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РАЗВИТИЕ ПОЗНАВАТЕЛЬНОЙ САМОСТОЯТЕЛЬНОСТИ СТУДЕНТА В КУРСЕ «ТЕХНИЧЕСКИЙ ПЕРЕВОД»

ПРАКТИКУМ

Рекомендовано Ученым советом государственного образовательного учреждения высшего профессионального образования «Оренбургский государственный университет» в качестве учебного пособия для студентов естественнонаучных и инженерно-технических специальностей, обучающихся по программам высшего профессионального образования

Оренбург 2008

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Т 35 **Развитие познавательной самостоятельности студента в курсе «Технический перевод»: практикум/ Г. В. Терехова, Л.Г.Акопян, Л.П. Терехова. – Оренбург: ГОУ ОГУ, 2008. – 105 с.**

В практикуме приведены аутентичные тексты на английском языке по информационным технологиям, задания к текстам для обучения переводу, глоссарий.

Цель практикума - развитие познавательной самостоятельности студентов в рамках курса «Технический перевод».

Практикум предназначен для студентов высших учебных заведений естественнонаучных и инженерно-технических специальностей, изучающий английский язык.

Содержание

Введение

Данный практикум по техническому переводу с английского языка предназначен для студентов 2 - 3 курсов естественнонаучных и инженерно-технических специальностей. Цель практикума - развитие познавательной самостоятельности студентов в рамках курса «Технический перевод».

Практикум состоит из восьми разделов. Цель первого раздела – ознакомление на основе текстов с биографиями известных ученых, чья деятельность была связана с информационными технологиями. Все тексты - аутентичные.

Цель второго раздела – научить студентов работать с различными видами научных публикаций на английском языке. Все упражнения данного раздела носят коммуникативный характер.

Третий и четвертый разделы предназначены для самостоятельной работы студентов. Целью данных разделов является развитие у студентов навыков чтения и перевода научно-технической литературы. При чтении оригинальных английских текстов студенты узнают подробнее о путях развития компьютерных технологий.

Пятый и шестой разделы носят познавательный характер и могут служить источником дискуссий на занятиях в продвинутых группах с ориентацией на самостоятельную внеаудиторную работу под контролем преподавателя.

В седьмом и восьмом разделах даны глоссарий терминов и вокабуляр, которые помогут студентам при переводе текстов по информационным технологиям.

1Section I Great people

1.1 Text I Biography of Bill Gates

1.1.1 Read the text, translate it and answer the questions: What is your attitude to William H.Gates? Why do any people dislike him or even hate him?

William (Bill) H. Gates is chairman of Microsoft Corporation, the worldwide leader in software, services and solutions that help people and businesses realize their full potential. Microsoft had revenues of $51.12 billion for the fiscal year ending June 2007, and employs more than 78,000 people in 105 countries and regions.

On June 15, 2006, Microsoft announced that effective July 2008 Gates will transition out of a day-to-day role in the company to spend more time on his global health and education work at the Bill & Melinda Gates Foundation. After July 2008, Gates will continue to serve as Microsoft's chairman and an advisor on key development projects. The two-year transition process is to ensure that there is a smooth and orderly transfer of Gates' daily responsibilities. Effective June 2006, Ray Ozzie has assumed Gates' previous title as chief software architect and is working side by side with Gates on all technical architecture and product oversight responsibilities at Microsoft. Craig Mundie has assumed the new title of chief research and strategy officer at Microsoft and is working closely with Gates to assume his responsibility for the company's research and incubation efforts.

Born on October 28, 1955, Gates grew up in Seattle with his two sisters. Their father, William H. Gates II, is a Seattle attorney. Their late mother, Mary Gates, was a schoolteacher, University of Washington regent, and chairwoman of United Way International.

Gates attended public elementary school and the private Lakeside School. There, he discovered his interest in software and began programming computers at age 13.

In 1973, Gates entered Harvard University as a freshman, where he lived down the hall from Steve Ballmer, now Microsoft's chief executive officer. While at Harvard, Gates developed a version of the programming language BASIC for the first microcomputer - the MITS Altair.

In his junior year, Gates left Harvard to devote his energies to Microsoft, a company he had begun in 1975 with his childhood friend Paul Allen. Guided by a belief that the computer would be a valuable tool on every office desktop and in every home, they began developing software for personal computers. Gates' foresight and his vision for personal computing have been central to the success of Microsoft and the software industry.

Under Gates' leadership, Microsoft's mission has been to continually advance and improve software technology, and to make it easier, more cost-effective and more enjoyable for people to use computers. The company is committed to a long-term view, reflected in its investment of approximately $7.1 billion on research and development in the 2007 fiscal year.

In 1999, Gates wrote Business @ the Speed of Thought, a book that shows how computer technology can solve business problems in fundamentally new ways. The book was published in 25 languages and is available in more than 60 countries. Business @ the Speed of Thought has received wide critical acclaim, and was listed on the best-seller lists of the New York Times, USA Today, the Wall Street Journal and Amazon.com. Gates' previous book, The Road Ahead, published in 1995, held the No. 1 spot on the New York Times' bestseller list for seven weeks.

Gates has donated the proceeds of both books to non-profit organizations that support the use of technology in education and skills development.

In addition to his love of computers and software, Gates founded Corbis, which is developing one of the world's largest resources of visual information - a comprehensive digital archive of art and photography from public and private collections around the globe. He is also a member of the board of directors of Berkshire Hathaway Inc., which invests in companies engaged in diverse business activities.

Philanthropy is also important to Gates. He and his wife, Melinda, have endowed a foundation with more than $28.8 billion (as of January 2005) to support philanthropic initiatives in the areas of global health and learning, with the hope that in the 21st century, advances in these critical areas will be available for all people. The Bill and Melinda Gates Foundation has committed more than $3.6 billion to organizations working in global health; more than $2 billion to improve learning opportunities, including the Gates Library Initiative to bring computers, Internet access and training to public libraries in low-income communities in the United States and Canada; more than $477 million to community projects in the Pacific Northwest; and more than $488 million to special projects and annual giving campaigns.

Gates was married on Jan. 1, 1994, to Melinda French Gates. They have three children. Gates is an avid reader, and enjoys playing golf and bridge.

If we are talking creativity and ideas, Bill Gates is an American unoriginal. He is Microsoft's chief and co-founder, he is the world's richest man, and his career delivers this message: It can be wiser to follow than to lead. Let the innovators hit the beaches and take the losses; if you hold back and follow, you can clean up in peace and quiet.

Gates is the Bing Crosby of American technology, borrowing a tune here and a tune there and turning them all into great buffo hits — by dint of heroic feats of repackaging and sheer Herculean blandness. Granted he is (to put it delicately) an unusually hard-driving and successful businessman, but the Bill Gates of our imagination is absurdly overblown.

Yet we have also been unfair to him. Few living Americans have been so resented, envied and vilified, but in certain ways his career is distinguished by decency — and he hasn't got much credit for it. Technology confuses us, throws us off the scent. Where Gates is concerned, we have barked up a lot of wrong trees.

A 1968 photo shows Bill as a rapt young teenager, watching his friend Paul Allen type at a computer terminal. Allen became a co-founder of Microsoft. The child

Gates has neat hair and an eager, pleasant smile; every last detail says "pat me on the head." He entered Harvard but dropped out to found Microsoft in 1975.

Microsoft's first product was a version of the programming language BASIC for the Altair 8800, arguably the world's first personal computer. BASIC, invented by John Kemeny and Thomas Kurtz in 1964, was someone else's idea. So was the Altair. Gates merely plugged one into the other, cream-cheesed the waiting bagel and came up with a giant hit.

By 1980, IBM had decided to build personal computers and needed a PC operating system. (Computers are born naked; they need operating systems to be presentable.) Mammoth, blue-chip IBM employed thousands of capable software builders, and didn't trust a single one of them; IBM hired Microsoft to build its operating system. Microsoft bought Q-DOS from a company called Seattle Computer Products and retailored it for the PC.

The PC was released in August 1981 and was followed into the market by huge flocks of honking, beeping clones. Microsoft's DOS was one of three official PC operating systems but quickly beat out the other two. DOS was clunky and primitive at a time when the well-dressed computer was wearing UNIX from Bell Labs or (if its tastes ran upscale) some variant of the revolutionary window-menu-mouse system that Xerox had pioneered in the 1970s. But despite (or maybe because of) its stodginess, DOS established itself as the school uniform of computing. It was homely, but everyone needed it. Once again, Gates had brokered a marriage between other people's ideas and come up with a hit. DOS was even bigger than Basic. Gates had it made.

Apple released the Macintosh in January 1984: a tony, sophisticated computer was now available to the masses. Henceforth DOS was not merely homely, it was obsolete. But it continued to rake in money, so what if the critics hated it? In May 1990, Microsoft finally perfected its own version of Apple windows and called it Microsoft Windows 3.0 — another huge hit. Now Gates really (I mean really) had it made.

By the early '90s, electronic mail and the Internet were big. Technologists forecast an Internet-centered view of computing called "mirror worlds." Technophiles enthused about the "information superhighway." The World Wide Web emerged in 1994, making browsers necessary, and Netscape was founded that same year. Sun Microsystems developed Java, the Internet programming language. Gates hung back. It wasn't until 1996 that Microsoft finally, according to Gates himself, "embraced the Internet wholeheartedly."

Why lead when you can follow? Microsoft's first browser, Internet Explorer 1.0, was licensed from a company called Spyglass. It was an afterthought, available off the shelf as part of a $45 CD-ROM crammed with random tidbits, software antipasto, odds and ends you could live without — one of which was Explorer. Today Microsoft is the world's most powerful supplier of Web browsers, and Gates really has it made. The U.S. Justice Department is suing Microsoft for throwing its weight around illegally, hitting companies like Netscape below the belt. The trial is under way. Whoever wins, Gates will still be the No. 1 man in the industry.

The world pondered Gates and assumed he must be a great thinker. During World War II, Cargo Cults flourished on New Guinea and Melanesia: people who had never seen an airplane pondered incoming U.S. aircraft and assumed they must be divine. Technology is confusing, and these were reasonable guesses under the circumstances. In 1995 Gates published a book (co-authored with Nathan Myhrvold and Peter Rinearson) called "The Road Ahead." Peering far into the future, he glimpsed a technology-rich dream world where you will be able to "watch Gone With the Wind," he wrote, "with your own face and voice replacing Vivien Leigh's or Clark Gable's." Apparently this is just what the public had been dying to do, for "The Road Ahead" became a runaway best seller, though it is lustrous with earnest goofiness, like a greased-down haircut.

And yet we tend to overlook (in sizing him up) Gates' basic decency. He has repeatedly been offered a starring role in the circus freak show of American Celebrity, Julius Caesar being offered the Emperor's crown by clamorous sycophants. He has turned it down. He does not make a habit of going on TV to pontificate, free-associate or share his feelings. His wife and young child are largely invisible to the public, which represents a deliberate decision on the part of Mr. and Mrs.

If postwar America of the 1950s and '60s democratized middle-classness, Gates has democratized filthy-richness — or has at least started to. Get the right job offer from Microsoft, work hard, get rich; no miracle required. Key Microsoft employees pushed Gates in this direction, but he was willing to go, and the industry followed. The Gates Road to Wealth is still a one-laner, and traffic is limited. But the idea that a successful corporation should enrich not merely its executives and big stockholders but also a fair number of ordinary line employees is (although not unique to Microsoft) potentially revolutionary. Wealth is good. Gates has created lots and has been willing to share.

Today Gates, grown very powerful and great, sits at the center of world technology like an immense frog eyeing insect life on the pond surface, now and then consuming a tasty company with one quick dart of the tongue.

But the Microsoft Windows world view is dead in the water, and Microsoft has nothing to offer in its place. Windows is a relic of the ancient days when e-mail didn't matter, when the Internet and the Web didn't matter, when most computer users had only a relative handful of files to manage. Big changes are in the works that will demote computers and their operating systems to the status of TV sets. You can walk up to any TV and tune in CBS; you will be able to walk up to any computer and tune in your own files, your electronic life. The questions of the moment are, What will the screen look like? How will the controls work? What exactly will they do? and Who will clean up?

Microsoft? Maybe. On the other hand, being the biggest, toughest frog in the pond doesn't help if you're in the wrong pond. Some people have the idea that Microsoft is fated to dominate technology forever. They had this same idea about IBM, once admired and feared nearly as much as Microsoft is today. They had essentially the same idea about Japan's technology sector back in the 1980s and early '90s. It isn't quite fair to compare Microsoft to a large country yet. But Japan was on a roll and looked invincible — once. (Or, if you go back to Pearl Harbor, twice.)

As for Gates himself, he is no visionary; he is a technology groupie with a genius for showing up, for being at the right place at the right time. His secret is revealed in that old photo with Paul Allen. He is a man who likes computers very much. Not their intellectual underpinnings, not the physics or electronics, not the art or philosophy or mathematics of software — just plain computers. He's crazy about them. It seems like an odd passion, but after all, some people are crazy about Pop-Tarts. And Gates will be remembered alongside Pop-Tarts, in the long run, as vintage Americana, a sign of the times. A little on the bland side perhaps, unexciting, not awfully deep, not to everyone's taste, but not all that bad. (David Gelernter is a professor of computer science at Yale University and author most recently of Machine Beauty). [1]

1.1.2 Find the main sentences in the text and retell the text using these sentences. While retelling add personal information

1.2 Text II About Tim Berners-Lee

1.2.1 Read the text and answer the questions: What is Berners-Lee famous for? What is he responsible for?

From the thousands of interconnected threads of the Internet, he wove the World Wide Web and created a mass medium for the 21st century By JOSHUA QUITTNER

Monday, March 29, 1999

Want to see how much the world has changed in the past decade? Log on to the Internet, launch a search engine and type in the word enquire (British spelling, please). You'll get about 30,000 hits. It turns out you can "enquire" about nearly anything online these days, from used Harley Davidsons for sale in Sydney, Australia ("Enquire about touring bikes. Click here!"), to computer-training-by-e-mail courses in India ("Where excellence is not an act but a habit"). Click once to go to a site in Nairobi and enquire about booking shuttle reservations there. Click again, and zip off to Singapore, to a company that specializes in "pet moving." Enquire about buying industrial-age nuts and bolts from "the Bolt Boys" in South Africa, or teddy bears in upstate New York. Exotic cigar labels! Tantric sex guides! Four-poster beds for dogs!

So what, you say? Everybody knows that with a mouse, a modem and access to the Internet, these days you can point-and-click anywhere on the planet, unencumbered by time or space or long-distance phone tariffs.

Ah, but scroll down the list far enough, hundreds of entries deep, and you'll find this hidden Rosebud of cyberspace: "Enquire Within Upon Everything" — a nifty little computer program written nearly 20 years ago by a lowly software consultant named Tim Berners-Lee. Who knew then that from this modest hack would flow the civilization-altering, millionaire-spawning, information suckhole known as the World Wide Web?

Unlike so many of the inventions that have moved the world, this one truly was the work of one man. Thomas Edison got credit for the light bulb, but he had dozens

of people in his lab working on it. William Shockley may have fathered the transistor, but two of his research scientists actually built it. And if there ever was a thing that was made by committee, the Internet — with its protocols and packet switching — is it. But the World Wide Web is Berners-Lee's alone. He designed it. He loosed it on the world. And he more than anyone else has fought to keep it open, nonproprietary and free.

It started, of all places, in the Swiss Alps. The year was 1980. Berners-Lee, doing a six-month stint as a software engineer at CERN, the European Laboratory for Particle Physics, in Geneva, was noodling around with a way to organize his far-flung notes. He had always been interested in programs that dealt with information in a "brain-like way" but that could improve upon that occasionally memory-constrained organ. So he devised a piece of software that could, as he put it, keep "track of all the random associations one comes across in real life and brains are supposed to be so good at remembering but sometimes mine wouldn't." He called it Enquire, short for Enquire Within Upon Everything, a Victorian-era encyclopedia he remembered from childhood.

