smarter it tends to be. However, Holekamp's work challenges this hypothesis as a general explanation for the evolution of intelligence. In a 2012 study carried out in the Masai Mara reserve, Holekamp and former graduate student Sarah Benson-Amram devised a “puzzle box” to measure hyenas' ability to innovate—that is, to solve a problem they had never before encountered. In each trial, a piece of raw meat was placed in the puzzle box, and the hyena's task was to slide a latch, and then to swing open a door to get the food. Across 62 hyenas, the best predictor of success was what might be considered an adaption to dealing with novelty in the environment—exploratory behaviour. Hyenas that employed a range of different behaviors in the first trial to size up the puzzle box were ultimately more likely to figure out how to open it than their less curious counterparts. On the other hand, there was no correlation between social rank and success.

More recently, in a study published in the *Proceedings of the National Academy of Sciences*, Benson-Amram, Holekamp, and colleagues used the puzzle-box paradigm to test innovation ability in 140 zoo-dwelling animals representing 39 species of mammalian carnivore, from the polar bear to the snow leopard to the fennec fox. Controlling for body mass, brain size predicted percentage of successful trials (bigger brain, better performance). However, there was no correlation between the average group size for the animals and success. In fact, despite their solitary nature, bears were the most adept at opening the puzzle box. By contrast, the highly social mongooses, who live in “mobs” with an average size

of nearly 30, were among the worst performers. While not necessarily ruling out the social brain hypothesis, these findings provide support for the cognitive buffer hypothesis. In future work, Holekamp and colleagues plan to more directly test the cognitive buffer hypothesis by comparing the innovation ability of hyenas living in wild versus urban environments.

So, the story of how intelligence has evolved across the animal kingdom is likely complex. Intelligence may have evolved in one way in primates, but in other ways in carnivores and other animals. With extinctions occurring across the animal kingdom at a rate estimated to be a thousand times greater than the natural rate, research like Kay Holekamp's groundbreaking study of the spotted hyena is all the more urgent to fill in the missing pieces of this puzzle.

### III. Answer the questions

1. What does *social brain hypothesis* mean?
2. What does *cognitive buffer hypothesis* mean?
3. Which findings provide support for the cognitive buffer hypothesis?
4. Does hyena's ability to innovate depend on social rank?
5. Which animals support the social brain hypothesis?

### IV. Give the Russian equivalents to the following English terms

outperform humans in certain types of cognitive tasks	
cognitive complexity is not unique to our closest evolutionary cousins	
goes along with coexisting with members of one's own species	
to fill in the missing pieces of this puzzle	
by comparing the innovation ability of hyenas living in wild versus urban environments	
their solitary nature	
percentage of successful trials	
social groups as complex as those of many primates	

### V. Match the sentences halves.

1. In future work, Holekamp and colleagues plan to more directly test the cognitive buffer hypothesis	A. an understanding that others may have different perspectives than oneself.
2. By contrast, the highly social	B. and the hyena's task was to slide a

mongooses, who live in “mobs” with an average size of nearly 30,	latch, and then to swing open a door to get the food.
3.The subject of many popular articles and books, this hypothesis posits that the complex information processing	C. but in other ways in carnivores and other animals.
4.Intelligence may have evolved in one way in primates,	D. than the natural rate, research like Kay Holekamp’s groundbreaking study of the spotted hyena is all the more urgent to fill in the missing pieces of this puzzle.
5.With extinctions occurring across the animal kingdom at a rate estimated to be a thousand times greater	E. were among the worst performers.
6. Chimps can also solve novel problems, use objects as tools, and may possess “theory of mind”—	F. that goes along with coexisting with members of one’s own species— forming coalitions, settling disputes, trying to outwit each other, and so on— selects for larger brains and greater intelligence.
7.In each trial, a piece of raw meat was placed in the puzzle box,	G. - like the spotted hyena.
8.In fact, it is abundant in species with which we would seem to have very little in common	H. by comparing the innovation ability of hyenas living in wild versus urban environments.

**VI. Look at the meaning of some prefixes. Then read and translate given words**

co-	with or together	co-worker (коллега) co-operate (сотрудничать)
out-	do better than	outlive (пережить (кого-л. / что-л.)), outrase (опережать; идти, бежать быстрее)
over-	too much	overcooked (передержанный, разваренный), overflow (переполняться, выходить за пределы)

under-	too little	Underweight (недовес)
--------	------------	--------------------------

estimate – overestimate – underestimate  
 exist – coexist  
 weight – overweight – underweight  
 work – overwork  
 busy – overbusy  
 production – overproduction – underproduction  
 buy – underbuy  
 standing - outstanding

### **VII. Complete the sentences**

1. They can even (*perform / outperform*) humans in certain types of cognitive tasks.
2. The administration (*estimates / overestimates*) that the social cost of carbon is \$37 a ton.
3. Many of the same shale rock formations where companies want to extract gas also happen to sit above optimal sites envisioned for storing carbon dioxide (*ground / underground*) that is captured from power plants and industrial facilities.
4. More than 100 species of coral (*exist / coexist*) in these waters; all spawn simultaneously every summer during the same few full moonlit nights, forming a thin pink slick of intermingled eggs and sperm on the water's surface.
5. Mathematics and computer science do not have a Nobel Prize. Instead, these areas have their own prizes to honor (*standing / outstanding*) achievement.
6. An 80-hour limit for a resident's workweek was introduced in July 2003 in response to concerns about (*work / overwork*).
7. This may be most likely to occur in small children, but infections that spread this way occur most often in (*developed / underdeveloped*) countries where sanitation is poor.

### **VIII. Read and translate the text without dictionary**

It has been suggested because of the potential usefulness of these traits in domestic setting that selection on this gene must have happened when chickens were first domesticated around 6,000 years ago in East Asia. But in an evolutionary timescale this is just a blink of an eye and we just do not know and do not have the resolution to tell when exactly between 6,000 years ago and now this selection happened, using data from only modern chicken populations...but with DNA from archaeological material we can follow what happened with a gene through time and in theory spot when changes in a population occur.

## III. BOTANY

### 1. Plants evolution



#### Vocabulary notes:

ground–земля

seeds – зерна

nepotism – nepoтизм, семейственность

nutrients – питательные вещества

soil - почва

diversity - разнообразие

permission - разрешение

species - виды

Joshua tree–юкка древовидная

In response - в ответ

plasticity - пластичность

selection - отбор

global warming–глобальное потепление

genetic sequencing–генетическое секвенирование

offspring - потомство

seed banks - семенной фонд исчезающих растений

sound waves - звуковые волны

interbreed – скрещиваться

irrigation – ирригация, полив

fertilizer – удобрение

crops – сельскохозяйственные культуры

impatiens -(бот.) бальзамин, недотрога

#### I. Discussion:

1. How does global warming influence plants? How did they change due to global warming?

2. What is the idea of artificial selection? Why do people try to enhance plants?

**II. Listen to the podcast *Plants Share Light if Neighbor is Related* and explain the main idea of the research which is being told about.**

**III. Listen again and choose the correct answer:**

1. *Earlier research showed that can recognize the .....of siblings from the same momma plant:*

- a. nutrients systems
- b. root systems
- c. seeds

2. *If the plants shared a pot with seeds from the same parent plant, they shared access to light by growing taller with .....*

- a. more branches and fewer leaves
- b. fewer branches and more leaves
- c. more branches and more leaves

3. *But when they were planted with not their siblings they put more energy into growing more and larger .....*

- a. Roots
- b. Branches
- c. Leaves

4. *When impatiens were planted near siblings but in separate pots, they.....*

- a. Recognize them
- b. Didn't realize who the neighbor is

**IV. Read the given text and make your essential assignments**

### **5 Million U.S. Seeds Banked for Resurrection Experiment**

**Project Baseline will monitor effects of climate change on plant evolution**

In a vault kept at  $-18^{\circ}\text{C}$  in Fort Collins, Colorado, more than 5 million seeds now lie frozen in time—destined to wait for up to 50 years until evolutionary scientists earn permission to experiment with them.

Unlike most seed banks, which aim to protect biological diversity, Project Baseline is designed to enable precise, controlled studies of how plants are

evolving in response to climate change and environmental degradation. Taken from around 250 locations across the continental United States and stored at a US Department of Agriculture facility, the seeds represent some 60 species.

Scientists began collecting the seeds in earnest in 2012, backed by a US\$1.3-million grant from the US National Science Foundation (NSF). They took care to gather specimens in a wide variety of environments and to cover a multitude of plant types, from the humble radish (*Raphanussativus*) to the iconic Joshua tree (*Yucca brevifolia*).

The collection phase is now complete, says project lead investigator Julie Etterson, a plant biologist at the University of Minnesota Duluth. Earlier this year, she and her colleagues published a paper in the *American Journal of Botany* introducing Project Baseline to the community.

To find out whether species are evolving in response to human pressures such as climate change, scientists have previously observed differences in similar species living at various sites or studied one site over time, charting how plants change along with the site. But it can be difficult to distinguish between changes that are the result of evolution—the selection of traits over generations owing to the survival of certain individuals—and those that are due to the ability of individual plants to react to a changing environment, called plasticity.

Project Baseline will allow scientists to grow stored seeds side by side with those from plants that were left to evolve, in identical conditions: any differences can then be attributed to evolution.

“I think it’s terrific,” says Richard Lenski, who studies evolution in bacteria at Michigan State University in East Lansing. “To some extent, museum specimens and even natural seed banks allow scientists to make these comparisons today, but not in the in-depth, systematic and well-thought-out way that this project will allow.”

Questions that could be explored include whether the early flowering observed in some plants in conjunction with global warming is attributable to evolution or plasticity, and how rates of evolution vary between different populations of the same species. Genetic sequencing will help researchers to discover which genes are linked to traits that have been selected for. It could also test predictions, such as that low genetic variation increases extinction rates, and that evolution occurs through many small genetic changes rather than a few large ones. “The list of hypotheses is really only limited by the imagination,” says Etterson.

Project Baseline breathes new life into a field known as resurrection ecology. Its best-known experiments hatched invertebrate eggs that had been naturally preserved in lake sediments, and compared the offspring with those of recently laid eggs. A now-classic example, from the lab of environmental scientist Nelson Hairston at Cornell University in Ithaca, New York, used sediments from Lake Constance in central Europe to prove that water fleas (*Daphnia galeata*) had rapidly evolved tolerance for toxic cyanobacteria.

Because Project Baseline actively lays the foundation for future research, rather than relying on what nature has sequestered in the past, it is a “kind of visionary project”, says Hairston.

It does assume that there will be observable environmental changes at the sites from which the seeds were collected, notes Charles Kerfoot, a biologist at Michigan Technological University in Houghton and another pioneer in resurrection ecology. But such differences are guaranteed because of climate change, he says: “This is a group that’s not in denial.”

Exactly when the scientists will wake the seeds in the vault from stasis is less clear. Project Baseline’s first call for proposals to work with the specimens is planned for 2018, and Etterson says that the first seeds could be planted as soon as 2020. She hopes to get at least one use out of the project herself before she retires.

The timescales are long compared with both the average evolution study and the average NSF grant, say researchers, but that makes Project Baseline special. “This is really different,” says Samuel Scheiner, the director of the NSF programme that funded the project, “but exactly what we need to do if we’re going to study global change.”

**V. Give the Russian equivalents to the following English terms**

evolution occurs through many small genetic changes	
genetic variation	
to discover which genes are linked to traits that have been selected for	
tolerance for toxic cyanobacteria	
resurrection ecology	
seed banks	
breathes new life	
recently laid eggs	

**VI. Complete the text with the words from the box:**

Fertilizers, species, irrigation, drought, crops (2), genetic modifications, interbreed

Many of the commercial food \_\_\_\_\_ now grown in Europe have also been imported from other continents, including potatoes, tomatoes and kiwi fruit. These do not readily spread across our landscapes, as they require constant human intervention in the form of \_\_\_\_\_, \_\_\_\_\_, herbicides and insecticides. However, some agricultural \_\_\_\_\_ can \_\_\_\_\_ with wild species. Oilseed rape is one example. Plants are adaptable and have in their gene characteristics that enable

them to survive and breed in variety of conditions. Recently, with development of genetically modified \_\_\_\_\_, some food plants have acquired new characteristics, such as resistance to \_\_\_\_\_, herbicides or insects attack. How long will it be before one of these \_\_\_\_\_ transfers to a vigorous weed, escapes our global garden and goes on the rampage in the remaining wild habitats of the world?

**VII. Match the sentences halves.**

1.Unlike most seed banks, which aim to protect biological diversity, Project Baseline is designed to enable precise,	A. are linked to traits that have been selected for.
2.But it can be difficult to distinguish between changes that are the result of evolution	B. and Etterson says that the first seeds could be planted as soon as 2020.
3.Genetic sequencing will help researchers to discover which genes	C. and compared the offspring with those of recently laid eggs.
4.Its best-known experiments hatched invertebrate eggs that had been naturally preserved in lake sediments,	D. and how rates of evolution vary between different populations of the same species.
5.Taken from around 250 locations across the continental United States and stored at a US Department of Agriculture facility,	E. the seeds represent some 60 species.
6.Questions that could be explored include whether the early flowering observed in some plants in conjunction with global warming is attributable to evolution or plasticity,	F. controlled studies of how plants are evolving in response to climate change and environmental degradation.
7.Project Baseline’s first call for proposals to work with the specimens is planned for 2018,	G. and that evolution occurs through many small genetic changes rather than a few large ones.
8.It could also test predictions, such as that low genetic variation increases extinction rates,	H. —the selection of traits over generations owing to the survival of certain individuals—and those that are due to the ability of individual plants to react to a changing environment, called plasticity.

### **VIII. Use active or passive voice of the given words**

One biotechnology applied to food crops is genetic engineering. Genetic engineering is the process in which either a desired gene of an organism (to isolate), spliced out of the surrounding genetic sequence, cloned using laboratory techniques, and inserted into the host organism which (to modify). The host crop then (to display) the desired manifestations of the gene. This means that scientists can modify a plant so that it displays traits from other plants, such as greater area or a different color. Genetic engineering can also refer to the removal of a specific gene from the DNA of the target crop, which then (to prevent) the plant from manifesting that gene. Using this technique, genetic engineers can select for certain phenotypes, and the processes related to said traits, without having to undergo selective breeding within a population. Genetic engineering (to take) less time than selective breeding, and in some cases is able to carry out genetic changes that would not occur naturally.

### **IX. Translate from Russian into English**

1. Растения способны адаптироваться, а также имеют генетические характеристики, которые делают их способными выживать и скрещиваться при любых условиях.

2. В настоящее время с развитием генетически модифицированных саженцев некоторые растения требуют наличия новых характеристик, таких как устойчивость к засухе, гербицидам и атакам насекомых.

3. Генетическое секвенирование поможет ученым установить, какие гены связаны с признаками, которые были отобраны.

4. Используя эту технологию, ученые могут отбирать определенные фенотипы и процессы, связанные с данными характеристиками без применения избирательного скрещивания внутри популяции.

### **X. Make up monologue on the topic *The effect of climate change on plants***

## 2. Amazing plants' abilities



### Vocabulary notes:

enhance – улучшать, увеличивать

pollination-опыление

bumblebees - шмели

sip – 1.глоток

2. пить по глоточку

buzz pollination – опыление вибрацией

fluid–жидкость

underestimate–недооценивать

foraging – сбор

larvae - личинка

corolla – венчик, лепесток

### I. Discussion:

1. What the most amazing plants do you know?
2. What interesting facts about plants do you know?

### II. Listen to the podcast *Bees Prefer Flowers That Proffer Nicotine and complete the text:*

We humans enjoy coffee and tea, to give our brains a caffeine boost. And bees sometimes sip nectar that naturally contains caffeine, which seems to enhance their \_\_\_\_\_. Now a study suggests that bees enjoy another familiar drug produced by plants: nicotine.

"As it turns out, not just in humans, but even the bees seem to have difficulties quitting." Lars Chittka, a professor of behavioral and sensory ecology at Queen Mary University of London.

Chittka and his colleagues studied \_\_\_\_\_ as they visited fake flowers that contained varying levels of nicotine. Unnaturally high nicotine concentrations deterred the bees. But at real-world levels, the drug attracted bees. And they even learned a flower's *color* faster, if that flower offered a \_\_\_\_\_.

Sometimes bees paid a steep price for this preference. "They returned actually to flowers that had previously sold them nicotine, so to speak, even if these flowers no longer contained nectar."

Which might give nicotine-pushing plants, like tobacco, an edge. "It provides these plant species with an unfair advantage over competing plants, because they can retain the faithful services of pollinators, even if they're offering suboptimal nectar in this case."

The results are in the journal *Scientific Reports*.

And if caffeine and nicotine have these effects on bees? Perhaps natural floral pharmacies stock other drugs too—that enhance \_\_\_\_\_, and give bees a buzz.

### **III. Read the given text and make your essential assignments**

#### **Can Plants Hear?**

##### **Flora may be able to detect the sounds of flowing water or munching insects**

Pseudoscientific claims that music helps plants grow have been made for decades, despite evidence that is shaky at best. Yet new research suggests some flora may be capable of sensing sounds, such as the gurgle of water through a pipe or the buzzing of insects.

In a recent study, Monica Gagliano, an evolutionary biologist at the University of Western Australia, and her colleagues placed pea seedlings in pots shaped like an upside-down Y. One arm of each pot was placed in either a tray of water or a coiled plastic tube through which water flowed; the other arm had only soil. The roots grew toward the arm of the pipe with the fluid, regardless of whether it was easily accessible or hidden inside the tubing. "They just knew the water was there, even if the only thing to detect was the sound of it flowing inside the pipe," Gagliano says. Yet when the seedlings were given a choice between the water tube and some moistened soil, their roots favored the latter. Gagliano hypothesizes that these plants use sound waves to detect water at a distance but follow moisture gradients to home in on their target when it is closer.

The research, reported earlier this year in *Oecologia*, is not the first to suggest flora can detect and interpret such information. A 2014 study showed the rock cress *Arabidopsis*, a relative of cabbage, can distinguish between caterpillar chewing sounds and wind vibrations—the plant produced more chemical toxins after "hearing" a recording of feeding insects. "We tend to underestimate plants because their responses are usually less visible to us. But leaves turn out to be extremely sensitive vibration detectors," says lead study author Heidi Appel, an environmental scientist now at the University of Toledo.

Another hint that plants can hear comes from the phenomenon of "buzz pollination," in which a bee buzzing at a particular frequency has been shown to stimulate pollen release. Other experiments have found that sounds can lead to

hormonal changes in plants, influence their oxygen uptake and change their growth rates. A study published earlier this year revealed that sound waves can even influence gene expression in *Arabidopsis*.

Michael Schöner, a biologist at University of Greifswald in Germany, who was not involved in the new research, believes that plants may have organs that can perceive noises. “Sound vibrations could trigger a response of the plant via mechanoreceptors—these could be very fine, hairy structures, anything that could work like a membrane,” he says.

This research raises questions about whether acoustic pollution affects plants as well as animals, Gagliano observes: “Noise could block information channels between plants, for example, when they need to warn each other of insects.” So next time you turn on a noisy leaf blower or a hedge trimmer in your garden, consider the lilies.

**IV. Answer the questions**

1. What kind of pots did scientists use?
2. How did roots grow? What was the reason?
3. What helps us to suggest that plants can hear?
4. What does “buzz pollination” mean?

**V. Give the Russian equivalents to the following English terms**

shaped like an upside-down Y	
moistened soil	
extremely sensitive vibration detectors	
paid a steep price	
to stimulate pollen release	
influence gene expression	
oxygen uptake	
organs that can perceive noises	

**VI. Find the synonyms among the pool of words**

1. rate, accessible, degree, grade, available
2. distinguish, influence, differentiate, affect

3. help, place, assist, situate, arrange  
 4. underestimate, underrate, gurgle, burble

**VII. Complete the text with the words from the box:**

learning abilities, larvae, nectar,  
 offspring, corolla (petals),

Even though bees have some pretty impressive \_\_\_\_\_, nearly all of what we know about this comes from bees' ability to learn in relation to nectar. Now, this makes sense, given that bees collect nectar from a range of flowers. However, while bees need nectar to stay alive from hour to hour while foraging (like hummingbirds), they also need pollen from flowers as their main source of protein. What's more, the \_\_\_\_\_ bees collect is critical for the survival of their \_\_\_\_\_, so they pack it on to their legs (in pollen loads) and carry it back to their colony to feed it to developing \_\_\_\_\_.

