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Учебное пособие для студентов-магистров ТУСУР – 120 с.

Рецензент

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Учебное пособие предназначено для студентов-магистров, а также студентов с высоким уровнем знания английского языка для обучения профессионально-ориентируемому английскому языку.

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Module I.

Grammar: Active Voice. Questions (1).

Language Skills: Emphatic Constructions.

Reading: Benjamin Franklin.

Discussion: Most important inventors and scientists.

Grammar.

I. Active Voice.

	Simple (do/does)	Progressive (be + Part. I)	Perfect (have + Part.II)	Perfect Progressive (have been + Part.I)
Present	He **draws**.	He **is drawing**.	He **has drawn**	He **has been drawing.**
	1)___________	He **isn't drawing**.	He **hasn't drawn**.	He **hasn't been drawing**.
	Does he **draw**?	3)___________	**Has** he **drawn**?	7)___________
Past	He **drew**.	He **was drawing**.	He **had drawn**.	He **had been drawing.**
	He **didn't draw.**	He **wasn't drawing.**	5)___________	He **hadn't been drawing.**
	2)___________	**Was** he **drawing?**	**Had** he **drawn**?	8)___________
Future	He **will draw**.	He **will be drawing.**	He **will have drawn.**	He **will have been drawing**.
	He **won't draw**.	He **won't be drawing.**	6)___________	He **won't have been drawing**.
	Will he **draw**?	4)___________	**Will** he **have drawn?**	9)___________

Task 1. *Fill in the missing sentences. What Russian verb tenses correspond to English ones?*

Task 2. *Translate the following sentences into Russian*.

1. Operation at these temperatures strongly suggests that it won't be long before we have commercial-grade transistor lasers capable of working under real-world conditions. 2. When transistor lasers move into commercial fabrication within the next few years, manufacturers won't be cleaving crystals by hand to create mirrors for the resonant cavity. 3. By 2007, when all three game console makers will have released their next-generation products, the market will have grown to 44 million. 4. All the data it calculates on, sends out, and brings in is fully protected. 5. The software team was running programs on a Cell simulator two full years before it got the first chip—and when the chip finally arrived, both the operating system and the applications worked on the first try. 6. The company has already released more than 700 pages of documents to applications developers and will begin releasing tools and compilers, as well. 7. Now Samsung is betting that you'll be willing to pay hundreds of dollars—and maybe much more—to have a 16- or 32-gigabyte flash-based memory in your notebook computer. 8. Bugs are notoriously hard to count, and estimates of how common they are vary hugely. 9. Formal methods were relatively new when Praxis started using them, and after some ups and downs, they have recently been gaining popularity.

Task 3. *Put the necessary verb forms into the blanks*.

1.I'm tired. I… (go) home now. Bye! 2. Angela … (just start) her diploma work. She is writing a new program for advertising company. 3. I … (know) Delphi but I … (not/use) it now. 4. We are still studying software protection. We … (not/finish) yet. 5. Mary … (go) to Australia for a while but she's back again now. 6. Sonia … (look) for a place to work. She … (work) as a computer consultant now. 7. Mr. Clark … (work) in a Disney corporation for 15 years. Then he gave up. 8. - Have you decided what to do about that job that was advertised? - Yes, … (apply) for it. 9. We are going on a business trip tomorrow. I… (tell) you all about it when we

… (come) back. 10. - Why are you turning off the computer? - I … (already do) all the work.

Task 4. *Translate the following sentences into English paying attention to appropriate verb tenses.*

1.После выхода книги, ученый получил мировую известность. 2. Как только вы завершите написание технического задания, мы приступим к распределению обязанностей. 3. Он занимается изучением принципов работы динамо-машины в данное время. 4. В каждом его научном труде он обращает внимание на существующие зарубежные наработки. 5. Не смотря на юный возраст, он прекрасно ориентируется в биохимии. 6. Вы уже подписали договор с Тайванской фирмой? 7. Возможно, это и был его последний значительный вклад в науку. 8. В этой статье мы рассмотрели подход к адаптивному контролю.

II. Questions.

Task 5. *What tenses are used in the following sentences?*

1.Why aren't we seeing code? 2.How do you program with eight engines running full speed without them constantly stopping and waiting for data? 3. Did it have to be that way? 4.Will consumers who have become used to freely copying DVDs for viewing on their hard drives or for sharing with friends accept a new technology that restricts such copying? 5. Isn’t it strange that I who has written only unpopular books should be such a popular fellow? 6. Didn’t the author express many different propositions? 7. Which of the methods provides the required information about the system? 8. Were there any signs that such devastation was coming?

Task 6. *Ask questions to the sentences below.*

1.For two years. 2. After I have done all the work. 3. Yes, the trip was more tiring than I expected. 4. If the professor allows me to. 5. I was there two days ago.

Task 7. *Translate these questions into English.*

1.Как можно доказать, что проблема неразрешима? 2. Кто разработал этот макет? 3. Сколько времени уйдет на разработку программы? 4. Почему процедура работы не отвечала требованиям технического задания? 5. Почему ты не позвонил в технический отдел, после того как представил свой проект? 6. Каким образом ты собираешься искать литературу для доклада? 7. С кем ты планируешь выполнять групповой проект?

Task 8. *Read the paragraph and ask as many questions as you can.*

The emergence of the transistor laser has taken a long time, but it's not because of lack of interest—but because of a death of ideas. Researchers have measured light emission from transistors before. In the early 1980s, a research group at the California Institute of Technology, in Pasadena, led by graduate student Joseph Katz even fabricated a few experimental devices they called translasers. Using a wire, they integrated a transistor with a laser diode to fashion a device that could produce both electrical signals and laser beams, though not both simultaneously.

In 1992, researchers at the Interuniversity MicroElectronics Center, in Leuven, Belgium, built an indium-gallium-arsenide bipolar transistor that emitted light when cooled to liquid nitrogen temperatures. Some groups have even reported that certain transistors emit light at room temperature. However, a transistor working as a transistor has never before shifted its operation into stimulated emission of light—that is, into generating an output laser signal—while simultaneously delivering an electrical signal with gain.

Now, based on our recent work at the University of Illinois, there is such a dual-output device, and a sound reason to envision a future where high-speed computing meets the next generation of broadband communications.

Task 9. *Translate the paragraph.*

Language Skills.

Emphatic Constructions.

1) Усилительно-выделительная конструкция ***it is … that (which, who, when)*** используется для выделения любого члена предложения кроме сказуемого. Переводится такая конструкция двумя способами:

а) используя слова ***именно, только, это, как раз.***

It is *this last category* ***that*** *is of interest to us.*

Именно эта последняя категория представляет для нас интерес.

в) без использования особых лексических элементов, с вынесением выделяемого слова или группы в конец предложения.

It was *Pr.N.,* ***who*** *was elected chairman of the session.*
Председателем собрания был избран профессор N.

2) Усилительные слова (precisely, only, even,…) используются непосредственно перед выделяемым словом.

It is ***precisely*** *this method that he followed.*
Как раз этот метод он и использовал.

3) Усилительный глагол ***do*** используется в утвердительных предложениях для усиления значения сказуемого и ставится непосредственно перед глаголом. Переводится словами ***действительно, все же, наконец,*** и т.д.

The value ***does seem*** *high in the light of this observation.*
В свете этого наблюдения данное значение действительно кажется высоким.

Task 1. *Translate the sentences with emphasizing structures.*

1.Today, ever more sophisticated tools are available to help companies manage all aspects of their software projects. 2. Nevertheless, even using those numbers as a guide, it's hard not to see the contract software business as anything but an enterprise all too often mired in mediocrity. 3. And, just as the few successful diet strategies all seem to require a major change in lifestyle, perhaps, too, the software failure rates won't improve significantly without a basic and widespread shift in tactics. 5. That Cell has more than one processor core on a single chip is more a sign of the times than a revolution. 6. What wasn't so obvious was that the 3-D rendering could be done four pieces of data at a time within each synergistic processor. 7. No technical measure ever has been proven to have an effect on these people. 8. Only after Praxis's engineers are sure that they have logically correct specifications written in Z do they start turning the statements into actual computer code. 9. But what Praxis does do is make such simulation a last resort, instead of the main line of defense against bugs. 10. That's the case with many military contractors that now need to demonstrate their use of formal methodologies to government purchasers; the same goes for financial institutions.

Task 2. *Rewrite the following sentences to make the information emphatic or peculiar.*

1. Recently we appreciated the potentialities in this field. 2. The absence rather than the presence of hindrance is noteworthy. 3. This opinion makes a

person defend this approach. 4. Monetary policy didn’t come to be re-discovered until the early fifties. 5. This composition will do for our purpose.

Task 3. *Finish the sentences.*

1.It was the only device… 2. Even though this essay was written by his coworker, … 3. This specification does seem … 4. It was the only gadget … 5. Just when the laboratory was opened …

Task 4. *Translate the text, paying attention to the translation of emphatic structures*.

Material Research is not new, but the interdisciplinary aspects of materials research now are receiving considerable emphasis. It has been only since chemists, physicists, metallurgists, ceramicists, polymer chemists, and other scientists began studying the detailed structure and properties of materials that the fundamental relationships underlying basic materials phenomena have begun to be understood.

It was not until recently that it has become increasingly evident that the rapid exploration of new discoveries and their incorporation into the technology depends largely on the combined efforts of research scientists and engineers drawn from several different disciplines.

The overwhelming problems of today are forcing the disciples to seek advice from one another.

Not only does the blending of various disciplines result in enhanced research, but modern materials systems themselves often are created from the integration of two or more materials. These systems do result in new materials having properties not previously available.

It is the lack of materials that are adequate to meet the needs imposed on them that many of the holding problems in our technological development stem from.

Reading.

"Fish and visitors smell in three days." (Benjamin Franklin)

Task 1. *What do you know about Benjamin Franklin? In what fields of science did he make his contribution? Read the text and find out.*

* * *

1. A list of Benjamin Franklin's inventions reveals a man of many talents and interests. His natural curiosity about things and the way they work made him try to find ways to make them work better.

2. Ben had poor vision and needed glasses to read. He got tired of constantly taking them off and putting them back on, so he decided to figure out a way to make his glasses let him see both near and far. He had two pairs of spectacles cut in half and put half of each lens in a single frame. Today, we call them bifocals.

3. Even though Ben is not famous for his study of bioscience, he was interested in how the human body works and looked for ways to help it work better. For example, Ben's older brother John suffered from kidney stones and Ben wanted to help him feel better. Ben developed a flexible urinary catheter.

4. During Ben's lifetime, he made eight voyages across the Atlantic Ocean. These long journeys gave him a lot of time to learn about ships and how they worked. As early as 1784, Franklin suggested following the Chinese model of dividing ships' holds into watertight compartments so that if a leak occurred in one compartment, the water would not spread throughout the hold and sink the ship.

5. Everyone knows the story of Ben's famous kite flight. Although he made important discoveries and advancements, Ben did not "invent" electricity. He did, however, invent the lightning rod which protected buildings and ships from lightning damage.

6. In colonial America, most people warmed their homes by building a fire in a fireplace even though it was kind of dangerous and used a lot of wood. His invention of an iron furnace stove allowed people to warm their homes less dangerously and with less wood. The furnace stove that he invented is called a Franklin stove. Interestingly enough, Ben also established the first fire company and the first fire insurance company in order to help people live more safely.

7. As postmaster, Ben had to figure out routes for delivering the mail. He went out riding in his carriage to measure the routes and needed a way to keep track of the distance. He invented a simple odometer and attached it to his carriage.

8. In his old age, Ben retired from business and public service and wanted to spend his time reading and studying. He found, however, that his old age had made it difficult for him to reach books from the high shelves. Even though he had many grandchildren to help him, he invented a tool called a long arm to reach the high books. The long arm was a long wooden pole with a grasping claw at the end.

9. Later, other famous inventors, like Thomas A. Edison and Alexander Graham Bell, would follow in Ben's footsteps by trying to find ways to help people live better. Today's curious thinkers are keeping Ben's traditions alive by inventing new and improved ways to make things work.

Task 2. *Where should these sentences go?*

1. Ben figured that there had to be a better way.
2. It was the scientist in Ben that brought out the inventor.
3. This thing appears to have been the first one produced in America.

Task 3. *Ask 5 questions to the text*.

Task 4. *Analyze the sentences below*.

1.It was the scientist in Ben that brought out the inventor. 2. Even though Ben is not famous for his study of bioscience, he was interested in how the human body works and looked for ways to help it work better. 3. As early as 1784, Franklin suggested following the Chinese model of dividing ships' holds into watertight compartments so that if a leak occurred in one compartment, the water would not spread throughout the hold and sink the ship. 4. He went out riding in his carriage to measure the routes and needed a way to keep track of the distance. 5. He did, however, invent the lightning rod which protected buildings and ships from lightning damage.

Task 5. *Prepare a short report about one other Franklin's invention*.

Discussion matter.

Find information about the most remarkable inventor or scientist and discuss in the group. Tell about the following:

- the author
- the historical background

- the most important works or inventions
- any big prizes he received

Module II.

Grammar: Passive Voice. Questions (2).

Reading: Technology Winners and Losers.

Language Skills: Compound Nouns. Explanations and Definitions.

Discussion: Successful and Unsuccessful Inventions**.**

Grammar.

I. Passive Voice. (be + Participle II)

	Simple	Progressive	Perfect
Present	It **is checked**.	It **is being checked**.	It **has been checked**.
	It 1)___________	It **isn't being checked**.	5)_______________
	Is it **checked**?	3)________________	**Has** it **been checked**?
Past	It **was checked**.	It **was being checked**.	It **had been checked**.
	It **wasn't checked**.	4)________________	It **hadn't been checked**.
	Was it **checked**?	**Was** it **being checked**?	6)_______________
Future	It **will be checked**.		
	It **won't be checked**.		
	2)______________		

Task 1. *Fill in the missing sentences. What Russian verb tenses correspond to English ones?*

Task 2. *Translate the following sentences into Russian*.

1. A diode laser is based essentially on the same principles as an LED, but it requires a few extra features. 2. The opposite ends of the recombination region must be made reflective to create a resonant cavity that aids in the stimulated recombination and emission of photons, ultimately forming a laser beam. 3. Because

transistors using today's technology are so small, even when they are supposed to be in the "off" state, infinitesimal currents still leak through them. 4. The Synergistic element's architecture prevents any application or external device from accessing the element's local memory, so that, a program cannot steal a music file that is being decrypted by the processor. 5. In Minor's simulation, it probably seems obvious that an image can be divided up into eight strips and these worked on independently. 6. Even projects considered successful were sometimes delivering software without all the features that had been promised or with too many errors—errors that, as in the missile-firing system, were sometimes extremely serious. 7. The discard and redesign may be done in one lump, or it may be done piece-by-piece. 8. In fact, once Spark code has been written, Chapman says, it has the uncanny tendency to work the first time, just as you wanted. 9. But the effect of widespread use of these tools on overall software quality hasn't been gauged in a detailed or rigorous way. 10. Most useful for risk assessment are standardized animal studies, which are being undertaken in a number of labs around the world.

Task 3. *Put the necessary verb forms into the blanks.*

1.Many accidents … (cause) by dangerous driving. 2. You … (invite) to the meeting. Why didn’t you come? 3. It’s a big software developing company. Five hundred people … (employ) there. 4. While I was on holiday, my notebook … (steal) from my hotel room. 5. I can’t find my briefcase. Somebody … (take) it. 6. I haven’t received the letter. It might … (send) to the wrong address. 7. The photocopier broke down yesterday, but now it’s OK. It … (repair). 8. The situation is serious. Something must … (do) before it’s too late.

Task 4. *Translate the following sentences into English paying attention to appropriate verb tenses.*

1.Мистика это то, что нельзя объяснить. 2. Было объявлено, что два человека пострадали во время взрыва на фабрике в Бирмингеме этим утром. 3. Компьютерному проектированию меня учил самый лучший преподаватель на кафедре. 4. Я не могу ничего сделать сейчас на компьютере, потому что его ремонтируют. 5. Вчера у нас не было электротехники. Урок был отменен. 6.

Новый корпус университета строится уже пять лет. Его обещают построить к началу следующего учебного года. 7. Обычно микрочипы делают из кремния. 8. Не торопись, эту часть программы уже написал твой одногруппник.

Task 5. *Read this newspaper article and put the verbs into the most suitable form.*

A woman … (1. take) to hospital after her car collided with a lorry near Norstock yesterday. She … (2. allow) home later after treatment. The road … (3. block) for an hour after the accident and traffic had to … (4. divert). A police inspector said afterwards: “The woman was lucky. She could … (5. kill).”

<u>II. Indirect questions.</u>

Task 6. ***Study the following questions. What rule can you derive from them?***

1.Do you know where Tom has gone? 2. Do you think it was as important as you supposed? 3. Could you tell me where I can find the dean? 4. Can you tell me how much it costs? 5. Have you any idea when they will arrive?

Make similar questions from the following?

1.Where is the industrial engineering department? 2. What’s the time? 3. What does this icon mean? 4. Who is that woman? 5. Has Ann got the task yet? 6. Is Sue going to give her report today? 7. Where can I park my car? 8. What time did they leave?

Task 7. *Ask indirect questions in passive or in active voice to the sentences below.*

1.Glass. 2. For six years. 3. By Power Point. 4. In the Silicon Valley. 5. Yes, but only some of them.

Reading.

You are going to read some texts about different technologies which have great or no success on the market. Read the first text and say if it is a winner or loser. Why do you think so?

Multimedia Monster

1. We're flying at about Mach 1.5 around Mount Saint Helens, in Washington state. IBM Corp. senior programmer Barry L. Minor is at the controls, rocketing us

over the crater and then down to the lake at its base to skim over the tree trunks that have been floating there since the volcano exploded over 25 years ago. The flight is exhilarating, even though it's just a simulation projected on a widescreen monitor in a cluttered testing lab.

2. Then, at the flick of a switch, Minor turns the simulation over from his new Cell processor to a dual-processor Apple Power Mac G5, and the scenery freezes. The G5 almost audibly groans under the burden, though it's no slouch. In fact, it's currently the top of the line for PCs. But Cell is something different entirely. It's a bet on what consumers will do with data and how best to suit microprocessors to the task—and it's really, really fast. Cell, which is shorthand for Cell Broadband Engine Architecture, is a US $400 million joint effort of IBM, Sony, and Toshiba. It was originally conceived as the microprocessor to power Sony's third-generation game console, PlayStation 3, to be released this spring, but it is expected to find a home in lots of other broadband-connected consumer items and in servers too.

3. Executives at Sony Corp., in Tokyo, wanted more than just an incremental improvement over PlayStation 2's processor, the Emotion Engine. What they got was a 36-fold acceleration, to a whopping 192 billion floating-point operations per second (192 gigaflops). Because Cell is a combination of general-purpose and multimedia processors, it defies an exact comparison with other upcoming chips, but it's thought to be more powerful than the chips driving competing game systems.

4. Cell can calculate at such blazing speed, in part, because it's made up of nine processors on a single chip of silicon, optimized for the kind of real-time calculations needed in today's broadband, media-rich environment. A specially designed 300-gigabit-per-second bus knits the processors into a single machine, and interface technology from Rambus Inc., Los Altos, Calif., gives it fast access to memory and other off-chip systems.

5. So far, microprocessor watchers have been impressed with what they've seen of Cell. "To bring huge parallel processing onto a single chip in a clean and efficient way is a real accomplishment," says Ruby B. Lee, a professor of electrical engineering at Princeton University and an IEEE Fellow.

6. A graphics-heavy item such as PlayStation 3 isn't just a showcase for an unusual chip. For IBM it's a philosophical statement. "Gaming is the next interface driving computing," says James A. Kahle, Cell's chief architect with the IBM Technology Group, in Austin, Texas. Just as moving from punch cards to electronic displays changed what people expected of computers, the highly collaborative, real-time realism of today's games will set the standard for what people want from computers in the future.

7. But even now, the sheer desire for power in the gaming market guarantees that Cell will be made in volumes that more than make up for the loss last year of IBM's highest profile customer, Apple Computer Inc. Market research firm iSuppli Corp., in El Segundo, Calif., predicts that 37 million game consoles will be sold this year alone worldwide. By 2007, when all three game console makers will have released their next-generation products, the market will have grown to 44 million. And though Cell is exclusive to the PlayStation 3, IBM has a lock on the rest of the console market. Its microprocessors will power both of Sony's competitors, Microsoft's Xbox and Nintendo's GameCube.

8. The Cell-powered PlayStation 3 can expect to pick up a little less than half of what could become a market worth up to $9.5 billion in 2007, according to iSuppli senior analyst Chris Crotty. And, of course, there are other high-volume plans for Cell.

9. Toshiba Corp., in Tokyo, for one, plans to build television sets around it. The company has already shown that a single Cell processor can decode and display 48 compressed video streams at once, potentially allowing a television viewer to choose a channel based on dozens of thumbnail videos displayed simultaneously on the screen. And in a smaller market, Cell has already found its first outside customer in medical- and military-systems maker Mercury Computer Systems Inc., in Chelmsford, Mass., which is developing a two-Cell blade server due out by April.

10. With two such massive consumer electronics makers as Toshiba and Sony behind it, Cell is an obvious attempt to control the "digital living room," as technology executives have dubbed their dream of a home where all the media

players are intelligent and networked together. "[Sony's] goal is to make a computer fun...to make it an entertainment platform," says Sony's Cell director Masakazu Suzuki. "But even if we make the Cell system an entertainment platform, there's nothing if there's no content."...

Task 1. *Answer some questions on the text.*

1.Where was this technology developed? 2. Who was this technology developed by? 3. What makes it so different from other similar technologies? 4. What future is predicted to this Cell-powered PlayStation 3?

Task 2. *1) Study the first 5 paragraphs and make 5 questions.*

2) Study the second 5 paragraphs and make 5 questions.

Ask your questions to your partner.

Task 3. *Find sentences in Passive in the text and translate them correctly*.

Task 4. *Translate the given paragraph*.

Read the first part of the second text and say if it is a winner or loser. Why do you think so?