Building on ideas that were current in software design at the time, Berners-Lee fashioned a kind of "hypertext" notebook. Words in a document could be "linked" to other files on Berners-Lee's computer; he could follow a link by number (there was no mouse to click back then) and automatically pull up its related document. It worked splendidly in its solipsistic, Only-On-My-Computer way.

But what if he wanted to add stuff that resided on someone else's computer? First he would need that person's permission, and then he would have to do the dreary work of adding the new material to a central database. An even better solution would be to open up his document — and his computer — to everyone and allow them to link their stuff to his. He could limit access to his colleagues at CERN, but why stop there? Open it up to scientists everywhere! Let it span the networks! In Berners-Lee's scheme there would be no central manager, no central database and no scaling problems. The thing could grow like the Internet itself, open-ended and infinite. "One had to be able to jump," he later wrote, "from software documentation to a list of people to a phone book to an organizational chart to whatever."

So he cobbled together a relatively easy-to-learn coding system — HTML (Hypertext Mark-up Language) — that has come to be the lingua franca of the Web; it's the way Web-content creators put those little colored, underlined links in their text, add images and so on. He designed an addressing scheme that gave each Web page a unique location, or url (universal resource locator). And he hacked a set of rules that permitted these documents to be linked together on computers across the Internet. He called that set of rules HTTP (HyperText Transfer Protocol).

And on the seventh day, Berners-Lee cobbled together the World Wide Web's first (but not the last) browser, which allowed users anywhere to view his creation on their computer screen. In 1991 the World Wide Web debuted, instantly bringing order and clarity to the chaos that was cyberspace. From that moment on, the Web and the Internet grew as one, often at exponential rates. Within five years, the number of Internet users jumped from 600,000 to 40 million. At one point, it was doubling every 53 days.

Raised in London in the 1960s, Berners-Lee was the quintessential child of the computer age. His parents met while working on the Ferranti Mark I, the first computer sold commercially. They taught him to think unconventionally; he'd play games over the breakfast table with imaginary numbers (what's the square root of minus 4?). He made pretend computers out of cardboard boxes and five-hole paper tape and fell in love with electronics. Later, at Oxford, he built his own working electronic computer out of spare parts and a TV set. He also studied physics, which he thought would be a lovely compromise between math and electronics. "Physics was fun," he recalls. "And in fact a good preparation for creating a global system."

It's hard to overstate the impact of the global system he created. It's almost Gutenbergian. He took a powerful communications system that only the elite could use and turned it into a mass medium. "If this were a traditional science, Berners-Lee would win a Nobel Prize," Eric Schmidt, CEO of Novell, once told the New York Times. "What he's done is that significant."

You'd think he would have at least got rich; he had plenty of opportunities. But at every juncture, Berners-Lee chose the nonprofit road, both for himself and his creation. Marc Andreessen, who helped write the first popular Web browser, Mosaic — which, unlike the master's browser, put images and text in the same place, like pages in a magazine — went on to co-found Netscape and become one of the Web's first millionaires. Berners-Lee, by contrast, headed off in 1994 to an administrative and academic life at the Massachusetts Institute of Technology. From a sparse office at M.I.T., he directs the W3 Consortium, the standard-setting body that helps Netscape, Microsoft and anyone else agree on openly published protocols rather than hold one another back with proprietary technology. The rest of the world may be trying to cash in on the Web's phenomenal growth, but Berners-Lee is content to labor quietly in the background, ensuring that all of us can continue, well into the next century, to Enquire Within Upon Anything.

Joshua Quittner, TIME's Personal Technology columnist, is the new editor of TIME DIGITAL. [2]

1.2.2 Find the main sentences in the text and retell the text using these sentences. While retelling add personal information

1.3 Text III Arthur Clarke

1.3.1 Read the text and answer the questions: What is your attitude to Arthur Clarke? Have you read any of his books? Do you like them?

Hello! This is Arthur Clarke, speaking to you from my home in Colombo, Sri Lanka. As I approach my 90th birthday, my friends are asking how it feels like, to have completed 90 orbits around the Sun. Well, I actually don't feel a day older than 89! Of course, some things remind me that I have indeed qualified as a senior citizen. As Bob Hope once said: "You know you're getting old, when the candles cost more than the cake!"

I'm now perfectly happy to step aside and watch how things evolve. But there's also a sad side to living so long: most of my contemporaries and old friends have already departed. However, they have left behind many fond memories, for me to recall. I now spend a good part of my day dreaming of times past, present and future. As I try to survive on 15 hours' sleep a day, I have plenty of time to enjoy vivid dreams. Being completely wheel-chaired doesn't stop my mind from roaming the universe - on the contrary!

In my time I've been very fortunate to see many of my dreams come true! Growing up in the 1920s and 1930s, I never expected to see so much happen in the span of a few decades. We 'space cadets' of the British Interplanetary Society spent all our spare time discussing space travel - but we didn't imagine that it lay in our own near future.

I still can't quite believe that we've just marked the 50th anniversary of the Space Age! We've accomplished a great deal in that time, but the 'Golden Age of Space' is only just beginning. After half a century of government-sponsored efforts, we are now witnessing the emergence of commercial space flight.

Over the next 50 years, thousands of people will travel to Earth orbit - and then, to the Moon and beyond. Space travel - and space tourism - will one day become almost as commonplace as flying to exotic destinations on our own planet. Things are also changing rapidly in many other areas of science and technology. To give just one example, the world's mobile phone coverage recently passed 50 per cent -- or 3.3 billion subscriptions. This was achieved in just a little over a quarter century since the first cellular network was set up. The mobile phone has revolutionized human communications, and is turning humanity into an endlessly chattering global family! What does this mean for us as a species?

Communication technologies are necessary, but not sufficient, for us humans to get along with each other. This is why we still have many disputes and conflicts in the world. Technology tools help us to gather and disseminate information, but we also need qualities like tolerance and compassion to achieve greater understanding between peoples and nations.

I have great faith in optimism as a guiding principle, if only because it offers us the opportunity of creating a self-fulfilling prophecy. So I hope we've learnt something from the most barbaric century in history - the 20th. I would like to see us overcome our tribal divisions and begin to think and act as if we were one family. That would be real globalisation. As I complete 90 orbits, I have no regrets and no more personal ambitions. But if I may be allowed just three wishes, they would be these.

Firstly, I would like to see some evidence of extra-terrestrial life. I have always believed that we are not alone in the universe. But we are still waiting for ETs to call us - or give us some kind of a sign. We have no way of guessing when this might happen - I hope sooner rather than later!

Secondly, I would like to see us kick our current addiction to oil, and adopt clean energy sources. For over a decade, I've been monitoring various new energy experiments, but they have yet to produce commercial scale results. Climate change

has now added a new sense of urgency. Our civilisation depends on energy, but we can't allow oil and coal to slowly bake our planet.

The third wish is one closer to home. I've been living in Sri Lanka for 50 years - and half that time, I've been a sad witness to the bitter conflict that divides my adopted country. I dearly wish to see lasting peace established in Sri Lanka as soon as possible. But I'm aware that peace cannot just be wished -- it requires a great deal of hard work, courage and persistence.

I'm sometimes asked how I would like to be remembered. I've had a diverse career as a writer, underwater explorer, space promoter and science populariser. Of all these, I want to be remembered most as a writer - one who entertained readers, and, hopefully, stretched their imagination as well.

I find that another English writer -- who, coincidentally, also spent most of his life in the East -- has expressed it very well. So let me end with these words of Rudyard Kipling:

If I have given you delight
by aught that I have done.
Let me lie quiet in that night
which shall be yours anon;
And for the little, little span
the dead are borne in mind,
seek not to question other than,
the books I leave behind.
This is Arthur Clarke, saying Thank You and Goodbye from Colombo! [3]

1.4 Work in pairs

1.4.1 Read the following dialogues, dramatize them in pairs doing some changes and additions

I

A: I see your university is a rather new one.

B: Yes, it was founded twenty years ago becoming the twelfth higher educational establishment in the city.

A: How many faculties are there in your university and what is the total number of students involved in all forms of studies? B: About eight thousand students in eight faculties.

II

A: Is there any system of further education in Russia for those adults who work after leaving school?

B: For these people almost every university and institute in our country has evening and extra-mural departments.

A: Do such students get any instruction on the premises of the university and if so how often do they come? '

B: Students of the evening department attend classes four times a week. As to the extra mural students, they have classes during mid-session examinations '(in winter) and session (in June).

III

A: What subjects do students take at the university? B: It depends on the faculty and the year they are in. A: Well, let's say the first year at the faculty of language and literature. B: Among the subjects studied in the first year are: linguistics, languages (Russian, Latin, national and foreign), literature, history, ethnography [etnografi], and physical training.

IV

A: Your institute covers a large area.

B: Yes, rather. Here is the administrative block. Farther and behind there are four teaching blocks. The library and the students' hostel (halls of residence) are on your left. There you can also see the union building.

A: It's quite a campus.

B: Yes, I know what you mean. The institute was planned and built as a single, separate complex on the outskirts of the city.

V

A: Did you pass all your session exams?

B: Yes. I could hardly manage them. I was sure I would fail at least two of them.

A: The trouble is that you burn the candle at both ends. You can't work all day and play at night.

B: But I don't. I sat up late and worked at night for the last two weeks. Л: Studying at night isn't good either. You need your rest, too. B: I took a short sleep every few hours.

A: Well, well. You should be serious about your studies at the university. It isn't a playground or a kind of pastime, you know.

VI

A: I enjoyed yesterday's lecture very much. The speaker really knew his subject, didn't he?

B: Yes, he covered it from A to Z, giving the audience convincing arguments and examples.

A: We are lucky we can listen to such lectures - people who aren't afraid to come out with new ideas.

B: Yes, there mustn't be any calm in such an important science as astronomy.

1.4.2 Ask your friend about his or her future

Model:

Are you studying the economics of the machine-building industry at the Moscow Institute of Management?
Are you going to be (become) economist?

1 I'm studying physics at Moscow University.
2 My favorite subject at the medical school where I'm studying is anatomy.
3. Ethnography is one of the most interesting subjects taught at the faculty of history where I study.
4 My brother is getting on very well at the Odessa College of Art.
5 Klim Bobrov studies at the Vladimir Pedagogical Institute.
6 I'm a first-year student of the Moscow Institute of Architecture.

1.4.3 Answer the questions

1 Where do you study?
2 What profession will you go into after University?
3 When was your University founded?
4 How many and what faculties are there at your University?
5 Do most of your class-mates live in the hostel or rent a room in town?
6 How many people study at your University in the day-time, evening and extra-mural departments?
7 How are grants paid to students?
8 Who can take a post-graduate course?

1.4.4 Describe the problem

I)   Alex, a student of the university, was going to become a chemist. But in the third year he suddenly realized that chemistry was not his location and that he would rather take up a course of French Literature. Now he is thinking about studying at the Foreign Language faculty of the university.

1 What did Alex want to become first?
2 What did he realize in his third year?
3 What is he thinking about now?
4 What is his problem?

II) Robert is a university student, he has an important exam in a few days. He felt bad this morning. After breakfast he looked at his books but he could not concentrate. He looked at himself in his mirror. What he saw was not very nice. His

eyes were red, his face pale. His sister said, "What you need is fresh air. You are studying too much." They went for a walk in the park. Robert felt much better and found he could concentrate on his books.

1 Who was Robert?
2 What had he in a few days?
3 What was wrong with him?
4 What was his problem?
5 Where did he and his sister go?
6 Dramatize a talk between Robert and his sister.

1.4.5 Dramatize a talk

Basic situation:

You meet (receive) students from Britain, (the USA, and Canada) at your university. You are to describe them the structure of the university, the system of higher education in Russia, to talk about students' life.

Topical words:

Higher educational establishments: university, college, institute, academy; academic year: term, semester, mid-session and session exams; grants, scholarship; teaching (administrative) block, library, laboratory, sports grounds, lecturer, to pass exams, to study various subjects, to take lectures, to read special literature, to do research work, to write term papers and educational thesis.

1.4.6 Ask questions using I'm sorry; may I ask you; will you tell me?

1 На каком факультете ты учишься?
2 Какие предметы изучают студенты на вашем факультете?
3 Какие предметы являются профилирующими?
4 Когда был создан факультет, на котором ты учишься?
5 Какими профессиональными навыками должен обладать выпускник факультета?
6 Знаешь ли ты о новой системе подготовки специалистов по Болонскому соглашению?

1.4.7 Make up a plan about your faculty and tell us about it

COMMENTARY

1 Имеется определенная трудность в передаче на английский язык ряда терминов, относящихся к российской системе высшего образования.

Так, не совсем удачно используется слово institute, поскольку в Великобритании в значении *институт* оно практически не используется. Весьма близко по смыслу к *институту* слово college, однако не каждый college в Англии - высшее учебное заведение. Поэтому при общении на английском языке следует, опираясь, все же на термин institute, давать объяснения или дублирующие варианты. Например:

• педагогический институт - pedagogical institute / college of education / [a] teacher training college

• политехнический институт - polytechnic (al) institute / college of (advanced) technology.

Для перевода на английский язык слова *училище* чаше всего используется слово school.

Например:

• художественное училище - art school

• профессионально-техническое училище (ПТУ) - vocational (technical) school

При переводе на английский язык слова *техникум* можно использовать словосочетание technical college или polytechnic.

•Русское слово *курсы как* учебное заведение переводится school. Например:

• language school / school of languages

Можно использовать и слово courses: The Courses of Foreign Languages.

2 Он учится в Университете. He is at University. Она учится в колледже. She is (studies) at college. Я окончил колледж в 1982 году. I left college in 1982. Как у него дела (с учебой) в университете? How is he getting on (doing) at University?

Обратите внимание на отсутствие в этих фразах артикля перед существительным, обозначающим название учебного заведения.

Словосочетание типа your (my, our) university, our (my) town, our country и т.д. нехарактерно для английской речевой практики. Англичане предпочитают в этих случаях употреблять фактическое наименование объекта (вуза, города и т.д.), либо сочетать существительное с указательным местоимением. Например: Cambridge University, this college, this country.

1.5 Text IV Ада Лавлейс: программа максимум

1.5.1 Read the text and retell it in English

Ада Августа Байрон-Кинг впоследствии графиня Лавлейс, была дочерью великого английского поэта Джорджа Гордона Байрона. Ада Байрон родилась 10 декабря 1815 года. Отца она не помнила. С точки зрения тогдашнего света лорд Байрон был распутником, опасным вольнодумцем и вообще врагом общества. Он бросил супругу с малышкой на руках. Воспитание юной Ады Байрон всецело легло на плечи матери. Надо отдать ей должное – леди Милбанк смогла дать дочери отличное образование. Девочка рано увлеклась

музыкой. А еще математикой, что, конечно, казалось странным занятием для будущей знатной дамы.

Но мать была рада уже тому, что ада не пыталась сочинять стихи! И когда 12-летняя дочь стала пропадать в своей спальне, леди Милбанк заподозрила неладное – уж не проявились ли у дочери отцовские наклонности? Каково же было ее облегчение, когда дочь, смущаясь, вместо исписанных виршами страниц извлекла из-под подушки…чертежи летательного аппарата собственной конструкции!

Когда Ада заболела и на три года слегла в постель, ее мать, не считаясь с расходами, наняла дочери не только лучших врачей, но и лучших преподавателей Лондона. Среди них были и математики, уроки которых юная Ада Байрон усваивала лучше всего. Уже в те годы формулы и числа представлялись ей не сухой безжизненной «цифирью», но настоящей магией, поэзией.

Хотя репутация отца Ады оставляла желать лучшего, он всё же занимал кресло в палате лордов, а в его жилах текла кровь могущественного шотландского клана Гордонов. Не говоря о том, что в те годы не было в мире поэта более модного, чем Байрон.

Поэтому первый выход в свет Ады Байрон был заранее обречен на успех. Когда же выяснилось, что стройная 16-летняя девушка с роскошными кудрями и прекрасным мраморно-белым лицом еще и умна и образованна, это произвело фурор.