If bees do learn which flowers have pollen, what might they learn? Since bees collect pollen from the anthers of flowers, anther colour seemed like a likely candidate. However, given that the \_\_\_\_\_ of a flower are usually pretty obvious and that bees pay attention to them when collecting \_\_\_\_\_, it also seemed plausible that bees might learn about corolla colour when collecting pollen.

**VIII. Complete the chart**

Noun	Adjective
	accessible
environment	
	sensitive
	hairy
noise	
behavior	
	fundamental

*Which suffixes can we use to make up adjectives?*

**IX. Read the definitions then label the diagram below.**

**Definitions:**

**anther** - the anther is the tip of a flower's stamen ( the male

**sepal** - the sepals are small leaves located directly under a flower - they are the outermost

reproductive organs of the plant) - it contains the pollen.

**filament** - the filament is the part of the flower that holds the anther (and part of the stamen, the male reproductive organs of the plant).

**ovary** - the ovary is a female reproductive organ in plants that produces ovules. It is at the base of the pistil.

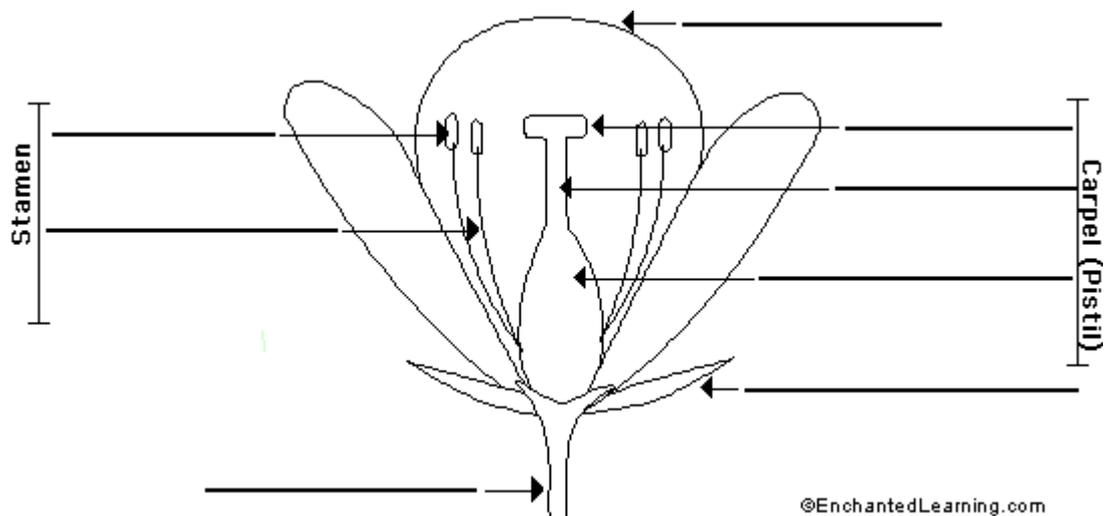
**petal** - a petal is one of the leafy structures that comprise a flower. Petals are often brightly-colored and have many different shapes.

part of a flower.

**stem (also called the peduncle)** - the stem supports the plant.

**stigma** - the stigma is uppermost part of the pistil, the female reproductive tissue of a flower. The stigma receives the male pollen grains during fertilization, when they travel through the style to the ovary.

**style** - the style is part of the pistil, the female reproductive tissue of a flower. The style is a long tube on top of the ovary, and below the stigma.



©EnchantedLearning.com

## IV. PHYSIOLOGY

### 1. The danger of strenuous exercise



#### Vocabulary notes:

muscle - мышца

strenuous exercise – интенсивная физическая нагрузка

aerobic - аэробный

evading - уходящий, ускользающий, исчезающий

saber tooth tiger – саблезубый тигр

lactic acid – молочная кислота

glycolysis - гликолиз

pyruvate - пируват

lactate - лактат, соль / эфир молочной кислоты

acidity - кислотность

disruption - разрушение

metabolic pathway - метаболический путь

exertion - напряжение, усилие

soreness - боль

inflammatory response - воспалительная реакция

delayed-onset muscle soreness - синдром отсроченной мышечной боли

eccentric contractions - эксцентрическое сокращение мышцы

concentric contractions - концентрическое сокращение мышцы

anti-inflammatory drugs - противовоспалительное средство

tenderness – болезненность

gut (intestines) – кишка

gut bacteria – кишечные бактерии

blood poisoning – заражение крови

leaky - дырявый

launch – запустить

tamp down – сгладить, умерить

immune overreaction – иммунная реакция

diaphragm – диафрагма

respiration – дыхание  
intercostals-внутренние межрёберные мышцы  
abdominal muscles – мышцы брюшной полости  
accessory muscles - вспомогательная дыхательная мускулатура  
respiratory distress syndrome – синдром острой дыхательной недостаточности  
emphysema – эмфизема  
vasoactive amines – вазоактивные амины  
blood vessels - кровеносные сосуды  
phosphorylation – фосфолирование  
burning sensation -жжение  
metabolites – метаболиты  
treadmill – тренажер  
swelling - опухоль

### **I. Discussion:**

1. How do you think the man in the picture feels? Why do you think so?
2. What exactly do strenuous exercises entail? And is this form of exercise beneficial or detrimental to the body and health?

### **II. Read the given text and make your essential assignments**

#### **Why Does Lactic Acid Build Up in Muscles? And Why Does It Cause Soreness?**

**Stephen M. Roth, a professor in the department of kinesiology at the University of Maryland, explains**

As our bodies perform strenuous exercise, we begin to breathe faster as we attempt to shuttle more oxygen to our working muscles. The body prefers to generate most of its energy using aerobic methods, meaning with oxygen. Some circumstances, however—such as evading the historical saber tooth tiger or lifting heavy weights—require energy production faster than our bodies can adequately deliver oxygen. In those cases, the working muscles generate energy anaerobically. This energy comes from glucose through a process called glycolysis, in which glucose is broken down or metabolized into a substance called pyruvate through a series of steps. When the body has plenty of oxygen, pyruvate is shuttled to an aerobic pathway to be further broken down for more energy. But when oxygen is limited, the body temporarily converts pyruvate into a substance called lactate, which allows glucose breakdown—and thus energy production—to continue. The working muscle cells can continue this type of anaerobic energy production at high rates for one to three minutes, during which time lactate can accumulate to high levels.

A side effect of high lactate levels is an increase in the acidity of the muscle cells, along with disruptions of other metabolites. The same metabolic pathways that permit the breakdown of glucose to energy perform poorly in this acidic environment. On the surface, it seems counterproductive that a working muscle would produce something that would slow its capacity for more work. In reality, this is a natural defense mechanism for the body; it prevents permanent damage during extreme exertion by slowing the key systems needed to maintain muscle contraction. Once the body slows down, oxygen becomes available and lactate reverts back to pyruvate, allowing continued aerobic metabolism and energy for the body's recovery from the strenuous event.

Contrary to popular opinion, lactate or, as it is often called, lactic acid buildup is not responsible for the muscle soreness felt in the days following strenuous exercise. Rather, the production of lactate and other metabolites during extreme exertion results in the burning sensation often felt in active muscles, though which exact metabolites are involved remains unclear. This often painful sensation also gets us to stop overworking the body, thus forcing a recovery period in which the body clears the lactate and other metabolites.

Researchers who have examined lactate levels right after exercise found little correlation with the level of muscle soreness felt a few days later. This delayed-onset muscle soreness, or DOMS as it is called by exercise physiologists, is characterized by sometimes severe muscle tenderness as well as loss of strength and range of motion, usually reaching a peak 24 to 72 hours after the extreme exercise event.

Though the precise cause of DOMS is still unknown, most research points to actual muscle cell damage and an elevated release of various metabolites into the tissue surrounding the muscle cells. These responses to extreme exercise result in an inflammatory-repair response, leading to swelling and soreness that peaks a day or two after the event and resolves a few days later, depending on the severity of the damage. In fact, the type of muscle contraction appears to be a key factor in the development of DOMS. When a muscle lengthens against a load—imagine your flexed arms attempting to catch a thousand pound weight—the muscle contraction is said to be eccentric. In other words, the muscle is actively contracting, attempting to shorten its length, but it is failing. These eccentric contractions have been shown to result in more muscle cell damage than is seen with typical concentric contractions, in which a muscle successfully shortens during contraction against a load. Thus, exercises that involve many eccentric contractions, such as downhill running, will result in the most severe DOMS, even without any noticeable burning sensations in the muscles during the event.

Given that delayed-onset muscle soreness in response to extreme exercise is so common, exercise physiologists are actively researching the potential role for anti-inflammatory drugs and other supplements in the prevention and treatment of such muscle soreness, but no conclusive recommendations are currently available. Although anti-inflammatory drugs do appear to reduce the muscle soreness—a good thing—they may slow the ability of the muscle to repair the damage, which

may have negative consequences for muscle function in the weeks following the strenuous event.

### **III. Answer the questions**

1. When does body convert pyruvate into lactate?
2. What is the effect of high lactate levels?
3. Is lactate responsible for the muscle soreness felt?
4. Give an example of eccentric contractions
5. What is the difference between eccentric contractions and concentric contractions?

### **IV. Match the words with their definitions**

1. lactic acid	A. a concept describing the use of physical or perceived energy. It normally connotes a strenuous or costly effort related to physical, muscular, philosophical actions and work.
2. metabolic pathway	B. common form of muscle contraction that occurs in rhythmic activities when the muscle fibers shorten as tension develops
3. inflammatory response	C. physical activity that requires a great amount of effort
4. anti-inflammatory drugs	D. contraction in the presence of a resistive force that results in elongation of a muscle, used to perform negative work or to decelerate a body part. It is less metabolically demanding than a concentric contraction but may cause disruption of associated connective tissue with delayed soreness or frank injury if it occurs in an unaccustomed manner, called also lengthening contraction.
5. eccentric contractions	E. a drug which inhibits or suppresses most inflammatory responses of an allergic, bacterial, traumatic or anaphylactic origin, as well as being immunosuppressant.
6. concentric contractions	F. a linked series of chemical reactions occurring within a cell.
7. exertion	G. an organic acid; it is the end product of glycolysis, which provides energy anaerobically in skeletal muscle during heavy exercise, and it can be oxidized aerobically in the heart for energy production or can be converted back to glucose (gluconeogenesis) in the liver.

8. strenuous exercise	H. a tissue reaction to injury or an antigen that may include pain, swelling, itching, redness, heat, and loss of function. The response may involve dilation of blood vessels and consequent leakage of fluid, causing edema; leukocytic exudation; and release of plasma proteases and vasoactive amines such as histamine.
-----------------------	---

**V. Complete the text. Use the words from the box:**

lactic acid, soreness (2), muscle swelling,

In 1983, in one of the first studies of the causes of \_\_\_\_\_, subjects ran level or downhill on a treadmill (downhill running causes more muscle damage than level running due to eccentric muscle contractions), and then afterward, subjects' perception of \_\_\_\_\_, lactic acid levels, and \_\_\_\_\_ was measured. Results showed approximately equal levels of lactic acid in both groups, but greater swelling in the downhill runners, and only downhill runners reported \_\_\_\_\_. Since only the downhill runners were sore and the only difference between the level- and downhill-runners was the swelling, the investigators concluded that it was the swelling that caused the delayed onset muscle soreness and not the \_\_\_\_\_, a finding consistent with the idea that lactic acid clears the muscle soon after exercise and is not responsible for \_\_\_\_\_.

**VI. Find English equivalents to the following word combinations:**

Russian term	English equivalent
Доставлять кислород	
Мышца активно сокращается	
Предотвращение и лечение мышечной боли	
Вырабатывают энергию анаэробно	
Воспалительно-восстановительная реакция	
Ключевой фактор развития синдрома отсроченной мышечной боли	
Повышение кислотности	

мышечных клеток	
Производство лактата и других метаболитов	
Доставить больше кислорода к работающим мышцам	
Ведет к большому повреждению мышечных клеток	
Замедлять способность мышц восстанавливать повреждения	

**VII. Listen to the podcast *Extreme Exercise Can Poison the Blood and complete given statements with missing words:***

1. If you're serious about fitness, you know the importance of training your \_\_\_\_\_ and your brain.
2. But it turns out that it may be just as important to train your gut—or suffer \_\_\_\_\_.
3. During the race, their \_\_\_\_\_ got leaky — due to a lack of blood flow to the intestines, and the physical trauma from so many jarring miles.
4. Some runners actually had blood profiles identical to those of patients admitted to the hospital with \_\_\_\_\_.
5. Their bodies launched a counterattack, unleashing \_\_\_\_\_  
\_\_\_\_\_ tamp down their bodies' immune overreaction.
6. Four hours of activity is extreme enough to kick off this chain of \_\_\_\_\_.

**VIII. Listen again and answer the questions:**

1. Where were results of the research published?
2. How many runners did researchers examine?
3. Who was able to avoid the problem of blood poisoning?

**IX. Translate the text**

Strenuous exercise has been shown to help prevent chronic disease in healthy people. It lowers risk of diabetes; helps control weight; releases endorphins contributing to positive mental health and overall well-being; promotes bone strength; to name a few. Strenuous exercise occurs when the heart rate reaches 80-85 percent of maximum heart rate and may cause a person to become quickly out of breath. Because strenuous exercise increases the need of oxygen, the respiratory muscles must work harder and recruit additional muscles to adapt. The diaphragm and intercostals are most important in respiration followed by abdominal and accessory muscles.

Breathing disorders that may affect your ability to participate in strenuous exercise include: weakness in the diaphragm or intercostals, respiratory distress syndrome, pneumonia, emphysema, asthma, pulmonary edema or embolism, and airway obstructions. Strenuous exercise is not recommended for people with breathing or heart problems and may cause stroke or heart attack in untrained individuals. If any of these conditions exist or if breathing troubles occur during exercise it is important to consult with a medical professional before initiating or continuing any exercise program.

## 2. People's health: serious and irreversible diseases



### Vocabulary notes:

amino acid - аминокислота

valine – валин (2-амино-3-метилбутановая кислота), одна из незаменимых аминокислот

blood – кровь

stem cell – стволовые клетки

treating – лечение

cancer – рак

protein - белок

chemotherapy - химиотерапия

radiation – радиация

deprive - лишать

bone marrow transplant - трансплантация костного мозга

obtain – потреблять

lack – недостаток

nutrient – питательное вещество

tissue repair – восстановление тканей

pregnant – беременная

intravenous – внутривенная

red blood cells – эритроциты

blood flow – кровообращение

deficiency – нехватка, дефицит, недостаток

coronary vessels – коронарные сосуды

angina pectoris – стенокардия

coronary heart disease – сердечно-сосудистые заболевания

hypertension - гипертония

### I. Discussion:

1. What kind of serious and irreversible diseases do you know? What diseases are the most common around the world and in our country?

2. What kind of the most effective cancer cures do you know?

## **II. Read the given text and make your essential assignments**

### **Could Diet Change Help Treat Blood Cancer or Transplant Patients?**

**Scientists make a fundamental discovery about the amino acid valine's role in blood stem cell development.**

A team of researchers from California and Japan has found that an essential amino acid plays a crucial role in the creation of blood stem cells—a discovery the scientists say could offer a potential alternative to chemotherapy and radiation in treating blood cancer patients.

The amino acid valine, which people obtain by eating protein, appears key to the formation of blood stem cells. Mice deprived of the protein building block for two to four weeks stopped making new blood cells altogether, according to the new study, published Thursday in *Science*.

In lab tests the study showed human blood stem cells also appear to be as dependent on valine, the researchers said. If this proves true, depriving patients of the amino acid before a bone marrow transplant might spare them the necessity of chemotherapy or radiation, both of which destroy blood stem cells to make room for new, transplanted ones. But with these procedures one in 20 transplant patients dies, sometimes from complications linked to the toxic treatments.

Additionally, depriving certain leukemia patients of valine might even kill off the cells that are causing their cancers, says Hiromitsu Nakauchi, a senior author on the new paper. “If such a simple and relatively less harmful therapy could be used to treat leukemias, that would be great,” says Nakauchi, a stem cell researcher at both the University of Tokyo and Stanford University. “That’s what I’m hoping at the moment.” Nakauchi adds that he was surprised to uncover such a basic biological process. “I couldn’t believe it myself,” he says.

Camilla Forsberg, a blood stem cell researcher at the University of California, Santa Cruz, who was not involved in the research, says she was impressed with the results and thrilled there are still such fundamental discoveries to be made. “It’s pretty exciting how the basic things we think about are still giving us surprises,” she says, adding that it will be crucial to figure out why these blood stem cells—also called hematopoietic cells—are so sensitive to valine. Other cell types might have particular sensitivities to the other 19 amino acids active in the body, nine of which are vital and must be obtained via food, so Forsberg believes these must now be studied as well. The essential role valine plays in blood should not come as such a surprise, says Linheng Li, a stem cell biologist at the Stowers Institute for Medical Research. Some people who eat a low-protein vegetarian diet are known to develop anemia, a disease characterized by low levels of red blood cells.

Li was not involved in the new research, but says he made a similar, unpublished finding in his own lab that makes him confident of Nakauchi's results. He also thinks valine deprivation could work as well in people as it does in mice, although it will take a lot of research to determine how long people can tolerate being deprived of the amino acid. If valine deprivation works in bone marrow transplant patients, it could open the procedure to some people—such as pregnant women—who are usually not considered candidates for chemotherapy or radiation, he says. Li suspects, however, that valine deprivation alone will not be effective for treating cancer directly, although it might work well combined with other therapies.

In the new study Nakauchi and his colleagues say they were able to successfully transplant bone marrow in valine-deprived mice without needing radiation or chemotherapy—but some of the mice died from lack of the nutrient, which is also involved in metabolism and tissue repair. Nakauchi says it should be relatively easy to deprive people of valine by feeding them on specially formulated intravenous diets, although he admits that might be difficult if the depletion needs to last weeks or months.

The researchers also found human blood stem cells failed to proliferate when cultured without valine. Nakauchi says the team realized only after their study was completed that it built on research published 70 years ago in *Science* by the late Nobel laureate Arthur Kornberg. When Nakauchi was a postdoctoral student at Stanford he knew the biochemist, and says it made him proud to renew and extend Kornberg's findings.

Now Nakauchi says he hopes the work will lead to new approaches to cancer treatment. "There may be some other, similar amino acid-dependency in other stem cells and also cancer stem cells," he says. "Those are the things I'm very much interested in."

### **III. Answer the questions**

1. Which two typical cancer cures are mentioned in the text? What's the alternative to these cures?
2. How do people usually obtain amino acid valine?
3. What's the effect of valine deprivation?
4. Why is it possible to say that valine deprivation can open the bone marrow transplant to some people? What kind of people?
5. What's the side-effect of valine deprivation? How is it possible to avoid this side-effect?

### **IV. Find the synonyms among the pool of words**

1. blood stem cells leukemia hematopoietic cells blood cancer
2. treatment cure open uncover
3. essential deprive abridge necessary

4. repair regenerate determine identify

**V. Fill in the gaps with the words and expressions from the text:**

1. Depriving patients of the amino acid before a \_\_\_\_\_ might spare them the necessity of chemotherapy or radiation, both of which destroy \_\_\_\_\_ to make room for new, transplanted ones.
2. However, \_\_\_\_\_ alone will not be effective for treating cancer directly, although it might work well combined with \_\_\_\_\_.
3. It should be relatively easy to deprive people of valine by feeding them on \_\_\_\_\_, although he admits that might be difficult if the depletion needs to last weeks or months.
4. There may be some other, similar \_\_\_\_\_ in other stem cells and also \_\_\_\_\_.
5. If valine deprivation works in bone marrow transplant patients, it could open the procedure to some people—such as \_\_\_\_\_ — who are usually not considered candidates for \_\_\_\_\_ or \_\_\_\_\_.
6. Some people who eat \_\_\_\_\_ are known to develop anemia, a disease characterized by low levels of \_\_\_\_\_.
7. They were able to successfully transplant bone marrow in valine-deprived mice without needing radiation or chemotherapy—but some of the mice died from \_\_\_\_\_, which is also involved in \_\_\_\_\_ and tissue \_\_\_\_\_.