Task 5. *What do these words refer to in the text?*

1) … at *its* base … (para 1)
2) *It* was originally conceived … (para 2)
3) … but *it* is expected … (para 2)
4) … but *it*'s thought … (para 3)
5) … *their* next-generation products … (para 7)
6) *Its* microprocessors … (para 7)
7) … around it. (para 9)
8) … *which* is developing … (para 9)
9) … have dubbed *their* dream … (para 10)
10)… to make *it* an entertainment platform … (para 10)

Task 6. *Divide the following words into groups: nouns, verbs, adjectives and adverbs.*

Blazing, audibly, showcase, conceive, originally, accomplishment, sheer, obvious, competitor, decode, currently, release, acceleration, huge, environment, upcoming.

Too Little, Too Soon. Part I.

By: Harry Goldstein

1. Solid-state flash memories are everywhere. They boot the operating systems in PCs, store photos in digital cameras and music in MP3 players, and let you tote music, photos, and presentations on a key chain. Now Samsung is betting that you'll be willing to pay hundreds of dollars—and maybe much more—to have a 16- or 32-gigabyte flash-based memory in your notebook computer.

2. Most analysts are nonplussed. "Does Samsung really understand the demographics and the price threshold that people are willing to pay for these products?" asks Celeste Crystal, a senior research analyst with IDC's Semiconductors Group, headquartered in Framingham, Mass.

3. While flash memory is ubiquitous these days in devices using 4 GB and less, there are several compelling reasons that you don't find it in the hard-drive bays of PCs, notebooks, subnotebooks, or tablet computers. For example, flash-based solid-state disks (SSDs) have astronomically high prices and absurdly low capacities relative to conventional magnetic hard drives. SSDs cost 60 to 70 times as much as hard-disk drives, which boast capacities and read/write speeds that flash makers like Samsung aren't going to approach for at least another three years, industry observers say.

4. Last May, Seoul, South Korea-based Samsung Electronics Co., the world's No. 1 NAND flash vendor, announced NAND flash-based SSDs ranging in capacity from 4 to 32 GB aimed at notebook, subnotebook, and tablet computers.

5. Flash Points: Flash comes in two flavors, NOR and NAND, so named for the arrays of logic gates that each comprises. Flash can be electrically erased and reprogrammed somewhere between 10 000 and 5 million times before the individual cells, each of which stores a bit, begin to break down and cause errors.

6. A cell is a CMOS transistor modified with a special polysilicon gate perched atop a layer of oxide. Writing data involves two steps: erasing, then writing. To write into the cell, voltage is applied, blasting electrons from the transistor channel through the oxide, where they wind up trapped on the gate. To erase data, electrons are forced to leave, often by tunneling through the same oxide.

7. All this tunneling takes a physical toll on the cells. NOR flash endures between 10 000 and 100 000 erase/write cycles, and NAND flash withstands from 100 000 up to 5 million cycles.

8. NOR and NAND flash differ in other important ways, as well. Individual NOR flash cells are each located at the intersection of a word line and a bit line, offering random access to the individual bits of code necessary to boot your PC. Though each NAND cell has its own word line, eight NAND cells share a bit line, limiting NAND flash to sequential access to its stored bits in blocks of 512 megabytes. With fewer wires, NAND flash cells can be more densely packed, and hence cheaper, than NOR cells. And because NAND cells are arranged in large blocks relative to NOR cells, NAND can be erased and written to much faster than NOR.

9. The NAND flash market has enjoyed a compound annual growth rate of 70 percent from 2001 through 2005. Last year, total NAND flash revenue exceeded that of NOR flash for the first time ever. The flash-based drives that Samsung began showing customers last August provide 16 GB in a package designed to go directly into a laptop hard-drive bay. It's worth noting that even cheap laptops are now shipping with 40-GB hard drives, and that 80-GB hard drives are fast becoming the standard, according to Gordon F. Hughes, associate director, Center for Magnetic Recording Research, University of California, San Diego.

10. So you've got to admire the chutzpah of Chang-Gyu Hwang, Samsung's Semiconductor Business Division CEO, who on 12 September 2005 essentially declared the end of the magnetic hard drive. "NAND flash will eventually replace other storage media, especially those used in mobile products, creating a 'flash rush,' as NAND continues to register an unprecedented surge in demand as the backbone of

the mobile electronics era," Hwang asserted at a press conference at the Shilla Hotel in Seoul. Hwang's prediction is the latest in a long history of forecasts of the imminent demise of the hard-disk drive.

11. "Samsung is out thumping their chest saying...we're going to bury disk drives," says Larry Swezey, deputy general manager of Hitachi Ltd.'s Mobile Hard Drive Business, whose 1-inch drive was spurned by Apple Computer Inc. in favor of Samsung's NAND flash for the iPod Nano personal music player. Samsung says that it will ship 32-GB SSDs next year. "What they don't mention," adds Swezey, "is how much the 32 GB will cost"—anywhere from US $2200 to $5000 today, depending on the specific application.

12. Currently, NAND flash costs about $45 per gigabyte; at that price, just the raw memory for a 32-GB drive would cost $1440. But that raw memory is only one component in the SSDs on the market today, which also include a controller loaded with specialized software that arbitrates read, write, and erase cycles; checks for bad blocks; corrects for bit errors; and runs algorithms that ensure that the same data isn't written in the same place twice, reducing wear and increasing lifetimes.

13. In addition, there is the packaging to make the flash-based memory fit into a conventional hard-disk-drive bay, as well as the serial ATA connector that makes the flash drive appear as a hard-disk drive to the computer. All that adds up to at least another $30 to $75 on top of the raw flash cost, according to Esther Spanjer, director of technical marketing for M-Systems Inc., with offices in Sunnyvale, Calif., a leading maker of flash-based solid-state disks. Throw in a healthy markup and you've got SSDs that cost thousands of dollars for relatively low capacity.

14. Now consider the alternative: a garden-variety 60-GB hard-disk drive, which costs around $150. Even allowing that prices for flash memory will continue to drop about 35 percent annually, it will be seven years at least before you'll be able to buy 60 GB of raw NAND flash for a similar price. Next year, 200-GB hard-disk drives are expected to be available for less than $200. Hard-drive makers are switching over to the new perpendicular recording technology, which promises to cram at least 200 billion bits into each square inch, twice the density possible with

current longitudinal writing technology. That promises to keep hard drives way ahead of flash drives in terms of density and price for years to come.

Task 1. *Answer some questions on the text.*

1.Where was this technology developed? 2. Who was it developed by? 3. What was it developed for? 4. What future is expected for this technology?

Task 2*. 1) Study the first 7 paragraphs and make 5 questions.*

2) Study the second 7 paragraphs and make 5 questions.

Ask your questions to your partner.

Task 3. *Find words in text with the similar meaning*.

1) Wishing (para 2)
2) Traditional (para 3)
3) Universal, common (para 3)
4) Deleted (para 5)
5) At any time (para 8)
6) Notebook (para 9)
7) Announced (para 10)
8) Rejected (para 11)
9) Ordinary (para 13)
10) Existing (para 14)

Task 4. *Make phrases from the words in group A and group B.*

A	B
Serial	media
Random	bay
Logic	system
Storage	access
Flash-based	connector
Hard-drive	electronics
Operating	drive
Mobile	gate

Task 5. *Read the second part of the text and find advantages and disadvantages of the hard drives over flash drives.*

Too Little, too soon. Part II.

15. Why are solid-state flash drives so shockingly expensive relative to hard drives? The capacity of a flash memory chip depends simply on how many transistors can be packed onto the chip. So raising capacity means turning to ever more advanced chip fabrication equipment. Indeed, Samsung is investing $33 billion in its Hwaseong Semiconductor Plant, with eight new fabrication lines (an undisclosed number of them devoted to flash) due to come on line between the end of this year and 2012. The company's next generation of NAND flash chips, which go into production by year-end, will contain 16.4 billion transistors, thanks to line widths of 50 nanometers.

16. The window of opportunity to recover the capital costs associated with such cutting-edge process technology is vanishingly small. Samsung's Hwang, an IEEE Fellow, stated in the November 2003 Proceedings of the IEEE that in NAND flash, transistor density doubles every 12 months, from 256 megabits in 1999 to 8 Gb in 2004. But the cost per gigabyte of flash, while falling 30 to 40 percent per year, has stayed sky-high relative to that for hard drives and will remain so for the foreseeable future.

17. Price isn't the only advantage hard drives have over flash drives. They also win on performance. The read/write speeds on hard-disk drives in most notebooks tend to be faster, too, up to 80 megabytes per second for a 2.5-inch disk spinning at 7200 revolutions per minute. Samsung's SSD has a respectable read speed of 57 MB/s but a downright poky write speed of 32 MB/s. "The write speed is the bottleneck in flash," says Krishna Chander, senior storage analyst for iSuppli Corp., Santa Clara, Calif. The latency isn't noticeable to the casual iPod Nano user, "[b]ut in a computer environment, when you're plugging an SSD into a notebook, desktop, or mission-critical enterprise system, you will notice the difference," Chander notes.

18. Over the last decade, SSDs have found their niche in battlefield laptops and warplanes, which demand rugged memory modules capable of withstanding extremes

of temperature, shock, and vibration. Pioneering companies like BitMicro Networks Inc., in Fremont, Calif., and M-Systems Ltd., in Kfar Saba, Israel, have done well in a market where their military customers care less about cost than they do about reliability.

19. The opposite holds true for someone who is buying a laptop for, say, a college-bound student. Those buyers are looking to get the most memory for their money, and flash's special features, such as exceptional durability, aren't likely to sway them. IDC's Crystal notes: "Consumers...are basically trained to realize that you probably shouldn't throw your laptop across the room." But while it will be years before consumers adopt SSDs, Crystal adds that these drives, including those from Samsung, will prosper in niche markets.

20. Samsung's Don Barnetson, associate director of flash marketing, insists that someone other than military procurement officers will find value in SSDs' ruggedness, low power consumption, and speed at start-up. Besides enjoying an extra half-hour of battery life, "a notebook with a solid-state disk boots Microsoft Windows in about half the time that a normal hard-disk drive does," says Barnetson, or about 30 seconds rather than 1 minute. "We think it provides a lot of value to the end user, and some people will be willing to pay for that."

21. Even so, a source close to Samsung's SSD project says the company's SSD isn't going to set the world on fire, at least not for a while: "I don't think you'll be going to your local Fry's or Best Buy and find a whole lot of notebooks with SSD in them" this year.

Task 6. *Match the words with their definitions*.

1) latency	a) the concentration of transistors on a chip;
2) durability	b) the amount of power consumed by a device;
3) chip density	c) the speed or effectiveness of a device;
4) write/read speed	d) the distance between the conductors on a printing board;
5) power consumption	e) the ability to withstand difficult conditions;
6) ruggedness	f) the speed at which the computer performs

write/read operations;

7) line width — g)the time needed for the program/computer response;

8) performance — h) the characteristic of a processor to last for a long without breaking or getting weaker.

Task 7. *Find sentences in Passive in the text and translate them correctly*.

Task 8. *Translate the given paragraph*.

Discussion matter.

Find information about technologies which can be referred as **Winners** or **Losers**. Prepare a short report and discuss it in the group. Tell about the following:

1. Where was this technology developed?
2. Who was it developed by?
3. What was it developed for?
4. What future is expected for this technology?

Language Skills.

I. Compound Nouns.

The language of computing in English contains as ever-increasing number of **compound nouns**, that is, a group of two or more nouns which act as a single noun. They are also called as **attributive groups**.

Example: *memory capacity* *address bus* *arithmetic unit*
Information systems *bar code scanner*

It's important to be able to recognize how such compounds are formed in order to understand what they mean.

The exact relationship between the words depends on the particular expression, but all these expressions have one thing in common: the last word in this chain says what the thing is, while the preceding word or group of words describes the thing. So when we read compound nouns, we have to start with the last word and work backwards.

A large number of possible meanings can be expressed by compound nouns. For instance, the first noun or group of nouns can tell us what the second noun is made of, what it is for, or what it is part of.

1. **Material**: the first noun tells us what the second consists of.

2. **Function**: the first noun tells us what the second noun is for.

3. **Part**: the second noun refers to as a part of the first noun.

4. **Activity or person**: the second noun refers to as an activity or person related to the first noun.

Multiple nouns.

Very often a compound noun will join together with one or more other nouns to give an expression that has three, four or more words. In such cases, it is important to examine the expression very carefully to break it into its constituent parts. The secret, as always, is to read the expression from the back towards the front.

Example: *a document-image-processing program*
(a program which processes images of documents).

Some expressions are written separately, while others are joined by hyphens. There are no clear rules for this. Sometimes you will see the same expression written in different ways in different texts.

Example: *a document-image-processing program*
a document image-processing program
a document image processing program

Task 1. *What is the Russian variant for these English phrases?*

a dual-processor Apple Power Mac G5, third-generation game console, general-purpose and multimedia processors, massive consumer electronics makers, video compression and decompression, encryption and decryption of copyrighted content, centimeter-resolution satellite map, game- and media-oriented processors, Solid-state flash memories, flash-based solid-state disks, Samsung's Semiconductor Business Division, more advanced chip fabrication equipment.

Task 2. *In your reports find some examples of attributive groups and read them to the group to translate.*

II. Explanations and definitions.

Texts containing technical terminology frequently contain definitions and explanations. This is particularly the case if the text is aimed at non-experts or students of technical subjects, or if the purpose of the text is to inform specialists about new developments.

1. ***Common words*** and expressions used in definitions or explanations.

is/ are	by … we mean
means	by … is meant
is taken to be	in other words
denotes	that is (to say)
is/can be defined as	

2. Some definitions and explanations give further distinguishing characteristics by means of a ***defining relative clause*** (using relative pronouns who, which, where, that, when).
3. Another way of defining or explaining is to use ***a noun, a noun phrase, or a clause*** separated from the rest of the sentence by commas or dashes.

Task 3. *Write definitions to the following terms from the texts*.

1)gigaflop 2)punch cards 3)thumbnail video 4)digital living room 5)entertainment platform 6) magnetic hard drive 7) subnotebook 8) tablet computer

Module III.

Grammar: Complex sentences. Reported Speech.

Skills: Abstract and Review writing.

Reading: The Exterminators.

Discussion: Programming experience.

Grammar.

I. Complex sentences.

coordinating conjunctions			*subordinating conjunctions and prepositions*	
and	still	while	after	till
besides	yet	or	before	until
but	nevertheless		since	
however	moreover		yet	…

1)**Subject clause** (that, what, whether, who, whose, which, when, why)	**That** the method is too complicated is obvious. **Who** will do it depends on the circumstances. **Whether** or not these cells interact with each others has to be checked.
2) **Predicate clause** (how, that, whether, which,…) is used after "be"	The question is **how** he does it. The decision was **that** the similarities and differences should be explored in detail. The question is **whether** this scientific model will apply to the industrial plant.
3) **Attribute clause** (whose, which, why, … or without a linking word) is used after the defining word	We know professor N. **whose** articles were published in 1980. The reason **why** he did not come is not clear. The methods we have developed extend straightforwardly to these designs.
4) **Adverbial clause** - **of place** (where) - **of time** (when, as, while, before, after, as long as, till, until) - **of concession** (though, although, while, whereas, even if)	 **Where** there is a will there is a deed. We must learn to obey orders **before** we are qualified to give them. **Although** the new method can be used to study these systems, we shall use the old one.

- **of purpose** (that, in order that, lest) - **of consequence** (so that) - **of result** (as, since, for) - **of condition** (if, unless, provided, providing that, given, even though, even if, but for, not for)	Two different sources were used, **lest** there be interference. They gathered together round the table **so that** they could review the procedures they now follow. **Since** aluminum is light and strong it is used in aircraft industry. 1) The experiments show agreement with theory **provided** the conditions are met. 2) **If** the tools were used with greater force, the depth of the cut would be affected. **Had** we time we should test the sample twice. 3) **If** the tools had been used with greater force, the depth of the cut would have been affected. They could have understood the task **had** he explained it clearly.
5) **Object clause** (that, if, whether, who, which, whom, whose, what, where, how, why, when or without "that")	A computer will do only **what** it is precisely told to do. We are sure it is possible to change the conditions.

Task 1. *What type of complex sentences are these? Translate them into Russian.*

1. "We knew we couldn't anticipate all the different security needs in the future, but we wanted to know we had the right hardware to support a very robust security system." 2. Yet time and again, Amey knew the software development process didn't prevent bugs; it merely put off dealing with them until the end. 3. This

fact points to the postulated relationship provided no inversion has taken place. 4. You never know what you can do till you try. 5. Unless a driver drives largely by automatic habits, he is going to be an insecure, dangerous driver. 6. Although these two methods will require completely different control structures, the techniques used will not be very different. 7. There are some infinite numbers which are larger than any number we can possibly write no matter how long we work. 8. Most laboratories have small machines which are being used for demonstration purposes. 9. The problem is whether the results of the test should be recorded, whether successful or not. 10. Whether or not a social system evolves and survives is dependent on the efficiency with which it processes information.

Task 2. *Translate the following sentences paying attention to linking words. What do they mean?*

1.Amey says his superiors, rather than commending his discovery, complained that it would delay the system's deployment. 2. And though Praxis employs just 100 people, its name has become surprisingly well known. 3. And although formal methods have been used to great effect in small and medium-size projects, no one has yet managed to apply them to large ones. 4. Nevertheless, even though the company may not have all the answers to make software projects more successful, those working in the field can learn plenty of lessons from it, say advocates like Knight and Humphrey. 5. Because transistors using today's technology are so small, even when they are supposed to be in the "off" state, infinitesimal currents still leak through them. 6. Because there are at least two hot spots on each chip, the heat is spread more evenly over it, so it's less damaging to the circuitry and easier to get rid of with fans and heat sinks. 7. Rather than waste several clock cycles waiting for the right data to arrive from memory, a Synergistic element works only on data stored in its own 256 kilobytes of memory, to which it has a high-bandwidth connection. 8. So far, it's going very well, though discussions are spirited at times. 9. Once products do ship, potential crackers—including teens in basements, academics, and large-scale pirates—will undoubtedly tackle this new encryption challenge. 10. As long as I have the technology in my living room to watch it for myself, I can modify the system to extract the video.

Task 3. *Join the following pairs of sentences to make one*.

1.Formal methods have been used to great effect in small and medium-size projects. No one has yet managed to apply them to large ones. 2. British mathematician Alan Turing formalized the concept of algorithm and computation by means of his now famous Turing Machine. This machine boils the idea of a computer down to an idealized device that steps though logical states. 3. The market for diet products is a billion-dollar industry. Obesity as a public health problem hasn't gone away. 4. The Synergistic element's architecture prevents any application or external device from accessing the element's local memory. A program cannot steal a music file that is being decrypted by the processor. 5. NAND cells are arranged in large blocks relative to NOR cells. NAND can be erased and written to much faster than NOR. 6. Hard-drive makers are switching over to the new perpendicular recording technology. This technology promises to cram at least 200 billion bits into each square inch, twice the density possible with current longitudinal writing technology. 7. Even strong keys can be compromised. The heart of the new protection technology will be its ability to keep on protecting data even after it has been cracked. 8. Cell is a US $400 million joint effort of IBM, Sony, and Toshiba. Cell is shorthand for Cell Broadband Engine Architecture. 9. In a smaller market, Cell has already found its first outside customer in medical- and military-systems maker Mercury Computer Systems Inc., in Chelmsford, Mass. This company is developing a two-Cell blade server due out by April.

II. Reported Speech.

Direct Speech	**Reported Speech**
“I like him,” she said.	She said she liked him.
“I’m seeing him this evening,” she said.	She said she was seeing him that evening.
“I’ve never felt like this before,” she said.	She said she had never felt like this before.

"I enjoyed meeting you tonight," she said.	She said she had enjoyed meeting her that night.
"I'll ring you tomorrow," she said.	She said she would ring her the next day.
"Is satellite television very popular?" he asked.	He asked if (whether) satellite television was popular.
"Which newspaper have you read recently?" he asked.	He asked which newspaper he had read recently.
"Sit down, please," she offered.	She invited her to sit down.
"Don't cry," she said.	She told her not to cry.
"I'll look after her", she said.	She promised to look after her.
"Would you like a cup of tea?" she said.	She suggested her a cup of tea.

Changing time reference.

Today – that day tonight – that night tomorrow – the next day

yesterday – the day before ago – before last week – the week before

next week – the following week this morning – that morning

Task 4. *Rewrite the given sentences in reported speech*.

1."Once you bring your code in and decrypt it, it can execute in a virtually trusted environment," said IBM's Cell architect Charles R. Johns. 2. "We can get over 128 memory transactions going in flight at once," boasted Michael N. Day, a distinguished engineer at IBM. 3. Minor said, "Once you've done that, you're 80 percent done." 4. "How do you program with eight engines without them constantly stopping and waiting for data?" Steffen asked. 5. "I don't think you'll find a whole lot of notebooks with SSD in them", said Barnetson. 6. "No technical measure ever has been proven to have an effect on these people," said the Electronic Frontier Foundation's Schoen. 8. "Why aren't we seeing code? Why aren't we seeing implementation?' " he recalled. 9. "Ask any professional engineer if he could do the job without math, and you'll get a very rude reply," Cohen said. 10. "Over the next several years, we won't think of an asymmetric processor as anything different," predicted he.

Reading.

You are going to read the text about Praxis High Integrity Systems, one of software companies in Great Britain. Before reading work in pairs and answer these questions:

Do you have any experience in programming?

Is it an individual or a corporate business?

Is it possible to write a bug-free program?

What do you need to know to write a program?

Task 1. *Read the text and* a*nswer the questions.*

1.Where is Praxis situated? When was it founded? 2. How big is it? 3. What are the main approaches they use? 4. What are their results? 5. How do you understand the following things – formal methods, programming code, custom systems? Give definitions to them.

The Exterminators

By: Philip E. Ross

I

1. Peter Amey was an aeronautical engineer serving in the United Kingdom's Royal Air Force in the early 1980s when he found a serious flaw in an aircraft missile-control system being deployed at the time. It wasn't a defect in any of the thousands of mechanical and electronic parts that constituted the system's hardware. The problem was in the system's software. Amey found an erroneous piece of program code—a bug.