На дворе стоял XIX век, первые его десятилетия. Наука и техника из хобби чудаков-одиночек превратилась в повальное увлечение, захватившее и высший свет европейских столиц.

Вокруг дочери лорда Байрона, представленной королю, сразу же образовалась плотная толпа блестящих поклонников. Соперницам оставалось лишь скрывать досаду и распускать слухи о том, что тут дело нечисто. Что-то странное проглядывало в ее увлечении естествознанием.

"Клянусь дьяволом, не пройдет и десяти лет, и я высосу достаточно жизненного сока из тайн мироздания. Так, как этого не могут сделать обычные смертные умы и уста". Многие ли родители читали такое в дневниках своих 16-летних дочерей?

Ада не зря носила фамилию Байрон. Она все решила сама - и выбрала себе для начала не мужа и не отца будущих детей. Ее избранником оказался коллега и соратник по увлечению. Звали его Чарльзом Бэббиджем, он был ученым-математиком, профессором Кембриджа (это место ранее занимал сам сэр Исаак Ньютон) и членом Королевского общества.

Познакомились эти две яркие личности на выставке достижений науки и техники. Аде тогда едва стукнуло 17, а маститый ученый уже разменял пятый десяток. Никаких пикантных отношений у них не было, юная аристократка включилась в работу Бэббиджа просто по велению души. Бэббидж увлек ее полубезумной (с общей точки зрения) идеей "аналитической" машины, счетной машины с программным управлением.

На мысль построить счетную машину английского математика натолкнул глава французского Бюро переписи населения барон Гасиар де Прони. Его шеф, император Наполеон, еще в бытность свою первым консулом задумал среди прочих нововведений ввести во Франции метрическую систему. Это требовало составления новых логарифмических и тригонометрических таблиц в небывалых объемах, что и было поручено ведомству де Прони. Барон задумал создать своего рода "технологическую цепочку", для которой использовал единственную находившуюся под рукой "вычислительную машину" - людские ресурсы.

На первом этапе группа сильнейших математиков во главе с Адриеном Лежандром и Лазаром Карно разрабатывала математическое обеспечение, на втором - "среднее звено" организовывало процесс вычислений и следило за тем, чтобы он не давал сбоев, а на третьем - десятки рядовых счетчиков вели непосредственные расчеты.

Ничего не напоминает? Программное обеспечение - схема вычислений - обработка данных. Осталось добавить, что люди-счетчики в этой схеме в переводе на английский именовались... компьютерами! Правда, проект так и не: был реализован. Началась большая европейская война, и коронованному заказчику стало не до математики. Спустя какое-то время о схеме де Прони узнал Бэббидж, которому осталось сделать последний логический шаг - заменить ненадежный "человеческий материал" более передовым механическим устройством.

В 1822 году Бэббидж смог заинтересовать своей машиной (он назвал ее "дифференциальной") самое главное учреждение в родной Британии - Адмиралтейство. Оно выделило деньги под грандиозный проект. По замыслу изобретателя машина должна была занимать целую комнату и производить вычисления с точностью до 20-го знака после занятой!

Прошло десять лет напряженных трудов, но Бэббидж смог построить лишь один из блоков своей машины. Во-первых, не хватало денег, а во-вторых, неуемного изобретателя захватила новая идея - создание принципиально иной машины - "аналитической", способной выполнять любые счетные операции, с какой угодно степенью точности. Итак, в середине позапрошлого века гениальный провидец предложил ни больше ни меньше принципиальную схему современного компьютера. В нем были предусмотрены центральный процессор (в терминологии Бэббиджа - «мельница"), ввод программ ("инструкций") с помощью перфорированных карт, блок памяти ("склад"), печатающее устройство, роль которого выполнял печатный пресс... Агрегат, состоявший из тысяч механических зубчатых колес, его автор предполагал приводить в действие единственной известной к тому времени силой - паром.

1879 году правительственная комиссия решила, что построить эту машину невозможно, поскольку сделать это был в состоянии только сам Бэббидж, умерший за восемь лет до того (и, кстати, успевший разорить казну на 17470 фунтов, на которые можно было построить два десятка паровозов). Из современников Бэббиджа в его затею верила только Ада Байрон. Она стала

добровольной помощницей математика, написав для его машины "задания" на перфокартах - первые в мире компьютерные программы.

При этом Ада совсем не собиралась лишать себя прочих радостей: жизни. В 20-летнем возрасте она, наконец, успокоила сердце матери, выйдя замуж, причем по любви и за выгодного во всех отношениях жениха! Ее избранником стал давний воздыхатель - 29-летний лорд Уильям Кинг. Спустя три года после свадьбы лорду Кингу был пожалован графский титул. К тому времени у них было трое детей, и графиня Лавлейс переложила воспитание потомства на плечи несгибаемой леди Милбанк.

К началу 1840-х годов слухи о фантастической "паровой счетной машине" распространились за пределы Британской империи. Проектом, в частности, заинтересовался итальянский математик Луиджи Менабреа, преподававший баллистику в артиллерийской академии в Турине. Он посвятил Бэббиджу и его идеям основательный научный труд, перевести который на английский язык взялась та же безотказная помощница - графиня Лавлейс. Она также снабдила английское издание своими комментариями и замечаниями. Они заняли 53 страницы убористым шрифтом и оказались пророческими: "Многие лица, недостаточно знакомые с математикой, считают, что роль машины сводится к получению результатов в цифровой форме, а природа самой обработки данных должна быть арифметической и аналитической. Это заблуждение. Машина может обрабатывать и объединять цифровые величины точно так же, как если бы они были буквами или любыми другими символами общего характера... Машина сможет писать музыку, рисовать картины, а, кроме того, укажет науке такие пути развития, которые мы не в состоянии себе вообразить".

Еще в июле 1843 года Бэббидж получил письмо от своей помощницы, в котором впервые в истории была сформулирована идея программируемых вычислительных устройств. Леди Ада писала: "Я хочу вставить в примечания кое-что о числах Бернулли - в качестве примера того, как неявная функция может быть вычислена с помощью вашей машины без всякого участия человека... Не знаю, ангел я или| дьявол, но для вас, Чарльз Бэббидж, я выполняю поистине дьявольский труд, просеивая числа Бернулли".

Спустя три дня пришло еще одно письмо - теперь уже с конкретным списком операций (алгоритмом) для вычисления тех самых чисел Бернулли. В этот день, 13июля 1843 года, родилась новая наука-компьютерное программирование.

Графиня Лавлейс оказалась азартным игроком. Остаток своей краткой жизни дочь Байрона провела в поисках "верной формулы" для ставок на бегах. К 1848 году супруги Лавлейс оказались по уши Б долгах, часть из которых выкупила мать Ады, леди Милбанк. Спустя два года ее дочь, среди друзей которой хватало светил Фарадей, Диккенс, - серьезно заболела. Врачи оказались бессильны против тех же байроновских генов - Ада Лавлейс умерла в ноябре 852 года на 37-м году жизни. В том же возрасте, что и ее отец.

Похоронили их рядом - в родовой усыпальнице Байронов. Удивительно, но с наступлением нового, компьютерного века число посетителей, желающих

взглянуть на могилу Ады Лавлейс, превысило число тех, кто приходил отдать дань памяти великому поэту.

Нынешние же творцы компьютерного "софта" по-своему отметили свою основоположницу - в1970-х годах один из компьютерных языков, разработанный по заказу Пентагона, был официально назван ADA.

А день рождения Ады Лавлейс, 10 декабря, с недавнего времени отмечается как неофициальный день программиста. [4]

1.6 Text V Race to the Moon

1.6.1 Eight sentences have been removed from the text (1.6.2). Choose from the extracts A-l the one which fits each gap (1-8). There is one extra sentence which you do not need to use

A On the twentieth anniversary of the Apollo 11 mission, President Bush, imitating Kennedy, announced grandly that the USA should aim to send a man to Mars before the year 2029.

B But the Americans had still not managed to get a man into orbit.

C Is this vision that some people will be living on the Moon one day any crazier than the idea, say 50 or 100 years ago, that a man would walk on the Moon?

D Many scientists claim that if human beings are ever forced in the future to emigrate to another planet, the Moon would be their first choice.

E Members of the public were beginning to express concern at the enormous cost of the space race.

F Then, on 12 April 1961, the Soviets stole another march on the Americans when Vostok 1 took Yuri Gagarin for a single orbit around the Earth, becoming the first man in space.

G The plan was riskier than Von Braun's but it was the one that was eventually adopted. H By then, scientists hope they will have identified suitable rocks and other minerals for the construction of the Moon station.

I Millions watched on TV screens all over the world as Armstrong 'took one small step for man; one giant leap for mankind.

1.6.2 Read and translate the text

On 4 October 1957, the USSR launched into orbit the world's first satellite. Sputnik 1. It was a tremendous success: the Earth had a new moon and it bore the letters CCCP. Then the USA launched its first satellite, 5 Explorer 1, on 31 January 1958. Six months later, President Eisenhower created NASA, the National Aeronautics and Space Administration, which immediately began the Mercury programme to launch a manned space vehicle. (1)

On 25 May 1961, President John F Kennedy told the US Congress 'that this nation should commit itself to achieving the goal, before the decade is out, of launching a man on the Moon and returning him safely to Earth'. The Apollo project

had been born. (2) That came when an Atlas rocket sent John Glenn into space for five hours on 20 February 1962.

Behind the scenes, however, NASA was very uncertain about exactly how to get a man on theMoon. Von Braun favoured sending two rockets into orbit round the Earth, one to refuel the other, which would then travel to the Moon. But other scientists at NASA preferred to fire a two-part spacecraft direct to the Moon, where it would separate, with two crew members descending to the surface while a third circled the Moon in the other part. When the lunar landing was over, the spacemen on the Moon would rejoin their companions, leaving their landing vehicle behind. (3)

Finally, on 16 July 1969, Apollo 11 set off for the 30 Moon. The names of the astronauts on that trip would go down in history: Neil Armstrong, Edwin Buzz Aldrin and Michael Collins. Neil Armstrong, after four days in space, climbed down the ladder of the lunar module Eagle, which had landed on the Moon's Sea of Tranquillity. He stepped off on to the surface of the Moon. (4)

Other visits to the Moon followed. The last time was on 15 December 1972 and it was, as President Nixon had predicted, to be 'the last time in this century that men will walk on the Moon'. (5) Experts, however, brought him down to earth saying the President had 'good intentions but they are unrealistic'.

Although NASA has decided to leave the Moon in peace, the same cannot be said of the private sector. Private space companies such as International Space Enterprises and General Dynamics, both based in California, will be launching their first manned space flights to the Moon in the near future. In the long term, they aim to found the first colonies on the Moon. (6)

The plan looks a bit like this: the first stage will take place in 2010, when robot explorers will be sent to the Moon to gather information concerning the suitability of the soil. Ten years later, by which time the ideal area will have been found, astronauts will arrive to carry out experiments on the spot and they will start building the first station. (7)

If all goes well, by 2060 the first colony on the Moon will be ready: a huge space station shaped like an igloo, which will have been equipped with all the latest technological gadgets. It will also have been furnished to receive its first guests: several hundred scientists for whom it will be the first home in space. It is not unlikely that after several decades, or perhaps a century later, these igloos will have increased in number. (8) [5]

1.7 The Text VI The coming of the robot age

1.7.1 For questions 1-10, read the text below. Use the word given in capitals to form a word that fits in the space

1 DIRECT
2 DRAMA
3 EXTEND
4 INTELLIGENT
5 ABLE

6 DEPEND
7 PREDICT
8 EXTINCT
9 LIKE
10 SCIENCE

A few years ago, Hans Moravec, the (1) ___ of the Robot Laboratory in Pittsburgh, published a book called *Mind Children.* According to Moravec, the coming of the robot age will bring (2) ___ changes to the world as we know it. He predicts that robots will develop to such an (3) ___ that within 50 years machines with human (44) ___ will be common. At first we will benefit from the work that robots do for us, but gradually, as their (5) ___ increase, they will become more and more (6) ___ of humans. Moravec also makes the frightening (7) ___ that one day robots will take over the world and we will face (8) ___ . Are these claims in *Mind Children* (9) ___ to come true? At present, (10) ___ can create robots which have their own learned behaviour patterns. However, so far what robots can actually do on their own is very simple compared to what human life is capable of. [5]

1.8 Text VII The end of intelligence?

1.8.1 Decide whether these statements about the future are true or false

1 Machines will one day be more intelligent than, human beings.
2 Machines will one day be our masters.
3 Robots with human intelligence will be common in 30 years.
4 Machines will destroy the human race one day.

1.8.2 Now read the text and check your answers

'Will machines ever be more intelligent than humans? The answer is dearly, yes!' So began a lecture given last month to the British Association for the Advancement of Science by Professor Kevin Warwick of Reading 5 University.

Sounding like a mad scientist from a bad movie, Professor Warwick went on to draw some worrying conclusions from his prediction. 'If machines can be made as intelligent as humans,' he said, 'then that's really it for the human race. The machines will take over and either destroy us or force us to lead a slave-type existence. People who say it will never happen are not being realistic.'

At first glance, this looks like the fantasy of a man who has spent too long with toy robots and has lost touch with reality. For perhaps the most worrying thing about his views on the future of robots and the human race is that many other people working in artificial intelligence do not think such views are particularly eccentric.

A few years ago, Hans Moravec, the director of the Mobile Robot Laboratory in Pittsburgh, published a book called *Mind Children.* He also predicted that robots - the children of our minds - will be able to develop more quickly than we can to face the enormous challenges in the larger universe. We humans will benefit for a time

from their work, but sooner or later, like natural children, they will seek their independence.

Neither Moravec nor Warwick is writing about the distant future, thousands of years from now. They both seem to believe that, as Moravec puts it, 'Robots with human intelligence will be common within 50 years', or as Professor Warwick claims, machines that are more intelligent than humans will be built 'certainly within the lifetime of our children'.

Are all the people working in computers mad?

Is there any reason to believe these predictions? 'At present,' Warwick claims, 'we can make an exact copy of the brain and intelligence of some more primitive forms, for example insects. We can also create artificial animals with their own individual behaviour patterns, for example taking on a more defensive or aggressive role.'

This sounds impressive, but what does it mean in practice? When you move towards them, they will run away, and when the 'threat' is gone, they will go back again to what they were doing before, ie charging about randomly. Interesting, certainly, but it looks like a long step from there to world domination.

Are there any more convincing demonstrations of the intelligence and power of the 'mind children'? Well, next summer, at the World Robot Championships to be held at the Royal Concert Hall in Glasgow, we shall perhaps see. [5]

1.8.3 Seven sentences have been removed from the text. Choose from the sentences A-H the one which fits each gap (1-7). There is one extra sentence which you do not need to use

A But if Professor Warwick is mad, then so are a lot of his colleagues.

B Children in the 21st century may have their own robot to help out with homework.

C Or do they know something we don't?

D In it he predicted the coming of the robot age and the end of the human race.

E They hardly pose a threat to the United States Army.

F It means that Warwick and his team have built seven tiny robots, named after Snow White and the Seven Dwarfs.

G His view is that, 'If something is superior to us, we will not be top dogs on Earth anymore.

H Meanwhile we, their aged parents, will fade away.

1.9 Text 8 What is the Internet?

1.9.1 For questions 1 -15, read the text below and think of the word which best fits each space. Use only one word in each space

The Internet in computer science is an open interconnection of networks that enables connected computers to communicate directly. (1) _____ is a global, public

Internet and many smaller, local networks. In 1996 there (2) _____ about 30 million computers connected via the Internet.

One important service available (3) _____ the public is E-mail (or electronic mail), which allows a message to (4) _____ sent from one computer to one or more (5) _____ computers. One unique feature of E-mail is the possibility it gives a group (6) _____ people with a common interest to join a mailing list and automatically receive (7) _____ same mail. The World Wide Web also allows users to create and use documents (8) _____ are linked across the Internet to form an endless supply of information (9) _____ almost any subject under the sun. If you are connected to the Internet, you (10) _____ find particular information or just browse. The Internet continues (11) _____ grow at about a rate of ten per cent more users a year. It is believed that (12) _____ 2000, there will be at least 100 million people (13) _____ the system. That means 100 million people (14) _____ , within seconds, be able to contact (15) _____ other to get and share information anywhere in the world.