**VI. Find English equivalents to the following word combinations**

<b>Russian term</b>	<b>English equivalent</b>
Низкий уровень эритроцитов	
Эффективен для лечения рака	
Недостаток питательных веществ	
Внутривенная диета	
Диета с низким содержанием белка	
Гемопоэтическая клетка	
Потреблять с пищей	
Основной биологический процесс	
Принимает участие в метаболизме и восстановлении тканей	

Избавить их от необходимости химиотерапии и радиации	
Разрушать стволовые кроветворные клетки	

### **VII. Listen to the monologue and complete the text:**

I am all for stem cell research. I know \_\_\_\_\_ the moment. Lots of people don't like it. They say it is unethical and that \_\_\_\_\_. Other people say we will create Frankenstein's monster. Britain seems to be \_\_\_\_\_ in this research. The government has passed laws to encourage it. British scientists have made \_\_\_\_\_ with stem cell research. For along time America did \_\_\_\_\_. President Obama \_\_\_\_\_ now American scientists are doing lots of research. I don't think you can stop scientists doing research. \_\_\_\_\_ history of science. I think stem cell research is very important. It will lead \_\_\_\_\_ for diseases.

### **VIII. Make up a monologue on the topic *My attitude to stem cell research***

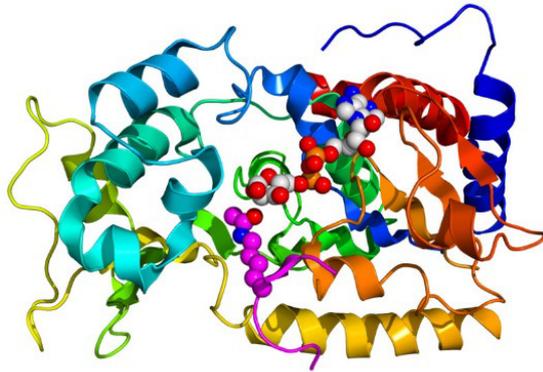
### **IX. Translate the text**

Pain which had been developed in the heart may be due to a blood flow deficiency in the coronary vessels. This is referred to (actually felt in) the left arm and shoulder. Such pain from the heart has been called angina pectoris. Angina pectoris may not actually be noticed until the work load is too great in relation to the flow in the coronary vessels. People who had experienced it repeatedly often do not feel pain unless they experience strong emotion. Others experience it much of the time. Fortunately, the great majority of coronary disease patients will have recovered and have been able to lead active, useful lives, when they receive proper treatment under good medical supervision. There are many preparations which have been effective and are under clinical investigation at the present time.

Heart and artery diseases have been presently the number one health problem in the world. Cardiovascular ailments are by far the chief causes of illness, disability, and death among both middle-aged and elderly people. Among these, coronary heart disease, illness of the blood vessels supplying the heart, is responsible for the greatest number of deaths (over 50 per cent of all cardiovascular diseases). Causes of other cardiovascular disease deaths, in order of decreasing importance, are stroke and hypertension. These three diseases are responsible for more than 80 per cent of all cardiovascular disease deaths.

## V. Molecular biology

### 1. Secrets of proteins



#### Vocabulary notes:

protein - белок

three-dimensional - трехмерное

rigid – жесткий, неподвижный

shape shifters - хамелеон

chain - цепь

sequence – последовательность

fluidity - текучесть

folded – сложенный

to bind - связывать

molecular Velcro – молекулярное «велкро» (молекулярная «липучка»)

intrinsically disordered proteins – внутренне неупорядоченные белки

launch – начать, запустить

versatile – разносторонний

tangle up – спутывать

float around – существовать

approach - подход

cohesion – связь, согласование

interfere – нарушать

autophagy – аутофагия, самопожирание

figure out- додумываться, догадываться

droplet - капля

#### I. Discussion

1. What is DNA? What is the role of DNA?
2. What do you know about proteins and their role in our body?

## **II. Read the given text and make your essential assignments**

### **The Shape-Shifting Army inside Your Cells**

**Proteins work like rigid keys to activate cellular functions—or so everyone thought**

Structure equals function: If there is one thing we all learned about proteins in high school biology, that would be it. According to the textbook story of the cell, a protein's three-dimensional shape determines what it does—drive chemical reactions, pass signals up and down the cell's information superhighway, or maybe hang molecular tags onto DNA. For more than a century, biologists have thought that the proteins carrying out these functions are like rigid cogs in the cell's machinery.

Of course, exceptions would occasionally crop up. A scientist might bump into a protein that performed its functions perfectly well yet did not have rigid structures. Most researchers chalked these cases up to experimental error, or dismissed them as insignificant outliers.

More recently, however, biologists have begun paying attention to these shapeshifters. Their findings are tearing down the structure-function dogma.

Proteins are chains of strung-together amino acids, and recent studies estimate that up to half of the total amino acid sequence that makes up proteins in humans does not fold into a distinct shape. (While some of the proteins that make up this total are unstructured from end to end, others contain long unstructured regions side-by-side with structured ones.) “Partly, people did not realize how big that number was, and that's why they ignored it,” said Julie Forman-Kay, a biochemist at the Hospital for Sick Children and the University of Toronto. “And partly they just didn't know what to think of it.”

This fluidity—dubbed “intrinsic disorder”—endows proteins with a set of superpowers that structured proteins do not have. Folded proteins tend to bind to their targets firmly, like a key in a lock, at just one or two spots, but their more stretched-out wiggly cousins are like molecular Velcro, attaching lightly at multiple locations and releasing with ease. This quick-on-quick-off binding's effect in the cell is huge: it allows intrinsically disordered proteins—or IDPs, for short—to receive and respond to a slew of molecular messages simultaneously or in rapid succession, essentially positioning them to serve as cellular messaging hubs, integrating these multiple signals and switching them on and off in response to changes in the cell's environment and to keep cellular processes ticking along as they should.

Researchers are just beginning to understand how this paradigm shift will change what we know about the goings-on in the cell. Yet already, IDPs appear to have their paws in a lot of biological processes. Through their signaling prowess, IDPs help regulate the gas and brake pedals for producing proteins from the DNA code, according to evidence that has accumulated over the past decade, as well as the process by which cells divide. IDPs may also provide cues that allow cells to

take on traits specific to different tissues or parts of the body. In other words, they may somehow help make a blood cell a blood cell and a muscle cell a muscle cell. Biologists are also finding that many disordered proteins are involved in neurodegenerative disorders, cancers and other diseases.

“The key now is that we need to understand how these proteins are functioning in biology,” said Peter Wright, a structural biologist at the Scripps Research Institute in La Jolla, California. In response to the recent revelations, an international group of researchers has launched a project called the Human Dark Proteome Initiative to study how disordered proteins cause disease. Scientists know that they still have much to learn about what these shape-shifters are up to. “It’s a re-envisioning of cell biology,” said Madan Babu, a molecular biologist at the University of Cambridge.

## STRUCTURELESS FUNCTION

Protein disorder occurs along a continuum. At one end of the spectrum lie proteins like p21, which fold on contact with other proteins. At the other end are ones that remain limp and floppy, like wet noodle strands, never taking on a shape. Researchers still don’t know how this range corresponds to their versatile functions, but being more like a string than like a lump with keyholes means that a protein can make many contacts with other molecules to regulate the network of signals that drives the cell. “You have all these on-off switches for all kinds of functions,” said Dunker.

But even though IDPs in multicelled organisms make up 30 to 50 percent—depending on the organism—of the proteins that genes are able to make, it turns out that at any given moment, they exist in the cell in only tiny amounts. Babu made this discovery in 2008, after a researcher in his lab raised a niggling question: If these unfolded proteins were in fact so common, and if many of them floated around the cell like limp spaghetti, why were not they getting all tangled up, or causing trouble in the cell by tangling up other molecules? When they examined a database of around 5,000 human proteins, they found that most unstructured proteins were expressed in small quantities and quickly destroyed after they had done their job.

The reason cells regulate their production so tightly and make sure they turn over so quickly is that IDPs pack a huge punch, Babu said. Having too many would be like having a glut of upper management — with too many people shouting commands, productivity grinds to a halt. Extend that logic to a cell, though, and things can get ugly: because IDPs regulate how different components of the cell communicate with one another, having extra copies floating around could leave them sending signals that should not get sent. “These proteins are so dangerous that you can’t afford not to regulate them,” Babu said.

Babu’s study was the first to reveal a biological principle for how disordered proteins are regulated in the cell. The following year, a paper by Ben Lehner’s group at the Center for Genomic Regulation in Barcelona, Spain, drove the point

home: When a cell produces too many of these proteins, they found, it dies. “By demonstrating the biological importance of disorder, this pair of papers put the field on the map”, said Kriwacki. “A lot of biologists saw that intrinsically disordered proteins are really important—they are not just a figment of the imagination of a group of structural biologists.”

“It is no surprise that IDPs’ significance was overlooked until then, because until recently, most methods used to study proteins would have missed them, Babu said. “It’s like the classic paradigm of looking for the key under the lampshade.”

The most popular approach for determining the shape of proteins was a technique developed in the 1960s called protein crystallography. Protein crystallography involves separating out a pure sample of the protein, coaxing the protein to crystallize, then shooting X-rays at the crystal and mapping where the light bounces off. The problem is, because they have no fixed shape, IDPs do not crystallize. That left researchers ignoring proteins that were disordered entirely, or finding ways to chop out the disordered parts. “Most crystallographers, including myself, considered this stuff junk—they were things you had to get rid of to obtain the crystals,” said James Hurley at the University of California, Berkeley. “At most we considered them as linkers that connected the interesting bits.”

For him the turning point came five years ago, when a colleague showed him data suggesting that some disordered proteins can form liquid droplets that briefly exist suspended in the fluid of the cell. Researchers still don’t know exactly how or why this process occurs, but some speculate that it brings molecules together for signaling. “At that point I realized this was going to be big,” Hurley said.

Hurley’s own expertise is autophagy, a form of molecular self-cannibalization that was the subject of the 2016 Nobel Prize in Physiology or Medicine. In the past couple of years, he and others found that two disordered proteins help initiate the process. Hurley speculates that these disordered regions act like a weak glue, creating just the right level of cohesion—not too rigid and not too loose—to bring together the molecular components needed for autophagy.

As they continue to explore what disordered proteins do inside the cell, researchers are also pursuing basic questions about how disordered proteins work. If a protein has both disordered and ordered regions, how do the two interact? How did the evolution of disordered proteins differ from that of folded ones? Also, how do molecules figure out where to attach on disordered proteins? “Even though both computer analysis and experimental lab tools for probing IDPs have improved over the past five years, studying them directly in a living cell remains a challenge”, Wright said.

Researchers also want to explore how disordered proteins contribute to disease. Most drugs are designed to interfere with a specific disease pathway by elbowing their way into important spots inside the cell. But researchers have only begun to target IDPs.

### **III. Answer the questions**

1. What are intrinsically disordered proteins?
2. What is the difference between folded proteins and intrinsically disordered proteins?
3. Which diseases can be caused by intrinsically disordered proteins?
4. What is the main idea of technique called protein crystallography?

### **IV. Give the Russian equivalents to the following English terms**

multicelled organisms	
have their paws in a lot of biological processes	
protein's three-dimensional shape	
traits specific to different tissues or parts of the body	
interfere with a specific disease pathway	
study how disordered proteins cause disease	
right level of cohesion—not too rigid and not too loose	
some disordered proteins can form liquid droplets	

### **V. Find English equivalents to the following word combinations**

<b>Russian term</b>	<b>English equivalent</b>
Включает и выключает их в ответ на изменения в клеточной среде	
Большинство неструктурированных белков были представлены в маленьком количестве и разрушались после того, как проделывали их работу	
Содержат длинные неструктурированные отрезки вместе со структурированными	
Трехмерная структура белка	

Процесс, с помощью которого делятся клетки	
Их изучение напрямую в живых клетках остается проблемой	
Внутренне неупорядоченные белки помогают регулировать старт и торможение производства белков из ДНК кода	
Одновременно получать молекулярные сообщения и реагировать на них	
Последовательность аминокислот	
Белки выполняют эти функции	
Белковая кристаллография включает выделение чистого образца белка	

## **VI. Fill in the gaps with the words and expressions from the text:**

1. According to the textbook story of the cell, a protein's three-dimensional shape determines what it does—drive \_\_\_\_\_, pass signals up and down the cell's information superhighway, or maybe hang molecular tags onto \_\_\_\_\_.
2. Proteins are \_\_\_\_\_ of strung-together \_\_\_\_\_, and recent studies estimate that up to half of the total amino acid \_\_\_\_\_ that makes up proteins in humans doesn't fold into a distinct shape.
3. Biologists are also finding that many \_\_\_\_\_ are involved in \_\_\_\_\_, \_\_\_\_\_ and other diseases.
4. In response to the recent revelations, an international group of researchers has launched a project called the Human Dark Proteome Initiative to study how \_\_\_\_\_.
5. \_\_\_\_\_ involves separating out a pure sample of the protein, coaxing the protein to \_\_\_\_\_, then shooting X-rays at the crystal and mapping where the light bounces off.
6. Because \_\_\_\_\_ regulate how different components of the cell communicate with one another, having extra copies floating around could leave them sending signals that shouldn't get sent.

**VII. Fill in the gaps with the words: *for, as, since, after, before***

1. .... it is commonly started one of the chief distinctions between animals and plants lies in the fact that animals depend upon highly organized foodstuffs .... their sources of supply.
2. The protozoa are considered ... very primitive organisms, rudimentary ancestors of higher animals ....., they are unicellular.
3. .... the discovery of streptomycin, a great deal of information has been accumulated concerning its use.
4. Rats deprived of vitamin D .... 35 to 40 days become unable to use their hind legs.

**VIII. Fill in the gaps with the words: *either... or, neither...nor, not only...but, so...that.***

1. The cations K and Ca induce diuresis when administered ... together ... in succession.
2. The kidney is an organ capable of altering the quantity and quality of the urine secreted .... ... the water balance and osmotic relations in the blood and tissues are kept within optimal ranges.
3. The functions of the kidney are ... numerous ... they require a high degree of correlation as well.
4. ... our group ... group 5 decided who will be the first to begin the experimental work on glomerular filtration.

**IX. Translate the text**

Every human being begins life as a single cell. This cell is the fundamental component of all living things.

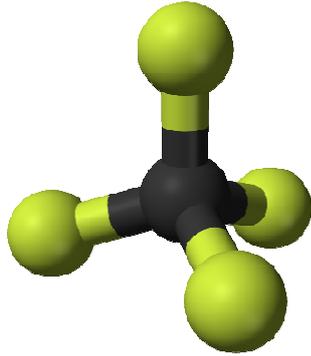
Cells deteriorate, people age. Cells malfunction, people get sick. Thanks to a number of research, scientists began to learn about them. Living things contain cells discovered by scientists three centuries ago. Scientists know fundamental things such as: every single adult cell contains the same set of genes as the original cell.

Every aspect of cell biology provides insight into the secrets of life and health.

The knowledge of functions and properties of cells summarized took place in the last two decades.

In the last few years it became possible to use the advanced techniques of recombinant DNA analysis of the structure of the human genome, as well as to produce many clinically useful peptides. Biochemistry journals provide an integrate picture of the roles played by cells in the structure and functions of biological systems.

## 2. Chemical nature of genes



### Vocabulary notes:

allele – аллель

phenotype - фенотип

genotype - генотип

meiosis - мейозис

genetic recombination – генетическая рекомбинация

coat – оболочка

desiccation - высыхание

inheritance – наследственность

strain - штамм

bacteriophage - бактериофаг

### I. Match the terms with their equivalents:

1. Allele(s)	Interactive genes
2. Dominant phenotype	Process of germ cells (sperm and egg) dividing twice to produce four germ cells
3. TT or tt genotype	Trait in family seen in only a few members
4. Meiosis	Homozygous family members
5. Recessive phenotype	Trait in family seen in many members
6. Genetic recombination	They come in pairs
7. Polygenes	Process of biological reshuffling

## **II. Read the given text and make your essential assignments**

### **The Chemical Nature Of Genes**

A capsule is an outer coat covering a bacterial cell. Unlike a slime layer, it is not easily washed off. Although capsules are not essential for bacterial growth and reproduction in laboratory conditions, they can make the difference between life and death in natural situations. For example, *Streptococcus pneumoniae* (a member of the pneumococci, the group of pneumonia-causing bacteria used in Griffith's experiment; see text) has non-capsulated and capsulated strains. Those lacking a capsule are easily destroyed by the host and do not cause disease. However, the capsulated strain kills mice quickly. The capsule helps the bacterium resist phagocytosis by host cells. It contains a great deal of water, protecting the bacterium from desiccation; it keeps out detergents which could destroy the cell surface membrane; and it helps bacteria attach to host cells.

We know today that DNA is the chemical in which information is from parent to offspring. This spread looks at how researchers established this link between DNA and inheritance. In the 1860s, nearly 100 years before Watson and Crick's work on the structure of DNA, Gregor Mendel established that inheritance depends on factors that are transmitted from parents to offspring. In 1909 it was found that patterns of inheritance were reflected in the behaviour of chromosomes. Wilhelm Johannsen referred to these factors as genes. Genes were assumed to be located on the chromosomes because genes that are inherited together (linked genes) were found to be carried on the same chromosome. However, the chemical composition of genes was not known.

### **Protein or DNA: which is the genetic material?**

Chromosomes were known to contain both protein and DNA. Most biologists assumed that proteins, with their highly complex and infinitely variable structure, were the inherited material. The nucleic acids were thought to be too simple to carry complex genetic information. This view was reinforced by the work of Phoebus Aaron Levene. Levene made major contributions to the chemistry of nucleic acids but believed, mistakenly, that DNA was a very small molecule, probably only four nucleotides long.

In 1928 Fred Griffith, an English medical bacteriologist, published a paper describing experiments on pneumococci. His results set the stage for the research that finally showed that DNA is the genetic material.

### **Griffith's experiment: transformation of pneumococci.**

Pneumococci are bacteria that cause pneumonia. They occur in two strains: a disease-causing smooth strain (strain S), and a harmless rough strain (strain R).

Strain S has a capsule on its cell surface; this capsule is absent from the harmless strain R (see Fact of life).

Griffith found that mice injected with live strain S soon died, but those injected with live strain R survived. Mice injected with dead strain S bacteria (killed by heat) all survived. The results of this series of experiments were as expected. However, the results of Griffith's next series of experiments were thoroughly baffling: mice injected with a mixture of heat-killed strain S and live strain R died. Moreover, Griffith recovered live strain-S bacteria from the dead mice.

After many careful experiments, Griffith concluded that hereditary material had passed from the dead bacteria to the live bacteria. This changed harmless strain R bacteria into virulent strain S pathogens. This process is called transformation.

### **Avery's experiment: DNA was the transforming agent.**

In the 1940s, Oswald T. Avery, Colin MacLeod, and Maclyn McCarty showed that DNA was responsible for transformation.

- They used enzymes that hydrolysed polysaccharide, DNA, RNA, and protein on samples of the disease-causing strain-S pneumococci.

- Different samples had different parts of their cells destroyed by these enzymes.

- The researchers then exposed strain-R pneumococci to the treated samples of strain S.

- The transformation of strain R to strain S was blocked only when the DNA in the sample was destroyed.

These results provided strong evidence that DNA carried genetic information for transformation. However, many scientists remained unconvinced.

### **Hershey and Chase: the role of DNA on the T2 phage life cycle**

In 1952, Alfred D. Hershey and Martha Chase performed several experiments with T2 bacteriophage, a virus that infects bacteria. Their results convinced even the sceptics that DNA, and not protein, was the genetic material.

Electron micrographs indicate that T2 bacteriophage infects *Escherichia coli* by injecting its DNA into the bacterium while leaving its protein coat on the outside. The phage takes over the genetic machinery of the host cell to make new phages. Eventually, the bacterial cell bursts (a process called lysis), releasing new phages to infect other bacteria (figure 1).

Hershey and Chase wanted to test the hypothesis that only the viral DNA entered the bacterium. They made use of the fact that DNA contains phosphorus but not sulphur, whereas protein contains sulphur but not phosphorus.

- With some T2 phages, they labelled the viral DNA with a radioactive isotope of phosphorus ( $^{32}\text{P}$ ). With other T2 phages, they labelled the viral protein coat with a radioactive isotope of sulphur ( $^{35}\text{S}$ ).

□ They added the viruses to a culture of E. coli and gave them enough time to infect their host cells (but not enough time to reproduce).

□ The viral coats were then separated from the infected bacteria by shaking the mixture vigorously in a blender.

□ When E. coli was infected with a T2 phage containing <sup>35</sup>S (labelled Protein), little radioactivity occurred within the bacterial cells.

□ With a T2 phage containing <sup>32</sup>P (labelled DNA), the bacterial cells were radioactive. Moreover, when the bacterial cells burst open, the new viruses that emerged were radioactively labelled with <sup>32</sup>P. When the protein was labelled, new viruses were only slightly radioactive.