2. Because of it, the unthinkable could happen: under rare circumstances, a missile could fire without anyone's having commanded it to do so.

Amey says his superiors, rather than commending his discovery, complained that it would delay the system's deployment. Like most project managers, they didn't like the idea of fixing errors at the end of the development process. After all, good design ought to keep errors out in the first place. Yet time and again, Amey knew, the software development process didn't prevent bugs; it merely put off dealing with them until the end. Did it have to be that way? Or could developers avoid bugs in the first place? He would find the answer to be "yes" when, years later, he joined Praxis High Integrity Systems.

3. Praxis, headquartered in Bath, 2 hours from London by car, was founded in 1983 by a group of software experts who firmly believed they could put together a sound methodology to ruthlessly exterminate bugs during all stages of a software project.

4. At the time, the software world was in a malaise that it hasn't fully shaken even today. Software projects were getting larger and more complex, and as many as 70 percent of them, by some estimates, were running into trouble: going over budget, missing deadlines, or collapsing completely. Even projects considered successful were sometimes delivering software without all the features that had been promised or with too many errors—errors that, as in the missile-firing system, were sometimes extremely serious. The personal computer era, then just starting, only reinforced a development routine of "compile first, debug later."

5. Praxis armed itself not only with an arsenal of the latest software engineering methods but also with something a little more unusual in the field: mathematical logic. The company is one of the foremost software houses to use mathematically based techniques, known as formal methods, to develop software.

6. Basically, formal methods require that programmers begin their work not by writing code but rather by stringing together special symbols that represent the program's logic. Like a mathematical theorem, these symbol strings can be checked to verify that they form logically correct statements. Once the programmer has checked that the program doesn't have logical flaws, it's a relatively simple matter to convert those symbols into programming code. It's a way to eliminate bugs even before you start writing the actual program.

7. Praxis doesn't claim it can make bug-free software, says Amey, now the company's chief technical officer. But he says the methodology pays off. Bugs are notoriously hard to count, and estimates of how common they are vary hugely. With an average of less than one error in every 10 000 lines of delivered code, however,

Praxis claims a bug rate that is at least 50—and possibly as much as 1000—times better than the industry standard.

8. Praxis is still a small, lonely asteroid compared to the Jupiter-size companies that dominate the software universe—companies like Microsoft, Oracle, and SAP. The tiny British software house doesn't make products for the masses; it focuses on complex, custom systems that need to be highly reliable. Such mission-critical systems are used to control military systems, industrial processes, and financial applications, among other things.

9. Sometimes the software needs to work 99.999 percent of the time, like an air-traffic control program Praxis delivered some years ago. Sometimes it needs to be really, really secure, like the one Praxis recently developed for the National Security Agency, the supersecret U.S. signals intelligence and cryptographic agency, in Fort Meade, Md.

10. And though Praxis employs just 100 people, its name has become surprisingly well known. "They're very, very talented, with a very different approach," says John C. Knight, a professor of computer science at the University of Virginia and the editor in chief of IEEE Transactions on Software Engineering. Praxis's founders, he says, believed that building software wasn't as hard as people made it out to be. "They thought, it isn't rocket science, just very careful engineering."

11. Watts S. Humphrey, who once ran software development at IBM and is now a fellow at the Software Engineering Institute at Carnegie Mellon University, in Pittsburgh, also speaks highly of Praxis. He says the company's methodology incorporates things like quality control that should be more widely used in the field. In fact, Humphrey spent this past summer at Praxis headquarters to learn how they do things. He wants to use that knowledge to improve a complementary methodology he developed to help organizations better manage their software projects.

12. Praxis's approach, however, isn't perfect and isn't for everybody. Formal methods obviously are no silver bullet. For one thing, using formal methods can take more time and require new skills, all of which can mean higher up-front costs for a

client. In fact, Praxis charges more—50 percent more in some cases—than the standard daily rate. To this its engineers will say: "You get what you pay for; our bug rate speaks for itself."

Task 2. *Write questions to the sentences below.*

1.A missile could fire without anyone's having commanded it to do so. 2. A group of software experts who firmly believed they could put together a sound methodology to ruthlessly exterminate bugs during all stages of a software project. 3. Going over budget, missing deadlines, or collapsing completely. 4. By stringing together special symbols that represent the program's logic. 5. To control military systems, industrial processes, and financial applications, among other things.

Task 3. *Find words in the text with the meanings similar to these*:

- faulty (para 1)	- used (para 1)	- postpone (para 2)
- sensible (para 3)	- properties (para 4)	- leading (para 5)
- confirm (para 6)	- drawbacks (para 6)	- transform (para 6)
- remarkably (para 7)	- involve (para 11)	
- deal with (para 11)	- money paid before the work done (para 12)	

Task 4. *Analyze the underlined sentences referring them to different types of complex sentences.*

Task 5. *Read the second part of the text and find other examples of complex sentences.*

II

1<u>. And although formal methods have been used to great effect in small and medium-size projects, no one has yet managed to apply them to large ones.</u> There's some reason to think no one ever will, except perhaps in a limited fashion. Nevertheless, even though the company may not have all the answers to make software projects more successful, those working in the field can learn plenty of lessons from it, say advocates like Knight and Humphrey.

2. Software was conceived as a mathematical artifact in the early days of modern computing, when British mathematician Alan Turing formalized the concept of algorithm and computation by means of his now famous Turing Machine, which

boils the idea of a computer down to an idealized device that steps though logical states.

3. But over time, software development gradually became more of a craft than a science. Forget the abstractions and the mathematical philosophers. Enter the realm of fearless, caffeinated programmers who can churn out hundreds of lines of code a day (often by hastily gluing together existing pieces of code). The problem is that for some projects, even tirelessness, dedication, and skill aren't good enough if the strategy is wrong.

4. Large, complex software systems usually involve so many modules that dealing with them all can overwhelm a team following an insufficiently structured approach. That's especially true of the mission-critical applications Praxis develops, as well as of large enterprise resource-planning systems, of the sort used by Fortune 500 companies, and complex data-driven software, such as the FBI's Virtual Case File project.

5. Even when you break such a big program down into small, seemingly manageable pieces, making a change to one turns out to affect 10 others, which may in turn affect scores or maybe even hundreds of other pieces. It may happen that making all the fixes will require more time and money than you have. If your system's correct operation depends on those changes, you'll have to either admit defeat or scramble to find a way to salvage what you've done so far, perhaps by giving up on some of the capabilities or features you'd hoped to have in the software.

6. As it turns out, complete failure—projects canceled before completion—is the fate of 18 percent of all information technology projects surveyed in a 2004 study by consultancy Standish Group International Inc., in West Yarmouth, Mass. Apparently that's the good news; the rate 10 years ago, according to Standish, was 31 percent.

7. Still, the overall picture is pretty bleak. Standish asserts that more than 50 percent of the thousands of projects it surveyed faced problems, from being turned over without significant features to going well beyond their deadlines or budgets. In

the end, according to the Standish numbers, only 28 percent of projects could be considered successes by any rigorous definition.

8. Standish's numbers, however, are far from universally accepted in the computer industry. For contract software projects, more specifically, other analyses in recent years have put the success rate as low as 16 percent and as high as 62 percent. Nevertheless, even using those numbers as a guide, it's hard not to see the contract software business as anything but an enterprise all too often mired in mediocrity. As one study by consultant Capers Jones, in Marlborough, Mass., put it: "Large software systems...have one of the highest failure rates of any manufactured object in human history."

9. Today, ever more sophisticated tools are available to help companies manage all aspects of their software projects. These tools help conceptualize and design the system; manage all people, files, computers, and documents involved; keep track of all versions and changes made to the system and its modules; and automate a number of tests that can be used to find system errors.

10. Indeed, worldwide sales of such software development tools, according to Stamford, Conn.based market research firm Gartner Inc., generate more than US $3 billion a year. Rational Software Corp., a company acquired by IBM in 2002 for $2.1 billion, is currently the market leader, followed by Microsoft, Computer Associates International, Compuware, Borland, and others, according to Gartner.

11. But the effect of widespread use of these tools on overall software quality hasn't been gauged in a detailed or rigorous way. Some would even argue that the sector is a little reminiscent of the market for diet products: it, too, is a billion-dollar industry, and yet, somehow, obesity as a public health problem hasn't gone away. And, just as the few successful diet strategies all seem to require a major change in lifestyle, perhaps, too, the software failure rates won't improve significantly without a basic and widespread shift in tactics.

Task 6. *Translate paragraphs 5 and 6 of the second part of the text.*

Task 7. *Find words with the similar meaning to the following ones.*

Made up (para 2) hopeless (para 7)

Expertise (para 3)	thorough (para 7)
Crucial (para 4)	of not very good quality (para 8)
To rescue (para 5)	bought (para 10)
Lack of success (para 6)	measured (para 11)

Language Skills.

I. Abstract writing.

Аннотирование.

Аннотированием называется процесс составления кратких сведений, характеризующих документ со стороны его содержания, ценности, назначения, оформления и происхождения. Аннотация специальной статьи или книги – это краткая характеристика оригинала, излагающая его содержание в виде перечня основных вопросов и иногда дающая критическую оценку. Поэтому аннотация дает читателю представление о ***характере оригинала*** (научная статья, техническое описание и т.д.), о его ***строении*** (какие вопросы и в какой последовательности разбираются, к каким выводам приходит автор и т.д.), о ***назначении оригинала*** (на кого рассчитан), а также об ***объеме оригинала***, качестве изложения, актуальности, обоснованности выводов и о других подобных моментах, характеризующих оригинал. Итак, главное отличие аннотации статьи или книги – это характеристика оригинала. Аннотации бывают общие и специализированные, справочные и описательные. ***Аннотации объемом более 500 печатных знаков практически не делаются.***

При составлении аннотации по ***зарубежной научно-технической литературе на иностранном языке*** помимо общих требований, необходимо также учитывать дополнительные требования:

- точность в передаче научно-технических определений и формулировок с иностранного языка;
- единство терминов и обозначений;
-использование общепринятых сокращений слов;

- избежание повторений в заглавии и в тексте публикации при переводе;
- соблюдение точности и лаконичности заглавия, при необходимости возможно вставка дополнительных русских слов.

II. Review writing.

Реферирование.

Реферирование – более сложный творческий процесс, чем аннотирование. Реферирование позволяет получить конспективное изложение ***содержание печати***, имеющего ценную информацию, с ***описанием методов исследования и технологии производства***, с ***фактическими данными и итогами работы.*** Рефераты бывают информативными (реферат-конспект) и индикативными (указательный или реферат-резюме). По количеству используемых источников рефераты могут быть монографическими и обзорными.

Требования к реферату:
- объективное изложение реферируемого оригинального материала, т.е. фиксирование только тех сведений, которые содержатся в оригинале;
- полнота изложения, т.е. фиксирование всех существенных положений оригинала;
- единство стиля: использование тех же языковых средств, единой терминологии, сокращений и т.д.

Текст реферата состоит из трех частей – вводная, описательная (главная идея и все существенные положения оригинала) и заключительная (основные выводы по тексту). ***Объем реферата не должен превышать 2000 печатных знаков.***

Task 8. *Read the third part of the text and formulate its abstract.*

III

1. Certainly, Praxis's experience supports that idea (the software failure rates won't improve significantly without a basic and widespread shift in tactics). Consider one of the company's recent projects, for Mondex International Inc., a financial services company founded in the UK that is now a <u>subsidiary</u> of MasterCard

International Inc. First, a little background. Mondex had a product called an electronic purse, a credit cardlike payment card that stored electronic cash. That is, it did not debit a bank account or draw on a line of credit; it stored the cash digitally in an embedded chip. Mondex wanted to make the card flexible enough to run a variety of applications that would keep track not only of electronic cash but also of discount coupons, loyalty reward points, and other items still unimagined.

2. The critical issue was to make sure that only cards with legitimate applications would work; any other card, even if programmed to pass as a Mondex card, would be deemed invalid. The solution Mondex chose was to use a special program, known as a certification authority, that would run on a central computer at the company's headquarters. The certification authority would generate unique digital certificates—long strings of numbers—to accompany all applications on the cards. That way, a card reader at, say, a store could validate a card's certificates by running them through a series of mathematical operations that would prove unequivocally that they came from Mondex.

3. Mondex hired Praxis to develop the certification authority, which was the most critical part of the whole system. After all, if the security of one card was broken, then just that one card could be forged. But compromising the certification authority would allow mass forgery of cards.

4. The Praxis team began working on the solution in late 1998. The first step was to hammer out what, precisely, the Mondex system was supposed to do—in software jargon, the system's requirements. These are essentially English-language bullet points that detail everything the program will do but not how it will be done.

5. Getting the requirements right is perhaps the most critical part of Praxis's methodology. For that reason, Praxis engineers held many exhaustive meetings with the people from Mondex, during which they tried to imagine all possible scenarios of what could happen. As Praxis does for all its projects, it insisted that Mondex make available not only its IT people but everyone who would have any involvement with the product—salespeople, accountants, senior managers, and perhaps even the CEO.

"We focus very hard on identifying all stakeholders, everybody that cares," says Roderick Chapman, a principal engineer at Praxis.

6. To make sure Praxis was on target with the system requirements, it devised a prototype program that simulated the graphical interface of the proposed system. This prototype had no real system underlying it; data and commands entered through the interface served only to check the requirements. In fact, Praxis made no further use of the prototype—the real graphical interface would be developed later, using much more rigorous methods. In following this approach, Praxis was complying with an edict from Frederick P. Brooks's 1975 classic study of software development, The Mythical Man-Month: Essays on Software Engineering (Addison-Wesley, 2nd edition, 1995):

7. In most projects, the first system built is barely usable. It may be too slow, too big, awkward to use, or all three. There is no alternative but to start again, smarting but smarter and build a redesigned version in which these problems are solved. The discard and redesign may be done in one lump, or it may be done piece-by-piece. But all large-system experience shows that it will be done....

Hence plan to throw one away; you will, anyhow.

8. Once Praxis's engineers had a general idea of what the system would do, they began to describe it in great detail, in pages and pages of specifications. For example, if a requirement said that every user's action on the system should produce an audit report, then the corresponding specification would flesh out what data should be logged, how the information should be formatted, and so on.

9. This is the first math-intensive phase, because the specifications are written mostly in a special language called Z (pronounced the British way: "zed"). It's not a programming language—it doesn't tell a computer how to do something—but it is a formal specification language that expresses notions in ways that can be subjected to proof. Its purpose is simple: to detect ambiguities and inconsistencies. This forces engineers to resolve the problems right then and there, before the problems are built into the system.

10. Z, which was principally designed at the University of Oxford, in England, in the late 1970s and early 1980s, is based on set theory and predicate logic. Once translated into Z, a program's validity can be reviewed by eye or put through theorem-proving software tools. The goal is to spot bugs as soon as possible.

11. The process is time-consuming. For the Mondex project, spec-writing took nearly a year, or about 25 percent of the entire development process. That was a long time to go without producing anything that looks like a payoff, concedes Andrew Calvert, Mondex's information technology liaison for the project. "Senior management would say: 'We are 20 percent into the project and we're getting nothing. Why aren't we seeing code? Why aren't we seeing implementation?' " he recalls. "I had to explain that we were investing much more than usual in the initial analysis, and that we wouldn't see anything until 50 percent of the way through." For comparison, in most projects, programmers start writing code before the quarter-way mark.

12. Only after Praxis's engineers are sure that they have logically correct specifications written in Z do they start turning the statements into actual computer code. The programming language they used in this case, called Spark, was also selected for its precision. Spark, based on Ada, a programming language created in the 1970s and backed by the U.S. Department of Defense, was designed by Praxis to eliminate all expressions, functions, and notations that can make a program behave unpredictably.

13. By contrast, many common programming languages suffer from ambiguity. Take, for example, the programming language C and the expression "i++ * i++," in which "*" denotes a multiplication and "++" means you should increment the variable "i" by 1. It's not an expression a programmer would normally use; yet it serves to illustrate the problem. Suppose "i" equals 7. What's the value of the expression? Answer: it is not possible to know. Different compilers—the special programs that transform source code into instructions that microprocessors can understand—would interpret the expression in different ways. Some would do the multiplication before incrementing either "i," giving 49 as the answer. Others would increment the first "i"

only and then do the multiplication, giving 56 as the answer. Yet others would do unexpected things.

14. Such a problem could not happen in Spark, says Praxis's Chapman, because all such ambiguous cases were considered—and eliminated—when the language was created. Coding with Spark thus helps Praxis achieve reduced bug rates. In fact, once Spark code has been written, Chapman says, it has the uncanny tendency to work the first time, just as you wanted. "Our defect rate with Spark is at least 10 times, sometimes 100 times lower than those created with other languages," he says.

15. Peter Amey explains that the two-step translation—from English to Z and from Z to Spark—lets engineers keep everything in mind. "You can't reason across the semantic gap between English and code," he says, "but the gap from English to an unambiguous mathematical language is smaller, as is the gap from that language to code."

16. What's more, Spark lets engineers analyze certain properties of a program—the way data flows through the program's variables, for example—without actually having to compile and run it. Such a technique, called static analysis, often lets them prevent two serious software errors: using uninitialized variables, which may inject spurious values into the program, and allocating data to a memory area that is too small, a problem known as buffer overflow.

17. In practice, though, not everything can be put through the mathematical wringer. Problems with the way different modules exchange data, for instance, by and large have to be solved by the old-fashioned way: by thinking. Nor can Praxis completely eliminate classic trial-and-error testing, in which the programmers try to simulate every situation the software is likely to confront.

18. But what Praxis does do is make such simulation a last resort, instead of the main line of defense against bugs. (As famed computer scientist Edsger Dijkstra wrote, "Program testing can be used to show the presence of bugs, but never to show their absence!") For the Mondex project, such testing took up 34 percent of the contract time. That's in the lower end of the usual share, which typically ranges from

30 to 90 percent. Reduced efforts on testing mean huge savings that go a long way toward balancing the extra time spent on the initial analysis.

19. The system went live in 1999. Though it cost more up front, the contract called for Praxis to fix for free any problem—that is, any deviation from the specification—that came up in the first year of operation, a guarantee rarely offered in the world of contract software. That first year, just four defects triggered the clause. According to Chapman, three of the problems were so trivial that they took no more than a few hours to correct. Only one was functionally significant; it took two days to fix. With about 100 000 lines of code, that's an average of 0.04 faults per 1000 lines. Fault rates for projects not using formal methods, by some estimates, can vary from 2 to 10 per 1000 lines of code, and sometimes more.

20. For Mondex, fewer bugs meant saving money. Calvert estimates that Mondex will spend 20 to 25 percent less than the norm in maintenance costs over the lifetime of the project.

Task 9. *Are the following statements true or false*?

1.Mondex card let its customers make all bank transactions and kept track of all money received by the cardholder. 2. A certification authority should be secure enough not to assume mass forgery of cards. 3. As soon as Praxis made prototype program they checked it at work involving everyone who cared. 4. The prototype program turned out to be too slow, too big and too awkward. 5. Z language was invented by Praxis to detect bugs in the program. 6. Having done 25 per cent of work Praxis could show the first line of code. 7. Programming language Spark was developed by Praxis to make sure that the program would not generate anything unpredictable. 8. C is as reliable as Spark. 9. Praxis also simulated different situations which can arise with the program. 10. Praxis gave guarantee to fix any problem for free which is unusual thing in software writing business.

Task 10. *Give definitions to the following words and phrases from the third part.*

1) an embedded chip
2) legitimate applications
3) certification authority

8) compilers
9) source code
10) bug rates

4) static analysis
5) prototype program
6) graphical interface
7) specifications
11) formal methods
15) buffer overflow
16) initial analysis
17) trial-and-error testing

Task 11. *Can you derive the meaning of the underlined words from the text?*

Task 12. *Choose the best variant of the word or phrase for each sentence.*

1. The company acquired a new business and turned it into its ….

a) certification b) subsidiary c) mediocrity

2. Before writing a program you get … from the supervisor of your group.

a) specifications b) authority c) liaison

3. To avoid … you should consider what data is most significant to allocate in the memory.

a) static analysis b) validity c) buffer overflow

4. Formal specification language allows you to express notions without any ….

a) precision b) increment c) ambiguities

5. During … the programmers try to simulate every situation the software may confront.

a) trial-and-error testing b) quality control c) initial analysis

Task 13. *In groups comprise the review of this part. Read them aloud and elicit the best one.*

Task 14. *Translate paragraphs 17 and 18.*

Discussion matter.

Prepare a short report on how you do or have done programming. Describe the programming languages you have used, the procedure of programming, etc.

Revision Section.

Task 1. *Read part IV of "The Exterminators".*

IV

Formal methods were relatively new when Praxis started using them, and after some ups and downs, they have recently been gaining popularity. Among their leading proponents are John Rushby at SRI International, Menlo Park, Calif.;

Constance Heitmeyer, at the U.S. Naval Research Laboratory's Center for High Assurance Computer Systems, Washington, D.C.; Jonathan Bowen at London South Bank University; the developers of Z at the University of Oxford and other institutions; and the supporters of other specification languages, such as B, VDM, Larch, Specware, and Promela.

In recent years, even Microsoft has used formal methods, applying them to develop small applications, such as a bug-finding tool used in-house and also a theorem-proving "driver verifier," which makes sure device drivers run properly under Windows.

But still, the perceived difficulty of formal tools repels the rank-and-file programmer. After all, coders don't want to solve logical problems with the help of set theory and predicate logic. They want to, well, code. "Few people, even among those who complete computer science degrees, are skilled in those branches of pure mathematics," says Bernard Cohen, a professor in the department of computing at City University, in London.

In every other branch of engineering, he insists, practitioners master difficult mathematical notations. "Ask any professional engineer if he could do the job without math, and you'll get a very rude reply," Cohen says. But in programming, he adds, the emphasis has often been to ship it and let the customer find the bugs.

Until formal methods become easier to use, Cohen says, Praxis and companies like it will continue to rely on clients' "self-selection"—only those users who are highly motivated to get rock-solid software will beat a path to their door. Those that need software to handle functions critical to life, limb, national security, or the survival of a company will self-select; so will those that are contractually obligated to meet software requirements set by some regulator. That's the case with many military contractors that now need to demonstrate their use of formal methodologies to government purchasers; the same goes for financial institutions. Mondex, for instance, required the approval of the Bank of England, in London, and formal methods were part of that approval.