What do/would you use the Internet for? What effects will the Internet have on our lives?[5]

2 Section II New technologies

2.1 Text I Automation and office worker

2.1.1 Read the text and ask your group mates the questions on the text

While the mechanization of office work has been going on for over half a century, a revolutionary development has taken place in the last twenty years. Electronic equipment has been applied to virtually all branches of office work and its use is steadily expanding. The most important piece of equipment is the computer. A great deal of office work can be reduced to simple routine and routine operations are easy to automate. In some ways office work is easier to automate than the production of goods: figures and letters have none of the inconvenient natural properties of materials.

Although automation has been an important subject of discussion, it is often assumed that it does not differ basically from earlier forms of mechanization. This assumption is not justified. The early office machines were designed to simplify and speed up particular operations, and involved little or no change in organization. Both punched card machinery and electronic equipment necessitate the introduction of a computably rationalized system of work organization which eliminates many old jobs. Automation also encourages the trend forward the centralization of administrative and clerical functions, promoting the development of government, commercial and educational data processing centers. Further, there are growing possibilities for small and medium sized firms to use computers will the expansion of facilities for the hiring of the time on a computer. All this will affect the working life of an increasing number of office - workers.

The physical environment and working conditions of office – workers have undergone many changes during last years. The automation of office work does have

some beneficial effects on the physical environment and working conditions of employees. Lighting, space and cleanliness requirements are usually specified to ensure efficiency and low maintenance costs. But there are some unfavorable consequences. The office environment becomes much more like a factory, with a constant high level of noise and vibration from the equipment. Employees have to spend much more time on their feet and the speed with which the equipment operates frequently entails a rapid, continuous working pace.

Electronic equipment does not produce physical fatigue, as some mechanical equipment does. However, there is pressure for fast work in the preparation of data to maximize the volume of work carried out by the equipment.

In the past there have been several changes in the nature of office work and in the type of skills required of office employees. The early machines eliminated a great deal of laborious routine work but did not displace skilled work. But the introduction of automation necessitates an entire reorganization of work procedures and computably changes the patterns of skill requirements in the office. The impact depends largely on the previous degree of mechanization. Where a computer system is introduced directly into a manually operated office, the change will radically alter the organization of work procedures, produce very different skill requirements and substantially reduce the size of the staff. Where a computer system is introduced into an office having punched card machinery, there will not be so many changes and the reduction in the size of the staff will not be so great. In the automated office there is no need for a large number of semi – skilled workers. There is a need for a small number of skilled technical workers. In future the number of this will diminish as the highly skilled work is simplified and standardized.

Such development raises the problem of training and retraining for employment in the automated office.

2.1.2 Find the sentence with the main idea of the text

1. Electronic equipment has been applied to virtually all branches of office work and its use is steadily expanding.
2. Automation is often assumed that it does not differ basically from earlier forms of mechanization.
3. The automation of office work does have some beneficial effects on the physical environment and working conditions of employees.
4. In the automated office there is no need for a large number of semi – skilled workers.

2.1.3 Find the equivalents

1) revolutionary	a) much, many, a lot
2) electronic equipment	b) get rid of
3) office work	c) bringing about fundamental change
4) a great deal of	d) effective operation
5) discussion	e) computer

6) to simplify   f) something done for another
7) efficiency   g) a formal treatment of a topic in speech or writing
8) fatigue   h) to diminish
9) employee   i) the temporary loss of power
10) eliminate   j) a worker
11) punched card   k) a card with holes

2.1.4 Agree or disagree with the following statements

I agree   I disagree
I think so   I don't think so
I suppose so   I'm afraid I don't agree…
Certainly   I couldn't agree with…

1 Electronic equipment does not produce physical fatigue, as some mechanical equipment does.

2 The early machines eliminated a great deal of laborious routine work.

3 Computers did not displace skilled work.

4 In the automated office there is no need for a small number of semi – skilled workers.

5 Automation encourages the trend towards the centralization of administrative and clerical functions.

2.2 Text II What is nanotechnology?

2.2.1 Read the text making notes like this

Things, I already knew …
Things, I didn't know…
Things, I don't understand…

Computers reproduce information at almost no cost.

A push is well underway to invent devices that manufacture at almost no cost, by treating atoms discretely, like computers treat bits of information. This would allow automatic construction of consumer goods without traditional labour, like a Xerox machine produces unlimited copies without a human retyping the original information.

Electronics is fueled by miniaturization. Working smaller has led to the tools capable of manipulating individual atoms like the proteins in potato manipulate the atoms of soil, air and water to make copies of itself.

The shotgun marriage of chemistry and engineering called "Nanotechnology" is ushering in the era of self-replicating machinery and self-assembling consumer goods made from cheap raw atoms (Drexler, Merkle paraphrased).

Nanotechnology is molecular manufacturing or, more simply, building things one atom or molecules at a time with programmed nanoscopic robot arms. A

nanometer is one billionth of a meter (3 − 4 atoms wide). Unitilizing the well understood chemical properties of atoms and molecules (how they "stick" together), nanotechnology proposes the construction of novel molecular devices possessing extraordinary properties. The trick is to manipulate atoms individually and place them exactly where needed to produce the desired structure.

The anticipated payoff for mastering this technology is far beyond any human accomplishment so far…

Technical feasibility includes:

Self – assembling consumer goods

Computers billion of times faster

Extremely novel inventions (impossible today)

Safe and affordable space travel

Medical Nano… virtual end to illness, aging, death

No more pollution and automatic cleanup of already existing pollution

Molecular food syntheses… end of famine and starvation

Access to a superior education for every child on Earth

Reintroduction of many extinct plants and animals

From the introduction of the plenary of Dr. Drexleer at the January'96 program of the twenty – ninth annual Hawaii International Conference on System Science, Maui. (An academic meeting of software and systems scientist.)

In a world of information, digital technologies have made copying fast, cheap, and perfect, quite independent of cost or complexity of the content. What if the same were to happen in the world of matter?

The production cost of a ton of terabyte RAM chips would be about the same as the production cost of steel. Design costs would matter, production costs wouldn't.

By treating atoms as discrete, bit – like objects, molecular manufacturing will bring a digital revolution to the production of material objects. Working at the resolution limit of matter, it will enable the ultimate in miniaturization and performance. By starting with cheap, abundant components – molecules – and progressing them with small, high – productivity machines, it will make products inexpensive. Design computers that each executes more instructions per second than the entire semiconductor CPUs in the world combined.

Research programs are chemistry, molecular biology, and scanning probe microscopy is laying the foundations for a technology of molecular machine systems. Focused efforts today are centered in Japan, sponsored by STA and MITI, the US has a strong position in the basic technologies. It's time we paid more attention.

Discoverer of Buck balls, chairman of Chemistry and head of the Nanotechnology Initiative at Rice University, DR. Richard Smalley: "Nanotechnology will reverse the harm done by the industrial revolution".

Imagine being able to cure cancel by drinking a medicine stirred into your favorite fruit juice. Imagine a supercomputer no bigger than a human cell. Imagine a four – person, surface – to – orbit spacecraft no larger or more expensive than the family car. These a just a few products expected from Nanotechnology.

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2.2.2 Answer the questions

1 What would allow automatic construction of consumer goods without traditional labor?
2 What is Nanotechnology?
3 How have digital technologies made copying?
4 Where will molecular manufacturing bring a digital revolution to?
5 What are laying the foundations for a technology of molecular machine system?
6 Where are focused efforts centered in?
7 What will Nanotechnology reverse?
8 Give the examples of products expected from Nanotechnology.

2.2.3 Make a report about Nanotechnology

Reproduce information, automatic construction, traditional labor, miniaturization, self – replicating machinery, the desired structure, digital technologies, research programs, industrial revolution, human cell.

2. 3 Text III Great Strides in Computer Technology

2.3.1 Read the text, translate it

Still faster means of getting at computer-stored information must be developed. The problems of communicating with the computer are becoming increasingly apparent. Punch cards, typewriter terminals, and paper tapes ail demand special codes and computer languages. Such a situation can no longer be accepted, for computers already calculate at a blinding pace, and their speeds are steadily increasing.

The great leap forward in computer technology was attained in 1947 with the development of the transistor. Transistors can perform all of the functions of vacuum tubes but are flea-sized by comparison and require only a fraction as much power to operate. The transistor is made of a semiconductor, a crystal that conducts electricity better than glass, though not as well as metal. The manufacture of a transistor starts with a single pure crystal of semiconductor, such as germanium. The addition of very small amounts of a chemical impurity such as arsenic introduces excess electrons into the crystal lattice. These electrons can move easily to carry electricity. Other atomic impurities such as boron soak up electrons from the lattice and thus create deficiencies, or holes, -where there are no electrons. The hole, in effect, is a positive charge, the opposite of a negatively charged electron. Both holes and electrons skip through the material with ease.

Arsenic- and boron-doped crystals are sliced into wafers and then sandwiched together so that alternating layers containing either free electrons or holes face each other. Holes and electrons, carrying opposite electrical charges, are attracted to each other and a few drift across the junction, creating an electrical field.

By adding electrical contact points to each of the layers in the sandwich, a

transistor is created.

Current flowing between two of the contact points can be controlled by sending an electrical signal to a third point. The signal can thus be amplified from fifty to forty thousand times.

Moreover, the current keeps step with the incoming signal, so that when it is pumped back out again, the signal is a precisely amplified image of the original signal.

By 1955 the transistor was replacing the vacuum tube in computers, shrinking their size and increasing their speed. The transition from vacuum tubes to transistors was but the first step however. Integrated circuits that combine both amplifiers and other electrical components on slivers of material far smaller than even transistor are shrinking the size of the computer still further.

The integrated circuits (1C) conserve space, and they also save time and the effort of linking up individual components. This means that a quarter-inch chip containing five or six complete circuits can move information across its route faster than a transistorized circuit because every element within it is closer that are the elements of transistors. On the horizon is yet another shrinkage, which will be made possible by a process, still undeveloped, called large-scale integration, or LSI. An LSI chip will be only a tenth of an inch square and will carry as many as one hundred circuits. The difference between an LSI chip and an 1C chip may seem like hairsplitting, but on such negligible differences are built great strides in computer technology.

The limiting speed on computers is the speed of light. Computer engineers used this fact to create a standard measure-the light-foot-by which to clock computer speeds. It is defined as the distance about twelve inches that light travels in a billionth of a second.

Miniaturization will narrow the gap between circuits and so reduce the number of light-feet that must be traversed through the logic circuits. But there are still other limitations that must be overcome before computer processing will be rapid enough to satisfy the demands of perfectionists.

2.3.2 Read the passage and answer the question

How many and what steps were there in the computer technology development?

2.3.3 Look through the passage and find the English equivalents for the following Russian phrases

с огромной скоростью; постоянно возрастают; большой скачок вперед; размером с блоху; химическая примесь; избыточные электроны; кристаллическая решетка; кристалл, легированный мышьяком; разрезать на полупроводниковые пластины; перемежающиеся слои; экономит время и силы; мелочный педантизм; пренебрежимо малые различия; большие успехи в технологии; предельная скорость; люди, занимающиеся совершенствованием

2.3.4 Match each word in A with that in B which means the opposite

A.   excess, off, purity, subtract, divide, pure, nonsense
B.   on, impurity, deficiency, sense, add, multiply, doped

2.3.5 Answer the following questions based on the information found in the text or on your own experience and thinking

1   How many great leaps forward were made in the development of the computer technology?
2   What was the technology of the first generation of computers'?
3   Why were the first computers so bulky and speed-limited?
4   When were transistors invented?
5   What were the advantages of transistor technology?
6   What is the technology of a transistor?
7   What further still greater leap forward in the computer technology was made after 1955?
8   What still greater opportunities did the 1C technology provide?
9   What does LSI means?
10   How many circuits does a single LSI chip carry?
11   What other problems do there remain in computer technology?
12   How this problems be solved?
13   Are there still any other limitations that must be overcome before computer processing will be rapid enough to satisfy the demands of perfectionists?

2.3.6 Think and say about

a)   the history of the computer technology
b)   the process of transistor manufacturing
c)   the advantages of modern IC and LSI technologies

2.4 Text IV Translation by Computer

2.4.1 Answer the following questions

1 Is it possible to translate using a computer?
2 What characterized the MT output in seventies?
3 What characterizes the MT output nowadays?
4 How many words had been altered by the editor in the post-translation editing?

2.4.2 Read the text and translate it

There has long been an interest in language translation and, in particular, in the prospects for automatic translation by computer. In the sixties when the translation

studies began, there was .already considerable stirring among professional linguists and others about the efficiency of translation by computer or machine translation (MT). At that time different modes of translation were compared, that is, human translators against different versions of MT. Soon the researchers conducting the studies were able to add to their observations from the output of the latest MT system that had become operational.

Within a year, they submitted a Russian paper for translation by the then operational MT system.[1] However, no analysis of the output was done at that time, and the material has not been used for a long time. The installation of a new MT system prompted to have the same Russian paper translated again 7 years later, in the seventies. The translations were prepared from an English paper containing 1685 words. A professional translator provided a Russian text translated from the English-text. The Russian was then retranslated into English by MT (the experiment of the sixties) and remained unedited just as it came out of the computer. Two human translations by professional linguists (working independently)--were also made in the sixties. Two versions of the translation by MT (the seventies) were produced, one being unedited (that is, corrected and revised by a bilingual editor). An additional human translation was made in the second case.

Two characteristics of MT output are: 1) untranslated words and 2) translated words that have two or more possible meanings in the target language[2] (English in the case). Using each of these characteristics as a crude index of translation efficiency, differences between the sixties' and the seventies' MT systems were found to be slight and not consistently favouring one or the other system.

The MT translation of the sixties contained 1.2 % untranslated words and 6.3 % multiple meanings. The MT translation of the seventies contained 2.3 % untranslated words and 5.3 % multiple meanings. None of the three translations by linguists contained either type of error. An examination of the post-translation editing (the seventies` MT output) showed that many changes had been made: each of the approximately 80 sentences had had some editorial modifications, most of them extensive. About 35 % of the English words printed by the computer had been altered by the editor. It would be unwise to conclude on a less-than-optimistic note because of one set of observations. However, if the present data are at all indicative of[3] the status of MT, it is apparent that little progress has been made during recent years.

Moreover, I do not know of any demonstrated advantages of MT over human translations. (Advocates of translation by computer will claim that the seventies' MT system is still far from perfect.)[4] Other methods should be applied to determine the readability of translation. We are now collecting such data.

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[1] the then operational … system - действовавшая тогда … система

[2] the target language - *зд.* язык, на который делается перевод

[3] if the present data are at all indicative of - если данные, существующие на настоящий момент, могут свидельствовать о

[4] far from perfect - далека от совершенства

2.5 Text V "AESCULAPIUS"[1] Diagnoses the Case

2.5.1 Read the text, translate it, ask your groupmates any questions on the text. Be ready to retell the text

A computer complex "Aesculapius" which is able to decode electric cardiograms and draw appropriate conclusions has started functioning at one of St. Petersburg's hospitals.

The medical nurse puts electrodes on the patient. She feeds into the computer data of[2] the patient's sex, age, arterial pressure and medicines he takes. Then the system is actuated and this statement goes upon the display screen: "Error. Repeat Input." It appears that the nurse has failed to connect one electrode on purpose,[3] to show how "Aesculapius" fixes the least human errors.

An electric cardiogram is made. The patient hasn't yet had enough time to put on his clothes when the monitor's screen shows a statement which is immediately typed out by the printer.

The system includes a portable device for taking electric cardiograms directly at one's place of work.[4] According to the program "Health" all persons who are over forty ought to go in for a medical check-up[5] of the heart.