### **III. Answer the questions:**

1. How can the harmless rough strain of pneumococcus be transformed into the pathogenic smooth strain?

2. How can the DNA in the disease-causing smooth strain of bacteria be extracted from RNA and proteins?

3. Describe the distribution of protein and DNA in T2 bacteriophage.

4. Explain how they can each be labeled.

5. Explain the significance of Griffith's work on Pneumococcus.

6. Describe how Avery and other workers analyzed the transforming factor.

7. Describe Hershey and Chase's experiment.

8. Express the main idea of each paragraph in a single sentence in English.

9. Suggest a suitable title for each paragraph of the text.

10. Divide the text into an introduction, principal part and conclusion.

### **IV. Fill in the gaps with the words and expressions from the text:**

1. The capsule contains a great deal of water, protecting the bacterium from desiccation; it keeps out detergents which could destroy \_\_\_\_ \_; and it helps bacteria attach to host cells.

2. The nucleic acids were thought to be too simple to carry \_\_\_\_ \_.

3. Their results convinced even the skeptics that DNA, and not \_\_\_\_, was the genetic material.

4. They made use of the fact that DNA contains \_\_\_\_ but not \_\_\_\_, whereas protein contains \_\_\_\_ but not \_\_\_\_.

5. Genes were assumed to be located on the \_\_\_\_ because genes that are inherited together (linked Genes) were found to be carried on the same \_\_\_\_.

6. Different samples had different parts of their cells destroyed by these \_\_\_\_.

## **V. Give the definitions to the next words:**

Sample, surface, injection, destroy, host cells, offspring

## **VI. Listen to the lecture and say these statements are true or false:**

1. Humans share some genes with fruit.
2. Genetics is independent scientific area.
3. Mendel grew 28000 pea plants.
4. Mendel studied how to alter crops and improve domestic animals.
5. Mendel studied science at the University of Vienna and used physics to explain natural phenomena.
6. Genes are tiny biochemical structures in cells that determine traits.
7. Environment is not important, only genes determine all.

## **VII. Listen again and answer the next questions:**

1. What do genes control?
2. Whose work did Mendel use? And what was the name of the work?
3. Why did Mendel study the garden pea? Give five reasons.

## **VIII. Read and translate the text**

Genes can be thought of as the basic units of heredity – the inheritance of traits from one generation to the next. Genes determine a variety of physical features, including your gender, height, and hair and eye colours. To find out how genes control such traits, geneticists study the patterns of variation, or change, in traits passed along from parents to their offspring.

When an individual exhibits a trait, geneticists say that the phenotype for that trait is expressed. Phenotypes are determined by combinations of different versions of a gene. Just as chromosomes come in pairs, so do most genes. These similar genes are called alleles. Alleles are located at the same site on each member of a chromosome pair and contain the genetic code for alternate forms of the same gene. The combination of alleles is called a genotype.

## **IX. Food for thought**

Think about a recent experiment you carried out in biology, chemistry, or some other science. Also, think about an unscientific (but fun!) experiment you carried out in which you observed people and noted how they behaved under certain conditions, perhaps at a party or a meeting. Explain what made the experiment you did in biology, physics, chemistry, a rigorous “scientific experiment”, and what made your observation of people an enjoyable, but not very rigorous experiment. What makes an experiment rigorous and enlightening for science?

## VI. Genetic-engineering technologies

### 1. Genetic engineering: changing animals and plants



#### Vocabulary notes:

chestnut - каштан

wheat - пшеница

disarm - нейтрализовать

fungus - грибок

fungal disease –грибковое заболевание

sheltered - приютить

resident - житель

crossbreed - скрестить

blight - болезнь растений

gene insertion - генная вставка

carpet - покрывать

tweaking - доработка, корректировка

virulent - опасный

rot - гнить, гниение

thrive – процветать, распространяться, разрастаться

disseminate – распространять, переносить

eradicate - истреблять

muggy – сырой и теплый

prompt – побуждать, вызывать

vanquish - преодолевать

invasive– агрессивный, захватнический

pests – вредители

emerge – появляться, возникать

gene drive – генный драйв

flourish - процветать

enzyme - фермент

mosquito cage – москитные клетки

halt – останавливать, обрывать

incision – надрез, разрез

propensity – склонность, свойство

resistance - устойчивость

prevent - предотвращать

thwart—срывать, мешать исполнению

proof-of-concept – подтверждающий работоспособность концепции

to be shelved - заваляться

infertility -бесплодие

## **I. Discussion**

1. What is your attitude to genetic engineering?
2. What do you know about gene drives? What is CRISPR?
3. How can genetic-engineering technologies help us to increase the population of animals?

## **II. Listen to the podcast and complete the text with missing words:**

Scientists have introduced genes into the American chestnut from wheat that help disarm the fungus that killed almost all three billion of the trees in the eastern U.S. David Biello reports

Chestnut trees once carpeted the eastern U.S. Three billion of them fed and sheltered many forest residents—until the early decades of the 20th century when a fungal disease called chestnut blight killed almost every last one of the trees. But now the American chestnut is making a comeback in its former range—thanks to \_\_\_\_\_.

The blight came to the U.S. on imported Asian chestnuts, which are \_\_\_\_\_ to the disease. With that resistance in mind, in the 1980's the American Chestnut Foundation began working to crossbreed the Asian chestnut with surviving individuals of its American cousin.

Such crossbreeding is time-consuming, however, and results in something less than a full American chestnut. In a bid to speed up restoration work and minimize the need for genetic changes, scientists at S.U.N.Y. College of Environmental Science and Forestry have introduced \_\_\_\_\_ into the American chestnut from wheat that help disarm the fungus. And, in the future, genes from its Chinese cousin, other trees and even grapes could help make the American chestnut even more resistant to the \_\_\_\_\_.

A few of the \_\_\_\_\_ have been planted in the wild from New Jersey to Virginia. And test plots of the genetically fortified trees have shown promising results. Some environmentalists worry about genetically modified organisms. But a bit of genetic tweaking, whether by \_\_\_\_\_ or gene insertion, looks like the only way to restore the chestnut to its former glory.

## **III. Complete the text with the words from the box:**

Wheat, gene resistance, fungus,

Increases, blight, tissues

Researchers at the Department of Energy's Oak Ridge National Laboratory, working collaboratively with scientists funded by The American Chestnut Foundation, have helped confirm that addition of a wheat gene \_\_\_\_\_ the blight resistance of American chestnut trees.

The ORNL team, in collaboration with foundation researchers led by Dr. William Powell of the State University of New York, used gas chromatography-mass spectrometry to analyze chestnuts from transgenic American chestnut trees—trees that were transformed with a \_\_\_\_\_ to increase \_\_\_\_\_ to blight. Results also showed that the transgenic chestnuts had similar metabolite concentrations to a panel of non-transgenic nuts, suggesting that they are edible.

Chestnut \_\_\_\_\_, caused by *Cryphonectria parasitica*, a fungus accidentally introduced from Asia in the late 1800s, has caused American chestnut populations to crash from stands making up around a quarter of forests in the eastern United States to a handful of large trees and patches of saplings scattered throughout the region.

Part of the reason the fungus is so virulent is because it produces oxalate, which causes chestnut \_\_\_\_\_ to rot. The wheat gene (oxalate oxidase) that was introduced into American chestnut by the research team associated with New York chapter of The American Chestnut Foundation, breaks down oxalate, helping to limit the deadly effects caused by the \_\_\_\_\_.

**IV. Give the Russian equivalents to the following English terms**

genetically modified organisms	
disarm the fungus	
similar metabolite concentrations	
restoration work	
breaks down oxalate	
minimize the need for genetic changes	
patches of saplings	
genetically fortified trees	

**V. Read the given text and make your essential assignments**

**Gene Drives Thwarted by Emergence of Resistant Organisms**

**Until this obstacle is overcome, the technology is unlikely to succeed in the wild.**

In the small city of Terni in central Italy, researchers are putting the final touches on what could be the world's most sophisticated mosquito cages. The enclosures, each occupying 150 cubic metres, simulate the muggy habitats in

which Africa's *Anopheles gambiae* mosquitoes thrive. By studying the insects under more-natural conditions, scientists hope to better understand how to eradicate them—and malaria—using an emerging genetic-engineering technology called gene drives.

The technique can quickly disseminate genetic modifications in wild populations through an organism's offspring, prompting some activists to call for it to be shelved. Yet gene drives might not be as effective as activists think. Recent research has identified a major hurdle to using them to eliminate diseases and vanquish invasive pests: evolution.

Organisms altered by gene drives, including mosquitoes, have shown promise in proof-of-concept laboratory experiments. But wild populations will almost certainly develop resistance to the modifications. Researchers have begun identifying how this occurs so that they can address the problem.

Gene drives thwart the rules of inheritance in sexually reproducing organisms. Normally, offspring have a 50:50 chance of inheriting a gene from their parents. Gene drives alter those odds, preferentially passing on one version to an organism's offspring until, in theory, an entire population bears that gene.

Such 'selfish' genetic elements occur naturally in mice, beetles and many other organisms, and researchers have had modest success with hijacking them to battle pests. But interest in gene drives has surged with the advent of CRISPR–Cas9 gene editing, which can be used to copy a mutation from one chromosome into another.

In late 2015, researchers reported a CRISPR gene drive that caused an infertility mutation in female mosquitoes to be passed on to all their offspring. Lab experiments showed that the mutation increased in frequency as expected over several generations, but resistance to the gene drive also emerged, preventing some mosquitoes from inheriting the modified genome.

This is hardly surprising, says Philipp Messer, a population geneticist at Cornell University in Ithaca, New York. Just as antibiotics enable the rise of drug-resistant bacteria, population-suppressing gene drives create the ideal conditions for resistant organisms to flourish.

One source of this resistance is the CRISPR system itself, which uses an enzyme to cut a specific DNA sequence and insert whatever genetic code a researcher wants. Occasionally, however, cells sew the incision back together after adding or deleting random DNA letters. This can result in a sequence that the CRISPR gene-drive system no longer recognizes, halting the spread of the modified code.

The researchers building the mosquito cage in Italy, part of a multimillion-dollar project called Target Malaria, found this form of resistance in some mosquitoes. And Messer's team reported in December that these mutants are likely to flourish.

Natural genetic variation is another route to resistance. CRISPR-based gene drives work by recognizing short genetic sequences, and individuals with differences at these sites would be immune to the drive. A recent study analysed

the genomes of 765 wild *Anopheles* mosquitoes from across Africa. The team found extreme genetic diversity, which would limit the list of potential gene-drive targets, the researchers say.

“These things are not going to get too far in terms of eradicating a population,” says Michael Wade, an evolutionary geneticist at Indiana University Bloomington. Gene drives could result in the genetic isolation—in which populations do not mate with each other—of groups that manage to avoid inheriting the modified genetic code, he and his colleagues found. And gene variants that decrease a population’s propensity to mingle with other populations—such as those that limit flight capacity in insects—would suddenly prove beneficial and could spread.

Resistance to gene drives is unavoidable, so researchers are hoping that they can blunt the effects long enough to spread a desired mutation throughout a population. Some have floated the idea of creating gene drives that target multiple genes, or several sites within the same gene, diminishing the speed with which resistance would develop. By surveying a species’ natural genetic diversity, researchers could target genes common to all individuals.

The Target Malaria team has developed a second generation of gene-drive mosquitoes, hoping to slow the development of resistance, says Andrea Crisanti, a molecular parasitologist at Imperial College London. The researchers plan to test them in their new Italian facility later this year to get a sense of how the mosquitoes might fare in the wild. But molecular biologist Tony Nolan, also at Imperial, expects evolution to throw up some surprises. He says that his greatest worry about gene drives is that they simply will not work.

## **VI. Answer the questions**

1. What are two sources of the resistance to the gene drive?
2. Is it possible to achieve the resistance to gene drives?
3. How can gene drives thwart the rules of inheritance?
4. Why do scientists use special mosquito cages? What kind of cages are they?
5. What is the greatest worry about gene drives?

## **VII. Find English equivalents to the following word combinations**

<b>Russian term</b>	<b>English equivalent</b>
В лабораторных экспериментах, подтверждающих концепцию	
Организмы, размножающиеся половым путем	
Устойчивость к генному драйву	
Не давая некоторым москитам наследовать модифицированный	

геном	
Бактерия, резистентная к лекарственным средствам	
Распространять желательные мутации среди популяции	
Ограничивать способность насекомых летать	
Бороться с вредителями	
Группы, которые смогли не унаследовать модифицированный генетический код	
Генетическое разнообразие	

### **VIII. Find the synonyms among the pool of words**

1. Vanquish, dangerous, overcome, virulent
2. Thrive, flourish, prevent, thwart
3. Eradicate, occur, eliminate, emerge
4. Disseminate, spread, change, alter

### **IX. Read and translate**

Genetic engineering is the term applied to scientific techniques that alter genes or combinations of genes in an organism. The cells of all living organisms contain genes. Genes carry the chemical information that determines the organism's characteristics or traits. By changing the organism's genes, you can give the organism and its descendants different traits.

For thousands of years, breeders of plants and animals have used breeding methods to produce favorable combinations of genes. These "genetic engineers" have produced most of the economically important varieties of flowers, grains, cows, horses, dogs, and cats. Beginning in the 1970s, scientists developed ways to reintroduce individual genes into cells or into plants, animals, or other organisms. Such techniques alter the heredity of the cells or organisms.

### **X. Make up a monologue on the topic *My attitude to genetically modified food***

## **2. Genetic engineering: changing people**



### **Vocabulary notes:**

peer – ровня

fortitude – стойкость, сила духа

scarcely – едва ли

ridiculous – нелепый, смешной

precisely – четко

socket set – комплект насадок

boost – повышать

causal – причинный, детерминистский

reliability – надежность

measure – измерять, взвешивать

pinpoint – точно определить, точно указать

pleiotropic effects – плейотропный эффект

impediment – препятствие, помеха

idiosyncratic – характерный, отличительный

intended target – желаемая цель

disruption – разрушение, разрыв

gene doping – генный допинг

temporal cortex – височная кора

prefrontal cortex – префронтальная кора

cerebellum – мозжечок

income – доход, прибыль

parental neglect – отсутствие родительского внимания

jittery – тревожный

struggle – бороться

emotional turmoil – расстройство эмоциональной сферы

genome – геном

enhancement – улучшение, усовершенствование

## I. Discussion

1. What do you know about eugenics?
2. What is positive eugenics? What is negative one?

## II. Read the given text and make your essential assignments

### **Can CRISPR–Cas9 Boost Intelligence?**

**Not now, certainly, but maybe someday—although there are plenty of hurdles to overcome first**

A letter was recently published in *Nature* on 329,000 young people identifying 74 genetic variants—spelling mistakes in single nucleotides in the six billion letter human genome—which can be used to predict nearly 20 percent of the variation in school years completed, a quantitative trait of fortitude which is correlated to general intelligence, and which you can learn about by sequencing your own genome.

Staple that to your college application.

Even before the “molecular age,” we were on guard for the slightest tips that show we are more or less valued than our peers. But there was also caution from the academics that there was actually very little we could do to leverage our biology for improvement. In 1924, the Harvard geneticist William Castle quipped that “we are scarcely as yet in a position to do more than make ourselves ridiculous in this matter. We are no more in a position to control eugenics than the tides of the ocean.”

Enter Crispr-Cas9, the first pair of tiny molecular scissors that can alter nucleotides of DNA precisely and simply. If the first draft of the human genome, published at the turn of the millennium, was like introducing a Chilton’s auto manual for human genetics, Crispr-Cas9 is the socket set.

“In my opinion, Crispr could in principle be used to boost the expected intelligence of an embryo by a considerable amount,” said James J. Lee, a researcher at University of Minnesota, one of the authors of that study. “But “in principle” does a lot of work here. One practical obstacle is that we still do not have a reliable means of determining the causal site(s) responsible” for the association. In other words, Lee cautioned me that just because a genetic variant is associated with a quantitative trait, it might only be hitchhiking with another genetic variant in the area that is actually the cause or “driver” of the effect.

“There is a vast amount of work establishing the heritability of intelligence, and the reliability of measuring it,” the cognitive scientist Steven Pinker told me. “We know the genes are in there, but because each one accounts for such a small proportion of the variance, they are hard to pinpoint. I doubt that we’ll see parents using Crispr to implant any of them in their kids, for a number of practical reasons—there are too many genes, the effect of each one is small, we don’t know which ones have negative pleiotropic effects (meaning they may contribute to a

weaker effect when combined with different genetic backgrounds in different people) and the safety impediments to allowing the procedure are almost certainly too steep.”

The safety and accuracy of Crispr-Cas9 is fast improving. New proteins are being discovered and selected which make the tool more accurate and less likely to cause “off target effects,” meaning unintentional edits or disruptions to genes in a different neighborhood in a cell. Because each of our genomes is idiosyncratic, just a bit unique, we will never be entirely sure that a genome edit does not occur to a site that is highly similar to an intended target. But technical improvements mean that the technology is becoming closer to acceptance as a tool, and our knowledge of genetic targets is ever more precise.

“Doing things to our own bodies seems to be something many people are willing to do,” said Steve Gullans, a scientist who has written on genetic enhancement, or gene doping, as it is known in circles of professional sports. “Gene doping is an area of uncertainty in terms of legal and moral structures. Not sure who is the thought leader in this space. There is still too much concern about safety to do any enhancement, I believe. Once the safety issue is overcome in the minds of everyone, all bets are off.”

The bioethicists Julian Savulescu and John Harris have argued that it was not only a right but a duty to manipulate genetic code of our future children, a concept termed “procreative beneficence,” and extending the term parental neglect to “genetic neglect,” if we do not gene engineer. The bio-ethicist HilleHaker, has by comparison, noted there is more to being a human than genetics. Others, including the University of New Mexico Academic David Correia, have envisioned dystopian outcomes, suggesting the wealthy might use genetic engineering to translate power from the social sphere into the enduring code of the genome, effectively as “legacy genetics,” establishing “permanent capitalist social relations.”

But, whatever changes we code into our genomes will end up getting thrown up against different genetic backgrounds in future generations, due to random rearrangements in chromosomes, so it is unlikely to fix any permanent relations.

Perhaps more importantly, intelligence is not a simple input-output system, as much as it is a developed ability to hold in mind and toggle between two or more opposing thoughts, as much as it is a capacity for memory. There are also questions about what kinds of intelligence we have, whether it is the techno-scientific intelligence that is most easily converted to income in the modern society, or the kind of struggling creative intelligence that leads to the creation of novels and art. To think intelligently can require a sense of insecurity for some of the most basic facts of nature. David Foster Wallace demonstrated a kind of probing essence of intelligence, and how troubling it can be, when he reflected on the questions that bothered him the most: “what is a number?”

In fact, there are no superior genes, only genes that provide advantages with a tradeoff for other disadvantages. For instance, the *COMT* gene encodes for the catechol-O-methyltransferase enzyme involved in degradation of dopamine in the

prefrontal and temporal cortex. People with two copies of a mutation have a fourfold increase in *COMT* activity, while if you have less you may have better concentration, but also be more jittery. In 1995, Arnold Ludwig reported a 77 percent rate of psychiatric disorders in eminent fiction writers. Jonathan Gottschall noted that writers are 10 times, and poets 40 times, more likely to be bipolar than the general population.

Psychologists who study the connection between creativity and madness report that emotional turmoil is correlated with creativity to a point, after which too much chronic stress leads to a decline in creative capacity, a concept broadly called “inverted U.” But this also tells us that stress influences intelligence in profound ways, and that intelligence is not coded, as much as it is fought for and built. “My intelligence – whatever I call my intelligence – was assembled by that kid I was between the ages of 26 and 36 who just did not stop reading,” the author Junot Diaz told *Scout Magazine*. “That kid build the edifice which I currently claim as my own.”

In his 1999 paper *Genetic Enhancement in Humans*, Jon Gordon expressed his great doubts we will ever use genetics to improve our brains. “A useful way to appreciate the daunting task of manipulating intelligence through gene transfer is by considering the fact that a single cerebellar Purkinje cell may possess more synapses than the total number of genes in the human genome. There are tens of millions of Purkinje cells in the cerebellum, and these cells are involved in only one aspect of brain function: motor coordination. The genome only provides a blueprint for formation of the brain; the finer details of assembly and intellectual development are beyond direct genetic control and must perforce be subject to innumerable stochastic and environmental influences.”

The willingness to make alterations to our brains is inevitable if history is any indicator. In 1999, Joe Tsien and his colleagues at Princeton University shocked the world when they reported genetically engineering mice with better memories. They achieved the effect by popping an extra copy of the NR2B gene into their genomes. This gene encodes the NMDA receptor, which is used in memory formation and can affect a trait that neuroscientists call “long-term potentiation.” The press dubbed the super smart mouse pups “Doogie mice,” after the popular television show *Doogie Hauser MD* (then in syndication). At the time, Tsien said, if it worked in humans, everyone would want to use it, since “everyone wants to be smart.”