Yet even if regulators were omnipresent, not all problems would be amenable to formal methods, at least not to those that are available now. First, there is the problem of scaling. The largest system Praxis has ever built had 200 000 lines of code. For comparison, Microsoft Windows XP has around 40 million, and some Linux versions have more than 200 million. And that's nothing compared with the monster programs that process tax returns for the U.S. Internal Revenue Service or manage a large telecom company's infrastructure. Such systems can total hundreds of millions of lines of code.

What does Praxis say about that? "The simple answer is, we've never gone that big," says Chapman. "We believe these methods should scale, but we have no evidence that they won't or that they will." So what if a client approaches Praxis with a really big project? Would the company handle it? "The key weapon is abstraction," he says. "If you can build abstractions well enough, you should be able to break things down into bits you can handle." That maxim guides every other discipline in engineering, not least the design of computer hardware. Why not apply it to software, too?

Bugproof Code

By:

Praxis High Integrity Systems uses mathematical logic to check that its programs are free from bugs. You can get the gist of how the company does that by following this simple example.

Suppose a Praxis programmer needs a piece of code to add two numbers, a and b, and multiply that sum by a third number, c. The first thing to do is to describe that calculation using Z, a formal specification language that spells out the program's logic. In the language of Z, that simple operation looks like this:

Calculation : Number Number Number Number

" a, b, c : Number *

Calculation (a, b, c) = (a + b) * c

Next, the programmer converts this Z specification into Spark, a programming language created by Praxis. To allow the programmer to more easily spot bugs, Spark code has two parts. The first part is essentially a refinement of the Z specification:

function Calculation(A, B, C : in Number) return Number;

—# return (A + B) * C

The second part of the Spark code is the executable portion that effectively makes the calculation. But note that the second part contains a bug: the expression (A + B) * C is mistakenly written as (A + B * C):

```
function Calculation(A, B, C : in Number) return Number
is
begin
return (A + B * C);
end Calculation;
```

The Praxis programmer would catch the bug by verifying—either by eye or through the use of special verification software—that the first part of the Spark code doesn't match the second part. The verification software also checks a number of other conditions to make sure the calculation won't cause errors, like a memory buffer overflow or a division by zero.

The program discussed in this example is extremely simple, with just a few lines of code, so any programmer could easily spot the bug without the help of mathematical methods. But Praxis constructs programs with tens of thousands of lines of code containing complex logical operations, and in such cases Z and Spark are invaluable tools for spotting—and killing—bugs.

—P.E.R.

Task 2. *Write a review to this part.*

Module IV.

Grammar: Modal verbs.

Reading: How to give an academic talk.

Language Skills: Expressing opinion.

Discussion: Analyzing friends' experience.

Grammar.

Auxiliary	Use	Present/Future	Past
May	Polite request	May I borrow your pen?	
	Formal permission (be allowed to)	You may leave the room.	

	Less than 50% certainty	-Where is John? - He may be at the library.	He may have been at the library.
Might	Less than 50% certainty	-Where is John? - He might be at the library.	He might have been at the library.
	Polite request	Might I borrow your pen?	
Can	Ability/possibility (be able to)	I can run fast.	I couldn't run fast when I was a boy, but I can now.
	Informal permission	You can use my car tomorrow	
	Informal polite request	Can I borrow your pen?	
	Impossibility (negative)	That can't be true!	That can't have been true!
Could	Past ability		I could run fast when I was a child.
	Polite request	Could you help me?	
	Suggestion	- I need help in maths. - You could talk to your teacher.	You could have talked to your teacher.
	Less than 50% certainty	- Where is John? - He could be at home.	He could have been at home.
	Impossibility	That couldn't be	That couldn't have

	(negative)	true!	been true!
Must	Strong necessity	I must go to class today.	I had to go to class today.
	Prohibition (negative)	You mustn't open that door.	
	95% certainty	Mary isn't in class, she must be sick.	Mary must have been sick yesterday.
Should	Advisability	I should study tonight.	I should have studied last night.
	90% certainty	She should do well on the test. (future)	She should have done well on the test.
Ought to	Advisability	I ought to study tonight.	I ought to have studied last night.
	90% certainty	She ought to do well on the test. (future)	She ought to have done well on the test.
Be able to	Ability	I am able to help you. I will be able to help you.	I was able to help him.
Be to	Strong expectation	You are to be here at 9.00.	You were to be here at 9.00.
Have to	Necessity	I have to go to class today.	I had to go to class yesterday.
	Lack of necessity	I don't have to go to class today.	I didn't have to go class yesterday.
Need	Necessity	I need to pass my project tomorrow.	I needed to pass my project yesterday.

Needn't	Lack of necessity	I needn't pass my project tomorrow.	I didn't need to pass my project yesterday.
Have got to	Necessity	I have got to go to class today.	I had to go to class yesterday.
Had better	Advisability	You had better be on time, or we will leave without you.	
Be supposed to	Expectation	Class is supposed to begin at 10.	Class was supposed to begin at 10.

Task 1. *Translate the following sentences into Russian*.

1.Law-makers should not be law-breakers. 2. Men are not to be measured by inches. 3. The technique of taking Raman spectra cannot be made the subject of detailed discussion. 4. In a conceptual analysis one need only examine the parts. 5. Systems must handle future as well as present. 6. They were not allowed to carry out the experiment. 7. The program or the database does not have to be changed. 8. It may take you twelve hours reading to produce an intellectually honest article of a thousand words.

Task 2. *Translate the text identifying the modals and their equivalents*.

The plan for implementation.

Planning for the implementation of research results should begin when research itself begins; it should not wait until the results are obtained. Specifically, the technical abilities of those who will use the results and the facilities at their disposal should be taken into account in determining the form and nature of the research results which should be sought. It would be foolish to expect a clerk to solve an equation requiring the calculus of variations; a monograph or a table may be necessary. But a monograph or a table may be able to provide only very approximate solutions to equations. An approximation which is used, however, will produce better results than an exact solution which is ignored. In order to assure that the research results are carried out as intended, it is necessary to develop a detailed plan for their implementation. This need is generally acknowledged where the action ultimately to be taken is to be performed by a computer. In such a situation the researcher recognizes his responsibility for developing a program for the computer. What is not so well recognized is that almost as detailed a program is required for human operators. It is necessary to specify exactly who is to do what, when they are to do it and how. The “who” and “when” can normally be shown on a flow chart which indicates the way that the relevant operations are to be conducted. The “what” requires detailed instructions in terms of operations that can be performed by the kinds of people involved.

Task 3. *Use a modal or similar expression*.

1. It looks like rain. We (shut)… the windows. 2. I returned a book to the library yesterday. It was two weeks overdue, so I (pay)… a fine of $1.40. I (return) … the book when it was due. 3. Neither of us knows the way to their house. We (take) … a map with us or we’ll probably get lost. 4. You (not tell) … Jack about the party. It’s a surprise birthday party fro him. 5. In the USA elementary education is compulsory. All children (attend) … six years of elementary school. 6. There was a long line in front of the theatre. We (wait) … almost an hour to buy tickets. 7. It’s not like Tony to be late. He (be) … here an hour ago. I hope nothing bad happened. 8. Jane’s looking at the test paper the teacher just returned. She’s smiling. She (pass) … the test. 9. - The phone is ringing again. Let’s not answer it. Just let it ring. - No, we (answer) … it. It (be) … important. 10. (Cash)… you this check for me?

Reading.

“The brain starts working the moment you are born
and never stops until you stand and speak in public.”

What does the author of this quotation mean by these words? What do you feel speaking in public?

Task 1. *In groups talk about the main advice for speaking in public and compare your ideas with the ideas of the other group*.

Task 2. *Read the following text and see what you haven’t mentioned. Are the rules useful? Do you think any of them are not useful? Or difficult to follow?*

How to Give an Academic Talk: Changing the Culture of Public Speaking in the Humanities

Paul N. Edwards
School of Information
University of Michigan

1) **Talk rather than read**. Written academic language is too complex and too awkward for reading aloud. Just talk — it's easier to understand, and it allows you to make genuine contact with your audience. Furthermore, it ultimately helps you to think more clearly, by forcing you to communicate your points in ordinary terms.

2) **Stand up unless you're literally forced to sit**. People can see you better. Standing also puts you in a dominant position. This may sound politically incorrect, but it's not. Remember, you're the focus. The audience wants you to be in charge. Listeners need your help to maintain their attention.

3) **Move around, rather than standing still**. It's easier to keep focused on someone who's moving than on a motionless talking head. (Hand gestures are good, too.) It's possible to overdo this one, though. If you jump around like a pop star you'll distract people from the content of the talk. Simply walking back and forth from one side of the room to the other every three or four minutes is probably enough.

4) **Vary the pitch of your voice**. Monotones are sleep-inducing. Many people don't realize they do this. Get a trusted friend or colleague to listen to your delivery and give you honest feedback. (This is an important principle in itself!) Even better, tape or videotape yourself and check out how you sound.

5) **Speak loudly and clearly, facing the audience**. Be careful, especially when using visual aids,that you continue to face the audience when you speak. An important element of vocal technique is to focus on the bottom (the deepest pitch) of your vocal range, which is its loudest and most authoritative tone. (This can be especially important for women.) Speak from the gut, not the throat. Breathe deeply —it's necessary for volume, and will also help you keep your mind clear.

Tip: here are two effective vocal "special effects." First, when you come to a key phrase that you want people to remember, repeat it. Second, pause for a few seconds at several points in your talk; this breaks the monotony of a continuous flow of speech. It also gives you a chance to sip some water.

6) **Make eye contact with the audience**. If this is anxiety-inducing, at least pretend to do so by casting your gaze toward the back and sides of the room. Be careful not to ignore one side of the audience. Many speakers "side" unconsciously, looking always to the left or to the right half, or only to the front or the back, of the room.

7) **Focus on main arguments**. Especially in a conference situation, where talks are short and yours is one of many, your audience is not going to remember details. In such a situation, less is more. Give them short, striking "punch lines" that they'll remember. They can always read your written work later, but if you don't get them interested and show them why it's important, they won't want to.

8) **Use visual aids**. This is one of the most important principles of all. At a minimum have an outline of your talk. Some people seem ti think they are giving everything away by showing people what they're going to say before they've said it. But the effect of a good talk outline is exactly the opposite: it makes your audience want to hear the details. At the same time, it helps them understand the structure of your thinking.

Slides should be extremely concise and visually uncluttered. Slides are maps, not territories; they are tracking devices that let both you and your audience follow the flow of the talk. So they must not be overfilled. 6 lines of text per slide is good; 9 lines is a lot; 12 lines is pretty much unreadable. If you need more space, use more slides.

Pictures, graphs, and other images are especially helpful (if they are related to your topic!) People are visual creatures. The old adage that a picture is worth a thousand words is especially apropos in the context of a talk.

Always choose white or light-colored slide backgrounds. To see dark slides, you'll have to turn off the lights. This will make it hard for you to see your notes, and will also tend to put your audience to sleep. Really. If at all possible, do NOT turn off room lights or close window shades! Light-colored slides can usually be read with lights on.

Don't talk to the screen. If you do, not only will the audience be looking at your back, but also they'll be unable to hear you. Have a paper version of your outline in front of you; speak from that, rather than from the one on the screen. This takes practice.

About Powerpoint:

Microsoft Powerpoint — now standard issue in many presentation settings — can be a great tool, not least because its default presentation formats encourage brevity.

But beware: Powerpoint's fades, transitions, backgrounds, sound effects, and so on can be a real pitfall. Preparing glitzy presentations can be a serious time sink for you. Worse, they can give your audience the impression that you care more about surface than substance. My recommendation: choose simple, light-colored backgrounds with relatively dark type, and limit the use of special effects.

If you haven't completely mastered the software, don't use it. Nothing irritates an audience more than watching somebody fiddle with a computer. Since they introduce many possible points of failure, Murphy's law applies in spades to computerized presentations. Something can, and usually does, go wrong with the computer, the projector, the software, the connector cables, or your presentation itself. One of my worst experiences as a presenter happened the day my hard disk crashed, permanently, on slide number 3 of a one-hour talk.

What I learned from that: if you insist on using a computer, bring backup. That's backup, backup, backup. There is no more basic principle of operating in a high-tech environment. Bring printed notes or outlines. Have a copy of your presentation on a CD- ROM, a USB key, or some other format that most computers will accept. Even better, print transparencies as well. Finally, always be mentally prepared to deliver your talk without the slides, just in case.

9) **Finish your talk within the time limit**. Don't diss your audience by running overtime. Never go on longer than 45 minutes — most people's maximum attention

span. If you exceed this limit, you'll lose them at the crucial point, namely your conclusion.

In conference settings, exceeding your time limit is also incredibly rude, since it cuts into other speakers' allotted time and/or the discussion period. Don't rely on panel chairs to enforce time limits; do it yourself. You can make real enemies by insisting on continuing after your time is up — but nobody has ever been criticized for finishing two minutes early.

> *Timing* is also crucial. Nothing is more embarrassing — for both you and your audience — than getting only halfway through your talk before hitting the time limit. The only way to be sure you time things right is to rehearse your talk. Timing is a complicated, learned skill that requires a lot of practice — so practice where it's easy, i.e. at home.

You are (or are becoming) a professional presenter. So invest in a watch especially for this purpose. Some digital watches have countdown timers. These are better than ordinary watches because you don't have to perform mental math to know how much time remains. But they only work if (a) you remember to use the timer, (b) the umbers are large and well-lit, so you can read them while talking, and (c) you're paying attention, so you can turn off the timer before it begins to beep. An analog watch with large, easy-to-read hands can be almost as good.

> **Tip**: If you use Powerpoint or some other presentation system, you can develop a good sense of timing by always using the same slide format. After you've given a few talks with the same format, you'll know about how long it takes you to talk through each slide, and you can gauge the length of your talk this way (at least roughly).

> **Another tip**: Say you have 20 minutes to talk. When you're rehearsing, mark your notes at the 5, 10, and 15 minute points, and maybe also the 18-minute point as well. This way you won't be caught by surprise if you start to run overtime.

> **My last tip on timing**: until you've really mastered presentations, never, ever improvise in front of an audience. This doesn't mean you can't interrupt

yourself to tell a joke or a story, or digress a bit from the main thread — those can be important techniques for maintaining attention. What it does mean is that when you're rehearsing, you must rehearse those things as well, because they take time. If you haven't practiced, you won't know how long they take. Like a professional comedian or actor, you need to rehearse everything you plan to do.

10) **Summarize your talk at the beginning and again at the end**. "Tell 'em what you're gonna tell 'em; tell 'em; and tell 'em what you told 'em": this ancient principle still holds. Following this rule helps your audience get your main points. Even more important, it helps them remember what you said, which is, after all, what you're there for.

11) **Notice your audience and respond to its needs**. If people seem to be falling asleep or getting restless or distracted, the problem may not be you. Is the room too hot or too cold? Is it too dark, or too noisy? Can people see you? Is the microphone on? Is something outside the room distracting people? Don't hesitate to stop talking in order to solve these problems.

Alternatively, you may have gone on too long, or you may need to speak louder. Whatever the case, notice what's happening and use it as feedback. If you can't figure out why your audience is responding poorly, ask somebody later and fix the problem next time.

If you're not sure whether people can see or hear, ask someone in the back row directly. (This is also a good technique for setting up initial communication with your audience. It makes listeners feel included, and puts you in touch with them as human beings.)

Tip: NEVER let someone else take control of room conditions. Many audiences — thinking they're being helpful — react to slide or computer projectors by jumping up to turn off lights and close window shades. Unless this is truly necessary, avoid it at all costs, especially at conferences, which often take place in exceedingly dim rooms. Taking charge of the talk environment is part of your job as a speaker.

12) **Emulate excellent speakers**. Perhaps the best way to become an excellent speaker yourself is to watch really good, experienced speakers and model your talks on theirs. Notice not just what they say, but what they do: how they move, how they use their voices, how they look at the audience, how they handle timing and questions. If you find an excellent model and work hard to emulate that person, you can't go wrong.

Can you remember what you have done wrong according to this advice?

Task 3. *Look again at the principles and summarize their content using modal verbs*.

Task 4. *Analyze the example presentations from the point of view of effectiveness of visual aids*.

Language Skills.

Expressing Opinion.

I think (that) …	If you ask me…
I'd say that …	As I see …
I believe (that …	The point is …
In my opinion	To my mind
You know what I mean, I mean that…	
I'd just like to say that …	I'd like to point out that …

Agreement.	**Disagreement.**
I (quite) agree (with you).	Yes, that's true but …
I think so too.	I'm not sure I quite agree …
Exactly.	Yes, you have a point here, but …
Quite so.	I see what you mean, but …
I couldn't agree more.	I can't agree with you there.
That's just what I think.	You can't be serious!

Task 1. *Analyze the example presentations and express your opinion. What would you have done differently?*

Task 2. *Study the situation and say what the speaker should have done the other way*.

The speaker approaches the head of the room and sits down at the table. (You can't see him/her through the heads in front of you.) S/he begins to read from

a paper, speaking in a soft monotone. (You can hardly hear. Soon you're nodding off.) Sentences are long, complex, and filled with jargon. The speaker emphasizes complicated details. (You rapidly lose the thread of the talk.) With five minutes left in the session, the speaker suddenly looks at his/her watch. S/he announces — in apparent surprise — that s/he'll have to omit the most important points because time is running out. S/he shuffles papers, becoming flustered and confused. (You do too, if you're still awake.) S/he drones on. Fifteen minutes after the scheduled end of the talk, the host reminds the speaker to finish for the third time. The speaker trails off inconclusively and asks for questions. (Thin, polite applause finally rouses you from dreamland.)

Task 3. *Effectiveness of your talk also depends on the vocabulary you choose to give it. Read the following sentences and divide them into "effective" and "not effective"*

I. "A procurement of this type is unprecedented in the garment industry."
"It's rare to see a purchase like this in the garment industry."

II. "Please let me know if there is any further information you need."
"Please feel free to contact me by phone or e-mail if you have any questions or require any further assistance in the near future."

III. "Profitability is estimated to decline in the next fiscal year."
"Sales are estimated to fall by 33% in the next 12 months. That's a $2.3 million loss."

IV. "Our upcoming ad campaign will feature three 24'x 30' billboards."
"Our upcoming ad campaign will feature three 24'x 30' billboards – each billboard is the size of a double-decker bus."

V. "This group is bound to realize the implications of this policy."
"I'm sure you all realize the implications of this policy."

Can you devise rules for the right vocabulary?

Task 4. *Work in pairs and read one of the texts below. Then tell your partner what you have read. Choose the most important advice from both texts.*

First 90 seconds.

It’s vital that the first moments of your presentation grab your audience’s attention. Not only does a great introduction provide an overview of what will be discussed, but it should also convince the audience that your presentation will be relevant. So how can you prepare an introduction that’s exciting and intriguing? Read on!

1. Ask a Question

Ask either a rhetorical question or one that seeks a response from the audience. If you want the audience to respond, make it easy for them to do so. Ask a question that can be answered with a yes or no, or call for a show of hands. For example, "How many of you are tired of unproductive and inefficient meetings?"

2. State a Fact

Begin with a fact or statistic that supports the topic of your presentation. For example, if your topic is the importance of meeting efficiency you could use a statistic such as, "Most professionals attend a total of 61.8 meetings per month and research indicates that over 50 percent of this meeting time is wasted."

3. Tell a Joke

However, be sure that the joke is appropriate! If you have any doubts, select another joke or a different method. Also be sure that the joke is relevant to your topic and the speaking situation.

4. Tell a Relevant Story

Everyone loves a well-told story, especially a personal story that relates an experience you had with some aspect of the topic being discussed. People are drawn to hearing about the experiences of others, and stories provide an opportunity for the audience to get to know you.

5. Use a Quotation

With the help of the Internet, it’s easy to find a quote for just about any topic.

6. Make an Emphatic Statement

A powerful statement captures the attention of your audience and sets a dynamic tone for your presentation. For example, "It’s time to take control of your unproductive meetings. Refuse to let them eat away at your bottom line any longer!"

No matter which type of introduction you select, make it enthusiastic! If you're interested in what you're saying, the audience will have a reason to be. And remember to practice your introduction several times before presentation day because, as they say, you won't get a second chance to make a great first impression.

Body Language.

It's 3 pm on a Tuesday afternoon and you're delivering an important presentation to one of your company's most prestigious clients.

Things get off to a good start, your audiovisual equipment is working and there's no need to refer to your notes; you know this speech inside and out. You're a little nervous but that's to be expected. Besides, you have your trusty podium to hide behind between PowerPoint slides. You know it's important to connect with the audience so as you go through your presentation you glance at the picture on the back wall every so often – a little trick you picked up – to look like you're making eye contact.

Ten minutes into your "awesome" presentation you ask a question and no one responds. You look up from your PowerPoint show and glance around the room only to see bobbing heads, glazed-over eyes and…hey, the president of the company has dozed off. Oh no, it looks like instead of "knocking 'em dead," you've knocked 'em out!

The Real Challenge...

Unfortunately many people think that once they've organized all the information they need for a presentation, their work is over. In reality preparing is only half the work. The real work is holding people's interest long enough to get your point across. You can write the greatest speech in history but if you can't keep your audience's attention, how will they ever know?

To ensure your message is received loud and clear, try paying attention to body language – both your own and that of your audience.

Beat Boredom

You can greatly improve your presentations by simply paying attention to the messages you send your audience with your body language. Are you standing in the same spot for the entire presentation? Is your voice flat and uninteresting? Or maybe you aren't using any hand gestures to get your point across. All of these things can make a presentation a little boring.

Celeste Sulliman, Assistant Professor, Communication at UCCB, says one of the keys to keeping your audience interested is making eye contact with your entire audience, not just one or two people. "This draws the audience into your presentation and allows you to make an interpersonal connection with them."

Remember to move around! You don't have to do cartwheels, but do shift from one area of the room to another periodically. You might also try moving forward so you're closer to your audience instead of hiding out behind your podium.