Consequently, "Aesculapius" is a good help during mass disease-prevention check-ups[6] that are now introduced at all enterprises. 500 electric cardiograms—a month's working load of a doctor[7] — are decoded by the computer within 12 hours. As regards[8] the accuracy of diagnosis, in 90 cases out of 100 the computer satisfactorily investigates the actual condition of the heart. If the computer states that the patient's heart is in a bad way[9] the doctors recheck this diagnosis by all means.[10]

The system was developed by the workers of the specialized design bureau "Biophyzpribor" jointly with the cardiologists of the Kirov Military Medical Academy.

2.5.2 Answer the questions

1 What is "Aesculapus" able to do?
2 Where was the system developed by?

_____

[1] AESCULAPIUS –Эскулап;

[2] feeds into the computer data of - вводит в компьютер данные по;

[3] on purpose - намеренно, нарочно;

[4] at one's place of work - на работе;

[5] go in for a medical check-up - проходить медицинский осмотр;

[6] mass disease-prevention check-ups - массовые профилактические медосмотры;

[7] a month's working load of a doctor - месячная нагрузка врача;

[8] As regards - что касается;

[9] the patient's heart is in a bad way - сердце больного в плохом состоянии;

[10] by all means – обязательно.

3 What does the nurse feed into the computer?

4 What does the system include for taking electric cardiograms directly at one's place of work?

5 When do the doctors recheck the diagnosis by all means?

6 What does "Aesculapius" fix?

2.5.3 Retell the text

2.6 Text VI A Smarter Way to Fly

2.6.1 Read the text. Underline the main idea of the text

Until recently, Lufthansa maintenance crews overhauled[1] the engines of the airline's Airbus A310 after every 3,000 hours of flight to make sure they were running properly.[2] Now, however, mechanics need to disassemble the huge engines only when a part must be replaced.

A new computer system aboard each jet monitors its engines in the air, letting technicians know when the engines may be in need of repair.

Its "brain" is contained in a small case about the size of a portable typewriter. Sensors placed in each jet engine transmit more than 50 different measurements to the computer, called a propulsion multiplexer.[3]

The data includes pressure and temperature information, engine rotation, fuel flow and vibrations. The multiplexer compiles the information, and a thermal printer[4] in the cockpit prints the results every four hours.

When the plane lands, the data is transmitted to the airline's main computer in Frankfurt, where it is evaluated. If the AIDS[5] system finds signs of trouble, it transmits those data first, alerting technicians to needed repairs.

2.7 Text VII Computer-Controlled Irrigation

2.7.1 Read the text, retell it

A computer has been put in control of a major irrigation system supplying water to one hundred thousand hectares in the Fergana Valley, in Uzbekistan. With the help of automatic and remote-control devices, the computer runs pumping stations, hydro schemes and canals.

_____

[1] to overhaul - разбирать для ремонта

[2] to make sure they were running properly - чтобы убедиться, что они работают исправно

[3] propulsion multiplexer - коммутатор (мультиплексор) реактивного двигателя

[4] thermal printer - термографическое печатающее устройство

[5] AIDS = Aerobus Indicating Data System - система данных аэробуса

Proceeding from stored information of agricultural land and water resources, as well as from real-time data derived from outlying control stations the computer determines the optimum irrigation regimen. Each field receives as much water as it needs. The computer takes mere seconds to evaluate an emergency situation and switch off the right part of the automatic control system.

A unified system to control water resources is now under construction in Uzbekistan. It already incorporates 45 automated irrigation networks in various regions of this Central Asian Republic.

2.8 Text VIII Boy`s Best Friend

2.8.1 Read some fact about Isaac Asimov

Isaac Asimov is America's best-known writer of popular science and a great popularizer of science for non-technical readers. He has written more than one hundred books.

I. Asimov was born in Russia in 1920 and came to America with his parents as a three-year-old boy. He finished school at the age of 15 and became a researcher in chemistry at the Columbia University. He published his first science-fiction story in 1938. During World War II I. Asimov worked as a military research engineer, and then served in the army. After the war he returned to Columbia to get a Ph. D. in chemistry in 1948. He wrote several textbooks and lectured on biochemistry at the Boston University School of Medicine In 1958 he gave up the classroom to become a full-time writer.

Many of I. Asimov's books are translated into Russian; they are very popular with Russian readers.

2.8.2 Read, translate the text Boy`s Best Friend (After I. Asimov)

Mr. Anderson said, "Where's Jimmy, dear?"

"Out on the crater," said Mrs. Anderson. "He'll be all right. Robutt is with him. - Has he arrived?"

"Yes. He's at the rockets station, going through the tests. Actually, I can hardly wait to see him myself. I haven't really seen one since I left Earth 15 years ago. You can't count films."

"Jimmy has never seen one," said Mrs. Anderson. "Because he's Moonborn and can't visit Earth. That's why I'm bringing one here. I think it's the first one ever on the Moon."

"It cost enough," said Mrs. Anderson with a small sigh.

"Maintaining Robutt isn't cheap, either," said Mr. Anderson Jimmy was out on the crater, as his mother had said. By Earth standards, he was thin, but rather tall for a 10-year-old. His arms and legs were long. He looked thicker with his spacesuit on, but he could handle the lunar gravity as no Earthborn human being could. His father couldn't begin to keep up with him when Jimmy stretched his legs and went into the kangaroo hop.

The outer side of the crater sloped southward and Earth, which was low in the southern sky (where it always was, as seen from Lunar City), was nearly full, so that the entire crater slope was brightly lit.

The slope was a gentle one and even the weight of the spacesuit couldn't keep Jimmy from racing, up it in a floating hop that made the gravity seem nonexistent.

"Come on, Robutt," he shouted.

Robutt, who could hear him by radio, squeaked and ran after.

Jimmy, quick as he was, couldn't outrace Robutt, who didn't have a spacesuit, and had four legs and muscles of steel. Robutt sailed over Jimmy's head, turning over and landing almost under his feet.

"Don't show off, Robutt," said Jimmy, "and stay in sight."

Robutt squeaked again, which meant, "Yes."

"I don't trust you, liar," shouted Jimmy, and he made one big jump that carried him over the crater.

The Moon sank under his feet and at once it was dark all around him. But the ground was smooth and Jimmy knew the exact location of every one of the few rocks.

And then it wasn't dangerous racing through the dark when Robutt was there with him, jumping around and glowing. Even without the glow, Robutt could tell where he was. and where Jimmy was, by radar. Once Jimmy had lain still and pretended he was hurt and Robutt had sounded the radio alarm and people from Lunar City got there in a hurry. Jimmy's father let them hear about that little trick and Jimmy never tried it again.

Just as he was remembering that, he heard his father's voice by radio. "Jimmy, come back. I have something to tell you."

...Jimmy was out of his spacesuit now and washed up. You always had to wash up after coming in from outside. Robutt stood there on all fours. His body was foot-long, he had a small head, no mouth and two large glass eyes. He squeaked until Mrs. Anderson said, "Quiet, Robutt."

Mr. Anderson was smiling. "We have something for you, Jimmy. It's at the rocket station now, but we'll have it tomorrow after all the tests are over. I thought I'd tell you now."

"From Earth, Dad?"

"A dog from Earth, son. A real dog. The first dog on the Moon. You won't need Robutt any more. We can't keep them both, you know, and some other boy or girl will have Robutt."

He waited for Jimmy to say something, then he said, "You know what a dog is, Jimmy? It's the real thing. Robutt is only a mechanical imitation!"

Jimmy thought a little. "Robutt isn't an imitation, Dad. He's my dog."

"Not a real one, Jimmy. Robutt's just steel and wiring and a simple electronic brain. It's not alive."

"He does everything I want him to do, Dad. He understands me. Sure, he's alive."

"No, son. Robutt is just a machine. It's just programmed to act the way it does. A dog is alive. You won't want Robutt when you have the dog."

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"The dog will need a spacesuit, won't he?"

"Yes, of course. But it will be worth the money and he'll get used to it. And he won't need one in the City."

Jimmy looked at Robutt who was squeaking again. Jimmy held out his arms and Robutt was in them in one Jump. Jimmy said, "What will the difference be between Robutt and the dog?"

"It's hard to explain," said Mr. Anderson, "but it will be easy to see. The dog will really love you. Robutt is simply adjusted to act as though it loved you."

"But, Dad, we don't know what's inside the dog, or what his feelings are. Maybe, it's just acting, too."

Mr. Anderson thought a little. "Jimmy, you'll know the difference when you experience the love of a living thing."

Jimmy held Robutt in his arms. He said, "But what does it matter why they act so? How about how *I* feel? I love Robutt and that is important!"

And the little robot squeaked again. His squeaks were happy. [6]

2.9 Text IX Limiting Factor (After CL. D. Simak)

2.9.1 Read the text about Clifford D. Simak, translate it

Clifford Simak is a well-known American science fiction writer. The son of a farmer, C. Simak was born in 1904 in the state of Wisconsin. Upon graduating from the University he was by turns a teacher and the editor of a provincial paper. He began to write in the 30s and soon gained popularity. C. Simak is an excellent story-teller. His stories and novels are marked for sudden twists of plot, deep psychological characteristics of personages and subtle humour. The writer follows a new trend in science fiction as he turns the industrial epoch into a fairy-tale. He makes fun of practically-minded people and takes the reader to a land of romance.

Simak's main idea is the problem of contacts between intelligent civilizations in distant planets of the Universe. C. Simak's works are translated into many languages of the world. For example, his novel "The Goblins' Reserve" was published in Russian. "Limiting Factor" is a short story [in] which a gigantic computer is described.

2.9.2 Read the text, translate it, and answer the question: Was the author right in describing the future?

First, there were two planets robbed of their ores mined and gutted and deserted. Then there was a planet with a fairy city, a place of glass and plastic so full of beauty that it hurt one's eyes to look. But there was just this one city. There was no other sign of habitation on the whole planet. And the city was deserted. Perfect in its beauty but hollow as a laugh. Finally, there was a metal planet, third outward from the sun. Its whole surface was polished as a bright steel mirror. And it shone by reflected light, like another Sun.

"I can't get over the conviction," said Duncan Griffith, "that this place is no

more than a camp."

"I think you're crazy," Paul Lawrence told him sharply.

"It may not, look like a camp," said Griffith stubbornly, "but it meets the definition."

"It looks like a city to me," Lawrence told himself. "It always has, from the first moment that I saw it. A big city that would take man a thousand years to build."

"What I can't understand," he said aloud, "is why "it is deserted."

"They up and went away," Griffith told him. "And they did it because it wasn't really home to them. It was just a camp, and it held no traditions and no legends. That's why those who built it could leave it easily enough."

"A camp," Lawrence returned, "is just a stopping place. A temporary habitation that you knock together and make as comfortable as you can with the things at hand."

"So?" asked Griffith.

"These people   did more than stop here," Lawrence   said.

"That city wasn't   knocked together. It was planned and built   with   loving care."

"From a human standpoint, yes," said Griffith. "But you're dealing here with non-human standards."

Lawrence squatted and plucked at a grass stem. He stuck it between his teeth, and chewed on it thoughtfully. He looked at the silent, empty city that lay before them under the bright noonday sun. Griffith squatted down beside him.

"Don't you see, Paul," he said, "that it has to be a temporary habitation? There is no sign of any previous culture on the planet. No relics of simple primitive art. King and his expedition went over it, and there wasn't anything. Nothing but the city— a fairy city at that. Think of it—first there'd be a tree to huddle under when it rained. Then a cave to huddle in when night came down. After that there'd be a tent or a hut. Then three huts, and you had a village."

"I know," Lawrence said. "I know."

"A million years of living," Griffith continued. "Ten thousand centuries before a race could have built a fairyland of glass and plastics. And those million years of living wasn't done on this planet. A million years of living leaves scars upon a planet. And there aren't any scars. This planet is quite new."

"You're convinced they came from somewhere else, Dune?" Griffith nodded. "They must have." "From Planet Three, perhaps." "We can't know that. Not yet."

"Maybe never," Lawrence said. He spat out the blade of grass.

"This system," he said, "is like a cheap detective story. Everywhere you turn you stumble on a clue, and every clue is misleading. Too many mysteries, Dune. This city here, the metal planet, the gutted planets".

"I have a feeling there's a tie between it all," said Griffith. Lawrence shrugged his shoulders.

Footsteps were heard behind them and they came to their feet, turning towards the sound. It was Doyle, the radioman, hurrying towards them from the scout spaceship.

"Sir," he said to Lawrence, "I just had Taylor out on Planet Three. He asks if you won't come.   It seems they've found a door."

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"A door!" said Lawrence. "A door into the planet!   What did they find inside?"

"He didn't say, sir."

"He didn't say!"

"No. You see, sir, they can't open it."

The door wasn't much to look at. There were twelve holes in the planet's surface, grouped in four groups of three each. And that was all. You could not tell where the door began or where it ended.

"There is a crack," said Taylor, "but you can hardly see it with a magnifying glass. Even under magnification it's no more than a hairline. The door's machined so perfectly that it's practically one piece with the surface. For a long time we did not even know it was a door. We sat around and wondered what the holes were for.

"Scott found it. He was just skating around and saw those holes. You'd never have found it except by accident."

"And there's no way to open it?" asked Lawrence.

"None that we have found. We tried sticking our fingers and lifting it. You might as well have tried to lift the planet. And anyhow, you can't get much purchase[4] here. Can't keep your feet under you. This stuff's so smooth you can hardly walk on it. You don't walk, in fact, you skate."

"I know," said Lawrence. "I put the lifeboat down as easy as I could, and we skidded forty miles or more."

"Ice is rough as compared to this stuff," Taylor put in.

"About this door," said Lawrence, "has it occurred to you it might be a combination?"

Taylor nodded. "Sure, we thought of that. And if it is, we haven't got the slightest chance: just the same we couldn't guess the right number.

"You checked?"

"We did," said Taylor. "We stuck a camera tentacle down into those holes and we took all kinds of shots. Nothing.

Absolutely nothing. Eight inches deep or so. Wider at the bottom than the top — and smooth. No secret mechanism.

"We managed to saw out a piece of metal so that we could test it. Used up three blades getting it out. It's steel, but alloyed with something else — and the molecular structure is quite puzzling."

"Unlike any other metal we know?" said Lawrence. "Yeah. I skated the ship over here. We hooked up a derrick ^{and} tried to lift the door. The ship swung like a pendulum and the door stayed put."

"There's just one thing to do," Lawrence told the men. "Yeah, we know—to blow it up," Taylor replied. "But I hate to do it. It means to admit we're beaten." "We can't just sit around," said Lawrence.

"No," said Taylor with a sigh. "No, we can't. I hope it works." It did. The explosion ripped the door free and threw it into space. It came down a mile away and slid across the smooth surface out of sight. A metal ramp, its upper ten feet twisted by the explosive force, wound downward like a circular staircase. Nothing came out of the hole. No sound or light or smell. Seven men went down the ramp to see what they

could find. The others waited round the hole.

It was machinery. There were shafts and spools, disks and banks of shining crystal cubes. There might have been tubes, although one couldn't be sure.

They had come down, the seven of them, twisting along the ramp, and always there was the machinery that glistened like a silvery Christmas tree in the rays of the helmet lights. One might think the metal had been polished no more than an hour before. But when Lawrence leaned over the side of the ramp and ran his fingers along a shining shaft, the fingers came back dusty — with a dust which had collected there for many countless ages. The machinery was motionless and still, and there were miles, of it, always the same, stretching away on every side as far as the lights could reach. Finally the ramp had ended on a landing, with the spidery machinery far above them for a roof, and strange-looking furniture arranged upon the floor. They stood for a while in silence, looking around.

"An office," said Duncan Griffith at last. "Or a control room," said Ted Buckley, the mechanical engineer.

"It might be their living quarters," Taylor said. "A machine shop, perhaps," suggested Jack Scott, the mathematician.

"Hasn't it occurred to you," asked Herbert Anson, the geologist, "that it might be none of these? It might be some thing which is not related to anything we know."

"All we can do," said Spencer King, the archeologist, "is to translate it into the terms we know. My guess is that it could be a library."

Lawrence thought: there were seven blind men, and they happened to come upon an elephant. He said, "Let's look. If we don't look, we'll never know."