Daniel Keyes anticipated Tsien’s experiment decades before in his 1966 book *Flowers for Algernon*. The book unfolds through progress reports written by Charlie Gordon, a 32-year-old bakery worker with an IQ of 70 who grew up in the Warren State Home and Training School. Using misspelled words and broken sentences, Charlie explains to readers that scientists have told him they’ve found a means to rapidly increase his intelligence. In fact, they say, they have already engineered a mouse named Algernon to become super smart.

Charlie’s IQ eventually soars to 186. He struggles with relationships as his intellectual development outpaces his emotional development. People at his bakery

job start to resent him. During his courtship with a love interest, Alice, he starts to get close to her, but senses that “Old Charlie” is near. He becomes too self-conscious to be close to her. She claims all he wants to talk about is “cultural variants, and neo-Boulean mathematics, and post-symbolic logic.” Thus, his character is divided into antithetical halves, as he struggles to reconcile his capacity for slicing insight with lagging emotional development.

Charlie decides: “Intelligence is one of the greatest human gifts. But all too often a search for knowledge drives out the search for love. This is something else I’ve discovered for myself very recently. I present it to you as a hypothesis: Intelligence without the ability to give and receive affection leads to mental and moral breakdown, to neurosis, and possibly even psychosis.”

### **III. Answer the questions:**

1. Why is it so difficult to boost intelligence?
2. What is the result of studying the connection between creativity and madness?
3. What is the idea of the book *Flowers for Algernon*?

### **IV. Complete the text with the words from the box:**

prefrontal cortex (2), cerebellum, developmental disorders, cognitive development, motor development,
---

Motor development and \_\_\_\_\_ may be fundamentally interrelated. Contrary to popular notions that \_\_\_\_\_ begins and ends early, whereas cognitive development begins and ends later, both motor and cognitive development display equally protracted developmental timetables. When cognitive development is perturbed, as in a neurodevelopmental disorder, motor development is often adversely affected. While it has long been known that the striatum functions as part of a circuit with dorsolateral \_\_\_\_\_, it is suggested here that the same is true for the \_\_\_\_\_ and that the cerebellum may be important for cognitive as well as motor functions. Like prefrontal cortex, the cerebellum reaches maturity late. Many cognitive tasks that require prefrontal cortex also require the cerebellum. To make these points, evidence is summarized of the close co-activation of the neocerebellum and dorsolateral prefrontal cortex in functional neuroimaging, of similarities in the cognitive sequelae of damage to dorsolateral \_\_\_\_\_ and the neocerebellum, of motor deficits in "cognitive" developmental disorders, and of abnormalities in the cerebellum and in prefrontal cortex in the same \_\_\_\_\_.

**V. Use active or passive voice of the given words**

Like many aspects of genetic engineering, manipulating DNA to potentially boost intelligence is a controversial topic with many ethical dilemmas. However, efforts still ..... (to continue) in this direction and recent experiments by researchers in the US .....(to produce) genetically-modified mice that demonstrate better learning and remembering. Such research may pave the way for new gene therapy treatments for mental disorders and even one day, the ability to improve human intelligence.

There are three main ways to modify the development of an organism through its genes: gene therapy, genetic breeding, and genetic engineering. With regards to intelligence, the first method (gene therapy) is not very relevant or useful as overall intelligence .....(to influence) by early brain development. The second method (genetic breeding) would be the simplest way to achieve intelligence improvement as the desired trait (high intelligence) .....(to occur) naturally and ..... (to pass on) from parent to progeny. However, human breeding is too sensitive and controversial an area to be engaged in seriously, particularly with the fears of genocide, so this leaves just the last method, genetic engineering, as the only alternative for biologically improving intelligence.

**VI. Give the Russian equivalents to the following English terms**

Boost intelligence	
single nucleotides	
expected intelligence of an embryo	
long-term potentiation	
motor coordination	
chronic stress leads to a decline in creative capacity	
misspelled words and broken sentences	
leads to mental and moral breakdown, to neurosis, and possibly even psychosis	

**VII. Match the sentence halves. Make complete sentences:**

1. Even before the “molecular age,” we were on guard for the slightest tips	a. that is most easily converted to income in the modern society, or the kind of struggling creative intelligence that leads to the creation of novels and art.
2. New proteins are being discovered and selected which make the tool more accurate	b. and these cells are involved in only one aspect of brain function: motor coordination.

3. There are also questions about what kinds of intelligence we have, whether it is the techno-scientific intelligence	c. if history is any indicator.
4. “My intelligence – whatever I call my intelligence – was assembled by that kid I was between the ages of 26 and 36 who just did not stop reading,” the author Junot Diaz told Scout Magazine.	d. “That kid build the edifice which I currently claim as my own.”
5. Psychologists who study the connection between creativity and madness report that emotional turmoil is correlated with creativity to a point,	e. that show we are more or less valued than our peers.
6. The willingness to make alterations to our brains is inevitable	f. after which too much chronic stress leads to a decline in creative capacity, a concept broadly called “inverted U.”
7. There are tens of millions of Purkinje cells in the cerebellum,	g. and less likely to cause “off target effects,” meaning unintentional edits or disruptions to genes in a different neighborhood in a cell.

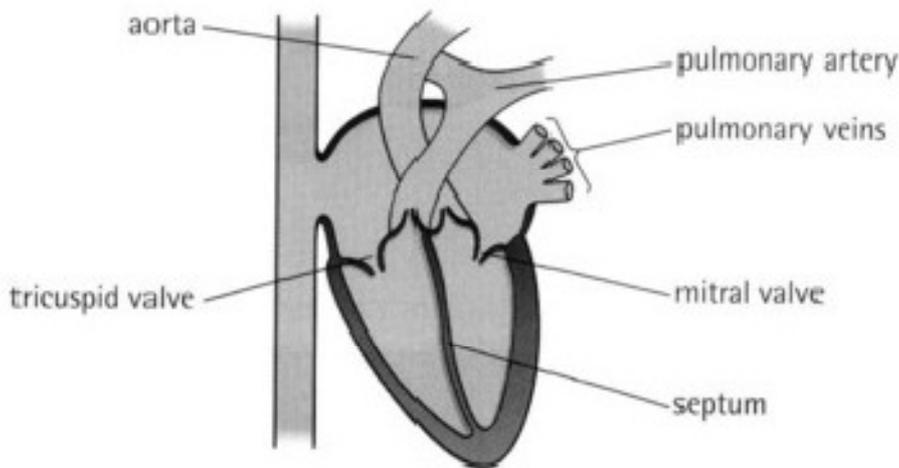
### **VIII. Unjumble the words**

I think the engineering genetic of idea fascinating is. It’s also quite dangerous. Fiddling around with what makes less us might us human human make. We could end up creating a Frankenstein’s monster. The idea of genetic engineering for been centuries around has. Scientists change to wanted always have us. The real breakthrough came last in latter of century the half. Geneticists cracked the genetic code and found ways of altering our genes. Now and animals clone can they reproduce human tissue and organs. I don’t think it’ll be too long before scientists clone a person. has down all fuss died Once the, younger generations will be more accepting of genetic engineering. live even might We hundred two be to years old.

### **IX. Listen and check**

**X. Make up a monologue on the topic *Role of genetic engineering in boosting intelligence***

## VII. The Cardiovascular System



### I. Discussion

1. Look at the picture and translate the names of the parts of the cardiovascular system.
2. Which cardiovascular diseases do you know?
3. What increases the risk of cardiovascular diseases? And what decreases this risk?

### II. Complete the description with the words from the box.

vessels, coronary arteries, heart attack,  
hypertension

The coronary blood \_\_\_\_\_ surrounding the heart have derived their name from the fact that they encircle the heart like a crown, or corona. These vessels transport almost a half pint of blood every minute over the surface of the heart. Any sudden blockage of one of the \_\_\_\_\_ deprives that section of the heart of its blood supply. Cardiac cells die, heart contractions may cease, and circulation may come to a standstill. If a coronary artery is completely plugged, the condition is called a coronary occlusion or \_\_\_\_\_. The vascular pathologic disorder itself has been very variable. If the obstruction is only partial or in one of the smaller coronary tributaries, prompt treatment often leads to the individual's recovery. An occlusion in main coronary arteries is very serious and may cause sudden death. Other causes of the coronary disease include heavy physical exercise, aging, dietary habits, obesity, smoking, or \_\_\_\_\_.

### **III. Read the given text and make your essential assignments**

#### **Heart Beat: Music May Help Keep Your Cardiovascular System in Tune**

##### **Could a regular dose of Pavarotti or Queen do your body good?**

Music may calm the savage beast or, at least, make the workday seem shorter. A new study now adds cardiovascular health to the list of music's potential benefits, suggesting it can directly trigger physiological changes that modulate blood pressure, heart rate and respiration.

"Music induces a continuous, dynamic—and to some extent predictable—change in the cardiovascular system," said Luciano Bernardi, a Professor of medicine at the University of Pavia in Italy and lead author on the paper published in the journal *Circulation*, in a statement. Understanding the mechanisms of how swelling crescendos and deflating decrescendos affect our physiology, he suggests, could lead to potential new therapies for stroke and other conditions.

Bernardi and his colleagues had previously found that changes in the cardiovascular and respiratory systems mirrored musical tempo. To extend this knowledge to the body's response to changing rhythms, they enlisted 24 volunteers—half experienced singers, the remainder with no musical training.

While participants listened to five random selections of Beethoven, Bach, Puccini and other classical artists as well as a two-minute segment of silence, monitors recorded physiological signals. The researchers found that selections with crescendos, especially those with a series of them (think: Queen's Bohemian Rhapsody), led to proportional constriction of blood vessels and increases in blood pressure, heart rate and respiration. These measures decreased during decrescendos and silent periods. The team also found that "rich" music phrases around 10 seconds long, like those rhythms from famous arias by Verdi, caused heart rate and other parts of the cardiovascular system to synchronize with the music. Both groups experienced this entrainment, although the musicians showed a stronger response.

These results, Bernardi says, indicate that music's effects go beyond a patient's head. "It is not only the emotion that creates the cardiovascular changes," he notes, "but this study suggests that also the opposite might be possible." He believes the boosts in mood—including those pleasurable "chills"—triggered by music might also be a side effect of a physiological reaction.

Connie Tomaino, the executive director and co-founder of the Institute for Music and Neurological Function in New York City, has seen evidence of this mechanism in her own clinical practice. "The study hints at the possibility that some of these entrainment mechanisms act at the subconscious level," Tomaino says. "There's enough clinical evidence out there that shows this is true." She notes that even people in semivegetative states show respiratory changes when music is played.

Bernardi's study is limited by a small sample size and uniformity between participants—all were healthy Caucasians between the ages of 24 and 26. The authors suggest further research is needed to confirm and generalize their findings to the wider population and to other types of music.

Meanwhile, Tomaino finds Bernardi's study "really nicely supports previous inferences" into the science of music. (She is a consultant for a new documentary airing tonight on PBS called "The Music Instinct: Science and Song," featuring an array of musicians including jazz, pop and rap and how they affect human mind and body.) She points to a paper published earlier this year that found a developing fetus is already equipped with the ability to distinguish changes in sound patterns, presumably in order to interpret and learn from the world around them. "We're prewired to be receptive to rhythm," Tomaino says. So, scaramouch, do the fandango.

**IV. Answer the questions:**

1. Which cardiovascular diseases can music prevent?
2. Describe the effect on music on cardiovascular system
3. What another system does music effect too?

**V. Give the Russian equivalents to the following English terms**

a side effect of a physiological reaction	
semivegetative states	
at the subconscious level	
to be receptive to rhythm	
caused heart rate	
therapies for stroke and other conditions	
modulate blood pressure, heart rate and respiration	
ability to distinguish changes in sound patterns	

**VI. Listen to the monologue and fill in the gaps.**

The heart is one organ we \_\_\_\_\_ look after. Most of us, I think, do not really know how to \_\_\_\_\_. Or perhaps we know, but do not do enough to keep our heart \_\_\_\_\_ condition. Our heart is an amazing thing, when you think about it. It \_\_\_\_\_ for years and years and years, pumping millions of litres of blood around our body. It keeps working, \_\_\_\_\_ do so many bad things to it. It really is \_\_\_\_\_ our life. We need

to promise our heart every day that we'll look \_\_\_\_\_. I think kids born \_\_\_\_\_. Modern medicine and science will soon \_\_\_\_\_ answers to keep our heart strong. Even today we're lucky. Doctors can replace your heart \_\_\_\_\_ transplant.

**VII. Read the case. Then complete the conversation based on the case history.**

A 22-year-old student was admitted to hospital with a long history of heart problems. She had been increasingly tired, with shortness of breath on exertion, orthopnoea, and palpitations. A **mitral valve replacement** had been carried out 3 years previously and this had stabilized the symptoms of heart failure but was followed by **episodes** (attacks) of **atrial fibrillation**, which had been particularly severe for the 6 months before admission.

**Doctor:** What seems to be the problem?

**Patient:** I have been getting (1) \_\_\_\_\_.

**Doctor:** How long have you had them?

**Patient:** For about six months. But I've had heart problems for years, with tiredness and (2) \_\_\_\_\_ of (3) \_\_\_\_\_. In the end I couldn't walk more than a hundred metres without having to stop. I had to sleep on three (4) \_\_\_\_\_. I had a (5) \_\_\_\_\_ replacement three years ago, and that improved things for a while.

**VIII. Fill in the gaps with the words: *fortunately, approximately, also***

1..., the great majority of coronary disease patients recover and are able to lead active, useful lives if they receive proper treatment under good medical supervision.

2. ... one fourth of all deaths in the world result from coronary artery disease.

3. ...it is estimated that more than one out of every ten persons suffers some degree of insufficiency of blood supply to the heart.

**IX. Read about the symptoms of cardiovascular diseases. The complete the case.**

**1. Shortness of breath**

*Shortness of breath, or breathlessness, is dyspnoea. At first this is caused by exertion – physical activity such as climbing stairs – but in severe cases it may be present even at rest. A patient who is breathless when lying flat (orthopnoea), for example in bed, will tend to sleep raised up on two or more pillows. The*

abbreviation SOBOE: stands for shortness of breath on exercise (or on exertion, or on effort).

## **2. Heart rhythm**

The normal resting heart rate is 65-75 beats per minute. In athletes it may be as low as 40 beats per minute. In extreme athletic activity the heart rate can go as high as 200/min. The heart rhythm may be regular or irregular. In an irregular rhythm (arrhythmia), there may be early beats which interrupt the regular rhythm (premature beats); or the rhythm may vary with respiration; or it may be completely irregular, as in fibrillation. When patients are aware of irregularity, they describe the symptom as palpitations.

## **3. Heart failure**

Heart failure occurs when the heart is unable to maintain sufficient cardiac output – the amount of blood pumped by the heart each minute – for the body's needs. It may involve the left side of the heart, or both. In the left heart failure the main symptom is breathlessness. The symptoms of right heart failure include peripheral oedema (swelling), beginning in the feet and ankles. This is known as pitting oedema if, when a finger is pushed into the swelling, it causes a small depression or pit.

### **CASE:**

A 60-year-old woman attended her GP's surgery complaining of breathlessness on (1) \_\_\_\_\_. This had been increasing over the previous eight months until it was producing problems at around 500 metres walking on the level. There was no history of chest pain. She had had several (2) \_\_\_\_\_ of fast (3) \_\_\_\_\_ which lasted 20-30 minutes and were associated with some (4) \_\_\_\_\_ of breath. She had noticed some (5) \_\_\_\_\_ of her ankles by the end of the day. This disappeared overnight.

### **X. Translate the text without dictionary**

One of the most important of all medical research problems to be investigated by scientists and clinicians is that of cardiovascular disease. This includes research on atherosclerosis, essential hypertension and ischemic coronary disease of the heart and cardiac insufficiency. Research workers, epidemiologists and clinicians examine the origin of family factors to find out what contributes to coronary heart disease in man.

Current methodological approaches are designed to clarify definitions. Specific genetic hypotheses and statistical procedures to be used as guidelines for future research will be developed.

Past investigations have led to the establishment of special anti-in-farct services to provide special care and prompt therapeutic measures to be taken.

The general practitioner, a doctor to face the epidemic of coronary heart disease, is the key to preventive medicine. The results of the research to provide the general practitioner with up-to-date and practical recommendations on the management of cardiovascular problems will be applied into practice.

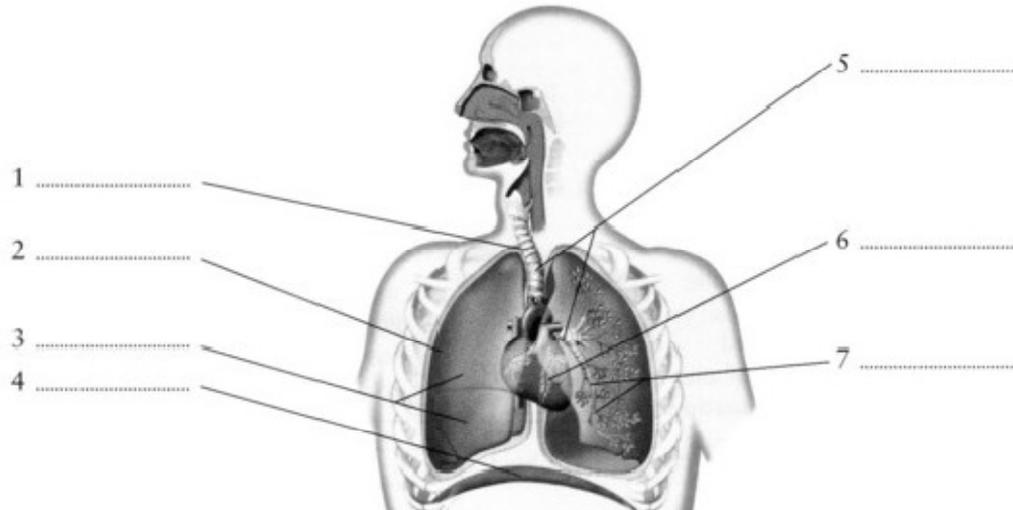
Most symptoms to be dealt with by doctors and others involved in primary care are well-known and the latter will be able to deal with such symptoms themselves.

The up-to-date approach will help doctors to understand the basis of various types of the disease and methods of assessment.

## VIII. The Respiratory System

### I. Label the diagram using the words from the box.

Diaphragm, lobes, windpipe, heart,  
lung, airways, bronchioles



### II. Fill in the gaps with missing words.

The chest (thorax) contains the organs of respiration and the \_\_\_\_\_. The main parts of the respiratory systems are the \_\_\_\_\_ and the \_\_\_\_\_. The left lung is divided into two \_\_\_\_\_, and the right into three. The airways consist of the larynx, the trachea (or \_\_\_\_\_), the right and left bronchus, and the \_\_\_\_\_. The chest is separated from the abdomen by the \_\_\_\_\_.

### III. Discussion

1. Describe the main parts of respiratory system
2. Which respiratory infections do you know? Which symptoms do they have?
3. Which respiratory infections are the most serious?

### IV. Read the given text and make your essential assignments

#### **Is an Unusual Virus Spreading in the Midwest?**

**The CDC is closely monitoring the outbreak of a rare respiratory infection afflicting people in Illinois and Missouri. Just how bad is it, and what can be done to stop the spread?**

A severe respiratory illness is knocking the wind out of Midwesterners, sending hundreds of children coughing and wheezing to the hospital. The primary

suspect in the outbreak is the seldom seen Enterovirus D68 (EV-D68), kin to the common cold's viral culprit.

The U.S. Centers for Disease Control and Prevention has identified EV-D68 in 19 of 22 intensive care patients from Missouri and 11 of 14 in Illinois. EV-D68 targets the upper respiratory tract and causes breathing difficulties. First discovered in the 1960s, EV-D68 has rarely been reported in the U.S. population. From 2009 to 2013 the CDC recorded only 79 cases of the virus but this year there have already been more confirmed cases than in any previous year.

At the University of Chicago's Comer Children's Hospital where the 11 Illinois cases were identified, there has been an unusually high number of children with cold symptoms and breathing problems this summer, according to Rachel Wolfson, an intensive care unit physician who treats patients there. Some children in her care only needed nebulizer treatment yet others were substantially more ill. One patient's lungs were in such bad shape that the doctors needed to connect the child to a blood oxygenator. Despite the debilitating effects of EV-D68, so far no one has died during its current emergence.