Don't speak in a monotone voice as if you're reciting your speech word for word. Sulliman suggests that you be enthusiastic and animated. Speak to your audience in a conversational manner just as you would to someone in a business meeting.

Decoding the Silent Signals

You can also improve your presentation by noticing the messages your audience sends back to you through their own body language. Check out their reactions to what you're saying. Are people nodding their heads in agreement or are they just nodding off? If they look puzzled, stop and allow them to ask questions.

Watch for signals of boredom or misinterpretation. Are they leaning toward you to listen or are they sitting back with their arms folded? When members of your audience are slouched back in their seats letting their eyes wander it usually means they're uninterested in what you're saying. But if they're sitting back with their arms folded across their chest, staring at you, they may have been offended by something you've said. If you're paying close attention, you can catch this and clarify your statement without any negative feelings.

The best speakers make you feel as if they're having a normal conversation – not spewing out a memorized speech. So relax and remember these tips – they may just help you avoid turning your presentation into nap time.

Discussion matter.

Prepare a short start for the topic “Computer Viruses” and deliver it to the group. Analyze your friends’ reports. Pay attention to all principles studied in the lesson. What do you think they should have done the other way?

Module V.

Grammar: Non-finite forms of the verbs. Participle.

Language Skills: Describing the pictures and diagrams.

Reading: How Europe Missed The Transistor.

Discussion: Identical Inventions**.**

Grammar.

Participle.

Participles	**Voice**	
	Active	**Passive**
Participle I Participle II Perfect Participle	Planning - Having planned	Being planned developed Having been planned

English language	**Russian language**
1) причастие в функции определения	**1) причастный оборот**
In the vicinity of the Pole there are animals **living on the ice**. The soldier **wounded in the leg** was brought to the hospital.	Вблизи от полюса есть животные, **живущие на льду**. Солдат, **раненный в ногу**, был отправлен в больницу.
2) причастие в функции обстоятельства	**2) деепричастный оборот**
Working at this problem, the scientists	**Работая над этой проблемой**, ученые

have made interesting discoveries. **Having arrived at the site**, they discovered many fragments of the meteorite. **Being built in a modern style**, the house looked very beautiful. **Having been subjected to all tests**, the machine was accepted.	сделали интересные открытия. **Прибыв на место**, они обнаружили много осколков метеорита. **Будучи построенным в современном стиле**, этот дом выглядел очень красивым. **Будучи подвергнутым всем испытаниям**, станок был принят. (После того как станок подвергся испытаниям…)
3) независимый причастный оборот (Absolute Participle Construction)	**3) нет эквивалента; переводится придаточным обстоятельственным или самостоятельным предложением**
The motor being in good order, we could start at once. **It being dark**, we could see nothing. **There being no bus**, we had to walk. The professor spoke of the discoveries in science, **his lectures being illustrated by diagrams.** They were walking on again**, with Sherlock Holmes calmly smoking his pipe.**	**Так как мотор был в полном порядке**, мы смогли отправиться тотчас же. **Так как было темно**, мы ничего не могли увидеть. **Так как не было автобуса**, нам пришлось идти пешком. Профессор говорил об открытиях в науке, **и его лекция иллюстри-ровалась диаграммами**. Они снова шли вперед; **Шерлок Холмс спокойно покуривал свою трубку**.
4) объектный причастный оборот (Complex Object)	**4) нет эквивалента; переводится придаточным дополнительным**

	предложением
In the next berth she could hear **her stepmother breathing heavily.** He had several **bottles of wine brought**. He had **his suit altered**. Why don't you have **your hair waved**?	Ей было слышно, как на соседней полке **тяжело дышит ее мачеха**. **Ему принесли несколько бутылок вина**. **Он переделал костюм** (поручил кому-то переделать костюм). Почему вы **не сделаете завивку волос**?
5) субъектный причастный оборот (Complex Subject)	**Нет эквивалента; переводится сложноподчиненным предложением**
The horse was seen **descending the hill.** **They** were heard **talking together**.	Видно было**, как лошадь спускалась с холма.** Слышно было, **как они беседовали**.

Task 1. *Translate the following sentences into Russian. Find participles and name their forms*.

1.In 2000, a small number of cases of childhood leukemia, first reported by a local physician, were blamed by residents on the strong radio-frequency fields generated by the Vatican antennas. 2. … the antennas, some transmitting at an effective 600 kilowatts, represent not only a blight on the landscape and something of a nuisance—hearing the Pope's voice picked up by your front-door intercom is not always appreciated—but also a possible health threat . 3. The movement of these charges, measured at 300 meters per second in the lab, causes changes in the rock's magnetic field that propagate to the surface. 4. If, however, there are charged particles in the air, a current begins to flow, creating a voltage drop across the resistor that registers with the voltmeter. 5. If the ground is full of positively charged holes, it would attract electrons from the ionosphere, decreasing the airborne electron concentration over an area as much as 100 km in diameter and pulling the ionosphere closer to Earth. 6. At the same time, they created software and hardware that will likely form a type of analog-to-digital converter, turning signals emitted by the brain into digital signals and vice versa. 7. Such a technique, called static analysis, often lets them prevent two serious software errors: using uninitialized variables, which may inject spurious values into the program, and allocating data to a memory area that is too small, a problem known as buffer overflow. 8. The window of opportunity to recover the capital costs associated with such cutting-edge process technology is vanishingly small.

Task 2. *Replace the subordinate clauses with participle constructions*.

1.While Boris was driving , he saw an accident. 2. After we had talked with Michael, we felt much better. 3. When John arrived at the station, he saw the train leave. 4. After he had left the house, he walked to the nearest metro station. 5. When I looked out the window, I saw Mary coming. 6. As we finished our part of the work, we were free to go home. 7. As Ann had had no time to write us a letter, she sent a telegram.

Task 3. *Find the sentences with absolute participle construction and translate them.*

1.The first engines appeared in the 17^{th} century and people began using them to operate factories, irrigate land, supply water to towns, etc. 2. The steam engine having been invented in 1825, a self-propelled vehicle was built. 3. The supply of steam in the car lasting only 15 minutes, the vehicle had to stop every 100 yards to make more steam. 4. After the German engineer N.Otto had invented the gasoline engine, the application of this engine in motor cars began in many countries. 5. The cars at that time were very small, the engine being placed under the seat. 6. Motorists had to carry a supply of fuel, because there were no service stations. 7. Brakes having become more efficient, cars achieved greater reliability. 8. Cars with internal combustion engines having appeared, the automobile industry began developing rapidly. 9. By 1960 the number of cars in the world had reached 60 million, no other industry having ever developed so quickly.

Task 4. *Translate the text, paying attention to participles and participle constructions*.

When considered dynamically, the biosphere appears an arena of complex interactions among the essential natural cycles of its major constituents, with continuous fluxes of these constituents entering the biosphere, or being released by it. Once brought into being by evolution from an inorganic environment, the living matter has profoundly altered the primitive lifeless earth, gradually changing the composition of the atmosphere, the sea, and the top layers of the solid crust both on land and under the ocean. Since then, if one were to ascribe a single objective to evolution, it would be the perpetuation of life. This is the signal end which the entire strategy of evolution is focused on, with evolution dividing the resources of any location, including its input of energy, among an ever increasing number of different kinds of users, which we recognize as plant and animal species.

Reading.

Read the text and find paragraphs where the following things are mentioned.

- What people are considered to have invented the similar transistors?
- Why were these devices similar?
- How did these devices differ?
- What was the historical background of those inventions?
- What happened after the device being patented?
- Who do you think is the real inventor of the device?

How Europe Missed The Transistor

By: Michael Riordan

1. In late 1948, shortly after Bell Telephone Laboratories had announced the invention of the transistor, surprising reports began coming in from Europe. Two physicists from the German radar program, Herbert Mataré and Heinrich Welker, claimed to have invented a strikingly similar semiconductor device, which they called the transistron, while working at a Westinghouse subsidiary in Paris.

2. The resemblance between the two awkward contraptions was uncanny. In fact, they were almost identical! Just like the revolutionary Bell Labs device, dubbed the point-contact transistor, the transistron featured two closely spaced metal points poking into the surface of a narrow germanium sliver. <u>The news from Paris was</u>

particularly troubling at Bell Labs, for its initial attempts to manufacture such a delicate gizmo were then running into severe difficulties with noise, stability, and uniformity.

3. So in May 1949, Bell Labs researcher Alan Holden made a sortie to Paris while visiting England, to snoop around the city and see the purported invention for himself. ..."This PTT bunch in Paris seems very good to me," Holden candidly admitted in his letter. "They have little groups in all sorts of rat holes, farm houses, cheese factories, and jails in the Paris suburbs. They are all young and eager." And one of these small, aggressive research groups, holed up in a converted house in the nearby village of Aulnay-sous-Bois, had apparently come through spectacularly with what might well be the invention of the century—a semiconducting device that would spawn a massive new global industry of incalculable value. Or had it?

4. As was true for the Bell Labs transistor, invented by John Bardeen and Walter H. Brattain in December 1947, the technology that led to the transistron emerged from wartime research on semiconductor materials, which were sorely needed in radar receivers. In the European case, it was the German radar program that spawned the invention. Both Mataré and Welker played crucial roles in this crash R&D program, working at different ends of the war-torn country.

5. Mataré, who shared his remembrances from his home in Malibu, Calif., joined the German research effort in September 1939, just as Hitler's mighty army rumbled across Poland. Having received the equivalent of a master's degree in applied physics from Aachen Technical University, he began doing radar research at Telefunken AG's labs in Berlin. There he developed techniques to suppress noise in superheterodyne mixers, which convert the high-frequency radar signals rebounding from radar targets into lower-frequency signals that can be manipulated more easily in electronic circuits. Based on this research, published in 1942, Mataré earned his doctorate from the Technical University of Berlin.

6. At the time, German radar systems operated at wavelengths as short as half a meter. But the systems could not work at shorter wavelengths, which would have been better able to discern smaller targets, like enemy aircraft. The problem was that

the vacuum-tube diodes that rectified current in the early radar receivers could not function at the high frequencies involved. Their dimensions—especially the gap between the diode's anode and cathode—were too large to cope with ultrashort, high-frequency waves. As a possible substitute, Mataré began experimenting on his own with solid-state crystal rectifiers similar to the "cat's-whisker" detectors he had tinkered with as a teenager...

7. Similar point-contact devices, especially those made with silicon, could be used as the rectifier required in the superheterodyne mixer circuit of a radar receiver, which shifts the received frequencies down by mixing the input signal with the output of an internal oscillator. Because the electrical action of such a crystal rectifier is confined to a very small, almost microscopic region on the semiconductor surface, the device can rectify currents at relatively high frequencies.

8. Theoretical work by Walther Schottky at Siemens AG, in Munich, Germany, and by Nevill F. Mott at the University of Bristol, in England, had given Mataré and other radar researchers a much better understanding of what was happening beneath the sharp metal point. When the point touched the semiconductor surface, excess electrons quickly flowed into it, leaving behind a neutral "barrier layer" less than a micrometer deep in the material just underneath it. This narrow zone then acted like an asymmetric barrier to the further flow of electrons. They could jump the barrier much more readily from the semiconductor surface to the metal point than vice versa, in effect restricting current flow to one direction.

9. As the war ground on, the leaders of the Berlin-based German radar establishment urged the Luftwaffe to pursue research on systems operating at wavelengths well below 50 centimeters—in what we now call the microwave range. They argued that such systems would be small enough to mount in warplanes and detect approaching enemy aircraft through dense clouds and fog.

10. But German military leaders, basking smugly in their early victories, ignored those pleas. Luftwaffe chief Hermann Göring, who had served as an open-cockpit fighter pilot in World War I, adamantly believed that the intrinsic fighting

abilities of his Aryan warriors made electronic systems superfluous. "My pilots," he bragged, "do not need a cinema on board!"

11. Everything changed after February 1943, however, when a British Sterling bomber downed over Rotterdam in the Netherlands revealed how far behind the Allies Germany had fallen in radar technology. Göring ordered a thorough analysis of the bomber's 9-cm radar system and recalled more than a thousand scientists, engineers, and technicians from the front in a desperate attempt to catch up. By summer they had built a working prototype, but it was much too late. Allied bombers, aided by onboard radar systems that allowed pilots to operate even in foul weather, were pulverizing German cities with increasing impunity.

12. Mataré recalled the sudden urgency in an interview. He intensified his previous R&D efforts on crystal rectifiers, particularly those made of silicon, which seemed best suited for microwave reception. But the Allied bombing of Berlin was making life exceedingly difficult for Telefunken researchers. "I spent many hours in subway stations during bomb attacks," he wrote in an unpublished memoir. So in January 1944, the company shifted much of its radar research to Breslau in Silesia (now Wroclaw, Poland). Mataré worked in an old convent in nearby Leubus...

13. Germany's eastern front collapsed in January 1945, and the Russian Army was swiftly approaching Breslau. The Telefunken lab in Leubus was hastily abandoned, and all of Mataré's lab books and records were burned to keep them out of enemy hands. The group attempted to reconstitute its R&D program in central Germany, but the U.S. Army terminated this effort when it swept through in April 1945, mercifully sending Mataré home to rejoin his family in nearby Kassel.

14. Mataré's future colleague Welker wasn't spared the indignities of war, either. Allied bombs destroyed his laboratory near Munich in October 1944. Early the following year, this theoretical physicist, who during the 1930s had worked on the quantum mechanics of electrons in metals, began speculating about how to use silicon and germanium to fabricate a solid-state amplifier...

15. In early 1945, Welker, who was mastering the art of purifying germanium, recognized that the two semiconductors could be used to make what we now call a

field-effect transistor. In fact, the device he had in mind was strikingly similar to one that Shockley was to suggest at Bell Labs a few months later.

16. In this scheme, an electric field from a metal plate should penetrate into a thin surface layer of a semiconductor strip beneath it, ripping electrons loose from their parent atoms to serve as current carriers. A voltage applied across the semiconductor strip would induce a current through it. Crucially, a varying voltage on the metal plate would modulate the current through the strip. Thus, small input signals would result in large output currents flowing through the strip. Or so Welker figured.

17. But tests he performed in March 1945 revealed no such amplification. In his logbook he recorded "only small effects," orders of magnitude less than what was predicted by Schottky's theory. Shockley, Brattain, and their Bell Labs colleagues attempted similar tests that very same spring, with similarly disappointing results.

18. The failures soon led Bardeen to postulate a novel idea of "surface states"—that free electrons were somehow huddling on the semiconductor surface, shielding out the field. This conjecture, and Brattain's follow-up experiments to determine the physical nature of the surface states, led to their invention of the point-contact transistor in December 1947—a month after they discovered how to overcome the shielding.

19. After his failures, Welker returned to research on germanium and resumed the theoretical studies of superconductivity he had reluctantly abandoned during the war. In 1946, British and French intelligence agents interrogated him about his involvement in German radar. They subsequently offered him an opportunity to work in Paris in an R&D operation set up under the auspices of a Westinghouse subsidiary, Compagnie des Freins et Signaux Westinghouse. The immediate goal was to manufacture germanium rectifiers for telecommunications and military electronics.

20. While teaching in Aachen at his alma mater in 1946, Mataré was also interviewed by agents. Fluent in French, he received a similar offer. He eagerly agreed to join the Paris effort, because doing research in devastated, occupied Germany was almost impossible.

21. Then in their mid-thirties, the two German physicists met in Paris and began organizing their operation...

22. With the rectifiers finally in production by late 1947, Welker resumed his research on superconductivity, while Mataré began to address the curious interference effects he had seen in germanium duodiodes during the war. When he put the two point contacts less than 100 mm apart, he again occasionally could get one of them to influence the other. With a positive voltage on one point, in fact, he could modulate and even amplify the electrical signal at the other! Mataré reckons he first recognized this effect in early 1948 (perhaps a month or two after Bardeen and Brattain's breakthrough at Bell Labs). But it still happened only sporadically.

23. On a hunch, he asked Welker to fashion larger germanium samples, from which they could cut slivers of higher purity. Using this higher-grade material, Mataré finally got consistent amplification in June 1948, six months after Bardeen and Brattain. Encouraged by this success, they phoned PTT Secretary Eugène Thomas and invited him over for a demonstration. But Thomas was apparently too busy—or perhaps not interested enough—to come by.

24. About that time, Welker put aside his theoretical work and tried to analyze what was going on just beneath the shiny germanium surface of Mataré's odd contraption. In an undated, handwritten document, now in the archives of Munich's Deutsches Museum, Welker speculated that one point—which he called the "électrode de commande," or "control electrode"—was inducing strong electric fields in the germanium just beneath the other electrode, altering the material's conductivity there.

25. But Mataré was not buying that explanation, which followed the logic of Welker's unsuccessful 1945 attempt at a semiconductor amplifier... Mataré argued instead that the control electrode must be injecting positive charges, called holes, into the germanium. And perhaps by trickling along the boundary between two crystal grains, he guessed, they reached the other electrode—many micrometers distant. There they would bolster the conductivity under this electrode and enhance the

current through it. "Welker didn't really understand my measurements," Mataré says. "At the time he was too busy studying superconductivity."...

26. But as the two men were debating the merits of their competing interpretations, surprising news arrived from across the Atlantic. In a 30 June press conference, Bell Labs suddenly lifted its six-month veil of secrecy and announced the invention of the transistor by Bardeen, Brattain, and Shockley. The breakthrough was reported in The New York Times on 1 July and published in the 15 July issue of Physical Review. Incredibly, the Bell Labs solid-state amplifier also had a pair of closely spaced metal points prodding into a germanium surface.

27. Mataré soon learned Bardeen and Brattain's explanation of the curious effects he had been observing. Electrons trapped on the germanium surface induce a shallow, positively charged layer just beneath it. Holes emitted by the control electrode (which they had dubbed the "emitter") travel easily within this layer over to the output electrode (or "collector"), markedly boosting the conductivity beneath it and therefore the current flowing through it.

28. After the Bell Labs revelations, Mataré and Welker had little difficulty getting the PTT minister to visit their lab. Thomas urged them to apply for a French patent on their semiconductor triode; he also suggested they call it by a slightly different name: transistron. So the two physicists hastily wrote up a patent disclosure and passed it on to the Westinghouse lawyers.

29. On 13 August, the company submitted a patent application for a "Nouveau système cristallin à plusieurs électrodes réalisant des effets de [sic] relais électroniques" to the Ministry of Industry and Commerce. Its brief description of what might be happening inside the germanium mostly followed Welker's field-effect interpretation but was probably influenced by Bardeen and Brattain's explanations.

30. By the May 1949 press conference, the two Germans had the device in limited production and were beginning to ship units for use by the PTT as amplifiers in the telephone system—initially in the line between Paris and Limoges. Speaking to the Paris press, Thomas compared these devices with vacuum tubes and demonstrated their use in radio receivers. Reporters hailed the two physicists as "les pères du

transistron" (the fathers of the transistron). The French device "turns out...to be superior to its American counterpart," read a more measured but still favorable account in Toute la Radio, a technical journal. "The latter has a limited lifetime and appears to be fairly unstable, whereas the existing transistrons do not show any sign of fatigue."

31. According to Mataré, this superiority could be attributed to the care they employed in fabricating their devices. While observing the process with microscopes, the women working on the small assembly line would measure current-voltage curves for both metal points with oscilloscopes and fix the points rigidly on the germanium with drops of epoxy after the curves matched the desired characteristics. When Brattain and Shockley visited the Paris group in 1950, Mataré showed them telephone amplifiers made with his transistrons—which allowed him to place a call all the way to Algiers. "That's quite something," admitted Shockley a bit guardedly, Mataré recalls half a century later.

32. But the French government and Westinghouse failed to capitalize on the technical advantages in semiconductors that they then appeared to have. After Hiroshima, nuclear physics had emerged as the dominant scientific discipline in the public mind, and nuclear power was widely heralded as the wave of the future. France became enchanted with pursuing the nuclear genie unbottled in the 1940s, while ignorant of its promising transistron.

33. Mataré and Welker struggled on in Paris for two more years, but as support for their operation waned during the early 1950s, they started looking for jobs in their native land...

34. What is arguably the most important invention of the 20th century remarkably occurred twice—and independently. Given the secrecy shrouding the Bell Labs device, there is no possibility Mataré and Welker could have been influenced by knowledge of it before July 1948, when news of the revolutionary invention became widespread. And it seems clear from the still-sketchy historical record that they indeed had a working, reliable amplifier by that time.

35. This dual, nearly simultaneous breakthrough can be attributed in part to the tremendous wartime advances in purifying silicon and, in particular, germanium. In both cases, germanium played the crucial gateway role, for in the immediate postwar years it could be refined much more easily and with substantially higher purities than silicon. Such high-purity semiconductor material was absolutely essential for fabricating the first transistors.

36. But the Bell Labs team had clear priority—and a superior physical understanding of how the electrons and holes were flowing inside germanium. That advantage proved critical to subsequent achievements, such as Shockley's junction transistor [see "The Lost History of the Transistor," IEEE Spectrum, May 2004], which was much easier to mass-produce with high reliability and uniformity. By the mid-1950s, nobody was trying to make point-contact transistors any longer, and the industry was moving on to silicon.

37. A factor crucial to success in the nascent semiconductor industry was the sustained innovation that flourished at Bell Labs—as well as at Texas Instruments and Fairchild Semiconductor—leading to silicon transistors and integrated circuits. And that required extensive infrastructure, both material and intellectual, to keep these companies at the frontiers of this fast-moving field. Such an infrastructure already existed in the United States after World War II because of its wartime radar efforts. But France had no comparable infrastructure and had to import talent from occupied Germany, which could not exploit its own radar expertise until the 1950s.

38. In the absence of any such advantages, it was inevitable that Europe's fledgling transistor would soon be eclipsed by other, better semiconductor devices and eventually fade from memory.

Task 1. *Find in the text examples of different types of participles. Translate them correctly*.

Task 2. *Analyze the underlined sentences from the grammatical point of view*.

Task 3. *What do these terms mean? What do you know about them?*

superheterodyne mixer, high-frequency radar signal, vacuum-tube diode, solid-state crystal rectifier, microwave range, resistance, capacitance, rectifier, oscillator, germanium duodiode, interference, solid-state amplifier, impurity, field-effect transistor, shielding, oscilloscope, current-voltage curve, light-emitting diode, integrated circuit.