They looked and saw a row of cabinets having the shape of cubes. There was half a mile of those cabinets stretched out there.

"Hey,' said Buckley, "this thing is light. Someone give me a hand."

Scott stepped forward quickly, and between them they lifted one of the cabinets off the floor and shook it. Something rattled inside it. They put it down again.

"There is something in there,' said Buckley breathlessly. »Yes, said King. "It is a filing cabinet. No doubt of that. And there's something in it."

"It won't do us much good,' said Taylor, "if we can't get at it. You can't tell much about it by just listening to it while you fellows shake it."

"That's easy,' said Griffith."You say the magic words and the sesame opens."

Lawrence shook his head. "Cut out your humour, Dune. This is serious business. Any of you got an idea how the thing is made?"

"It couldn't be made,' Buckley put in. "It simply wasn't made. You can't take a sheet of metal and make a cube of it and not have any seams."

"Remember the door up on the surface,' Anson reminded him. "We couldn't see anything there, either, until we got a magnifying glass. That cabinet opens somehow. Someone opened it at one time—to put in whatever rattled when you shook it."

"And they wouldn't have put something in there," said Scott, "If there was no way to get it out."

"We could rip it open," said King. "Get a torch." Lawrence stopped him. "We've done that once already. We had to blow up the door. Let's shake some more of those cabinets."

They shook a dozen more. There wasn't any rattle. There was nothing in the other cabinets.

"Let's get out of here,' said Anson. "This place gives me the creeps. Let's go back to the ship and sit down and talk it over. We'll go crazy racking our brains down here. Take those control panels over there."

"Maybe they aren't control panels," Griffith reminded him. "We must be careful not to jump at any conclusions."

"Indeed, they have no markings," Taylor broke in. "A control panel would have dials or lights or something you could see."

"I have a feeling," said Lawrence, "that we are getting nowhere."

King said, "We'll have to map out some orderly plan of exploration. Take first things first."

Lawrence nodded. "We'll leave a few men on the surface, and the rest of us will come down here and set up camp. We'll work in groups and we'll cover the situation as swiftly as we can—the general situation. After that we can fill in the details."

"What comes first?" asked Taylor.

"Let's find out what we have," suggested King. "A planet or a machine."

"We'll have to find more ramps," said Taylor. "There must be other ramps."

Scott spoke up. "We should try to find out how extensive this machinery is. How much space it covers."

"And find if the machine's running," said Buckley. "What we saw wasn't," Lawrence told him. "What we saw," Buckley declared, "may be no more than one corner of a huge machine. All of it mightn't work at once. Once in a thousand years or so a certain part of the machine might be used and then only for a few minutes or even seconds."

"Somehow," said Griffith, "we should try to make at least a guess what the machinery's for. What it does. What it produces."

It was a planet all right. They found the planetary surface— twenty miles below. Twenty miles through the twisting maze of shining dead machinery. There was air, almost as good as Earth's. So they set up camp on the lower level glad to get rid of space gear and live as normal people. But there was no light, and there was no life. Not one living being, not even an insect. And yet life had once been there. The ruined cities told the story of that life. King said it was a culture very much like that of twentieth-century Earth.

Duncan Griffith squatted beside the small atomic stove, spreading out his hands over it.

"There isn't much doubt, is there," he said turning his head to Scott, "that it's nothing but machinery?" [7]

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3 Section III What`s the news?

3.1 Text I What is Nanotechnology?

3.1.1 Read the text

So what is nanoscience and technology?

Nanoscience involves research to discover new behaviors and properties of materials with dimensions at the nanoscale which ranges roughly from 1 to 100 nanometers (nm). Nanotechnology is the way discoveries made at the nanoscale. Nanotechnology is more than throwing together a batch of nanoscale materials—it requires the ability to manipulate and control those materials in a useful way.

What is special about the nanoscale?

In short, materials can have different properties at the nanoscale— some are better at conducting electricity or heat, some are stronger, some have different magnetic properties, and some reflect light better or change colors as their size is changed.

Surface area

Nanoscale materials also have far larger surface areas than similar volumes of larger scale materials, meaning that more surface is available for interactions with other materials around them.

Why is surface area important?

Compare a piece of gum chewed into a wad with stretching that gum into as thin a sheet as possible. The surface, or area visible on the outside, is much greater for the stretched out gum than for the wad of gum. The stretched out gum will likely dry out and become brittle faster than the wad since the sheet has more contact at the surface with the air moving around it.

How small is a nanometer?

It's defined as one billionth of a meter. How small is that? Some ways to think about just how small a nanometer is:

- A sheet of paper is about 100,000 nanometers thick.
- Blond hair is probably 15,000 to 50,000 nanometers in diameter, but black hair is likely to be between 50,000 and 180,000 nanometers.
- There are 25,400,000 nanometers in an inch.
- A nanometer is a millionth of a millimeter.

See The Scale of Things and Three Examples at the Nanoscale

Where are nanoscale materials found?

If scientists can create artificial spider silk economically, the superstrong, lightweight materials could be used in sports helmets, armor, tethers and other products. Nanoscale materials and effects are found in nature all around us. Nature's secrets for building from the nanoscale create processes and machinery that scientists hope to imitate. Researchers already have copied the nanostructure of lotus leaves to create water repellent surfaces used today to make stain-proof clothing, other fabrics, and materials. Others are trying to imitate the strength and flexibility of spider silk, which is naturally reinforced by nanoscale crystals.

Many important functions of living organisms take place at the nanoscale. Our bodies and those of all animals use natural nanoscale materials, such as proteins and other molecules, to control our bodies' many systems and processes. A typical protein such as hemoglobin, which carries oxygen through the bloodstream, is 5 nanometers, or 5 billionths of a meter, in diameter.

Nanoscale materials are all around us, in smoke from fire, volcanic ash, sea spray, as well as products resulting from burning or combustion processes. Some have been put to use for centuries. One material, nanoscale gold, was used in stained glass and ceramics as far back as the 10th Century. But it took 10 more centuries before high-powered microscopes and precision equipment were developed to allow nanoscale materials to be imaged and moved around.

What is nanoscale behavior?

At the nanoscale, objects behave quite differently from those at larger scales. Gold at the bulk scale, for instance, is an excellent conductor of heat and electricity, but not of light. Properly structured gold nanoparticles, however, start absorbing light and can turn that light into heat, enough heat, in fact, to act like miniature thermal scalpels that can kill unwanted cells in the body, such as cancer cells.

Other materials can become remarkably strong when built at the nanoscale. For example, nanoscale tubes of carbon, 1/100,000 the diameter of a human hair, are incredibly strong. They are already being used to make bicycles, baseball bats, and some car parts today. Some scientists think they can combine carbon nanotubes with plastics to make composites that are far lighter, yet stronger than steel. Imagine the fuel savings if such a material could replace all the metal in a car! Carbon nanotubes also conduct both heat and electricity better than any metal, so they could be used to protect airplanes from lightning strikes and to cool computer circuits.

Introduction

Nanotechnology is an exciting area of scientific development which promises 'more for less'. It offers ways to create smaller, cheaper, lighter and faster devices that can do more and cleverer things, use less raw materials and consume less energy. There are many examples of the application of nanotechnology from the simple to the complex. For example, there are nano coatings which can repel dirt and reduce the need for harmful cleaning agents, or prevent the spread of hospital-borne infections. New-generation hip implants can be made more 'body friendly' because they have a nanoscale topography that encourages acceptance by the cells in their vicinity. Moving on to more complex products, a good example of the application of nanotechnology is a mobile phone, which has changed dramatically in a few years – becoming smaller and smaller, while paradoxically, growing cleverer and faster – and cheaper!

What is Nanotechnology?

Nanotechnology originates from the Greek word meaning "dwarf". A nanometre is one billionth (10^{-9}) of a metre, which is tiny, only the length of ten hydrogen atoms, or about one hundred thousandth of the width of a hair! Although scientists have manipulated matter at the nanoscale for centuries, calling it physics or chemistry, it was not until a new generation of microscopes were invented in the

nineteen eighties in IBM, Switzerland that the world of atoms and molecules could be visualized and managed.

In simple terms, nanotechnology can be defined as 'engineering at a very small scale', and this term can be applied to many areas of research and development – from medicine to manufacturing to computing, and even to textiles and cosmetics. It can be difficult to imagine exactly how this greater understanding of the world of atoms and molecules has and will affect the everyday objects we see around us, but some of the areas where nanotechnologies are set to make a difference are described below.

From Micro to Nano

Nanotechnology, in one sense, is the natural continuation of the miniaturization revolution that we have witnessed over the last decade, where millionth of a metre (10^{-6}m) tolerances (microengineering) became commonplace, for example, in the automotive and aerospace industries enabling the construction of higher quality and safer vehicles and planes. It was the computer industry that kept on pushing the limits of miniaturization, and many electronic devices we see today have nano features that owe their origins to the computer industry – such as cameras, CD and DVD players, car airbag pressure sensors and inkjet printers.

New applications

Because of the opportunities nanotechnology offers in creating new features and functions, it is already providing the solutions to many long-standing medical, social and environmental problems. Because of its potential, nanotechnology is of global interest. It is attracting more public funding than any other area of technology, estimated at 3.8 billion euros worldwide in 2005. It is also the one area of research that is truly multidisciplinary. The contribution of nanotechnology to new products and processes cannot be made in isolation and requires a team effort, which may include life scientists – biologists and biochemists - working with physicists, chemists and information technology experts. Consider the development of a new cochlear implant, and what that might require - at least a physiologist, an electronic engineer, a mechanical engineer and a biomaterials expert. This kind of teamwork is essential, not only for a cochlear implant, but for any new, nano-based product whether it is a scratch-resistant lens or a new soap powder.

Nano scientists are now enthusiastically examining how the living world 'works' in order to find solutions to problems in the 'non-living' world. The way marine organisms build strength into their shells has lessons in how to engineer new lightweight, tough materials for cars; the way a leaf photosynthesizes can lead to techniques for efficiently generating renewable energy; even how a nettle delivers its sting can suggest better vaccination techniques. These ideas are all leading to what is termed 'disruptive' solutions, when the old ways of making things are completely overtaken and discarded, in much the same way as a DVD has taken over from videotape, or a flat screen display from a cathode ray tube.

Nanotechnologies for Medical Applications

In the past, medical treatments have been, rather like medieval architecture, the result of adopting those techniques that worked and discarding those that didn't. Today, the improved knowledge of how the body functions at the cellular, or 'nano',

level is leading to many new and better medical techniques. For example, we know that the earlier a disease can be detected, the easier it is to remedy. To achieve this, research is focussing on introducing into the body specially designed nanoparticles, which are composed of tiny fluorescent 'quantum dots' that are 'bound' to targeting antibodies. These antibodies can bind in turn to diseased cells, and when this happens, the quantum dots fluoresce brightly. This fluorescence can then be picked up by new, specially developed, advanced imaging systems, enabling the accurate pinpointing of a disease even at a very early stage.

Nanotechnology is also leading to faster diagnosis. Diagnosis can be a lengthy and stressful business, often with a test sample having to be sent away for analysis, with the results taking several days or even weeks to arrive. Nanotechnology is enabling much faster and more precise diagnosis, as many tests can be built into a single, often palm-sized device that only requires tiny quantities of sample. This device is sometimes called a 'lab-on-a-chip', and samples can be processed and analysed so rapidly that the results can be read out almost instantaneously.

People often complain that the cure for a disease can feel almost as bad as the disease itself, as prescription drugs may have unpleasant (and if we are very unlucky, sometimes even fatal!) side effects. This is because the body needs to be flooded with very high doses of a drug in order to ensure that a sufficient volume reaches the site of the disease. Accurate targeting of the drug can now be achieved, using specially designed drug-carrying nanoparticles. This also means that much smaller quantities of a drug are necessary, so it is less toxic to the body. The drug is then activated only at the disease site (such as a tumour) by light or other means, and the progress of the cure can also be monitored by the imaging techniques described above.

Nano for the Environment

Nanotechnology offers some really exciting breakthroughs in environmentally friendly technologies from extracting renewable energy from the sun to the prevention of pollution. Geoffrey Sacks, the American Economist, in his 2007 BBC Reith lectures entitled 'Bursting at the Seams', commented: "The fate of the planet is not a spectator sport". He continued " We live in an interconnected world, where all parts of the world are affected by what happens in all other parts".

There is no doubt that the pressures we are putting on the planet are leading to potentially catastrophic consequences. In the developed world, we have grown accustomed to using our car to go to the local shops, take weekend cruises and even day trips to far-flung places that might have taken three or more months to reach before air travel became commonplace. We like our vegetables and fruit out of season, and increasingly expect to eat meat at least once, if not twice a day. We haven't thought about the effects of these activities on the planet, which in the past could absorb our excesses, but with the ongoing destruction of the rainforest (which is responsible for 25 % of carbon emissions!) and the population of the world reaching over 6.3 billion, the earth is showing signs of being unable to bounce back from the demands we are placing on it.

So what can we do to limit the damage and ensure a future for our children? Firstly, the bad news. The fossil fuel that oils our everyday lives is responsible for 44 % of the carbon dioxide we emit annually – and rising! The good news is that the

energy from sunlight is sufficient to meet our needs ten thousand times over. Today, more efficient and cheaper solar energy collectors are in the process of being developed using nanotechnology; these could be deployed as small units in our homes. They work particularly well in diffuse light, so would suit even less sunny climates. This would have the benefit of not sterilizing precious land (a diminishing resource for food), and quickly improve the quality of many people's lives, especially in poorer housing or in the less developed world.

Not only do we need new ways of generating energy, we need better ways of storing it. Nanotechnology is leading to improved, environmentally-friendly batteries and supercapacitors. We also need to reduce damage to the environment. Particularly toxic are those chemicals we use as solvents. Nanotechnology is leading to their eradication through the development new nanocoatings and nano structured surfaces that can effectively repel dirt and other contaminants. Coating metals to prevent corrosion also seriously affects the environment. Many anti-corrosion coatings involve chromium and cadmium, deadly substances, which the EU is seeking to limit. Of course, vehicle and component producers are keen to find alternatives, as recycling of toxic compounds is costly and unpleasant, andnew smart nanocoatings are in the process of being developed that are non-toxic and highly effective. Serious contamination of the environment with heavy metals and other pollutants are thrown into the atmosphere from the fumes and smoke being emitted from industrial processes. It is encouraging to note that most of these of these particles and gases (including carbon dioxide) can be 'scrubbed' out - and even reclaimed and reused, using specially functionalised nanomaterials, placed in the waste gas stream. Finally, given the old adage, if you can't measure it, you can't control it, fast, accurate, in-situ and online pollution monitoring is essential. New, cheap nanosensors are being developed from techniques used in medicine, that will enable us to do this quickly, effectively and cost effectively.

Nanomaterials

There are many fascinating examples of nanotechnology applications in new materials. For example, polymer coatings are notoriously easily damaged, and affected by heat. Adding only 2% of nanoparticulate clay minerals to a polymer coating makes a dramatic difference, resulting in coatings that are tough, durable and scratch resistant. This has implications for situations where a material fits a particular application in terms of its weight and strength, but needs protection from an external, potentially corrosive environment - which a reinforced polymer nanocoating can provide. Other nanocoatings can prevent the adherence of grafitti, enabling them to be easily removed by hosing with water once the coating has been applied. This has the important knock-on effect of improving urban environments, making them more attractive to bona fide citizens and less encouraging to criminals. These kinds of coatings, invented in Mexico, have been shown to work well in parts of Mexico City, transforming seedy crime-ridden neighbourhoods into increasingly respectable suburbs.

Nanoparticles

Particles at the nanoscale are below the wavelength of visible light, and therefore cannot be seen. Consequently, they can impart new properties while being

invisible themselves! Fluorescent nanoparticles, or quantum dots (mentioned earlier) have a whole range of possible applications. They are invisible until 'lit up' by ultraviolet light, and can even be made to exhibit a range of colours, depending on their composition and size. Such nanoparticles are ideal for crime prevention, where goods can be invisibly 'tagged' , preventing counterfeiting; stolen goods can be traced by their invisible 'bar code' and illict drugs by the fact they have no legal identification. In some countries, cheap agricultural fuel is 'laced' with harmless nanoparticles, making it easy for police to identify a stolen consignment, merely by using ultraviolet light.