At the CDC, Mark Pallansch is one of many virologists investigating the viral suspect in order to confirm if it is driving the current rise in respiratory illness. We asked him and Wolfson to explain what researchers and doctors are finding and whether EV-D68 may be on the rise.

**What is an enterovirus?**

**Pallansch:** Enteroviruses are a family of more than 100 viruses that cause a diversity of illnesses. The CDC reports more than 10 million enterovirus-related illnesses every year. Generally, their afflictions are common and mild. People with Enterovirus D70, for example, develop conjunctivitis. But some types—including poliovirus, which causes paralysis—are dangerous. Others can cause SARS, and viral meningitis. Researchers are worried about EV-D68 because it can severely disturb the respiratory system.

**How does it spread?**

**Pallansch:** EV-D68 spreads the same way that many other enteroviruses do, through contact with infected people, such as being in the line of fire of a cough or sneeze. Adults are much less likely than children to contract EV-D68 because of their stronger immune systems. Children can also catch the virus by touching a surface like a doorknob that may have the virus on it and then rubbing their eyes.

Like other similar enteroviruses, EV-D68 spreads through contact with infected feces as well. This may be most likely to occur in small children, but infections that spread this way occur most often in underdeveloped countries where sanitation is poor. Washing your hands is key to preventing the spread.

**Will it go nationwide?**

**Pallansch:** Every day different states contact the CDC reporting new cases of respiratory illness that may potentially be EV-D68. So far about a dozen states have reported cases.

It is too early to know if we're watching a spread or if it has already happened and we're just figuring out that it's happened. If the CDC can identify

EV-D86 as the definite cause behind the severe respiratory illness seen in the Midwest, then its next step is to figure out whether EV-D68 infections have been increasing in recent years or whether EV-D68 cases have stayed the same but now scientists have better tools for detecting them.

**Who is most at risk?**

**Wolfson:** School-aged children are most likely to contract the virus, although not everyone with EV-D68 becomes severely ill. Individuals with a history of asthma are more likely to develop serious respiratory complications, but many previously healthy children are also catching the virus.

It is impressive how many kids are getting severely ill from this virus. We are full.

The number of respiratory cases is unusually high for August and September. The rate is much closer to what the hospital expects to see mid-November when flu season is in full force. About one third of the patients tested positive for EV-D68, although more cases with similar symptoms are arriving each day.

Once you hear the same song a few dozen times you start to recognize the opening bars. So I have got a few calls all of which sound the same.

Keep children safe by washing your hands and having them wash theirs. None of the staff or other patients at Comer Children's Hospital has contracted the virus, which we attribute to meticulous washing.

**V. Answer the questions:**

1. Which symptoms did children sent to the hospital in the Midwest have?
2. What was wrong with children’s lungs?
3. What is enterovirus? How does it spread?
4. Which people are at risk to be infected with enterovirus?

**VI. Give the Russian equivalents to the following English terms**

sending hundreds of children coughing and wheezing to the hospital	
targets the upper respiratory tract and causes breathing difficulties	
doctors needed to connect the child to a blood oxygenator	
because of their stronger immune systems	
key to preventing the spread	
Individuals with a history of asthma	
flu season is in full force	

we attribute to meticulous washing	
------------------------------------	--

### VII. Read and translate the text:

**Cough** is a common symptom of **upper respiratory tract infection (URTI)** and lung disease. A cough may be **productive** where the patient coughs up **sputum**, or **non-productive**, where is no sputum. A productive cough is often described as **loose** and a non-productive cough as **dry**. Sputum (or **phlegm**) may be clear or white (**mucoid**), yellow due to the presence of pus (**purulent**), or **blood-stained** (as in haemoptysis)

### VIII. Read the dialogue between doctor and patient. Then rewrite questions below using words that are better known to patients:

A doctor is examining a patient who is complaining of a cough.

Doctor: How long have you had the cough?

Mr. Hamilton: Oh, for years.

Doctor: Do you smoke?

Mr. Hamilton: I used to **smoke heavily**, but I **gave up** a year ago.

Doctor: Do you **cough up** any **phlegm**?

Mr. Hamilton: Yes.

Doctor: What colour is it?

Mr. Hamilton: Usually yellow.

Doctor: Have you **noticed any blood** in it?

Mr. Hamilton: No.

Doctor: Any **problems with your breathing**?

Mr. Hamilton: Yes, I get very short of breath. I have to stop halfway up the stairs to **get my breath back**.

The doctor writes in the patient's case notes:

c/odyspnoea& cough c. purulent sputum for years. No haemoptysis.
--

1. Is your cough productive?
2. What colour is the sputum?
3. Is it ever purulent?
4. Have you ever had haemoptysis?
5. Do you suffer from dyspnoea?

### IX. Listen to the podcast and fill in the gaps.

Music. It can tug at our hearts. Perhaps even literally. Because when people sing together, their \_\_\_\_\_ begin to beat in sync with each other.

Researchers monitored the heart rates of 15 teenagers as they produced sounds solo. The participants either hummed one note or sang a hymn while \_\_\_\_\_ whenever they wanted. They also performed a mantra that required them to breath only at the end of each phrase. Then the exercises were repeated by groups of five subjects all singing at once. And when the subjects performed regular song structures in unison, their \_\_\_\_ \_\_\_\_ slowed down and sped up at the same time.

Vocal performances impose set breathing patterns, which regulate and synchronize heartbeats. According to the researchers, choral participation can thus improve well-being. It not only tones the \_\_\_\_\_, but also produces the same relaxing effect as breathing exercises practiced in yoga. So music truly soothes the savage breast—or at least, the heart beating inside it.

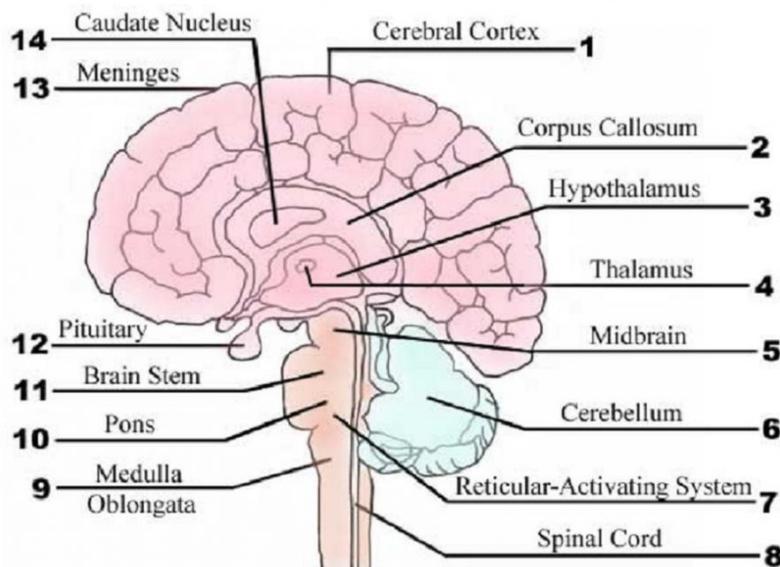
## IX. The Nervous System

### I. Read and translate the information about the nervous system.

The nervous system is broadly divided into central and peripheral parts which are continuous with each other.

The central nervous system consists of the brain and spinal cord. The peripheral nervous system consists mainly of nerves, which are enclosed bundles of the long fibers or axons that connect the CNS to every other part of the body.

We know the nerves to carry impulses to the brain. We know that the brain sends these impulses along so that they go to the right place. The brain is made up of three parts. The cerebrum sits like a cap on the cerebellum. And the medulla is that long portion connecting the brain with the spinal cord. The cerebrum has certain parts that do certain work.



### II. Read the description of the parts of nervous system and fill in the gaps with missing words.

Cerebrum is the largest part of the brain and is made up of two hemispheres called the cerebral hemispheres. The two hemispheres are joined together by a thick band of fibres called the \_\_\_\_\_. The cerebrum is made up of four distinct lobes - frontal, parietal, temporal and occipital.

\_\_\_\_\_ consists of outer grey cortex and inner white medulla. It is responsible for maintaining the balance while walking, swimming, riding, etc. It is also responsible for precision and fine control of the voluntary movements.

\_\_\_\_\_ is an area which coordinates the sensory impulses from the various sense organs - eyes, ears and skin and then relays it to the cerebrum. \_\_\_\_\_, though a small region situated below the thalamus, is an important region of the brain. It receives the taste and smell impulses, coordinates messages

from the autonomous nervous system, controls the heart rate, blood pressure, body temperature and peristalsis. It also forms an axis with the pituitary which is the main link between the nervous and the endocrine systems. It also has centres that control mood and emotions.

\_\_\_\_\_ is a collection of nervous tissue running along the back bone. It is, in fact, protected by the vertebral column. It is a continuation of the brain.

### **III. Discussion**

1. Which parts does nervous system consist of?
2. Which functions does central nervous system control?
3. Which diseases of nervous system do you know?

### **IV. Read the given text and make your essential assignments**

#### **A New Approach to Alzheimer's Treatment**

**The disease's complexity and multiple contributing factors suggest that combinations of drugs could be more effective than single medications**

Having witnessed the success of combination therapy in HIV, cancer and heart disease, the time has come for Alzheimer's disease. At meetings convened by the Alzheimer's Association and others, a consensus is emerging that the most effective Alzheimer's treatments may be those that attack the disease on multiple fronts.

Advances in understanding the progression of Alzheimer's point to a number of underlying biological processes involved in the development of the disease. By leveraging this knowledge, we now have a singular opportunity to pioneer new approaches against Alzheimer's, including combination therapies.

The Alzheimer's Association has partnered with the Alzheimer's Drug Discovery Foundation (ADDF) to challenge the research community to propose promising drug combinations to find more-effective treatments.

The joint effort, known as the Alzheimer's Combination Therapy Opportunities (ACTO) grant initiative, will provide \$2 million this year for testing approaches that simultaneously target two or more processes believed to underlie, exacerbate, or occur in the disease. An ACTO-funded study must involve repurposed drugs—those that have been determined safe for use in treating other conditions. With some information about safety already available, there is the potential to deliver new treatments more quickly than testing novel drugs, which take an average of 12 years to make it to pharmacy. ACTO will announce its initial award the first half of 2017.

The predominant theory of how Alzheimer's develops is that buildup of two characteristic lesions in the brain—amyloid plaques and tau tangles—leads to the death of nerve cells. Plaques are deposits of a protein fragment called beta-amyloid that build up in the spaces between nerve cells; tangles are twisted fibers of another

protein called tau that build up inside the cells. The majority of Alzheimer's drug candidates currently being tested in clinical trials target species of amyloid and/or the plaques.

Numerous other studies suggest brain inflammation and problems with blood circulation in the brain play a role in the disease's progression. Other studies have identified an additional abnormal protein in the brains of people with the disease—and that this protein may explain why some people have Alzheimer's changes in their brain but do not experience dementia. Because of the complexity of Alzheimer's and its multiple causal factors, it may not only be preferable to use combination therapy, but necessary.

Research on potential Alzheimer's combination therapies in mouse models is showing promise. One study in mice found that using a combination of experimental anti-amyloid drugs could more effectively reduce amyloid plaque buildup and prevent new plaques from forming than either candidate alone. A second study in mice found that using leptin, a hormone that inhibits hunger, in combination with pioglitazone, an approved diabetes drug, could reduce both amyloid plaque accumulation and brain inflammation.

Our hope is that testing multi-drug approaches is just the initial stirring of the innovation pot for Alzheimer's combination therapy. Currently, the best evidence for reducing the risk for cognitive decline as we age through lifestyle is also a combination approach, including regular physical activity, mental stimulation, and a brain/heart-healthy diet. This begs the question Alzheimer's combination therapy could also take the form of drug therapy plus lifestyle changes? A combined lifestyle-drug approach is now common for lowering risk of heart disease; many people pair healthy diet and exercise with cholesterol and/or blood pressure medications.

While combination therapy for Alzheimer's is a promising strategy, studying it presents unique challenges. These include both science- and business-related obstacles.

For example, few companies have a diverse enough pipeline of Alzheimer's therapeutic agents in development to carry out combination therapy trials alone. Most would need to collaborate with another company or research center while protecting their intellectual property. Fortunately, partnership models exist in ongoing Alzheimer's prevention trials where companies, academic researchers, government, non-profits and private charities have joined forces to test potential Alzheimer's drug therapies. This approach makes it possible for companies to negotiate intellectual property concerns and spread the risk of therapy development across multiple stakeholders. Nonetheless, there remain many issues to untangle in this area.

Another challenge is determining which treatment combinations to test. In April 2015, the Alzheimer's Association convened an expert workgroup of leaders from academia and industry, and a former member of the U.S. Food and Drug Administration, to identify challenges and solutions to developing Alzheimer's combination therapies. The group recommended that researchers collaborate to

bring forward combinations of drug candidates previously tested in Alzheimer’s animal models and with known safety in humans. These candidates, they said, would yield the best chances for success and ensure speedier clinical trials.

At the same time, we need more basic research to better understand how Alzheimer’s develops and progresses. Calling on lawmakers to increase federal Alzheimer’s research funding is something virtually anyone can do.

We are at a juncture of unprecedented promise in Alzheimer’s research. A few decades ago, we knew virtually nothing about how Alzheimer’s develops or progresses. Today we are looking at the possibility of combination therapies that attack the disease in multiple ways. With continued commitment from government, companies, academic researchers, and nonprofit research funders, we can unlock the combination to better Alzheimer’s therapy.

**V. Answer the questions:**

1. Which illnesses can be successfully cured using combination therapy?
2. Describe the theories about Alzheimer’s progression
3. Why is it necessary to use combination therapy in Alzheimer’s disease?
4. Describe the researches on potential Alzheimer’s combination therapies.
5. Which science- and business-related obstacles exist for researchers studying combination therapy for Alzheimer’s?

**VI. Give the Russian equivalents to the following English terms**

the success of combination therapy in HIV, cancer and heart disease	
suggest brain inflammation and problems with blood circulation in the brain	
reduce amyloid plaque buildup and prevent new plaques from forming	
a hormone that inhibits hunger	
include both science- and business-related obstacles	
to identify challenges and solutions to developing Alzheimer’s combination therapies	
attack the disease in multiple ways	
regular physical activity, mental stimulation, and a brain/heart-healthy diet	

**VII. Match the sentences halves.**

An ACTO-funded study must involve repurposed drugs	—and that this protein may explain why some people have Alzheimer’s changes in their brain but do not experience dementia.
Plaques are deposits of a protein fragment called beta-amyloid that build up in the spaces between nerve cells;	and spread the risk of therapy development across multiple stakeholders.
Other studies have identified an additional abnormal protein in the brains of people with the disease	including regular physical activity, mental stimulation, and a brain/heart-healthy diet.
Currently, the best evidence for reducing the risk for cognitive decline as we age through lifestyle is also a combination approach,	many people pair healthy diet and exercise with cholesterol and/or blood pressure medications.
A combined lifestyle-drug approach is now common for lowering risk of heart disease;	a hormone that inhibits hunger, in combination with pioglitazone, an approved diabetes drug, could reduce both amyloid plaque accumulation and brain inflammation.
A second study in mice found that using leptin,	tangles are twisted fibers of another protein called tau that build up inside the cells.
This approach makes it possible for companies to negotiate intellectual property concerns	previously tested in Alzheimer’s animal models and with known safety in humans.
The group recommended that researchers collaborate to bring forward combinations of drug candidates	—those that have been determined safe for use in treating other conditions.

### **VIII. Translate from Russian into English**

1. Нервная система координирует и стимулирует деятельность организма.
2. Дисфункция передней доли гипофиза сопровождается разного рода изменениями по всему организму.
3. Мозжечок состоит из серого и белого вещества и помогает поддерживать баланс при ходьбе и плавании.
4. Таламус – это участок , который координирует импульсы от различных органов чувств – глаз, ушей, кожи – и затем передает их в большой мозг.
5. Спинай мозг – это скопление нервных тканей, расположенных вдоль позвоночника.

### **IX. Listen to the podcast and fill in the gaps.**

A paper published this week in the *Proceedings of the National Academy of Sciences USA* reports success in repairing damaged nerves in a system critical for human movement. Christie Nicholson reports.

We depend on the corticospinal system, a dense tract of \_\_\_\_\_ that connect our brain's motor cortex to the spinal cord, simply to walk or move our hands.

And though researchers in the last two decades have made great progress in regenerating some kinds of damaged nerves, they have not been able to regrow nerves in the critical corticospinal system. Until now, the breakthrough was reported in the *Proceedings of the National Academy of Sciences USA*.

Scientists genetically engineered rats so that injured neurons in the \_\_\_\_\_ expressed receptors for a growth factor called brain-derived neurotrophic factor (BDNF). The injured neurons recognized the growth factor in the injured area, and then "grew" or regenerated.

But will the regrown nerves actually allow movement?

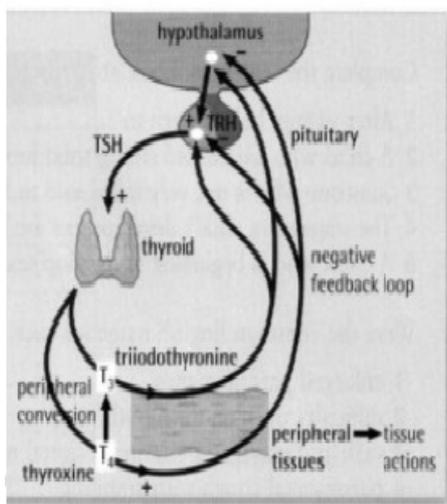
The researchers will have to test for this at a \_\_\_\_\_ injury site, to see if neurons will send the receptor down the \_\_\_\_\_ and into the spinal cord. If voluntary movement can be restored in larger animals first, the procedure could move on to human clinical trials, offering hope that people paralyzed by spinal cord injuries might someday be able to move again.

## X. The Endocrine System

### I. Discussion:

1. What are hormones?
2. Which organs excrete hormones?
3. How are nervous system and endocrine system linked?

### II. Read the information about some hormones:

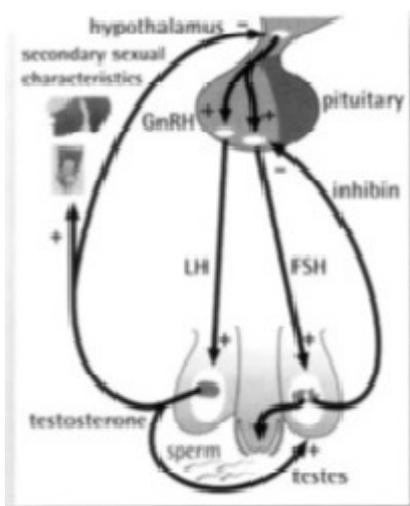


1. TRH (thyrotrophic-releasing hormone) is **secreted** in the hypothalamus and **triggers** the **production** of TSH (thyroid-stimulating hormone) in the pituitary.
2. TSH **stimulates** the TSH receptor in the thyroid to increase **synthesis** of both T<sub>4</sub> (thyroxine) and T<sub>3</sub> (triiodothyronine) and also to **release** stored hormone, producing increased plasma levels

of T<sub>4</sub> and T<sub>3</sub>.

3. T<sub>3</sub> **feeds back** on the pituitary and perhaps the hypothalamus to inhibit TRH and TSH **secretion**.

### III. Complete the passage, using the illustration and your own knowledge.



Pulses of GnRH (gonadotrophin-releasing hormone) are released from the hypothalamus and (1) \_\_\_\_\_ LH and FSH (2) \_\_\_\_\_ from the pituitary. LH (3) \_\_\_\_\_ testosterone (4) \_\_\_\_\_ from Leydig cells of the testis.

Testosterone (5) \_\_\_\_\_ back on the hypothalamus / pituitary to (6) \_\_\_\_\_ GnRH (7) \_\_\_\_\_. FSH (8) \_\_\_\_\_ the Sertoli cells in the seminiferous tubules to (9) \_\_\_\_\_ mature sperm and the inhibins A and B. Inhibin causes feedback on the pituitary to decrease FSH (10) \_\_\_\_\_.

#### **IV. Complete the sentences with the words from the box.**

Thyroxin, thymus gland, parathyroid hormone, pituitary gland, insulin, pituitary growth hormone

1. \_\_\_\_\_ is necessary in the body to maintain a normal level of metabolism in all body cells.
2. \_\_\_\_\_ causes calcium to leave bone tissue and enter the blood stream.
3. Removal of the \_\_\_\_\_ is found to be helpful in treatment of muscular-neurological disorders.
4. We know the \_\_\_\_\_ to be also called the hypophysis.
5. \_\_\_\_\_ acts on bone tissue to accelerate its growth in the body.
6. \_\_\_\_\_ is necessary in the blood stream so that sugars can pass from the blood into the cells of the body.