Task 4. *Match the synonyms*.

a) Crucial	1) experience
b) Candidly	2) from time to time
c) Remembrances	3) go beyond
d) Excess	4) huge
e) Occasionally	5) important
f) Boost	6) memories
g) Tremendous	7) openly
h) Nascent	8) increase
i) Expertise	9) appearing

Task 5. *What parts of speech are these words? Divide them into groups: verbs, adverbs and nouns*.

Uniformity, remembrance, occasionally, resemblance, hastily, purify, resume, revelation, flourish, validate, purity, validity, specification, ambiguity, variable, maintenance, embed.

Language skills.

Describing the process, the picture and the diagram.

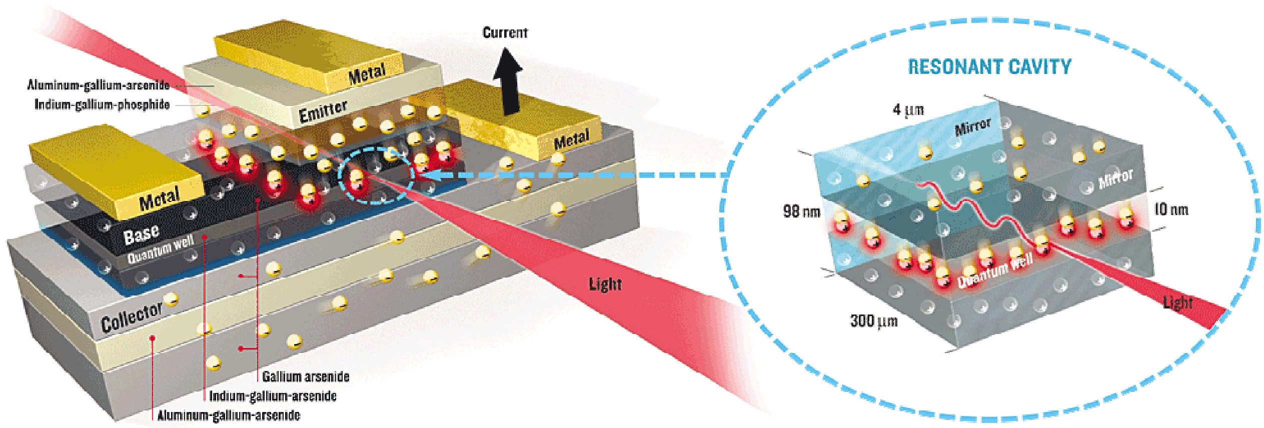
Divide these groups of phrases into the categories:

1) introduction
2) describing the structure
3) describing the order
4) giving examples
5) expressing the result
6) making conclusions

a) to begin with…	b)To sum up…	c) such as…
to start with…	To conclude…	for instance…
firstly… secondly…	Hence…	like…

I'd like to start with…	Thereby…	including…
d) Due to …	e) This diagram shows…	f) It has…
As the result of…	On this diagram you can see…	It's divided into…
Bring about …	This table demonstrates…	It consists of …
Result in …	This circle diagram illustrates …	It is composed of…
In response to…		

Task 1. *These picture shows transistor laser. Read the information below the picture and describe it in your own words.*



The semiconductor compounds we use in our transistor laser, gallium arsenide and indium-gallium-phosphide, readily produce photons. In these materials, which come from the III–V columns of the periodic table, the maximum energy in the valence band and the minimum energy in the conduction band occur at the same value of electron momentum. These III–V compounds are known as direct-band-gap materials because an electron that has been excited into the conduction band can easily fall back to the valence band through the creation of a photon (of little momentum) whose energy matches the band-gap energy.

Photon emission is at the heart of every light-emitting diode. The simplest of semiconductor devices, a diode consists of two terminals and a single junction, called the p-n junction, between them. The p-n junction separates a region rich in conduction-band electrons (n-type material) from one that is rich in valence-band holes (p-type material). Applying a negative voltage to the n-type side pushes the electrons across the junction into the region populated with holes. They recombine and emit light.

The basic structure of our transistor laser can be thought of as two back-to-back diodes separated by a thin connecting layer, a base layer. Called a bipolar junction transistor (BJT), it is one of two distinct families of transistors, the other being field-effect transistors.

Electrons that don't recombine with holes in the well or the base are swept into the collector, which exhibits a current gain. The device can be switched on and off billions of times per second and produces both optical and electrical signals.

The BJT is a direct descendant of Bardeen and Brattain's point-contact transistor and is so named because the main conduction channel uses both electrons and holes to carry the main electric current. It also shares the same names for the three terminals found on the point-contact transistor: emitter, base, and collector. Two p-n junctions exist inside the BJT: the collector-base junction and the base-emitter junction.

Discussion Matter.

Find information about identical inventions and report to the group. Include a picture or a diagram. Who do you think is a real inventor?

What do you know about patent writing? Study the following text and summarize its content.

How to Write the Description

Below are some how to instructions and tips to help get you started writing the description of your invention. When you are satisfied with the description you can begin the claims section of a patent application. Remember that the description and claims are the bulk of your written patent application.

When writing the description, use the following order, unless you can describe your invention better or more economically in another way. The order is:

- title
- technical field
- background information and prior art
- description of how your invention addresses a technical problem
- list of figures
- detailed description of your invention
- one example of intended use
- a sequence listing if relevant

To begin, it might be helpful to just jot down brief notes and points to cover from each of the above headings. As you polish your description into its final form, you can use the outline suggested below.

1. Begin on a new page by stating the title of your invention. Make it short, precise and specific. For example, if your invention is a compound, say "Carbon tetrachoride" not "Compound". Avoid calling the invention after yourself or using the words new or improved. Aim to give it a title that can be found by people using a few key words during a patent searching.
2. Then write a broad statement that gives the technical field related to your invention.
3. Continue by offering background information that people will need to: understand, search for, or examine, your invention.
4. Discuss the problems that inventors have faced in this area and how they have attempted to solve them. This is often called giving the prior art. Prior art is the published body of knowledge that relates to your invention. It is at this point that applicants frequently quote previous similar patents.
5. Then state in general terms how your invention solves one or several of these problems. What you are trying to show is how your invention is new and different.

6. List the drawings giving the figure number and a brief description of what the drawings illustrate. Remember to refer to drawings throughout the detailed description and to use the same reference numbers for each element.
7. Describe your intellectual property in detail. For an apparatus or product, describe each part, how they fit together and how they work together. For a process, describe each step, what you start with, what you need to do to make the change, and the end result. For a compound include the chemical formula, the structure and the process which could be used to make the compound. You need to make the description fit all the possible alternatives that relate to your invention. If a part can be made out of several different materials, say so. You should aim to describe each part in sufficient detail so that someone could reproduce at least one version of your invention.
8. Give an example of an intended use for your invention. You should also include any warnings of commonly used in the field that would be necessary to avert failure.
9. If relevant to your type of invention, provide the sequence listing of your compound. The sequence is part of the description and is not included with any drawings.

One of the best ways to understand how to write a patent for your type of invention is to take a look at already issued patents. Visit the USPTO online and do a search for patents issued for similar inventions to yours.

Module VI.

Grammar: Non-finite forms of the verbs. Gerund.

Language Skills: Subjunctive Mood.

Reading: Earthquake Alarm**.**

Discussion: Present day techniques and technology for predicting natural disasters.

Grammar.

Gerund.

Gerunds	Voice	
	Active	**Passive**
Indefinite Gerund Perfect Gerund	Planning Having planned	Being planned Having been planned

English language	Russian language
1) Сложный герундиальный оборот в функции подлежащего	**1) нет эквивалента; переводится придаточным предложением**
His being tired after his hard work is quite natural. **Her having been absent at the lecture** is easily explained.	**То, что он устал после тяжелой работы**, вполне естественно. **То, что она отсутствовала на лекции**, легко объяснимо.
2) сложный герундиальный оборот в функции дополнения	**2) нет эквивалента; переводится придаточным дополнительным предложением**
She knows **of my living in town, but** she doesn't know **of my having lived in the countryside.** I heard **of the bridge having been built.**	Она знает**, что я живу в городе,** но она не знает**, что я жил в сельской местности.** Я слышала**, что мост уже построен.**
3) сложный герундиальный оборот в функции определения	**3) нет эквивалента; переводится придаточным определительным предложением**
We understood the importance **of this problem being solved practically.** The teacher put forward the idea **of our**	Мы поняли важность того**, чтобы эта проблема была решена практически.** Преподаватель выдвинул идею**, чтобы**

speaking only English at our English lessons.	**мы говорили только по-английски на занятиях по английскому языку.**
4) сложный герундиальный оборот в функции обстоятельства	**4) нет эквивалента; переводится деепричастием или придаточным обстоятельственным предложением**
By listening attentively we at last understood everything. He left **without having seen the manager.** **After his having repaired the engine**, we started.	**Слушая внимательно**, мы, наконец, поняли все. Он ушел, **не повидавшись с управляющим.** **После того как он починил двигатель**, мы отправились в путь.

The verbs that are followed by gerunds

to account for	to accuse of
to aim at	to depend on (upon)
to differ in	to be fond of
to insist on (upon)	to be interested in
to object to	to prevent from
to rely on (upon)	to be responsible for
to result from	to result in
to succeed in	to think of

Make your sentences with these phrases.

Task 1. *Translate the following sentences and define the part of gerunds in them.*

1.Learning without thought is labour lost, thought without learning is perilous. (Confucius) 2. Seeing is believing. 3. Appetite comes with eating. 4. Upon switching off the current the pressure dropped. 5. Instead of using chlorine, they took bromine. 6. They continued experimenting with the substance. 7. From here on, the theory starts evaluating the various alternatives of action in terms of the objectives. 8. Having access to the code was symbolic. 9. It is worthwhile thinking over the effects I have just described. 10. Besides being useful in general interpolation technique, the procedure can be effectively used to approximate the first coefficients of F. 11. The new opportunities may make life on this planet much more worth living. 12. They couldn't help seeing the importance of the process. 13. In one's search to understand what happens in this particular case, one cannot help being influenced by the history of quite another problem. 14. It may well be worthwhile considering the purpose of the investigation. 15. Balancing is done by adjusting the position of the rods.

Task 2. *Translate the sentences, determining which part of speech the word with –ing ending is: Gerund, Participle I or noun.*

1.Everything must have a beginning. 2. Wisdom denotes the pursuing of the best end by the best means. (F.Hutcheson) 3. Submitting to one wrong brings on another. 4. We obtained these values in terms of the following formula. 5. This procedure is finding increasing use. 6. A man should be viewed as a free, rational being possessing a free will. 7. The problem, however, is in not dividing the structure finely enough. 8. Before starting the engine it is necessary to test the piping for leakage. 9. This is not surprising in view of the fact that these compounds undergo rearrangement, giving diazoesters. 10. Two results obtained using the protocol showed an interesting effect worth presenting and discussing here. 11. Frequently, one is watching a sports event involving two teams without any intrinsic reason for supporting either. 12. The accumulated bulk of knowledge on how to run a business provides deep understanding of the mechanism of business. 13. The theory also basically improves understanding of a queuing situation enabling better control.

Task 3. *Find gerunds in the text and name its function*.

Automation in the Research Process.

Our goal should be automating the routine and thereby leave more time for the creative process.

With that word of caution, let's proceed by arbitrarily dividing research into three stages and examining each stage to find what functions of the research process might be automated without endangering creativity. Stage one includes the dreams, the ideas, the exploratory work, selecting the problem, setting the objective, testing technical feasibility, and searching the literature. Stage two involves planning the experiment, conducting the experiment, checking the alternates, data taking, and data evaluation. Stage three is the solution of the problem – drawing conclusions and making recommendations.

Although there is a great deal of creativity involved in stage one, there are also opportunities for automation. The burden of keeping up with the literature search has increased immensely. Advances in computer technology have made possible storing and quick retrieving essentially all the scientific literature.

Reading.

You are going to read the text about earthquake prediction. Do you think this issue is of vital importance in our country?

Task 1. *Before reading the text check that you understand the meaning of these words. What parts of speech can they be?*

Impending emergency precede monitor dedicated devastation
Disturbance demolish fracture grind sundering propagate
Eerie attenuate congregate occur validation
Ripple imminent persist oddity alteration precursor

Task 2. *Read the text and give titles to its parts.*

Earthquake Alarm.

By Tom Bleier and Friedemann Freund

Impending earthquakes have been sending us warning signals—and people are starting to listen.

Deep under Pakistan-administered Kashmir, rocks broke, faults slipped, and the earth shook with such violence on 8 October that more than 70 000 people died and more than 3 million were left homeless . But what happened in the weeks and days and hours leading up to that horrible event? Were there any signs that such devastation was coming? We think there were, but owing to a satellite malfunction we can't say for sure.

How many lives could have been saved in that one event alone if we'd known of the earthquake 10 minutes in advance? An hour? A day?

Currently, predictions are vague at best. By studying historical earthquake records, monitoring the motion of the earth's crust by satellite, and measuring with strain monitors below the earth's surface, researchers can project a high probability of an earthquake in a certain area within about 30 years. But short-term earthquake forecasting just hasn't worked.

1)… With just a 10-minute warning, trains could move out of tunnels, and people could move to safer parts of buildings or flee unsafe buildings. With an hour's warning, people could shut off the water and gas lines coming into their homes and move to safety. In industry, workers could shut down dangerous processes and back up critical data; those in potentially dangerous positions, such as refinery employees and high-rise construction workers, could evacuate. Local government officials could alert emergency-response personnel and move critical equipment and vehicles outdoors. With a day's warning, people could collect their families and congregate in a safe location, bringing food, water, and fuel with them. Local and state governments could place emergency teams and equipment strategically and evacuate bridges and tunnels.

I.

It seems that earthquakes should be predictable. After all, we can predict hurricanes and floods using detailed satellite imagery and sophisticated computer models. Using advanced Doppler radar, we can even tell minutes ahead of time that a tornado will form.

Accurate earthquake warnings are, at last, within reach. They will come not from the mechanical phenomena—measurements of the movement of the earth's crust—that have been the focus of decades of study, but, rather, from electromagnetic phenomena. And, remarkably, these predictions will come from signals gathered not only at the earth's surface but also far above it, in the ionosphere.

For decades, researchers have detected strange phenomena in the form of odd radio noise and eerie lights in the sky in the weeks, hours, and days preceding earthquakes. But only recently have experts started systematically monitoring those phenomena and correlating them to earthquakes.

2)… On 17 January 1995, for example, there were 23 reported sightings in Kobe, Japan, of a white, blue, or orange light extending some 200 meters in the air and spreading 1 to 8 kilometers across the ground. Hours later a 6.9-magnitude earthquake killed more than 5500 people. Sky watchers and geologists have documented similar lights before earthquakes elsewhere in Japan since the 1960s and in Canada in 1988.

Another sign of an impending quake is a disturbance in the ultralow frequency (ULF) radio band—1 hertz and below—noticed in the weeks and more dramatically in the hours before an earthquake. Researchers at Stanford University, in California, documented such signals before the 1989 Loma Prieta quake, which devastated the San Francisco Bay Area, demolishing houses, fracturing freeways, and killing 63 people.

Both the lights and the radio waves appear to be electromagnetic disturbances that happen when crystalline rocks are deformed—or even broken—by the slow grinding of the earth that occurs just before the dramatic slip that is an earthquake. Although a rock in its normal state is, of course, an insulator, this cracking creates tremendous electric currents in the ground, which travel to the surface and into the air.

The details of how the current is generated remain something of a mystery. One theory is that the deformation of the rock destabilizes its atoms, freeing a flood of electrons from their atomic bonds, and creating positively charged electron deficiencies, or holes.

One of us, Freund, working at NASA Ames Research Center in Mountain View, Calif., demonstrated through laboratory rock-crushing experiments that the sundering of oxygen-to-oxygen bonds in the minerals of a fracturing rock could produce holes. These holes manage to propagate through rock up toward the surface, while the electrons flow down into Earth's hot mantle. The movement of these charges, measured at 300 meters per second in the lab, causes changes in the rock's magnetic field that propagate to the surface.

3)… The flow of this ionized water lowers the resistance of the rock, creating an efficient pathway for an electric current. However, some researchers doubt that water can migrate quickly enough into the rock to create large enough currents; for this theory to be correct, the water would have to move hundreds of meters per second.

Whatever the cause, the currents generated alter the magnetic field surrounding the earthquake zone. Because the frequencies of these magnetic field changes are so low—with wavelengths of about 30 000 kilometers—they can easily penetrate kilometers of solid rock and be detected at the surface. Signals at frequencies above a few hertz, by contrast, would rapidly be attenuated by the ground and lost.

We can detect such electromagnetic effects in a number of ways. Earthquake forecasters can use ground-based sensors to monitor changes in the low-frequency magnetic field. They can also use these instruments to measure changes in the conductivity of air at the earth's surface as charge congregates on rock outcroppings and ionizes the air.

Using satellites, forecasters can monitor noise levels at extremely low frequency (ELF)—below 300 Hz. They can also observe the infrared light that some researchers suspect is emitted when the positive holes migrate to the surface and then recombine with electrons.

II.

4)... One group is at QuakeFinder, a Palo Alto, Calif.based company cofounded by one of us, Bleier, in 2000. QuakeFinder researchers have begun directly monitoring magnetic field changes through a network of ground-based stations, 60 so far, in California . In 2003, the company joined forces with Stanford and Lockheed Martin Corp.'s Sunnyvale, Calif., center to launch an experimental satellite designed to remotely monitor magnetic changes. A larger, more sensitive satellite is in the design stages. QuakeFinder hopes to develop an operational earthquake warning system within the next decade.

The 1989 Loma Prieta earthquake near San Francisco sent out strong signals of magnetic disturbances fully two weeks before the 7.1-magnitude quake occurred. The idea that such signals existed was still a new one then, certainly not well enough accepted to justify a decision to issue a public warning.

We happen to have excellent data from that quake. Stanford professor Anthony C. Fraser-Smith had buried a device called a single-axis search-coil magnetometer to monitor the natural background ULF magnetic-field strength at about 7 km from what turned out to be the center of that quake. He selected this spot simply because it was in a quiet area, away from the rumblings of the Bay Area Rapid Transit trains and other man-made ULF noise. He monitored a range of frequencies from 0.01 to 10 Hz, essentially, the ULF band and the lower part of the ELF band.

On 3 October, two weeks before the quake, Fraser-Smith's sensors registered a huge jump in the ULF magnetic field at the 0.01-Hz frequency—about 20 times that of normal background noise at that frequency. Three hours before the quake, the 0.01-Hz signal jumped to 60 times normal. Elevated ULF signals continued for several months after the quake, a period rife with aftershocks, and then they disappeared.

The Loma Prieta quake was a stunning confirmation of the value of ULF signals in predicting earthquakes. This validation of the theory prompted Bleier to establish a network of earthquake sensors in the Bay Area, an effort that grew into QuakeFinder.

Other researchers around the world who monitored changes in the magnetic field at ULF frequencies had noticed similar, but not as extreme, changes prior to other events. These observations occurred shortly before a 6.9-magnitude quake in Spitak, Armenia, in December 1988 and before a devastating 8.0-magnitude earthquake in Guam in August 1993.

Author Bleier recorded spikes of activity, four to five times normal size, in the 0.2- to 0.9-Hz range for 9 hours before a 6.0-magnitude earthquake in Parkfield, Calif., on 28 September 2003. Solar storms sometimes cause ripples in the magnetic field at those frequencies, but there had been no appreciable solar activity for six days prior to the quake.

In Taiwan, sensors that continuously monitor Earth's normal magnetic field registered unusually large disturbances in a normally quiet signal pattern shortly before the 21 September 1999 Chi-Chi, Taiwan, earthquake, which measured 7.7. Using data from two sensors, one close to the epicenter, and one many kilometers away, researchers were able to screen out the background noise by subtracting one signal from the other, leaving only the magnetic field noise created by the imminent earthquake. Two teams, one in Taiwan and one in the United States, calculated that the currents required to generate those magnetic-field disturbances were between 1 million and 100 million amperes.

Besides detecting magnetic-field disturbances, ground-based sensors can record changes in the conductivity of the air over the quake zone caused by current welling up from the ground. These sensors can vary in form, but those we use are made from two 15-centimeter by 15-cm steel plates locked into position about 1 cm apart. A 50-volt dc battery charges one plate; the other is grounded. A resistor and voltmeter between the battery and the first plate senses any flow of current.

Normally, the air gap between the plates acts as an insulator, and no current flows. If, however, there are charged particles in the air, a current begins to flow, creating a voltage drop across the resistor that registers with the voltmeter. The currents created in this way are not large—on the order of millivolts—but are detectable.

Last year QuakeFinder installed 25 ELF detectors with such air- conductivity sensors in California's Mojave Desert to determine if increased air conductivity actually precedes earthquakes and contributes to the formation of the so-called earthquake lights. But to date, no large earthquakes have struck near these sensors, so no data are available yet.

III.

5)… Above the ground, satellite-based instruments are picking up interesting patterns in low-frequency signals and detecting other oddities.

In 1989, after the devastating earthquake in Armenia, a Soviet Cosmos satellite observed ELF-frequency disturbances whenever it passed over a region slightly south of the epicenter. The activity persisted up to a month after the quake. Unfortunately, no data were gathered just prior to the initial quake. In 2003, the U.S. satellite QuakeSat detected a series of ELF bursts two months before and several weeks after a 22 December, 6.5-magnitude earthquake in San Simeon, Calif.

In June 2004, a multinational consortium lead by the French government launched a new earthquake detection satellite called DEMETER (for Detection of Electro-Magnetic Emissions Transmitted from Earthquake Regions). DEMETER, much more sensitive than earlier satellites, has already detected some unusual increases in ion density and ELF disturbances above large quakes around the world. Unfortunately, the satellite was malfunctioning in the days before October's temblor in Kashmir. Because the project is so new, researchers are still working on the tools for processing DEMETER's data. Its backers are expecting more detailed analyses to be available this month.