Nanoparticles can seem to be quite strange as they have new and unusual properties that are not obvious in the corresponding bulk material. This is because a nanoparticle has a large surface area in relation to its size, and is consequently highly reactive. This is exemplified by the fine grained materials that we use in our daily lives, such as flour, which can become explosive in some circumstances. Applications of nanoparticles include nanoparticulate titanium dioxide for sunscreens, and it also acts as a photocatalytic agent in coatings that can be applied to stay-clean windows, causing the dirt to be oxidized and easily washed away by rain.

Carbon Nanotubes – The Miracle Material of the 21st Century?

Carbon nanotubes are a recently discovered unique material possessing amazing electronic, thermal, and structural properties They are highly conductive both to electricity and heat, with an electrical conductivity as high as copper, and a thermal conductivity as great as diamond. They offer amazing possibilities for creating future nanoelectronic devices, circuits and computers. Carbon nanotubes also have extraordinary mechanical properties - they are 100 times stronger than steel, while only one sixth of the weight. These mechanical properties offer huge possibilities, for example, in the production of new stronger and lighter materials for military, aerospace and medical applications. Other applications include lubricants, coatings, catalysts and electro-optical devices.

The cost, purification, separation of nanotube types (Single Walled NanoTubes from Multi Walled NanoTubes), constraints in processing and scaling up and assembly methods are still hurdles for some applications. However, there are already products containing nanotubes on the market, for example, in some tennis racquets nanotubes are used to reinforce the frame and improve the racquet's ability to absorb shocks. Carbon nanotubes can also be mixed with many different materials such as plastics and textiles, for example to produce lightweight bullet-proof vests. According to engineers at the Fraunhofer Technology Development Group in Stuttgart the greatest potential for creating new products lies in harnessing the electrical properties of lightweight and robust nanotubes to generate heat. Applications range from electric blankets to heatable aircraft wings that no longer ice up, to 'wallpaper' heating for cold walls.

Textiles

The textile industry is an early adopter of new ideas and technologies. Textiles are not only for the fashion conscious - they have important applications in the aerospace, automotive, construction, healthcare and sportswear industries. Already on the market are socks and leisurewear with embedded silver nanoparticles that combat

odour through killing bacteria – and this capability has been extended successfully to wound dressings. Several brands of clothing, including some designer labels, have incorporated self-cleaning and stain repellent nanotechnologies, very convenient for school clothes - and, of course, the less a garment needs to be washed, the more energy is saved! More glamorous applications include embedding gold nanoparticles into natural fabrics such as wool. The gold nanoparticles impart soft colours from pale soft greens, to browns and beiges, depending on the particle size and shape. These colours are stable, and may even provide some antibacterial properties to the fabrics, as an added bonus!

Across the globe a tremendous amount of research is taking place in electrospinning techniques. The spun, polymer-based nanofibres can be 'loaded' with different additives which could be nanoparticles, enzymes, drugs or catalysts. Some combinations can be antibacterial and sprayed on to wounds as a kind of healing 'web', others can be conductive or even form filters or membranes.

Scientists are also working on nanoelectronic devices that can be embedded into textiles to provide special support systems for individuals in dangerous professions or sports. Some garments can now provide life-signs monitoring, internal temperature monitoring, chemical sensing and also power generation and storage to enable communication with the outside world. Garments with this kind of technology can be vital for the safety of say firefighters working in dangerous situations in isolation from their colleagues, or even for skiers or their rescuers to give early warning signs of hypothermia.

In some establishments, research is ongoing into man-made nanofibres where clay minerals, carbon nanotubes or nanoparticulate metal oxides are used to impart new properties. These properties provide halogen-free, flame retardancy for a fabric, increased strength and shock-absorbency, heat and UV radiation stability, and even brighter colouration! Other work is ongoing in the very exciting area of inkjet printing onto textiles. This is opening up many possibilities, not just for the customised or localised printing of textiles to an individual design, but inkjet techniques can be used to create flexible electronic materials, sensing materials, and even the materials of the future with printed-on displays!

Scents and Flavours

A surprisingly interesting and lucrative field for the application of nanotechnology is in encapsulation and delivery technologies, especially for flavours and fragrances. These technologies were first developed for the delivery of pharmaceutical drugs, and have now found new applications in foods and household products. Encapsulation is an ideal way to improve the attributes and performance of a less-than-stable substance that might be affected by light or air, or have a tendency to sediment. Encapsulation gives active ingredients a longer shelf life, stability and protection from harsh processing environments so they can be delivered in a perfect state at 'the moment of consumption'! For the food industry, it is a way of delivering enhanced taste, or ensuring that daily doses of vitamins and minerals are met – this is discussed in more detail below. In household products, nano encapsulation techniques can aid in the deposition of a cleaner or polish onto a surface such as a floor or counter; they can provide long lasting scents in household fragrances, and the

slow release of enzymic and other agents in washing machines and dishwashers, helping reduce energy and water use.

Are there risks from nanotechnology?

Some engineered nanoparticles, including carbon nanotubes, although offering tremendous opportunities also may pose risks which have to be addressed sensibly in order that the full benefits can be realized. We have all learned how to handle electricity, gas, steam and even cars, aeroplanes and mobile phones in a safe manner because we need their benefits. The same goes for engineered nanoparticles. Mostly they will be perfectly safe, embedded within other materials, such as polymers. There is some possibility that free nanoparticles of a specific length scales may pose health threats if inhaled, particularly at the manufacturing stage. Industry and government are very conscious of this, are funding research into identifying particles that may pose a hazard to health or the environment, and how these risks may be quantified, and minimised over the whole lifecycle of a given nanoparticle. There is no doubt that nanotechnology has great potential to bring benefits to society over a wide range of applications, but it is recognised that care has to be taken to ensure these advances come about in as safe a manner as possible. [8]

4 Section IV Computers in use

4.1 Text I Computer onWheels

4.1.1 Read the text and answer the question

Why do schools and teachers have to be equipped with computer technology?

The mountain road was violently zigzagging, but the driver did not slow down. He seemed to be more concerned with two timetables - that of the bus and school lessons. The bus had to arrive at a country school in time for the next lesson.

Personal computers are mounted in the bus's interior where basic instruction is given under the school curriculum[1] in information science and computer technology. Children from village and town schools are thus learning to operate computers. It is one of the forms of implementing the countrywide programme[2] for computer knowledge among students.

At present, the fundamentals of information science and computer technology are studied in nearly 60,000 secondary schools throughout the country. The subject has been included in the curricula of the tenth and eleventh forms. As an experiment, computer lessons sometimes start at an earlier age, even at the elementary school.

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[1] school curriculum (pl. curricula) - школьная программа;
[2] implementing the... program - претворение в жизнь... программы.

The authors of the experiments have developed teaching method's that allow computer operation to be combined with strengthening the oral count habits, developing the so-called sense of numbers, improving the standards of logic and mathematical thinking. For example, a mathematical dictation for solving textual problems. Teachers know that with the conventional methods the better part of a math lesson is spent on putting down the solutions of problems (as a rule, children write slowly) and calculations. The logic part of the solution takes very little time. With computer equipment, this can be done efficiently and with the entire class participating[1].

The teacher slowly dictates the problem, while the children are not writing but listening attentively and thinking about the development. After a repeat, they immediately work out the problem on a computer or a calculator.

The computer enables them to check the solution. In the second part of the lesson, a pupil comments on the line of reasoning.[2] Using this method, the pupils of experimental classes can solve eight to ten problems in 15 to 20 minutes.

The introduction of the new course in schools made it imperative to reorient the higher educational establishments, too: over a hundred faculties and departments were opened to provide training in information science and computer technology.

General secondary and vocational schools, teacher training-institutes and universities had to be equipped with computer technology.

In many areas children are taken by bus to specialized centres, where they learn the new subjects because so far special classrooms cannot be equipped in every school.

In some regions another approach has been taken - buses were equipped with everything necessary, and their schedules were timed to serve the lessons at schools.[3]

4.1.2 Give the appropriate forms of the verbs instead of the infinitives

1 Teachers (to know) that with the conventional methods the better part of a math lesson (to spend) on putting down the solutions of problems (as a rule, children write slowly) and calculations.

2 The teacher slowly (to dictate) the problem, while the children (not to write) but (to listen) attentively and thinking about the development.

3 The introduction of the new course in schools (to make) it imperative to reorient the higher educational establishments, too: over a hundred faculties and departments (to open) to provide training in information science and computer technology.

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[1] with the entire class participating - при участии всего класса;

[2] line of reasoning - ход рассуждений;

[3] their schedules were timed to serve the lessons at schools - их графики былы составлены с таким рассчетом, чтобы обслуживать школьные занятия.

4.2 Text II The Computer Teaches Painting

4.2.1 Read the text and be ready for back translation of the text

The teachers of an art school in Wroclaw decided to "put Tiarm Ony to the 'test of algebra". Jointly with engineers, the Polish artists made the computer "learn" one more trade.

The computer superintends the process of teaching painting. A department of visual instruction,[1] the first in the republic, was opened. A group of enthusiasts worked out special tests and programs for primary, secondary and art schools. The leading role in these programs belongs to the most up-to-date engineering know-how.

The computer acquaints the beginners with the colour scale, technique of mixing paints and obtaining the required shades. With the help of game methods it is going to teach the children rudiments of composition and producing spatial shapes.[2]

These are skills that involve knowledge of mathematics and geometry. In the experts' opinion, the computer can become a valuable helper in the teaching process. It is noteworthy that the appropriate programs are designed for the Polish-made[3] microcomputers with which many of the country's schools are equipped. Quite a number of computers of this type make up the hardware of the Youth Computer Clubs[4] which are common in nearly all the provinces of the country and in the larger cities. There are also programs for other types of computers.

4.3 Text III A Talking ABC-book

4.3.1 Ask five types of questions on the text

Boys and girls from one of Gorky's children's centres got acquainted with an unusual ABC-book. The meeting began with a monologue of the electronic textbook which told the class about itself, "I'm a speech synthesizer. I speak Russian. I can change my voice and tempo of speech..."

After a while, the children guided by their teacher had a go at operating the wonderful machine. Six-year-old Yulia Kulikova sat down at the display and typed the Russian word "hare".

Following her typing, the computer's base spelled the word naming the letters one after another. Then the voice said, "Hare."Human speech is produced by a universal speech synthesizer — a miniaturized unit packed with a multitude of radio parts. The algorithm was worked out by specialists from Minsk and the synthesizer was made in Gorky.

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[1] department of visual instruction - кафедра визуального обучения;
[2] rudiments of composition and producing spatial shapes - начала пространственного построения сложных фигур и основы создания композиций;
[3] Polish-made - изготовленные в Польше;
[4] Youth Computer Clubs - молодежные компьютерные клубы.

The capabilities of the computer ABC-book do not strike only children. It can "speak" three male and two female voices. It is also able to produce an audio-text containing up to 400 characters, punctuate a text and do the simplest arithmetic operations.

«As you see, the scientists managed to turn an orthographic text into a phonetic one. And this is of great importance,"- the teacher said. The young learner takes a deep interest in producing the image of a letter, sound and word. He quickly learns to speak. At present, the scholars are busy preparing a program in English.

4.3.2 Change the following sentences into indirect speech

1 The meeting began with a monologue of the electronic textbook which told the class about itself, "I'm a speech synthesizer. I speak Russian. I can change my voice and tempo of speech..."

2 "As you see, the scientists managed to turn an orthographic text into a phonetic one."- the teacher said.

3 She added «And this is of great importance".

4.4 Text IV Computer in U.S. to teach spoken Language Course

4.4.1 Read the text, retell it

A computer that speaks a few languages teaches at Stanford University. The Institute of Mathematical Studies in the Social Sciences has designed a computer system that has taken the function of teaching beginners' courses in languages. The immediate aim is to make available[1] computerized courses in languages. The program has advantages that make it popular for the teaching of widely spoken languages, such as Spanish, French and German. Two manufacturers already have produced calculator-sized computers, designed for travelers that translate words and phrases. However, the program developed here is flexible. The computer offers highly individualized and interactive instructions.[2] Unlike classroom training, the program allows the student to move through the instruction as quickly or slowly as he wants, and whenever he has access to a computer terminal.

The use of computers in teaching is not new. Several universities offer computer-taught courses, primarily in mathematical and scientific subjects. Stanford has for years offered courses in logic and probability[3] some of which are taught entirely by computers. According to a report by the institute, language training was a natural product of these programs.

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[1] to make available - сделать доступным;

[2] interactive instructions - команды, предназначенные для диалогового режима;

[3] courses in logic and probability - курсы обучения логике и теории вероятности.

Computers are suited to language training, the report said, because such courses involve memorization and repeated drills by the student, something the computer can monitor and correct almost instantly. A study by the institute, comparing introductory Russian courses in the sixties using a computer with those given by lecture, found a "consistently superior performance by students[1] in the computer-assisted classes". The study noted that 80 percent of the computer-assisted students completed the second quarter of the course, compared with only 40 percent of the students in the regular class.

But those early computer-assisted classes used cassette tapes that were prerecorded and more rigidly programmed[2] than the new course. "Since then, computers have been created that synthesize speech," said Lawrence Merkosian, a research fellow[3] at the institute who helped develop the program. "That has given them great flexibility." The computer actually generates speech by calling up[4] prerecorded phrases in grammatical sequence.

The system could draw from[5] single words stored in the computer's memory but the resulting speech sounds unnatural. Since high-quality audio is desired in language training, phrases instead of words are synthesized.   The course requires no previous experience with computers. The student follows written instructions on how to begin operating the keyboard. Then the computer speaks to the student through headphones.

As the course begins, the alphabet is displayed on the screen and described in English synthesized from the computer's memory. Next the computer pronounces and writes a sentence in the foreign language. When the words disappear from the screen, the student then types the sentence from memory.

The computer congratulates the student if the response is correct, but asks the student to repeat the exercise if it is wrong. If the student still has trouble, he or she can ask the computer to go over background material.[6]

At least one professor at Stanford, John Barson, the head of the French department, does not believe that computers will completely displace human teachers. I don't personally view computers as a threat,"[7] he said. "There is enough of a social process and an infinite open-endedness to language[8] that a computer can never master."

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[1] a consistently superior performance by students - значительно лучшие результаты у обучающихся;

[2] that were prerecorded and more rigidly programmed - с предварительной « записью и менее гибкой программмой;

[3] a research fellow - ученый, исследователь;

[4] by calling up - вызывая из своей памяти;

[5] draw from - *зд.* основываться на;

[6] background material - *зд.* предыдущий материал ;

[7] I don't… view computers as a threat- Я не смотрю на компьютер как на угрозу;

[8] infinite open-endedness to language- бескрайние возможности языка.

4.4.2 Answer the questions

1 Where does the computer that speaks a few lanquaqes teach?
2 What is the immediate aim of the innovation?
3 What does the computer offer?
4 Why are Computers suited to language training?
5 What did the study note?
6 Will computers completely displace human teachers?
7 What does the course require?
8 What does the student follow?
9 Who does not believe that computers will completely displace human teachers?
10 What can`t a computer ever master?
11 What way did you begin to study the language?
12 Can you imagine the computer to be your teacher?
13 What is your attitude towards a computer that speaks a few languages?

5 Section V Texts to read

5.1 Text I What Is CERN?

At CERN if researchers wanted to share documents they had to organize and format them so that they would be compatible with the main CERN computing system. This was a problem since the researchers contributing to the work going on at CERN were located around the world and used many different kinds of computers and software. Many researchers were upset.