#### **V. Read the given text and make your essential assignments**

##### **Damage to Pea-Size Gland May Cause PTSD-Like Symptoms**

##### **Soldiers' with traumatic brain injury might suffer from undiagnosed but treatable hormonal disorders**

When Charles Wilkinson thinks about soldiers suffering from post-traumatic stress disorder (PTSD) his mind jumps to a pea-size structure tucked behind the bridge of the nose and ensconced below the base of the brain. There the pituitary gland serves as the master regulator of the human endocrine system, producing vital hormones that influence growth and development—except when something goes awry.

Wilkinson and a small cadre of scientists are studying whether traumatic brain injury (TBI) caused by battlefield explosions can damage soldiers' pituitary glands in ways that cause lasting health problems. Preliminary work that Wilkinson presented to the Department of Veterans Affairs in May indicates that soldiers with TBI go on to develop hormonal deficiencies and symptoms that could be mistaken for PTSD as much as 40 percent of the time.

The startling finding is based on only a couple dozen soldiers and needs to be replicated within a larger group, but several other small studies over the past six years suggest a similar relationship. The ostensible link might augment our understanding of what causes the complex constellation of symptoms associated with PTSD.

Combat is not the only arena in which scientists have found a connection between TBI and hormone dysfunction. Several studies have suggested that head injuries on the sports field or in car accidents are linked with an increase in

pituitary disorders. Based on those results, Wilkinson a neuroendocrinologist at the VA Puget Sound Health Care System in Seattle started looking for clues that soldiers suffering from TBI following blast exposures were also suffering from treatable disorders like hormone deficiency. Such patients may have PTSD-like symptoms including depression, anxiety and trouble focusing, which could be treated with hormone replacement therapy that might boost their ability to focus, libido and quality of life.

The theory, Wilkinson readily admits, is still in its early days. Only a handful of other researchers are looking into the possible link, and all the studies have tiny sample sizes, usually looking at a couple dozen soldiers. But if even a small fraction of TBI patients have undiagnosed pituitary disorders, perhaps they could get help that would substantially improve their health, he says.

Among civilians, estimates of the prevalence of TBI-related pituitary disorders vary widely, ranging between 15 and 68 percent of patients. That range reflects differences in diagnostic criteria and potential factors like the timing of the assessment, says Nicholas Tritos, a neuroendocrinologist at Massachusetts General Hospital who is studying such disorders among both civilian and military populations. Yet those numbers raise questions about how often such disorders may occur, and not resolve themselves naturally, among soldiers with head trauma.

In one recent study Tritos found that 39 percent of the blast victims (seven patients) had hormonal disorders. Preliminary findings from Wilkinson's ongoing study suggest that men (he only studied male service members) who suffered from blast-related TBI were more likely to have pituitary disorders, too. Among 27 blast victims, 44 percent had pituitary disorders whereas only 7 percent of a group of 14 military personnel without blast-related concussion had pituitary disorders. A separate study of British soldiers spearheaded by researchers at Imperial College London in 2013 had comparable results. Six of 19 soldiers with blast-related TBI had pituitary deficiencies whereas only one of 39 soldiers in the nonblast control group had these disorders.

No larger studies are currently planned. It is difficult to conduct such research among service members, partly because they may suffer from other health issues, says Wilkinson, who has struggled to recruit the hundreds of soldiers he originally hoped to include in his analysis. In the U.K. soldiers are no longer deployed to active war zones so there are no new blast victims available for larger studies there, says Tony Goldstone, an endocrinologist and an author of the 2013 British study.

Additionally, whether the patient is military or civilian there are still unanswered questions about exactly how a head injury could damage the pituitary gland in the first place. Its central placement in the head typically protects it from damage but a delicate stalk connects the gland to the brain and some experts hypothesize that this connection or the gland itself may be damaged by a violent blow or blast. Inflammation or other ruptured connections could also be factors. Because the damage is not visible on standard magnetic resonance imaging (MRI),

however, researchers may have to depend on animal models to glean further insights.

**VI. Answer the questions:**

1. How does pituitary gland serve?
2. What happens to soldiers with traumatic brain injury?
3. Which injuries are also linked with an increase in pituitary disorders?
4. Why is it difficult to conduct such research?
5. Is damaged pituitary gland visible on standard magnetic resonance imaging?

**VII. Give the Russian equivalents to the following English terms**

hormone replacement therapy	
soldiers suffering from post-traumatic stress disorder	
symptoms including depression, anxiety and trouble focusing	
damage soldiers' pituitary glands	
delicate stalk connects the gland to the brain	
to glean further insights	
blast-related concussion	
reflects differences in diagnostic criteria and potential factors	

**VIII. Translate from Russian into English**

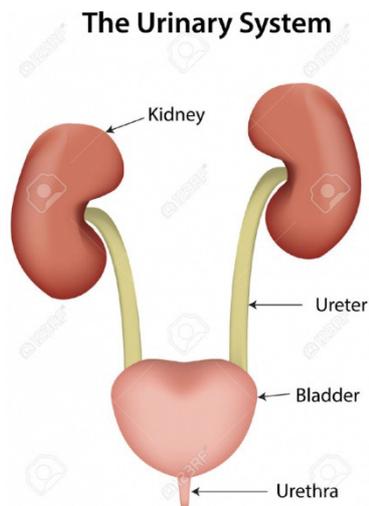
1. Щитовидная железа стимулирует метаболизм всех частей тела.
2. Мозговое вещество надпочечника активизирует деятельность многих систем органов в случае опасности.
3. Деятельность эндокринных желез регулируется нервной системой.
4. Избыток соматотропного гормона может вызвать гигантизм и привести к акромегалии у взрослых.
5. По утверждениям ученых, инсулин и гормон передней доли гипофиза влияют на уровень сахара в крови.

**IX. Complete the table.**

<b><u>Verb</u></b>	<b><u>Noun</u></b>
inhibit	

produce	
release	
replace	
	secretion
	stimulation

## XI. The Urinary System



### I. Fill in the gaps with missing word.

The bladder is situated in the pelvis, as you know, and it is connected to each .... by a long tube called the .... – one on each side. The ureters carry the urine from kidneys to the bladder, where it is stored until you decide to empty your .... . When that happens the urine passes down another tube, called the ....., to the outside.

### II. Read about common urinary symptoms and their definitions.

<b>frequency</b>	frequent passing of urine
dysuria	<b>burning or scalding pain in the urethra when passing urine</b>
nocturia	urination at night
<b>urgency</b>	urgent need to pass urine
<b>hesitancy</b>	difficulty starting to pass urine
<b>Urinary incontinence</b>	involuntary passing of urine
haematuria	macroscopic blood in the urine

### III. Now match the patient's descriptions of their symptoms (1-7) with the medical terms (a-g).

1. "I have to pee every half hour or so."
2. "I get a scalding pain when I pass water."
3. "I have to get up several times to pass water at night."
4. "I have to rush to go to the toilet."
5. "I have trouble getting started."
6. "I can't hold my water."

7. "I passed some blood in my urine."
  - a. Dysuria
  - b. Frequency
  - c. Haematuria
  - d. Hesitancy
  - e. Nocturia
  - f. Urgency
  - g. Incontinence

#### **IV. Read the given text and make your essential assignments**

##### **Cystitis: How bacteria get into your bladder**

Cystitis is a bacterial urinary tract or bladder infection. The main symptoms are a strong and desperate desire to pee coupled with pee that feels like burning acid, which is not a happy combination. If left for too long, eventually you start to pee blood which is completely terrifying the first time it happens. It tends to occur when bacteria from the outside world make their way into the urethra (the little pipe where pee comes out) and given that women have far shorter urethras than men, it can happen to them fairly frequently. Nobody is quite sure what leads to an attack, or why some people get it far more often than others.

The most common bacterial cause of cystitis is *E. coli*, because there tends to be quite a lot of it hanging around on the body. Because of this, the body usually has quite an efficient innate immune response that keeps the bacteria from getting anywhere near the tissues or bloodstream, but for some reason in cystitis this response simply is not effective. This may be genetic factors in some women, for others there are clear physical reasons (such as a strangely formed urinary tract, or a problem with the kidneys) and is definitely helped by the fact that the bladder is a sort of water reservoir, where bacteria can settle down and flourish.

The first challenge the bacteria face is getting up the urinary tract in the first place. True, it is fairly short in women, but it is still a piece of human tissue protected with white-blood cells and with regular streams of water running through it. Pathogenic bacteria have a wide range of adhesive molecules and other binding agents, which, when they bind to a surface, cause the bacterium to change from a floating blob to a blob capable of crawling along a surface. The particular *E. coli* associated with cystitis has a whole host of other molecules to help with binding to urinary tract tissue, although it is not yet clear which are directly associated with the infection in humans (research has been done mainly on mice). The *E. coli* is also able to bind and sense urine, and uses the rush of urine flow as a signal to cling tightly to the tissue where it's attached.

Once they get into the bladder, the *E. coli* are then internalised by the host-cells in order to destroy them. While most of the bacteria will be killed in this way, others actually start to form little biofilm-like clusters inside the cells. This highly

organised little bacterial city is surrounded by a sticky mess of proteins and sugars, which protect it from the cell trying to kill it.

This is where the story starts turning into horror sci-fi. Remember this is all happening *inside a human bladder*.

The biofilm starts to take over the cell it's growing in, engulfing the nucleus and filling the cytoplasm. It gets so large that the cell actually starts to bulge inwards, into the bladder space. This large bulging cell then starts to extrude bacterial filaments that grow outwards from the surface, latch onto surrounding cells, and start infecting them as well. Not only are the bacteria starting to take over the cells in the bladder, they also suppress the answering human immune system by suppressing the production of cytokines (small immune system signalling molecules) and encouraging the production of IDO, a molecule which tells the immune system that enough cytokines have been produced and they don't need to make any more. By breaking down communication channels within the immune system, the bacteria can evade attack.

The problem with the outer tissue layer of the bladder though, is that it's continually being shed through exfoliation, which makes it a rather unsafe place to have a bacterial colony. For longer lasting survival, the bacteria can burrow down to the underlying basal epithelium and surround themselves with a protective network of acting molecules. These bacteria are resistant to antibiotic attack, and can simply lie dormant for several months. The mechanisms by which it stays like this, or by which it initiates recurrent cystitis, are still a mystery.

One of the main problems with recurrent cystitis, from the point of view of the sufferer, is that each bout of infection leaves the tissues inflamed and, even after healing, more likely to succumb to an infection again. Like asthma, diabetes, and various other long-term diseases and symptoms, it's not something that can be cured, it's something that has to be lived with.

**V. Answer the questions:**

1. What bacteria are usually associated with cystitis?
2. Which symptoms does it have?
3. Why do women usually have cystitis more often than men?
4. What happens when bacteria get into the bladder?
5. What is the problem with tissue layer of the bladder?

**VI. Give the Russian equivalents to the following English terms**

bacteria from the outside world make their way into the urethra	
bladder is a sort of water reservoir,	
to help with binding to urinary tract tissue	
to form little biofilm-like clusters	

is surrounded by a sticky mess of proteins and sugars	
engulfing the nucleus and filling the cytoplasm	
suppress the answering human immune system	
resistant to antibiotic attack	

**VII. Match the sentences halves.**

1.It tends to occur when bacteria from the outside world make their way into the urethra (the little pipe where pee comes out)	A. although it is not yet clear which are directly associated with the infection in humans (research has been done mainly on mice).
2.Because of this, the body usually has quite an efficient innate immune response	B. by suppressing the production of cytokines (small immune system signalling molecules) and encouraging the production of IDO, a molecule which tells the immune system that enough cytokines have been produced and they don't need to make any more.
3.The particular <i>E. coli</i> associated with cystitis has a whole host of other molecules to help with binding to urinary tract tissue,	C. that keeps the bacteria from getting anywhere near the tissues or bloodstream, but for some reason in cystitis this response simple isn't effective.
4.This large bulging cell then starts to extrude bacterial filaments	D. and surround themselves with a protective network of acting molecules.
5.Not only are the bacteria starting to take over the cells in the bladder, they also suppress the answering human immune system	E. it is not something that can be cured, it's something that has to be lived with.
6. For longer lasting survival, the bacteria can burrow down to the underlying basal epithelium	F. and given that women have far shorter urethras than men, it can happen to them fairly frequently.
7.Like asthma, diabetes, and various other long-term diseases and symptoms,	G. and is definitely helped by the fact that the bladder is a sort of water reservoir, where bacteria can settle down and flourish.
8.This may be genetic factors in some women, for others there are clear physical reasons (such as a	H. that grow outwards from the surface, latch onto surrounding cells, and start infecting them as

strangely formed urinary tract, or a problem with the kidneys)	well.
--	-------

### **VIII. Rewrite given sentences using words *as, and, when, which***

Example: The usual manifestation of renal calculi is renal colic brought about by a stone in the kidney or ureter.

The usual manifestation of renal calculi is renal colic which is brought about by a stone in the kidney or ureter.

1. The conditions for stone formation are: a cavity containing a fluid; the fluid having salts in solution. 2. The salts held in solution in the fluid are deposited on the foreign substances. 3. The foreign objects forming stones in the kidneys and bladder are bacteria and the small shreds of mucus. 4. All experimental patients described here had stones in the bladder. 5. When collected in polypropylene bottles the urine was kept in refrigerated lockers.

### **IX. Read and translate the text:**

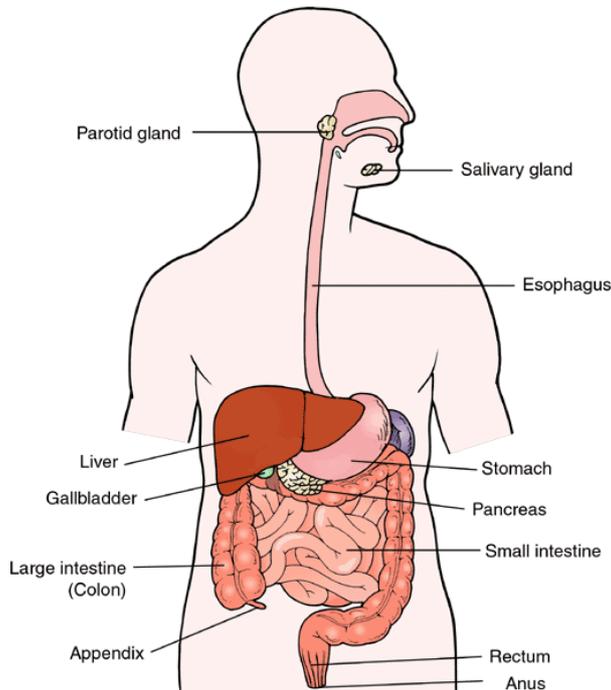
Very often an infection about the stone causes pyelonephritis or pyelonephrosis, resulting in the loss of the kidney.

The symptoms are mild fever, pain, malaise, anorexia, pus and albumin in the urine, frequency of urination and mild burning. The diagnosis can be made by X-raying. The pain toward the thigh, hematuria, on rare occasions ulceration in the ureter, fever, are symptoms of renal colic.

Treatment should be directed toward its removal unless the stone is «silent».

## XII. The Digestive System

### **Digestive System**



Copyright © 2005 McKesson Corporation and/or one of its subsidiaries. All Rights Reserved.

### **I. Fill in the gaps with missing word.**

- 1..... lies under the right ribs and expands across to the left of the epigastrium.
- 2..... lies beneath the right lobe of the liver and serves as a bile reservoir.
3. ... lies under the left ribs and expands across to the right. It is known that it is smaller and situates in the epigastrium.
4. .... occupy chiefly the central portions of the abdominal cavity.

### **II. Translate from Russian into English**

1. Печень играет важную роль в жизнедеятельности организма. Она выделяет желчь, которая участвует в пищеварительном процессе и выполняет защитную функцию: некоторые токсичные вещества детоксифицируются в печени.
2. Из желудка еда маленькими порциями проходит в тонкий кишечник, где претерпевает механические и химические изменения.
3. Тонкий кишечник только 1,5-2 дюйма в диаметре в той его части, где он отходит от желудка, и он сужается в дальнейшем.

### **III. Discussion:**

1. What food has negative effect on stomach?
2. What is the best food to eat on an empty stomach?

### **IV. Listen to the podcast and fill in the gaps.**

Humans have different numbers of a gene for digesting \_\_\_\_\_, probably because starch-eaters who got more of the genes had an advantage. Karen Hopkin reports.

You are what you eat. Or so it's been said. Well it turns out that what we eat has also influenced who we are. Down to the level of our \_\_\_\_\_. Researchers at the University of California, Santa Cruz have found that populations of people who eat a high-starch diet harbor extra copies of a gene whose product breaks down starch.

Ok, we all learned in high-school biology that genes come in pairs: one copy from mom, one from dad. In reality, things aren't always that simple. For some genes we get multiple copies. Such as the gene for salivary amylase, the \_\_\_\_\_ that kicks off the digestion of starch. On average, we humans have half a dozen copies of that gene. I say "on average" because not everyone has six. One person could have two, and another could have ten.

What the Santa Cruz scientists discovered is that individuals from populations that eat a lot of starch—potatoes or corn or rice—skew to the higher-end of that copy number spectrum. And they credit \_\_\_\_\_: more amylase probably conferred a fitness advantage to those who were eating starchy foods. Chimps, on the other hand, have only two copies of the amylase gene. Maybe because they're not bananas about bread.

### **V. Read the given text and make your essential assignments**

#### **Metabolism in Mind: New Insights into the "Gut–Brain Axis" Spur Commercial Efforts to Target It**

##### **What if controlling the appetite were as easy as flipping a switch?**

What if controlling the appetite were as easy as flipping a switch? It sounds like the stuff of science fiction, but Jeffrey Friedman of Rockefeller University and his colleagues did exactly this in genetically engineered mice to try to shed light on how the brain influences appetite. Friedman and his colleagues used magnetic stimulation to switch on neurons in a region of the brain called the ventromedial hypothalamus and found that doing so increased the rodents' blood sugar levels and decreased levels of the hormone insulin. Turning on the neurons also caused the mice to eat more than their control counterparts. The ultimate confirmation came when they inhibited these neurons and saw the opposite effects: it drove blood sugar down, elevated insulin levels and suppressed the animals' urge to consume their chow.

That the brain influences hunger is not an unexpected finding, but scientists have recently narrowed in on how it has sway on what ends up in the gut—and how the gut talks to the mind. This two-way communication, defined as the 'gut–brain axis', happens not only through nerve connections between the organs, but also through biochemical signals, such as hormones, that circulate in the body.

“The idea that there is bidirectional communication between the gastrointestinal tract and brain that affects metabolism traces back more than a century,” Friedman says, referring to the work of the nineteenth-century French scientist Claude Bernard, who made seminal discoveries into how the body maintains physiological equilibrium. “Our new findings that insulin-producing cells in the pancreas can be controlled by certain neurons in the brain that sense blood sugar provides further experimental evidence supporting this notion.”

The gut–brain axis seems to influence a range of diseases, and researchers have begun to target communication pathways between the nervous system and the digestive system in an attempt to treat metabolic disorders specifically. This makes sense to neuroscientist Daniele Piomelli, who has studied the connection at the University of California, Irvine. “There's every reason to be excited, because clearly the gut and brain are two peas in a pod and they really work together,” Piomelli sees potential in learning more about how the gut and brain communicate. “If we are able to find ways to understand that and to leverage that for therapeutic purposes, that will be key,” he says.

There are still some lingering worries about targeting the brain for metabolic disorders and their symptoms. Some of the concern traces back to a decade ago in June 2006, when European drug regulators approved the medication rimonabant for sale as a weight-loss medication. Rimonabant worked by blocking certain receptors in the brain involved in the so-called endocannabinoid system—switching off the same circuits that induce hunger from cannabis use—and it was effective. But because it sometimes caused psychiatric side effects, including a possibly heightened risk of suicide, the drug never made it through the approval process in the US. The maker of the drug, Sanofi-Aventis, pulled the product off the market a couple of years later, and in 2009, the European Commission withdrew its approval of the drug.

Still, the urgency of treating metabolic disease compels researchers and pharmaceutical companies to strive for new solutions. Worldwide, the number of people who are obese continues to climb, and last month, US government statistics showed that, for the first time, around four in ten women in the country fell into this category—more than the proportion of men classified as obese. Meanwhile, the number of individuals with diabetes has nearly quadrupled worldwide since 1980, now affecting around 415 million adults, the majority of whom have type 2 diabetes. Given the twin epidemics of obesity and type 2 diabetes, the new wave of efforts to target the gut–brain axis to reverse these conditions has great momentum behind it.