6)… Researchers in China reported several instances during the past two decades of satellite-based instruments registering an infrared signature consistent with a jump of 4 to 5 oC before some earthquakes. Sensors in NASA's Terra Earth Observing System satellite registered what NASA called a "thermal anomaly" on 21 January 2001 in Gujarat, India, just five days before a 7.7-magnitude quake there; the anomaly was gone a few days after the quake . In both cases, researchers believe, these sensors may have detected an infrared luminescence generated by the recombination of electrons and holes, not a real temperature increase.

Even the existing Global Positioning System may serve as part of an earthquake warning system. Sometimes the charged particles generated under the ground in the days and weeks before an earthquake change the total electron content of the ionosphere—a region of the atmosphere above about 70 km, containing charged particles. If the ground is full of positively charged holes, it would attract electrons from the ionosphere, decreasing the airborne electron concentration over an area as much as 100 km in diameter and pulling the ionosphere closer to Earth. This change in electron content can be detected by alterations in the behavior of GPS navigation and other radio signals. Each GPS satellite transmits two signals. The relative phase difference between the two signals when they reach a receiver changes, depending on the electron content of the ionosphere, so tracking these phase changes at a stationary receiver allows researchers to monitor changes in the ionosphere.

Researchers in Taiwan monitored 144 earthquakes between 1997 and 1999, and they found that for those registering 6.0 and higher the electron content of the ionosphere changed significantly one to six days before the earthquakes.

Earthquake forecasters can also watch for changes in the ionosphere by monitoring very-low-frequency (3- to 30-kilohertz) and high-frequency (3- to 30-megahertz) radio transmissions. The strength of a radio signal at a receiver station changes with the diurnal cycle: it is greater at night than in daylight, as anyone who listens to late-night radio from far-off stations knows. The altitude of the ionosphere, which moves lower as the positive holes migrate to the surface, also has an effect on radio signals; the lower the ionosphere, the stronger the signals. So at dawn on an earthquake day, a curve drawn to represent the drop-off in radio signal strength will appear markedly different from the normal curve for that signal at that location.

The connection between large earthquakes and electromagnetic phenomena in the ground and in the ionosphere is becoming increasingly solid. Researchers in many countries, including China, France, Greece, Italy, Japan, Taiwan, and the United States, are now contributing to the data by monitoring known earthquake zones.

IV.

7)… Satellites can cover most of the planet, but at ELF frequencies signal sources are hard to pinpoint. Ground-based monitors have smaller detection ranges, up to 50 km, depending on the sensitivity of the magnetometer and the size of the quake, but are far more precise. With a network of such sensors, forecasters looking at the amplitude of signals received at each sensor might be able to locate a quake within 10 to 20 km. This means that, for an area as large as California, accurate earthquake detection might require that forecasters distribute 200 to 300 magnetic-field and air-conductivity sensors on the ground.

QuakeFinder and other groups are trying to get funding to integrate space- and ground-based sensors to detect all these precursor signals—electronically detected

ELF and ULF magnetic-field changes, ionospheric changes, infrared luminescence, and air-conductivity changes—along with traditional mechanical and GPS monitoring of movements of the earth's crust. With such a broad range of phenomena being monitored, spikes registered by different monitors detecting different types of signals would make forecasts more reliable. Forecasters may then be able to issue graduated warnings within weeks, days, and hours, declaring increasing threat levels as the evidence from different sensors begins pointing in the same direction.

V.

Useful as such an earthquake warning system would be, we're not ready to deploy one yet. For one thing, the scientific underpinnings of the phenomena need to be better understood before public officials and others have confidence in the data. On this front, author Freund has been investigating the theory that currents are generated by breaking oxygen-to-oxygen bonds in rocks under stress. He has experimented with various rock samples, demonstrating at the laboratory scale that cracking rock can produce positive charges, which, on a geophysical scale, could form significant ground currents and infrared emissions. Other rock-crushing experiments are under way in Japan and Russia. In Mexico, meanwhile, researchers are focusing on understanding the related changes in the ionosphere.

A working prediction system won't come cheaply, but it's nothing compared with the loss of life and the billions of dollars in damage that earthquakes can cause. The 200 to 300 ground-based sensors necessary to blanket California alone will cost $5 million to $10 million. A dedicated satellite with magnetic, infrared, and other sensors would cost $10 million to $15 million to build and launch.

8)… At satellite altitudes, space itself is full of noise, compromising the data gathered. The data must be digitally processed with filters and pattern-matching software, still being refined. And down on the ground, man-made noise fills the electromagnetic spectrum. Researchers are attempting to use differential processing of two distant sensors to reduce or eliminate such interference.

We expect these problems, both technical and financial, to be worked out within the next 10 years. Then governments in active earthquake areas such as

California, China, Japan, Russia, and Taiwan could install warning systems as early as 2015, saving lives and minimizing the chaos of earthquakes.

Task 3. *How are these things connected with the problem of earthquake prediction?*

earth's crust	strain monitors	ionosphere
satellite imagery	ground-based sensors	QuakeFinder
magnetometer	electromagnetic disturbances	magnetic field
infrared luminescence	satellite-based instruments	radio signal

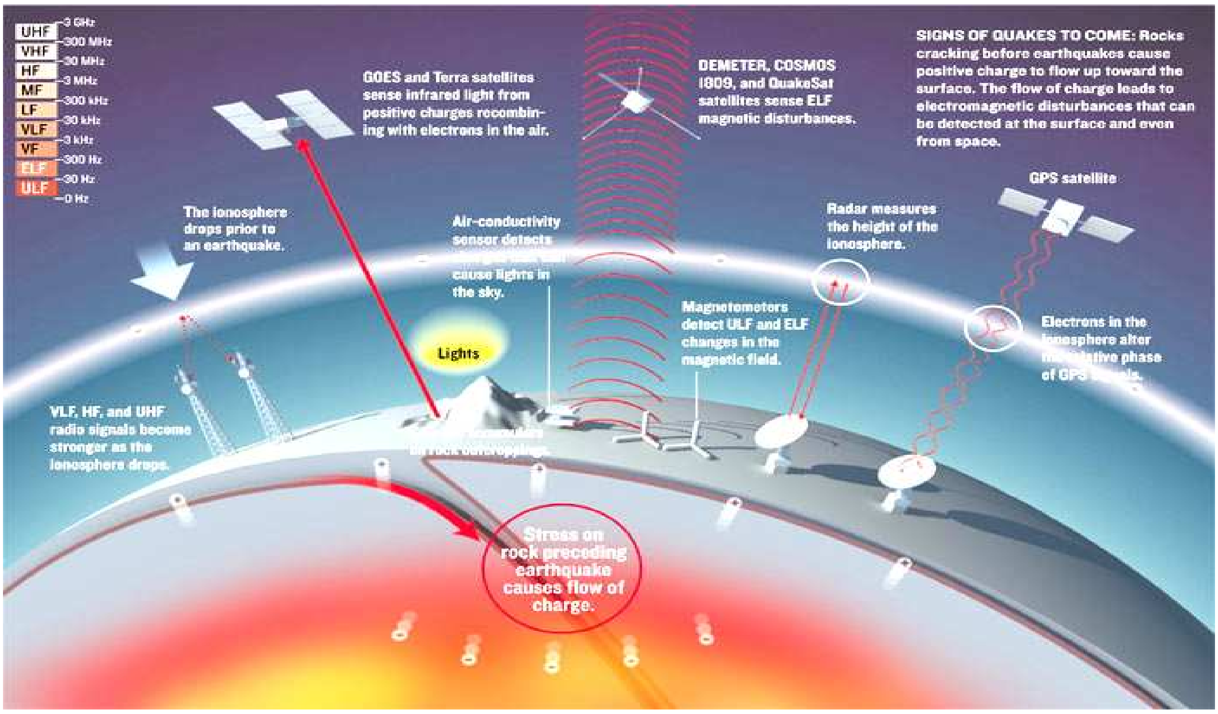
Task 4. *Insert the following sentences into the gaps in the text.*

1.Meanwhile, a few technical challenges remain to be solved. 2. Ground-based sensors are not the only mechanisms for monitoring the signals given off by impending earthquakes. 3. Scientists around the world are looking at all of these phenomena and their potential to predict earthquakes accurately and reliably. 4. Accurate short-term forecasts would save lives and enable businesses to recover sooner. 5. A light or glow in the sky sometimes heralds a big earthquake. 6. Infrared radiation detected by satellites may also prove to be a warning sign of earthquakes to come. 7. Another theory is that the fracture of rock allows ionized groundwater thousands of meters below the surface to move into the cracks. 8. Using these phenomena for earthquake prediction will take a combination of satellite and ground-based sensors.

Task 5. *Read the text again and make notes about the following questions to the text.*

1. Why is it important to learn to predict earthquakes?
2. What physical phenomena can help people make predictions?
3. What are the examples of measurement facilities used to forecast earthquakes?
4. Why is it essential to combine different types of equipment?
5. What problems arise with introducing all the techniques into life?

Task 6. *Comment on the picture on the basis of the information in this article.*



Language Skills.

<u>Subjunctive mood.</u>

Should **Would** **Could** **Might**	**Simple Active Infinitive** Play, write	Speaking about the present and future
	Simple Passive Infinitive Be played, be written	He suggested that these parts **should be tested** under very severe conditions.
	Perfect Active Infinitive Have played, have written	Speaking about the past
	Perfect Passive Infinitive Have been played, have been written	They **should have chosen** Prof.N. to preside at the meeting.
Старые формы	**Simple Infinitive** (without modals)	It is important that your translation **be** good.
	Past Simple (active or passive**)**	The work would be done if they **prepared** for it properly.

	Past Perfect (active or passive**)**	The work would have been done long ago if they **had been prepared** for it properly.

Using Subjunctive.

I.Simple sentences.

1. I'd like to know the research results as soon as they are ready. 2. You could have done it. Why didn't you try? 3. We analyze all possible ways this game could be played out.

II. Object clauses.

1. It is desirable that this method (should) be tested. 2. It is natural to require that final choices not be multiple valued. 3. The engineer demanded that the test (should) be repeated. 4. They required that he (should) explain this explanation. 5. I wish he were here. 6. I wish he would tell us everything.

III. Adverbial clauses.

1. But for you I should have solved the problem differently. 2. You should revise the material lest you forget it. 3. If it were not for hope, the heart would break. 4. The house was so quiet as if there were nobody in it. 5. It would be more convenient if a special machine were available. 6. Send him out of the room so that he should not hear what we talk about.

IV. Exclamations.

1. God bless you! 2. God save you! 3. Curse this fog!

Task 1. *Translate the sentences identifying Subjunctive mood*.

1. In the first place we might not have listed all the facts needed, and we would have no experience in finding new ones. 2. If the whole effect were to be traced to this cause, then our assumption would have been correct. 3. But for the lack of a reliable instrument the problem could have been solved long ago. 4. The system is in a state as if this transaction had never happened. 5. To have tested all possible combinations would have required a prohibitive effort. 6. Make exact calculations lest you should fail with your experiment. 7. It is not necessary that the substance to

be digested be brought entirely within the cells. 8. This would have to be a basic postulate for many any general theory of computer applications.

Discussion matter.

Using the following questions prepare the report about the current means of predicting other natural disasters (ex. draught, flood, hurricane, avalanche…); include a picture into your report.

1. Why is it important to learn to predict a disaster?
2. What physical phenomena can help people make predictions?
3. What are the examples of measurement facilities used to forecast a disaster?
4. Why is it essential to combine different types of equipment?
5. What problems arise with introducing all the techniques into life?

Module VII.

Grammar: Non-finite forms of the verbs. Infinitive.

Reading: Sins of Transmission

Communication Skills: Inversion**.**

Discussion: The effect that technology has on people's health, flora and fauna.

Grammar.

Infinitive.

Infinitive	**Voice**	
	Active	**Passive**
Indefinite Infinitive	to plan	to be planned
Continuous Infinitive	to be planning	to be being planned
Perfect Infinitive	to have planned	to have been planned
Perfect Continuous Infinitive	to have been planning	to have been being planned (is used very seldom)

English language	Russian language
1) инфинитив в функции подлежащего	**1) нет эквивалента; переводится инфинитивом**
To lay out the text is complicated.	**Верстать** текст сложно**.**
2) инфинитив в функции дополнения	**2) нет эквивалента; переводится придаточным дополнительным предложением**
I'm very pleased **to have given** you all the information. He does not like **to be interrupted**.	Я очень доволен, **что дал вам всю информацию.** Он не любит, **когда его прерывают**.
3) инфинитив в функции определения	**3) нет эквивалента; переводится придаточным определительным предложением**
The iron ore **to be mined in this district** is of the highest quality. The professors **to lecture at our university this year** are specialists from Great Britain and the USA.	Железная руда, **которая будет добываться в этом районе,** очень высокого качества. Профессора, **которые будут читать лекции в нашем университете в этом году,** специалисты из Великобритании и Соединенных Штатов.
4) объектный инфинитивный оборот	**4) нет эквивалента; переводится придаточным дополнительным предложением**
I haven't heard **anyone call me.** I believe **him to have no conscience at all.**	Я не слышал**, чтобы кто-нибудь меня звал.** Я считаю**, что у него совершенно нет совести.**

I dislike **you to talk like that.**	Я не люблю**, когда вы так говорите.**
5) субъектный инфинитивный оборот	**5) нет эквивалента; переводится частью именного сказуемого или самостоятельным предложением**
The rider was seen **to disappear in the distance.** **He** was thought **to be honest and kind.** **They** seemed **to have quite forgotten him already.** **The experiment** proved **to be a failure.**	Видно было, **как всадник скрылся вдали.** **Его** считали **честным и добрым человеком.** **Они**, казалось, **уже совершенного забыли его.** **Опыт** оказался **неудачным**.
6) инфинитив с предлогом for	**6) нет эквивалента; переводится придаточным или самостоятельным предложением**
I sometimes think it is a shame **for people to spend so much money this way**. This was **for him to find out**.	Я иногда думаю, **что стыдно людям тратить так много денег таким образом.** **Выяснить это должен был он.**

Task 1. *Translate the following sentences with infinitives and say its function in the sentence.*

1.A classic is something that everybody wants to have read and nobody wants to read. (M.Twain) 2. To construct an experiment of this kind seems nearly impossible. 3. With these conditions there are also opposing factors to be considered. 4. Some molecules are large enough to be seen on the electron microscope. 5. A small computer company announced a computer small enough to set on desktop and powerful enough to support high level language programming. 6. There is a tendency to act like an expert when being interviewed, and experts do not like to be asked questions. 7. If you want to be seen stand up, if you want to be heard speak up, if you want to be appreciated shut up. 8. The author claimed to have made a significant contribution to the problem solution. 9. The work of Reeney cites theoretical support for the idea of using a weighted sum of utility functions as a group utility function, the weights to be determined by a “benevolent dictator”. 10. The program uses very simple data structures and algorithms almost everywhere, with a few key techniques to take advantage of the hierarchy. 11. He permitted the treasure to be returned to the people. 12. Unfortunately at the same time another station may have detected the network to be free and started to broadcast its message. 13. Execution causes P1 and P2 to be concurrently initiated and requires both to terminate before the next command can be executed. 14. Have the user participate in writing the manual! 15. Good people are unlikely to be corrupted by their surroundings. 16. There happened to exist some ideas about the manipulation. 17. Hardly any aspect of economic life is likely to be unaffected, or is likely to remain unaffected by automation. 18. The substances which are accepted to be present in the mixture should reveal two absorption bands. 19. The device known to be built by Charles Babbage is now considered to be the parent of modern computers. 20. The language of specialists is often difficult for the layman to read. 21. Preliminary experiments showed that the time required for the specimen to reach thermal equilibrium was quite long. 22. For a computer to be programmed each problem must be reduced to a series of very simple steps.

Task 2. *Translate the text into English paying attention to formation of Infinitives.*

Ученые считают Лобачевского великим математиком. Весь мир знает, что Лобачевский продемонстрировал и доказал основные принципы теории параллельных линий. Мы его также считаем великим организатором народного образования и знаем, что он много писал о проблемах образования.

Лобачевский родился 1 декабря 1792 года около Нижнего Новгорода. Его отец умер, когда Лобачевский был ребенком, оставив семью в нищете. Семья переехала в Казань, где Лобачевского приняли в гимназию. В возрасте 14 лет он поступил в Казанский университет, где, как известно, он провел 40 лет, сначала, будучи студентом, потом доцентом, и наконец, ректором. Под его управлением произошло много перемен в университете. Мы знаем, что была основана и оборудована обсерватория и были установлены мастерские.

В течение 2200 лет все человечество верило, что Евклид открыл универсальную истину. Лобачевский же доказал, что аксиома Евклида о параллельных линиях была неверной. Он построил новую геометрическую теорию, которая сильно отличалась от теории Евклида. Нам известно, что его идеи оказали сильное влияние не только на область геометрии, но и механики, физики и астрономии. Как Галилей, Коперник и Ньютон, он является одним их тех, кто заложил основы науки.

Reading.

Do you think these statements are true or false?

1.The exposure of RF radiation on people's health is insignificant. 2. The officials working at antenna installations have never been sent into court for operating the transmitters. 3. There is an international organization which studies the impact of electromagnetic waves on people's health. 4. The most reliable results in studying how radio and electromagnetic waves effect people's health can be received pursuing experiments with culture cells. 5. Cell phones are not as dangerous as radio and television transmitters.

Read the text below and find out what it says about the statements above.

Sins of Transmission?

1. The view is impressive, if strange. A forest of about two dozen huge towers supports an <u>intricate</u> web of antenna wires that together pump many hundreds of kilowatts into the atmosphere from a site 25 kilometers north of Rome. The antennas are the Vatican's portal to the world: signals from two medium-wave transmitters reach all of Italy at all times, while those from 27 shortwave antennas are beamed at selected parts of the world in different languages at varying times. (Only two of the shortwave antennas transmit at any given time.) Thus, papal speeches, news programs, and religious events are dispatched in 40 languages to all the corners of the world, making this complex as important to the Vatican as the Voice of America and Radio Free Europe were to the United States at the height of the Cold War.

But to the inhabitants of Cesano and neighboring communities, the antennas, some transmitting at an effective 600 kilowatts, represent not only a <u>blight</u> on the landscape and something of a nuisance—hearing the Pope's voice picked up by your front-door intercom is not always appreciated—but also a possible health threat .

2. When the antennas were erected in 1951 on a 3.9-square-kilometer plot, the surrounding area, known as Santa Maria di Galeria, was still largely rural. But during the last few decades the area has been built up, and now an estimated 60 000 people live within a radius of 10 km of the transmitters. In 2000, a small number of cases of childhood leukemia, first reported by a local physician, were blamed by residents on the strong radio-frequency fields generated by the Vatican antennas.

On the one hand, leukemia incidence was higher close to radio towers; on the other hand, the difference was **Statistically Insignificant**.

3. This past May, an Italian court imposed suspended 10-day prison sentences on two Vatican officials responsible for operating the transmitters, a cardinal and a priest, for the "dangerous showering of objects"—meaning the antennas' electromagnetic waves. (The term "electromagnetic radiation" has not made it yet into Italy's legal vocabulary.) In addition, environmental groups and committees representing the local population will be awarded damages in a separate civil action, though the figures have yet to be determined.

Local residents and environmentalists have sought to have the Vatican close down the complex since 2000. Several years ago, an Italian environmental minister, Willer Bordon, organized field strength measurements and found that the Vatican's radio transmitters violated Italy's radiation standards, which are much stricter than those in other parts of the world. He threatened to cut off electric power to the site; in response, Vatican Radio reduced the time it was on the air and transferred some radio transmission to other sites.

The Vatican's situation improved in 2002, when courts ruled that the Italian government had no jurisdiction over the transmitters because of the Vatican's status as an independent state. But in 2003, Italy's Supreme Court overturned those rulings, which resulted in the two Vatican officials' having to stand trial.

4. What does science say? While the complaints against Vatican Radio were bouncing back and forth in the Italian courts, the regional government commissioned

an epidemiological study of leukemia incidence in the area around the disputed antennas. A team of researchers led by Paola Michelozzi of the Local Health Authority, in Rome, reported in 2002 that the incidence of childhood leukemia from 1987 to 1998 was twice the expected rate, but the actual numbers were very small. The results, published in the American Journal of Epidemiology, indicated that instead of the expected 3.7 cases in the population of 60 000, there had been eight. Because of the small number, Michelozzi considers the result statistically insignificant. But a somewhat more disconcerting finding in her study made a stronger impression on critics of the Vatican, members of the press, and even some experts.

5. Michelozzi's survey determined that if leukemia incidence was measured in concentric circles around the radio complex, rates dropped off with increasing distance from the transmitters. Based on that finding, a court-appointed expert science panel in the legal proceeding against the Vatican concluded, questionably, that "the weight of evidence...is much more in favor of the existence of a [cancer] risk" and that it "is in favor of a causal relationship." That assessment, together with the Vatican's violation of Italian power limits, is what prompted the guilty verdict last May against the Vatican officials.

6. Similar studies of populations around radio and television transmitters have been conducted during the past two decades in several countries, including the United States, Switzerland, the Netherlands, and New Zealand. But all these studies are crippled by the very low normal incidence of leukemia, the need to study very large populations, and the technical difficulty of accurately determining actual exposure levels. "The situation has not changed that much. If you look at the string of recent epidemiological studies, they are still equivocal," says Keith Florig, a specialist in risk analysis and radiation protection at Carnegie Mellon University, in Pittsburgh. Florig expressed surprise at the court's ruling in the Vatican case.

Others agree that the ruling was premature. "I'm quite concerned about a rush to judgment based on a less-than-adequate understanding of the scientific issues," says Wayne Overbeck, a specialist in the legal aspects of communications at

California State University, in Fullerton. (Overbeck, a ham radio operator, takes precautions to avoid exposing himself and other people to excess RF radiation.)

Local inhabitants, on the other hand, reacted to the Italian court's finding with jubilation. "We are satisfied; we had to suffer the arrogance of the Vatican for years," one resident told the press. Representatives of Vatican Radio, maintaining that the radiation levels are safe, said that they found the judgment unjust and plan to appeal it.