Companies planning to target the gut–brain axis have raised upwards of \$40 million in initial financial backing from investors. From industry to academia,

researchers are deploying an array of different tools to target the ongoing dialogue between the two organs as a way to treat metabolic disorders and help people to lose weight. The approaches range widely, from surgical interventions and devices, to probiotics and even drugs delivered via nasal sprays.

## **MIMICKING THE BENEFITS OF BARIATRIC SURGERY**

Aayed Alqahtani, who directs King Saud University's obesity treatment center in Saudi Arabia's capital Riyadh, has performed more than 4,000 bariatric surgeries, a broad category of procedures in which a patient's stomach size is reduced or in which their digestive system is rerouted. Of this number, around 700 of the treatments were for individuals with diabetes. Alqahtani stresses that, over the past decade, the medical community has come to appreciate the ability of bariatric surgery to reverse diabetes in many people, which culminated in guidelines published in May that recommend the procedure for individuals with diabetes. The new guidelines received support from numerous organizations, including the American Diabetes Association. "It's a historic moment," Alqahtani says, stressing the benefits of surgery for those with diabetes. "It's the most effective option."

Many of the mechanisms that underlie how gastric bypass and bariatric surgery produce metabolic benefits remain unclear, but researchers do know, for example, that these procedures elevate levels of the hormones peptide YY (PYY) and glucagon-like peptide-1 (GLP-1), which help to reduce appetite and have effects on the central nervous system. Still, Alqahtani notes that only a fraction of those who would benefit from these procedures receive them, with many prevented by a lack of health-insurance coverage, among other reasons.

Scott Shikora, who leads the Center for Metabolic and Bariatric Surgery at Brigham and Women's Hospital in Boston, says medical devices might provide an alternative if they can mimic the benefits of bariatric surgery. Shikora also serves as chief medical officer of EnteroMedics, a company that makes a weight-loss device called the Maestro Rechargeable System. The device sends electrical pulses to the vagus nerve, thereby blocking some of the signals the nerve carries between the brain and digestive tract. The procedure for inserting the Maestro device is minimally invasive and involves only a handful of small incisions around the abdomen. Two miniature, candy-cane-shaped electrodes are hooked around the left and right trunks of the vagus nerve near where the esophagus joins the stomach. For 12 hours a day, the implanted device interrupts signals from these extensions by applying a constant electrical current, and this, for reasons that are still not totally clear, encourages a feeling of fullness.

The data are encouraging: in a clinical trial published in May, 53 participants with moderate obesity who received the Maestro device lost about 11% of their total weight, as compared with 6% among those who received the sham treatment. According to Shikora, data from a two-year follow up of an earlier study found that

individuals who received the device kept the weight off, whereas those in the control group regained the pounds that they had initially shed.

The Maestro device received approval from the US Food and Drug Administration (FDA) in January 2015, becoming the first new medical device for obesity approved by the agency in a decade.

**VI. Answer the questions:**

1. How are brain and gut linked?
2. What is gut–brain axis? Which diseases does it influence?
3. Which surgeries has Aayed Alqahtani performed?
4. Which devices might provide an alternative if they can mimic the benefits of bariatric surgery?
5. Is Maestro device the first new medical device for obesity?

**VII. Give the Russian equivalents to the following English terms**

increased the rodents' blood sugar levels and decreased levels of the hormone insulin	
biochemical signals, such as hormones, that circulate in the body	
gut–brain axis seems to influence a range of diseases	
to strive for new solutions	
surgical interventions	
gastric bypass and bariatric surgery	
levels of the hormones peptide	
signals the nerve carries between the brain and digestive tract	

**VIII. Match the sentences halves.**

1. Our new findings that insulin-producing cells in the pancreas can be controlled	A. to target the ongoing dialogue between the two organs as a way to treat metabolic disorders and help people to lose weight.
2. Rimonabant worked by blocking certain receptors in the brain involved in the so-called endocannabinoid system	B. thereby blocking some of the signals the nerve carries between the brain and digestive tract.
3. From industry to academia, researchers are deploying an array of different tools	C. and involves only a handful of small incisions around the abdomen.

<p>4. Alqahtani stresses that, over the past decade, the medical community has come to appreciate the ability of bariatric surgery to reverse diabetes in many people,</p>	<p>D.—switching off the same circuits that induce hunger from cannabis use—and it was effective.</p>
<p>5. The procedure for inserting the Maestro device is minimally invasive</p>	<p>E. it drove blood sugar down, elevated insulin levels and suppressed the animals' urge to consume their chow.</p>
<p>6. Worldwide, the number of people who are obese continues to climb,</p>	<p>F. and last month, US government statistics showed that, for the first time, around four in ten women in the country fell into this category—more than the proportion of men classified as obese.</p>
<p>7. The ultimate confirmation came when they inhibited these neurons and saw the opposite effects:</p>	<p>G. which culminated in guidelines published in May that recommend the procedure for individuals with diabetes.</p>
<p>8. The device sends electrical pulses to the vagus nerve,</p>	<p>H. by certain neurons in the brain that sense blood sugar provides further experimental evidence supporting this notion.</p>

## Listening:

### **1. Bird Feeders Attract Bird Eaters, Too**

Some predators are attracted to the food in bird feeders, and end up targeting nestlings, too. Jason G. Goldman reports.

More than half of U.S. households provide food for birds. It's a billion dollar industry. Now a study asks whether the same feeders that attract birds also attract predators that eat the eggs and newly hatched nestlings of those birds.

“We imagined that the food resource on the landscape could have a couple different effects on relationships between nest predators and their prey.” Ohio State University researcher Jennifer Malpass.

“On the one hand, you could see that the food might be attracting predators to certain areas, and that could increase nest predation risk. However, predators may be exploiting these food resources, and if you've got a good, predictable food resource on the landscape that's easy for predators to access, you could imagine that they could switch to those anthropogenic, or those human-provided foods, like bird feeders. And that could perhaps lessen nest predation risk.”

Which could also be a problem, because predators help control the population.

Malpass and her team looked at the nests of American robins and Northern Cardinals in seven Ohio neighborhoods. They noted the presence or absence of feeders and recorded potential nest predators, like squirrels, domestic cats, and other birds. Over the four-year study, they observed more than 15,000 day-active predators across 19 species, but only brown-headed cowbirds and American crows were associated with bird feeders. The results were published in the journal *The Condor*.

The survival of Northern Cardinal nestlings did not seem to be related to the presence of these nest predators or even to bird feeders. But the American robins tell a different story.

“In areas that had both many crows and many bird feeders, American robin nest survival was the lowest.”

So the effect of bird feeders on urban wildlife communities differs from species to species, neighborhood to neighborhood.

“At least some predators seem to be attracted by bird feeders and the food resource they provide, and in some cases this can lead to increased nest predation risk for native backyard breeding birds.”

But that doesn't necessarily mean that we should get rid of all the bird feeders.

“There are some great ecological and social benefits from this practice. We see them as nature's ambassadors. They're a point of connection to nature and the outside world and our native wildlife.”

Homeowners have been feeding wild birds for a long time, but only now are scientists finally beginning to understand just how that affects urban ecosystems. And the upshot, of course, is: it's complicated.

## **2. Plants Share Light if Neighbor is Related**

A study in the *American Journal of Botany* finds that plants can tell if they're next to a relative and will grow to allow the kin more access to light. Cynthia Graber reports

We humans are known to help out members of our own families. When it comes to business we call it nepotism. Now plants have demonstrated the same predilection, in a study published in the *American Journal of Botany*.

Previous research showed that plants—in that study they used a plant called the Great Lakes sea rocket—can recognize the root systems of siblings from the same momma plant and will give them a more fair share of nutrients in the soil.

This new study is the first to look above ground. Researchers at McMaster University in Canada potted North American impatiens. When the plants shared a pot with seeds from the same parent plant, they shared access to light by growing taller with more branches and fewer leaves. But when those same impatiens were planted with other impatiens—but not their siblings—they put more energy into growing more and larger leaves that could crowd out the nonrelatives.

Researchers say the roots alert plants to the relationship of nearby plants, because when impatiens were planted near siblings but in separate pots, they didn't recognize their kin. Just goes to show that even in the plant world, family comes first.

## **3. Bees Prefer Flowers That Proffer Nicotine**

Bumblebees sought out flowers with nicotine in their nectar, and the drug appeared to enhance the bees' memories. Christopher Intagliata reports.

We humans enjoy coffee and tea, to give our brains a caffeine boost. And bees sometimes sip nectar that naturally contains caffeine, which seems to enhance their memory. Now a study suggests that bees enjoy another familiar drug produced by plants: nicotine.

"As it turns out, not just in humans, but even the bees seem to have difficulties quitting." Lars Chittka, a professor of behavioral and sensory ecology at Queen Mary University of London.

Chittka and his colleagues studied bumblebees as they visited fake flowers that contained varying levels of nicotine. Unnaturally high nicotine concentrations deterred the bees. But at real-world levels, the drug attracted bees. And they even learned a flower's *color* faster, if that flower offered a nicotine fix.

Sometimes bees paid a steep price for this preference. "They returned actually to flowers that had previously sold them nicotine, so to speak, even if these flowers no longer contained nectar."

Which might give nicotine-pushing plants, like tobacco, an edge. "It provides these plant species with an unfair advantage over competing plants, because they can retain the faithful services of pollinators, even if they're offering suboptimal nectar in this case."

The results are in the journal *Scientific Reports*. And if caffeine and nicotine have these effects on bees? Perhaps natural floral pharmacies stock other drugs too—that enhance pollination, and give bees a buzz.

#### **4. Extreme Exercise Can Poison the Blood**

Even four hours of intense activity may be enough to let bacteria escape from the gut into the blood, setting off a chain of inflammation. Christopher Intagliata reports

If you're serious about fitness, you know the importance of training your muscles and your brain. Without the right prep, you won't have the physical or mental endurance to finish, whether it's a five-k or an Ironman. But it turns out that it may be just as important to train your gut—or suffer inflammatory consequences. So says a study in the *International Journal of Sports Medicine*.

Researchers sampled the blood of 17 runners before and after a 24-hour ultramarathon—where runners covered anywhere from 75 to 130 miles on foot. During the race, their guts got leaky—due to a lack of blood flow to the intestines, and the physical trauma from so many jarring miles. Gut bacteria escaped into the blood, where some released toxins. The runners' bodies then responded by launching an immune response, and inflammation set in.

Some runners actually had blood profiles identical to those of patients admitted to the hospital with blood poisoning, or sepsis.

But the most well-trained competitors avoided the problem. Their bodies launched a counterattack, unleashing anti-inflammatory compounds to tamp down their bodies' immune overreaction.

The authors say just four hours of activity is extreme enough to kick off this chain of inflammation. Suggesting it's key to gradually build up to new personal bests, even if they're not ultraworthy. As has long been said: slow and steady wins the race.

#### **5. Stem cell research**

I'm all for stem cell research. I know it is a huge issue at the moment. Lots of people don't like it. They say it is unethical and that it is playing God. Other people say we will create Frankenstein's monster. Britain seems to be leading the world in this research. The government has passed laws to encourage it. British scientists have made many discoveries with stem cell research. For a long time America did very little research. President Obama changed that and now American scientists are doing lots of research. I don't think you can stop scientists doing research. It's a part of the history of science. I think stem cell research is very important. It will lead to many cures for diseases.

## **6. Wheat Genes Could Bring Back Chestnut**

Scientists have introduced genes into the American chestnut from wheat that help disarm the fungus that killed almost all three billion of the trees in the eastern U.S. David Biello reports

Chestnut trees once carpeted the eastern U.S. Three billion of them fed and sheltered many forest residents—until the early decades of the 20th century when a fungal disease called chestnut blight killed almost every last one of the trees. But now the American chestnut is making a comeback in its former range—thanks to genetic modification.

The blight came to the U.S. on imported Asian chestnuts, which are resistant to the disease. With that resistance in mind, in the 1980's the American Chestnut Foundation began working to crossbreed the Asian chestnut with surviving individuals of its American cousin.

Such crossbreeding is time-consuming, however, and results in something less than a full American chestnut. In a bid to speed up restoration work and minimize the need for genetic changes, scientists at S.U.N.Y. College of Environmental Science and Forestry have introduced genes into the American chestnut from wheat that help disarm the fungus. And, in the future, genes from its Chinese cousin, other trees and even grapes could help make the American chestnut even more resistant to the deadly blight.

A few of the hybrid chestnuts have been planted in the wild from New Jersey to Virginia. And test plots of the genetically fortified trees have shown promising results. Some environmentalists worry about genetically modified organisms. But a bit of genetic tweaking, whether by crossbreeding or gene insertion, looks like the only way to restore the chestnut to its former glory.

## **7. Genetic engineering**

I think the idea of genetic engineering is fascinating. It's also quite dangerous. Fiddling around with what makes us human might make us less human. We could end up creating a Frankenstein's monster. The idea of genetic engineering has been around for centuries. Scientists have always wanted to change us. The real breakthrough came in the latter half of last century. Geneticists cracked the genetic code and found ways of altering our genes. Now they can clone animals and reproduce human tissue and organs. I don't think it'll be too long before scientists clone a person. Once all the fuss has died down, younger generations will be more accepting of genetic engineering. We might even live to be two hundred years old.

## **8. Heart**

The heart is one organ we really have to look after. Most of us, I think, don't really know how to look after it. Or perhaps we know, but don't do enough to keep our heart in a healthy condition. Our heart is an amazing thing, when you think about it. It beats so fast for years and years and years, pumping millions of litres of blood around our body. It keeps working, even though we do so many bad things to it. It really is the source of our life. We need to promise our heart every day that we'll look after it properly. I think kids born today are lucky. Modern medicine and science will soon have all the answers to keep our heart strong. Even today we're lucky. Doctors can replace your heart via a heart transplant.

## **9. Choral Singers Sync Heartbeats**

Because phrasing requires synchronous respiration, choral singers also sync up their heartbeats, which may add to the group feeling of unison. Sophie Bushwick reports

Music. It can tug at our hearts. Perhaps even literally. Because when people sing together, their hearts begin to beat in sync with each other. [Björn Vickhoff et al., Music structure determines heart rate variability of singers]

Researchers monitored the heart rates of 15 teenagers as they produced sounds solo. The participants either hummed one note or sang a hymn while breathing whenever they wanted. They also performed a mantra that required them to breath only at the end of each phrase. Then the exercises were repeated by groups of five subjects all singing at once. And when the subjects performed regular song structures in unison, their heart rates slowed down and sped up at the same time.

Vocal performances impose set breathing patterns, which regulate and synchronize heartbeats. According to the researchers, choral participation can thus improve well-being. It not only tones the cardiovascular system, but also produces the same relaxing effect as breathing exercises practiced in yoga. So music truly soothes the savage breast—or at least, the heart beating inside it.

## **10. Hope for Spinal Cord Injuries**

A paper published this week in the *Proceedings of the National Academy of Sciences USA* reports success in repairing damaged nerves in a system critical for human movement. Christie Nicholson reports

We depend on the corticospinal system, a dense tract of nerve fibers that connect our brain's motor cortex to the spinal cord, simply to walk or move our hands.

And though researchers in the last two decades have made great progress in regenerating some kinds of damaged nerves, they've not been able to regrow nerves in the critical corticospinal system. Until now. The breakthrough was reported in the *Proceedings of the National Academy of Sciences USA*.

Scientists genetically engineered rats so that injured neurons in the motor cortex expressed receptors for a growth factor called brain-derived neurotrophic factor (BDNF). The injured neurons recognized the growth factor in the injured area, and then “grew” or regenerated.

But will the regrown nerves actually allow movement?

The researchers will have to test for this at a spinal cord injury site, to see if neurons will send the receptor down the axon and into the spinal cord. If voluntary movement can be restored in larger animals first, the procedure could move on to human clinical trials, offering hope that people paralyzed by spinal cord injuries might someday be able to move again.

### **11. Extra Genes For Starch Eaters**

Humans have different numbers of a gene for digesting starch, probably because starch-eaters who got more of the genes had an advantage. Karen Hopkin reports.

You are what you eat. Or so it’s been said. Well it turns out that what we eat has also influenced who we are. Down to the level of our genes. Researchers at the University of California, Santa Cruz have found that populations of people who eat a high-starch diet harbor extra copies of a gene whose product breaks down starch.

Ok, we all learned in high-school biology that genes come in pairs: one copy from mom, one from dad. In reality, things aren’t always that simple. For some genes we get multiple copies. Such as the gene for salivary amylase, the enzyme that kicks off the digestion of starch. On average, we humans have half a dozen copies of that gene. I say “on average” because not everyone has six. One person could have two, and another could have ten.

What the Santa Cruz scientists discovered is that individuals from populations that eat a lot of starch—potatoes or corn or rice—skew to the higher-end of that copy number spectrum. And they credit natural selection: more amylase probably conferred a fitness advantage to those who were eating starchy foods. Chimps, on the other hand, have only two copies of the amylase gene. Maybe because they’re not bananas about bread.

## References

### **Internet sources:**

1. <https://www.scientificamerican.com/podcast/episode/bird-feeders-attract-bird-eaters-too/>
2. <https://www.scientificamerican.com/article/did-a-changing-climate-wipe-out-the-giant-kangaroo/>
3. [https://www.scientificamerican.com/article/what-hyenas-can-tell-us-about-the-origins-of-intelligence/?WT.mc\\_id=SA\\_MB\\_20170531](https://www.scientificamerican.com/article/what-hyenas-can-tell-us-about-the-origins-of-intelligence/?WT.mc_id=SA_MB_20170531)
4. <https://www.scientificamerican.com/podcast/episode/plants-share-light-if-neighbor-is-r-09-11-20/>
5. <https://www.scientificamerican.com/article/5-million-u-s-seeds-banked-for-resurrection-experiment/>
6. <https://www.scientificamerican.com/podcast/episode/bees-prefer-flowers-that-proffer-nicotine/>
7. <https://www.scientificamerican.com/article/can-plants-hear/>
8. <https://www.scientificamerican.com/article/why-does-lactic-acid-buil/>
9. <https://www.scientificamerican.com/podcast/episode/extreme-exercise-can-poison-the-blood/>
10. <https://www.scientificamerican.com/article/could-diet-change-help-treat-blood-cancer-or-transplant-patients/>
11. [https://listenaminute.com/s/stem\\_cell\\_research.html](https://listenaminute.com/s/stem_cell_research.html)
12. <https://www.scientificamerican.com/article/the-shape-shifting-army-inside-your-cells/>
13. <https://www.scientificamerican.com/podcast/episode/wheat-genes-could-bring-back-chestnut/>
14. <https://www.scientificamerican.com/article/gene-drives-thwarted-by-emergence-of-resistant-organisms/>
15. <https://blogs.scientificamerican.com/guest-blog/can-crispr-cas9-boost-intelligence/>
16. [https://listenaminute.com/g/genetic\\_engineering.html](https://listenaminute.com/g/genetic_engineering.html)
17. <https://www.scientificamerican.com/article/music-therapy-heart-cardiovascular/>
18. <https://listenaminute.com/h/heart.html>
19. <https://www.scientificamerican.com/article/is-an-unusual-virus-spreading-in-the-midwest/>
20. <https://blogs.scientificamerican.com/observations/a-new-approach-to-alzheimers-treatment/>

21. <https://www.scientificamerican.com/podcast/episode/hope-for-spinal-cord-injuries-09-04-08/>
22. <https://www.scientificamerican.com/article/damage-to-pea-size-gland-may-cause-ptsd-like-symptoms/>
23. <https://blogs.scientificamerican.com/lab-rat/how-bacteria-invade-your-urinary-tract/>
24. <https://www.scientificamerican.com/article/metabolism-in-mind-new-insights-into-the-gut-brain-axis-spur-commercial-efforts-to-target-it/>

### **Books:**

1. EssentialEnglishforBiologyStudents: учебное пособие по английскому языку для студентов биологических факультетов вузов / Арсланова Г.А., Сосновская Г.И., Гали Г.Ф., Васильева Л.Г., Шустова Э.В., Мельникова О.К. – Казань: Казанский университет, 2012 – 196 с.
2. Glendinning Eric H., Howard Ron. Professional English in Use. Medicine – Cambridge, 2007 – 196 с.
3. Cambridge English for scientists - Cambridge University Press, 2011 – 108 с.
4. Peter H. Raven, George B. Johnson Biology Oxford, 2002