7. The case of Vatican Radio is but the latest episode in a half-century-long scientific controversy. Last December, a panel of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), headquartered in Oberschleissheim, Germany, published a global review of epidemiological studies dealing with the impact on health of electromagnetic waves. The report covered a range of RF sources, including cellphones and communication towers, and one section reviewed eight epidemiological studies of residents living around radio and television transmitters, including Michelozzi's study.

The panel found the results inconclusive. "For these studies to be informative, there have to be better exposure assessments, and the numbers [of people in the samples] should be larger," says Anders Ahlbom of the Karolinska Institute in Stockholm, Sweden, who led the study. "Even taken together, they don't really suggest any health risks," he says.

8. RF radiation is nonionizing—that is, it cannot break the bonds in molecules—and no plausible biophysical mechanism has been proposed that would predict biological effects from low-level fields, except as related to heating. Therefore, many scientists in the field have viewed research on the biological effects of radio waves with some skepticism. Radio frequencies do, however, induce currents in parts of the human body, which can resonate as a half-wave antenna: there is a maximum in the fraction of incident energy that is absorbed in the whole body at 100 megahertz and at 800 MHz in the head—the latter is close to the 850 and 900 MHz frequencies used for mobile phones in the United States and Europe. Exposure limits, such as those recommended by the IEEE, take that effect into account.

9. In addition to epidemiological studies, researchers are looking at what happens to cultures of human cells (and also of other organisms) when they are exposed to radio waves of intensities that do not produce any significant heating in the material in which the radiation is absorbed. Most useful for risk assessment are standardized animal studies, which are being undertaken in a number of labs around the world. But some researchers are pursuing other areas of investigation, some of which are scientifically controversial.

At CNR-IREA, the Italian National Research Council's Institute for Electromagnetic Sensing of the Environment, in Naples, researchers place petri dishes with cell cultures in beams of radio waves and then compare the cells with control samples that have not been irradiated. DNA damage, cell division, oxidative stresses, and the induction of apoptosis (cell death) are some of the effects the small Naples group investigates.

So far, however, such studies "do not produce a coherent picture," says Maria Rosaria Scarfi, a researcher at CNR-IREA. Fundamentally, the absence of theoretical models explaining the interaction between electromagnetic fields and biological systems complicates the research, she says.

10. Despite the lack of compelling results, whether the focus is on cellular changes or statistical anomalies found in connection with radio transmitters, high-power lines, or mobile telephony, Ahlbom thinks that research should continue, because RF radiation is so ubiquitous. "So many people are exposed. I think it makes sense to try to investigate as much as possible whether there might be any risks, although the likelihood is against [there being any] risks."

In the meantime, the inhabitants of Cesano can, in principle, rest assured that they are in no great danger. "The exposure from the [Vatican] transmitters is much lower than what you receive from ordinary cellphones—several orders of magnitude lower," says Ahlbom. This does not mean, however, that Cesano residents actually are relaxing or giving up their struggle to close down the Vatican complex altogether.

11. Italy's stricter limits on RF energy exposure, ironically, seem to have made the public more ill at ease rather than more confident. Though they were intended to

provide an extra measure of safety, the limits "actually increased public fears and controversies," concludes Paolo Vecchia of Italy's National Institute of Health, in Rome, and Kenneth R. Foster, a professor of biophysical engineering at the University of Pennsylvania, in Philadelphia. Vecchia and Foster believe this is because the public took the stricter Italian limits to be an admission that RF fields really are dangerous in the long run.

For this very reason, Vecchia and Foster note in an article they wrote about the Vatican controversy for IEEE Technology and Society in winter 2002, the World Health Organization in Geneva has advised against adoption of overly cautious exposure limits. The organization warns that the credibility of exposure standards is undermined if limits are lowered to levels "that bear no relationship to the established hazards or have inappropriate arbitrary adjustments."

Task 1. *Can you understand the meaning of the underlined words from the context?*

Task 2. *Find the words in the text with similar meaning to the words below*:

To transmit (para 1)	To try (para 3)	ingest (para 8)
To hold (para 6)	Impact (para 6)	general (para 10)
To study (para 9)	too (para 11)	

Find the words with opposite meaning o the following:

Same (para 1)	To obey (para 3)
To rise (para 5)	questionable (para 6)
to make easy (para 9)	

Task 4. *What do these words mean? What part of speech are they? What affixes are used in them?*

Insignificant	environmentalist	measurement
Overturned	epidemiological	statistically
Disconcerting	concentric	questionably
Inconclusive	nonionising	overly
Credibility	inappropriate	likelihood

Task 5. *Analyze the following sentences from the text.*

1. But to the inhabitants of Cesano and neighboring communities, the antennas, some transmitting at an effective 600 kilowatts, represent not only a blight on the landscape and something of a nuisance—hearing the Pope's voice picked up by your front-door intercom is not always appreciated—but also a possible health threat .

2. Several years ago, an Italian environmental minister, Willer Bordon, organized field strength measurements and found that the Vatican's radio transmitters violated Italy's radiation standards, which are much stricter than those in other parts of the world.

3. But a somewhat more disconcerting finding in her study made a stronger impression on critics of the Vatican, members of the press, and even some experts.

4. Based on that finding, a court-appointed expert science panel in the legal proceeding against the Vatican concluded, questionably, that "the weight of evidence...is much more in favor of the existence of a [cancer] risk" and that it "is in favor of a causal relationship."

5. Radio frequencies do, however, induce currents in parts of the human body, which can resonate as a half-wave antenna: there is a maximum in the fraction of incident energy that is absorbed in the whole body at 100 megahertz and at 800 MHz in the head—the latter is close to the 850 and 900 MHz frequencies used for mobile phones in the United States and Europe.

6. DNA damage, cell division, oxidative stresses, and the induction of apoptosis (cell death) are some of the effects the small Naples group investigates.

7. Despite the lack of compelling results, whether the focus is on cellular changes or statistical anomalies found in connection with radio transmitters, high-power lines, or mobile telephony, Ahlbom thinks that research should continue, because RF radiation is so ubiquitous.

8. Italy's stricter limits on RF energy exposure, ironically, seem to have made the public more ill at ease rather than more confident.

Task 6. *Find out the meaning of the following phrases from the text and make your own sentences with them.*

at the height of   to stand trial   in favor of

take into account makes sense in the long run
at ease rather than

Task 7. *Find examples of infinitives in the text.*

Language Skills.

Inversion.

Инверсия – это отступление от прямого порядка слов в английском предложении.

Случаи отступления от прямого порядка слов:

- образование вопросительной формы;
- необходимость особо выделить (усилить) тот или иной член предложения;
- необходимость улучшить ритм предложения

В начало предложения может выноситься -

- дополнение: **This mistake** we observed in all his articles.
- сказуемое: In the vacuum **was** a new sample. **There are** some interesting facts about this scientist in this article.
- смысловая часть сказуемого: **Remaining** to be discussed is the main problem.
- со словами ***though*** и ***as***: **Difficult** ***though*** it may be the problem will be formulated.
- после слов ***only, never, rarely, nowhere, not only…but, hardly … when, neither, nor: But only*** recently **have** experts started monitoring those phenomena and correlating them to earthquakes.

Task 1. *Translate the text paying attention to inversion and emphatic constructions.*

Material Research is not new, but the interdisciplinary aspects of materials research now are receiving considerable emphasis. It has been only since chemists, physicists, metallurgists, ceramicists, polymer chemists, and other scientists began studying the detailed structure and properties of materials that the fundamental relationships underlying basic materials phenomena have begun to be understood.

It was not until recently that it has become increasingly evident that the rapid exploitation of new discoveries and their incorporation into the technology depends largely on the combined efforts of research scientists and engineers drawn from several different disciplines.

The overwhelming problems of today are forcing the disciplines to seek advice from one another.

Not only does the blending of various disciplines result in enhanced research, but modern materials systems themselves often are created from the integration of two or more materials. These systems do result in new materials having properties not previously available.

It is the lack of materials that are adequate to meet the needs imposed on them that many of the holding problems in our technological development stem from.

Discussion Matter.

Prepare a short talk about other factors of technological influence on people, animals and nature. Include the description of a scheme or a chart into your report.

Module VIII.

Grammar: Comparison**.**

Reading: Fiber to the Brain.

Language Skills: Making Predictions.

Discussion: Forecast for the future.

Grammar.

Comparison of adjectives and adverbs.

	Absolute	**Comparative**	**Superlative**
Adjectives	New	Newer	The newest
	Big	Bigger	The biggest
	Tiny	Tinier	The tiniest
	Clever	Cleverer	The cleverest
Adverbs	Soon	Sooner	The soonest
	Late	Later	The latest
	Early	Earlier	The earlier

Adjectives	Convenient Beautiful	More convenient More beautiful	The most convenient The most beautiful
Adverbs	Easily Carefully	More easily More carefully	The most easily The most carefully
Adjectives	Common Gentle	Commoner More common Gentler More gentle	The commonest The most common The gentlest The most gentle
Adjectives	Bad Far Good Many	Worse Further/farther Better More	The worst The furthest/farthest The best The most
Adverbs	Badly Far Little Much Well	Worse Further/farther Less More Better	The worst The furthest/farthest The least The most The best

Comparative structures.

I. Equivalence.

As …as	are similar	each
As many …as	equal to	either
As much …as	is like	all
The same …as	similar/ly	both
Similar to	equal/ly	alike
The same	compared to	etc.

II. Non-equivalence.

Not as … as	greater than	unequal/ly
…-er than	not as many … as	unlike
More … than	not as much … as	not the same …as
Fewer … than	not equal to	not all

Less …than	etc.

III. The highest degree.

The … -est	the most …	the least …

IV. Parallel increase.

The …-er, the more ….
The more …, the …-er
The …-er, the less ….

Task 1. *Translate the following sentences with comparative and superlative degrees.*

1. The condition M greater than or less than N ensures that the capacity C is satisfied at all the stages. 2. The exact expressions are almost as easy to evaluate as the approximate ones. 3. The less sharp the pulse the greater the path length. 4. Opposed to this are two factors, neither measurable. 5. Cellulose is the most abundant of all naturally occurring organic substances. 6. This model is not so important as a financial one. 7. The easiest answer is not the most enlightening. 8. A compound is considered more stable the smaller its potential energy. 9. Either process will take place more readily in the more basic solutions. 10. There are at least three objections to such a plan. 11. The axis is turned by as much as thirty degrees. 12. Their results were neither conclusive nor optimistic. 13. The higher the purity of titanium the easier it is to fabricate, but the lower is its strength. 14. Life began in water and most probably in sea water. 15. The most serious problem is that of finding much more precisely how long man can endure permanence in space.

Task 2. *Write a comparative or superlative form of the adjective in the sentences.*

1. She sings …. (good) than anyone else I've ever heard.
2. This work seemed … (complicated) than it turned out to be.
3. It's … (long) day of the year.
4. … (many) clothes she buys, … (many) clothes she wants to buy.
5. My mother's driving is getting … and … (dangerous) as the years go by.
6. … (old) I get, … (dark) my hair gets.

Task 3. *Compare different applications or anti-virus programs, or semiconductor devices, etc.*

Task 4. *The following text has prospects about nanotechnology in future. What's more likely to appear? Express your opinion using comparatives.*

Nanotechnology Breakthroughs of the Next 15 Years

Nanotechnology — the manipulation of materials and machines at the nano-scale — one billionth of a meter — promises exciting new developments. Interviews with a group of nanotechnology experts yielded this list of likely developments:

Two to five years from now:

1. Car tires that need air only once a year.
2. Complete medical diagnostics on a single computer chip.
3. Go-anywhere concentrators that produce drinkable water from air.

Five to 10 years

4. Powerful computers you can wear or fold into your wallet.
5. Drugs that turn AIDS and cancer into manageable conditions.
6. Smart buildings that self-stabilize during earthquakes or bombings.

10 to 15 years

7. Artificial intelligence so sophisticated you can't tell if you're talking on the phone with a human or a machine.
8. Paint-on computer and entertainment video displays.
9. Elimination of invasive surgery, since bodies can be monitored and repaired almost totally from within.

Reading.

You are going to read the text called “Fiber to the brain”. What do you think the text is going to be about? What do you know about nanotechnology in medicine? Which of these words do you expect to see in the text? Do you know what they mean?

Muscle	***wire***	***skull***	***tissue***	***cell***	***sensor***
Vessel	***software***	***converter***	***gauge***		***wound***

Task 1. *Read the text and see if you were right about the meaning of the words above.*

Fiber to the Brain

Today, surgical procedures for implanting electronic devices that stimulate the heart muscle to correct abnormal cardiac rhythms are considered routine. But addressing the brain in this way—and reaching areas deep within the cerebral mass without destroying neurons en route—is another matter.

While surgeons have successfully installed electrodes in the brain that have restored a semblance of sight or hearing, stopped the tremors of Parkinson's disease, and cataloged the brain's responses to environmental stimuli, they've always had to break in through the skull. That procedure damages healthy brain tissue, exposes patients to infection, and leaves wires sticking out of their heads. And over time, scar tissue forms around the electrodes, encapsulating them and isolating them from the active brain tissue.

In a paper that appeared in the 5 July issue of The Journal of Nanoparticle Research, researchers from the New York University Medical Center, the Massachusetts Institute of Technology, and the University of Tokyo demonstrate how advances in nanotechnology could lead to a better way of getting into the brain. The team, led by Rodolfo Llinas, head of the department of physiology and neuroscience at the NYU Medical Center, in New York City, has devised a method for attaching electrodes to small clusters of brain cells—or even individual neurons—using the cardiovascular system as the conduit through which wires are threaded.

The researchers predict that within a decade or so, it will be possible to insert a catheter into a large artery and guide it through the circulatory system to the brain. Once there, an array of nanowires (wires with diameters on the order of 10-9 meters) would spread into a "bouquet" consisting of millions of tiny probes that could use the 25 000 meters of 10-micrometer-wide capillaries inside the brain as a way to harmlessly reach specific locations within the brain.

In the team's proof-of-concept experiments, they maneuvered 500-nm-diameter platinum wires through the blood vessels in human tissue samples and detected the electrical activity of living brain cells placed adjacent to the tissue. At the same time, they created software and hardware that will likely form a type of analog-to-digital converter, turning signals emitted by the brain into digital signals and vice versa.

"Five years ago, we [at the MIT BioInstrumentation Laboratory] created arrays comprising 100 microelectrodes that [required us] to open the skull and literally punch electrodes into the brain to do recordings," said Patrick Anquetil, a coauthor of the paper who is a Ph.D. candidate at MIT, in Cambridge, Mass. "When we started our collaboration with Professor Llinas and showed him the original work, he was really shocked at how crude a method it was. It was his idea to use the bloodstream, or, in his words, 'the plumbing that is already there.'"

Since then, the challenge has been to create a connector that is small enough at one end to reach any neuron without blocking blood flow, but large enough at the other end (roughly 500 mm) so it can connect with instruments for recording or for delivering pulses of electricity. "That's actually the whole problem with nanotechnology," says Anquetil. "It's actually easy to create these [very tiny] structures, but how do you interface them with our macro world?"

One solution for making this stepping down of wire gauges possible was changing the type of wire. The platinum wires used in the experiments are being phased out in favor of conducting polymers, because they are cheaper, can be turned into much thinner wires, and are more flexible. The team is working on a process to create conducting polymer nanowires as thin as 100 nm.

They believe that a nanowire of this type can also be made steerable so that it could be directed along one of many small blood vessels branching out from a larger one. When a small current is applied to a suitably doped wire, the polymers swell or contract, prompting the wire to bend in a controllable way. The arrangement in the material of dopant (a chemical additive that determines whether the material has the electrical properties of a semiconductor or a conductor) can be electrochemically switched in real time.

What's more, the conducting polymer material is biodegradable, so depending on its composition, it can be implanted for short-term studies or medical diagnostics and will decompose in a manner similar to the sutures used by surgeons to close wounds below the skin. For longer-term connections, such as those that would make possible a through-the-bloodstream cerebral pacemaker for Parkinson's patients, a different polymer formulation would be created from the same set of basic molecular building blocks.

"One of the reasons we're so excited about [these polymers] in the long term is that they are, to our knowledge, the only materials that allow you to build a whole system from the same class of materials," said Anquetil. "Not only can you create wires to transmit information or energy, you can build actuators [to replicate the function of muscles], logic gates for computation, or even sensors."

Task 2. *Find the translation to the underlined words*.

Task 3. *Answer the following questions on the text.*

1.What methods are used now to reach the wounds under the skin? 2. What new opportunities does nanotechnology give in this respect? 3. What materials are supposed to be used in such methods? 4. Are there any problems with introducing this technology into practice? 5. What sort of problems with nanotechnology as a whole is mentioned here?

Task 4. *Make questions to these answers.*

1.That procedure damages healthy brain tissue, exposes patients to infection, and leaves wires sticking out of their heads. 2. How crude a method it was. 3. One of the reasons we're so excited about [these polymers] in the long term is that they are, to our knowledge, the only materials that allow you to build a whole system from the same class of materials.

Task 5. *Analyze the following sentences*.

1. Once there, an array of nanowires (wires with diameters on the order of 10-9 meters) would spread into a "bouquet" consisting of millions of tiny probes that could use the 25 000 meters of 10-micrometer-wide capillaries inside the brain as a way to harmlessly reach specific locations within the brain.
2. "When we started our collaboration with Professor Llinas and showed him the original work, he was really shocked at how crude a method it was.
3. The platinum wires used in the experiments are being phased out in favor of conducting polymers, because they are cheaper, can be turned into much thinner wires, and are more flexible.
4. "Not only can you create wires to transmit information or energy, you can build actuators [to replicate the function of muscles], logic gates for computation, or even sensors."

Task 6. *Find examples of Gerunds*, *Participles and Infinitives in the text*.

Discussion matter.

You have read the text about using nanotechnology in treating brain diseases. Prepare your own report about using nanotechnology in other areas of our life. Use the following plan to speak about.

- the traditional way
- the main idea of using nanotechnology in the same area
- the advantages of using nanotechnology
- the problems
- the prospects

React and express your own opinion on your friends' reports using speech patterns.

Communication Skills.

Making Predictions.

Certainty	Will (definitely, certainly) Certain, sure Without a doubt, without a question
Probability	Probable, probably, likely Most/highly probable, most probably Most/highly likely
Possibility	May (not), might (not), can, could Possible, possibly, perhaps
Improbability	Improbable, unlikely Doubtful, questionable Probably not Most/highly improbable/unlikely Most/highly doubtful/questionable Most probably not
Impossibility	Cannot, could not Not possible, impossible

Task 1. *Read the following predictions about the future and decide what you agree with and what you disagree with. Prove your answers.*

- Forecast #1: Generation Y will migrate heavily overseas. For the first time, the United States will see a significant proportion of its population emigrate due to overseas opportunities. According to futurists Arnold Brown and Edie Weiner, Generation Y, the population segment born between 1978 and 1995, may be the first generation in U.S. history to have many of its members leave the U.S. to pursue large portions of their lives, if not their entire adult lives, overseas.

- Forecast #2: Dwindling supplies of water in China will impact the global economy. With uneven development across China, the most water-intensive industries and densest population are in regions where water is scarcest. The result is higher prices for commodities and goods exported from China, so the costs of resource and environmental mismanagement are transferred to the rest of the world.
- Forecast #3: Workers will increasingly choose more time over more money. The productivity boom in the U.S. economy during the twentieth century created a massive consumer culture--people made more money, so they bought more stuff. In the twenty-first century, however, workers will increasingly choose to trade higher salaries for more time with their families. Nearly a third of U.S. workers recently polled said they would prefer more time off rather than more hours of paid employment.
- Forecast #4: We'll incorporate wireless technology into our thought processing by 2030. In the next 25 years, we'll learn how to augment our 100 trillion very slow interneuronal connections with high-speed virtual connections via nanorobotics. This will allow us to greatly boost our pattern-recognition abilities, memories, and overall thinking capacity, as well as to directly interface with powerful forms of computer intelligence and to each other. By the end of the 2030s, we will be able to move beyond the basic architecture of the brain's neural regions.
- Forecast #5: Children's "nature deficit disorder" will grow as a health threat. Children today are spending less time in direct contact with nature than did previous generations. The impacts are showing up not only in their lack of physical fitness, but also in the growing prevalence of hyperactivity and attention deficit. Studies show that immersing children in outdoor settings--away from television and video games--fosters more creative mental activity and concentration.
- Forecast #6: Outlook for Asia: China for the short term, India for the long term. By 2025, both countries will be stronger, wealthier, freer, and more

stable than they are today, but India's unique assets--such as widespread use of English, a democratic government, and relative transparency of its institutions--make it more economically viable farther out.

- Forecast #7: The robotic workforce will change how bosses value employees. As robots and intelligent software increasingly emulate the knowledge work that humans can do, businesses will "hire" whatever type of mind that can do the work--robotic or human. Future human workers may collaborate with robotic minds on projects for a variety of enterprises, rather than work for a single employer.
- Forecast #8: The costs of global-warming-related disasters will reach $150 billion per year. The world's total economic loss from weather-related catastrophes has risen 25% in the last decade. According to the insurance firm Swiss Re, the overall economic costs of catastrophes related to climate change threatens to double to $150 billion per year in a decade. The U.S. insurance industry's share would be $30-$40 billion annually. However, the size of these estimates also reflects increased growth and higher real-estate prices in coastal communities.
- Forecast #9: Companies will see the age range of their workers span four generations. Workers over the age of 55 are expected to grow from 14% of the labor force to 19% by 2012. In less than five years, 77 million baby boomers in the United States will begin reaching age 65, the traditional retirement age. As a result, the idea of "retirement" will change significantly.
- Forecast #10: A rise of disabled Americans will strain public transportation systems. By the year 2025, the number of Americans aged 65 or older will expand from 35 million to more than 65 million according to the U.S. Census Bureau. Individuals in that age group are more than twice as likely to have a disability as those aged 16 to 65. If that figure remains unchanged, the number of disabled people living in the United States will grow to 24 million over the course of the next 20 years. Rising rates of outpatient care and chronic illness

point to an increased demand for public transportation as well as special public transportation services in the coming decades.

Discussion Matter.

Imagine you have invented a prefect device. You need money to develop it and to put it into production. Prepare a short talk to the audience who are your possible investors. Include you view on its future application and prove its usefulness.

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