In 1989, Berners-Lee submitted a proposal at CERN to develop an information system that would create a web of information. Initially, his proposal received no reply, but he began working on his idea anyway. In 1990, he wrote the Hypertext Transfer Protocol (HTTP) - the language computers would use to communicate hypertext documents over the Internet and designed a scheme to give documents addresses on the Internet. Berners-Lee called this address a Universal Resource Identifier (URI). This is now known as a URL - Uniform Resource Locator. By the end of the year he had also written a client program (browser) to retrieve and view hypertext documents. He called this client "WWW." Hypertext pages were formatted using the Hypertext Markup Language (HTML) that Berners-Lee had written. He also wrote the first web server. A web server is the software that stores web pages on a computer and makes them available to be accessed by others. Berners-Lee tried to sell his new creation at CERN as a way to link data between the many incompatible systems at CERN. Still the bureaucracy at CERN was slow in acknowledging his efforts. Berners-Lee turned to the Internet community. In 1991, he made his WWW browser and web server software available on the Internet and posted notices to several newsgroups including hypertext. The Web began to take off as computer enthusiasts around the world began setting up their own web servers. Often the

owners of the new sites would email Berners-Lee and he would link to their sites from the CERN site. His dream of a global information space was finally happening.

Indeed, use of the WWW became widespread in the mid 1990's, but its beginnings can actually be traced back to 1980 when Tim Berners-Lee, an Englishman who had recently graduated from Oxford, landed a temporary contract job as a software consultant at CERN (the famous European Particle physics Laboratory in Geneva). He wrote a program, called Enquire, which he called a "memory substitute," for his personal use to help him remember connections between various people and projects at the lab. This was a very helpful tool since CERN was (and still is) a large international organization involving a multitude of researchers located around the world.

Berners-Lee finished his work at CERN and left, but he returned in 1984 with a more permanent position. His previous work with Enquire had left a mental mark. He envisioned a global information space where information stored on computers everywhere was linked and available to anyone anywhere. There were two technologies already developed that would allow his vision to become reality. In 1945, Vannevar Bush wrote an article in which he described a theoretical system for storing information based on associations. Others like Ted Nelson and Douglas Englebart had furthered Bush's work with their own work on hypertext. Hypertext allows documents to be published in a nonlinear format. Hypertext links allow the reader to jump instantly from one electronic document to another. Berners-Lee had already used this format when he wrote Enquire.

The other technology was the Internet - a computer network of networks. The Internet is a very general infrastructure that allows computers to link together. It uses standardized protocols (TCP/IP) which let computers of different types using different software communicate. HyperText would allow any document in the information space to be linked to any other document. The Internet would allow those documents to be transmitted.

World Wide Web Consortium (W3C)

Berners-Lee was also concerned that the new success of the Web would lead to destructive competition that would create proprietary Web products that could destroy the open nature of the Web. He knew that some sort of oversight was needed to keep the Web running smoothly, but any new oversight organization could also not be allowed to fundamentally alter the free and open character of the Web. He envisioned a forum where developers of servers and browsers could reach a consensus on how the Web should operate.

On May 24, 1994, the first WWW conference was held in CERN. Berners-Lee used this conference to share his vision to create a consortium to help the Web develop smoothly.

Berners-Lee also discussed the idea of a consortium with some his friends at MIT. In July of 1994 he received a phone call from one of those friends. MIT agreed to host the consortium. MIT would be the American headquarters and CERN would be the European headquarters. (CERN would later decide to drop out of the consortium and France's National Institute for Research in Computer Science and Control became the European headquarters). Berners-Lee moved almost immediately

to MIT to head the new consortium, which was known as the World Wide Web consortium or simply W3C.

The purpose of the new consortium was to lead the Web to its full potential, primarily by developing common protocols to enhance the interoperability and evolution of the Web. Membership in the consortium would be open to any organization: commercial, governmental, educational, etc. Any member would be free to participate in any meeting or working group put together by the consortium. XX century brought us a new idea: workers are paid for their time. Later, in mid-sixties, it was thought that companies pay their employees for their skills and personal qualities.

Among those qualities were creativity, company loyalty. For those companies that eventually switched to new system, it became very difficult to properly measure worker's contribution to company's results. These companies try to increase workers morale, motivate them, because it is evident: if workers don't want to work, they won't work. Or at least, the results will be extremely poor. That's why in addition to motivation by money, managers try to create a feeling of mutual trust, belonging to company and common interests.

What new brings telework to this field? First it is ease of control and measurement. Results in electronic form can be easily archived, analysed by computers, forwarded for checking and copied. Next, all information about time and efforts spent is available. Another thing is that fixed time-based salaries are gone. The company will no longer care so about who and how much spent on a task. This will become a question of personal choice.

Now everyone will be given a freedom to decide whether to work or to have a rest. This can differentiate workaholics from ordinary lazy people. Right now there are same rules for everybody. Rarely a company wants to have a lot of part-time workers. We cannot imagine a worker coming to factory when he is in the right mood. But with distant jobs you can have workers switching every now and then. We can even dream about perfect labour marketplace with contracts signed electronically for several hours. [9]

5.2 Text II The Hacker's Handbook

5.2.1 Read the extract from the book "THE HACKER'S HANDBOOK" and translate it using the vocabulary and making notes like this

Things I already knew
Things I don't know
Things I did not understand

5.2.2 Make up all kinds of questions to the sentences

1 The first hack I ever did was executed at an exhibition stand run by BT's.
2 Most hackers seem to have started in a similar way.
3 The critical element must be the use of skill in some shape or form.

4 They were able to borrow terminals to work with.

5 What has changed now, of course, is the wide availability of home computers and the modems to go with them.

6 Hackers vary considerably in their native computer skills.

7 The materials and information you need to hack are all around you.

8 And you must be prepared for long periods when nothing new appears to happen.

9 In the introduction to this book I described hacking as a sport.

10 Nevertheless, it is astonishingly easy to get remarkable results.

11 No one involved has a stake in the truth.

12 It is even possible to hack with no equipment at all.

13 But all these hackers were privileged individuals.

14 That was how I found the number to call.

5.2.3 Read and translate the text

The first hack I ever did was executed at an exhibition stand run by BT's then rather new Prestel service. Earlier, in an adjacent conference hall, an enthusiastic speaker had demonstrated view- data's potential world-wide spread by logging on to Viditel, the infant Dutch service. He had had, as so often happens in these circumstances, difficulty in logging on first time. He was using one of those sets that display auto-dialed telephone numbers; that was how I found the number to call.

By the time he had finished his third unsuccessful log-on attempt I (and presumably several others) had all the pass numbers. While the BT staff was busy with other visitors to their stand, I picked out for myself a relatively neglected view data set. I knew that it was possible to by-pass the auto-dialer with its pre-programmed phone numbers in this particular model, simply by picking up the phone adjacent to it, dialing my preferred number, waiting for the whistle, and then hitting the keyboard button labeled 'view data'.

I dialed Holland, performed my little by-pass trick and watched Viditel write itself on the screen. The pass numbers were accepted first time and, courtesy of...no, I'll spare them embarrassment...I had only lack of fluency in Dutch to restrain my explorations. Fortunately, the first BT executive to spot what I had done was amused as well.

Most hackers seem to have started in a similar way. Essentially you rely on the foolishness and inadequate sense of security of computer salesmen, operators, programmers and designers.

In the introduction to this book I described hacking as a sport; and like most sports, it is both relatively pointless and filled with rules, written or otherwise, which have to be obeyed if there is to be any meaningfulness to it. Just as rugby football is not only about forcing a ball down one end of a field, so hacking is not just about using any means to secure access to a computer.

On this basis, opening private correspondence to secure a password on a public access service like Prestel and then running around the system building up someone's

bill is not what hackers call hacking. The critical element must be the use of skill in some shape or form.

Hacking is not a new pursuit. It started in the early 1960s when the first "serious" time-share computers began to appear at university sites. Very early on, 'unofficial' areas of the memory started to appear, first as mere notice boards and scratch pads for private programming experiments, then, as locations for games.(Where, and how do you think the early Space Invaders, Lunar Landers and Adventure Games were created?) Perhaps tech-hacking—the mischievous manipulation of technology-goes back even further. One of the old favorites of US campus life was to rewire the control panels of elevators (lifts) in high-rise buildings, so that a request for the third floor resulted in the occupants being whizzed to the twenty-third.

Towards the end of the 60s, when the first experimental networks arrived on the scene the computer hackers skipped out of their own local computers, along the packet-switched high grade communications lines, and into the other machines on the net. But all these hackers were privileged individuals. They were at a university or research resource, and they were able to borrow terminals to work with.

What has changed now, of course, is the wide availability of home computers and the modems to go with them, the growth of public-access networking of computers, and the enormous quantity and variety of computers that can be accessed.

Hackers vary considerably in their native computer skills; a basic knowledge of how data is held on computers and can be transferred from one to another is essential. Determination, alertness, opportunism, the ability to analyse and synthesise, the collection of relevant helpful data and luck - the pre-requisites of any intelligence officer - are all equally important. If you can write quick effective programs in either a high level language or machine code, well, it helps. Knowledge of on-line query procedures is helpful, and the ability to work in one or more popular mainframe and mini operating systems could put you in the big league.

The materials and information you need to hack are all around you - only they are seldom marked as such. Remember that a large proportion of what is passed off as 'secret intelligence' is openly available, if only you know where to look and how to appreciate what you find. At one time or another, hacking will test everything you know about computers and communications. You will discover your abilities increase in fits and starts, and you must be prepared for long periods when nothing new appears to happen.

Popular films and TV series have built up a mythology of what hackers can do and with what degree of ease. My personal delight in such Dream Factory output is in compiling a list of all the mistakes in each episode. Anyone who has ever tried to move a graphics game from one micro to an almost-similar competitor will already know that the chances of getting a home micro to display the North Atlantic Strategic Situation as it would be viewed from the President's Command Post would be slim even if appropriate telephone numbers and passwords were available.

Less immediately obvious is the fact that most home micros talk to the outside world through limited but convenient asynchronous protocols, effectively denying direct access to the mainframe products of the world's undisputed leading computer

manufacturer, which favors synchronous protocols. And home micro displays are memory-mapped, not vector-traced... Nevertheless, it is astonishingly easy to get remarkable results. And thanks to the protocol transformation facilities of PADs in PSS networks, you can get into large IBM devices....

The cheapest hacking kit I have ever used consisted of a ZX81, 16K RAM pack, a clever firmware accessory and an acoustic coupler. Total cost, just over $ 100. The ZX81's touch-membrane keyboard was one liability; another was the uncertainty of the various connectors.

Much of the cleverness of the firmware was devoted to overcoming the native drawbacks of the ZX81's inner configuration - the fact that it didn't readily send and receive characters in the industry-standard ASCII code, and that the output port was designed more for instant access to the Z80's main logic rather than to use industry-standard serial port protocols and to rectify the limited screen display.

Yet this kit was capable of adjusting to most bulletin boards; could get into most dial-up 300/300 asynchronous ports,re-configuring for word-length and parity if needed; could have accessed a PSS PAD and hence got into a huge range of computers not normally available to micro-owners; and, with another modem, could have got into view data services. You could print out pages on the ZX 'tin-foil' printer. The disadvantages of this kit were all in convenience, not in facilities.

It is even possible to hack with no equipment at all. All major banks now have a network of 'hole in the wall' cash machines—ATMs or Automatic Telling Machines, as they are officially known. Major building societies have their own network. These machines have had faults in software design, and the hackers who played around with them used no more equipment than their fingers and brains.

Though I have no intention of writing at length about hacking etiquette, it is worth one paragraph: lovers of fresh-air walks obey the Country Code; they close gates behind them, and avoid damage to crops and livestock. Something very similar ought to guide your rambles into other people's computers: don't manipulate files unless you are sure a back-up exists; don't crash operating systems; don't lock legitimate users out from access; watch who you give information to; if you really discover something confidential, keep it to yourself. Hackers should not be interested in fraud. Finally, just as any rambler who ventured past barbed wire and notices warning about the Official Secrets Acts would deserve whatever happened thereafter, there are a few hacking projects which should never be attempted.

After the hack a number of stories about how it had been carried out, and by whom, circulated; it was suggested that the hackers had crashed through to the operating system of the Prime computers upon which the Dialcom electronic mail software resided - it was also suggested that the BBC had arranged the whole thing as a stunt, or alternatively, that some BBC employees had fixed it up without telling their colleagues. Getting to the truth of a legend in such cases is almost always impossible. No one involved has a stake in the truth. British Telecom, with a strong commitment to get Gold accepted in the business community, was anxious to suggest that only the dirtiest of dirty tricks could remove the inherent confidentiality of their electronic mail service.

Naturally, the British Broadcasting Corporation rejected any possibility that it would connive in an irresponsible cheap stunt. But the hacker had no great stake in the truth either - he had sources and contacts to protect, and his image in the hacker community to bolster. Never expect any hacking anecdote to be completely truthful. [10]

5.2.4 Find the main information in every passage of the text

5.3 Text III E-mail

5.3.1 Read the text. Find the sentence with the main idea

Using electronic mail, or e-mail, anyone using a computer connected to the Net can send messages to anyone else with a computer connected to the Net. E-mail has transformed the way we communicate. It enables people to contact each other and respond to messages within minutes. Unlike a telephone conversation, which leaves no printed record, an e-mail can be printed out. Businesses are now using printouts of e-mails as records of discussions, agreements and actions.

If millions of e-mails are being sent every day, the postal service must be losing a lot of business. Well, no, actually. The number of letters and parcels being sent is still increasing - and e-mail is contributing to this increase. The growth of on-line shopping is producing a measurable increase in parcel deliveries - up to ten per cent in the run-up to Christmas 1999 in some countries.

E-mail is normally released from a mailbox to a computer that can provide the right user name and password. Both of these are stored in the computer when an Internet service account is set up. Internet Service Providers (ISPs) are companies that offer connections to the Internet. Picking up your e-mail usually means making a local call to the ISP which hosts your mailbox. Picking up your e-mail when you are traveling around and cannot make that local call is more tricky. Travelers can use a different type of e-mail, called web mail that is easier to use from different computers and places. A web mail service is located at a web site. Anyone setting up a web mail account can pick up e-mails simply by logging on to the web site and keying in the necessary security and, identification information, so it doesn't matter which computer is used.

Although e-mail is great for contacting people far away very quickly, it is often used to contact people on the other side of the same office or to send messages that could be dealt with better by a phone call. So could e-mail be making us lazy and discouraging us from having face-to-face contact with each other?

In the short term, the social effects are not particularly marked. The same people who are e-mailing colleagues sitting nearby are also chatting with each other at lunchtime, talking to neighbors over the garden fence, visiting shops and calling friends and relatives. But further in the future, it we're all on-line, digital communication could replace thus routine, daily face-to-face contact with people. And that might have undesirable consequences. When we communicate with other people, we don't just rely on words. We also use a lot of non-verbal communication -

we 'read' people's facial expressions and body language and we listen to the tone of their voice. E-mail eliminates all of these non-verbal cues. But in the future we will have video-conferencing and one-to-one conversations using webcams (small video cameras used to send images across the Internet) which could ultimately replace the phone.

Of course, one communications medium we've been using all our lives — the telephone - is also incapable of communicating facial expressions or body language: and a lifetime of communication by telephone doesn't seem to have damaged us in any way. While it fails to transmit some of the non-verbal cues we use face-to-face, it has caused an explosive growth in communication because it enables us to contact more people over greater distances than was possible before. In the same way, perhaps our tears about the implications of on-line communication will turn out to be groundless. One could argue that on-line shopping, banking, mail and so on take much less time than traveling to shops, banks, and post offices in person, which leaves us more time for leisure or work, where we will meet each other in the 'traditional' way. [11]

5.3.2 Answer the questions

1 What has E-mail
2 What is the growth of on-line shopping producing?
3 Where is a web mail service located?
4 Could e-mail be making us lazy and discouraging us from having face-to-face contact with each other?
5 How often do you use e-mail?

5.3.3 Tell the group about your experience of using e-mail

5.4 Text IV Women on-line

5.4.1 Read the text. Find the sentence with the main idea

There are so many people on-line now those distinct groups of Internet users arc appearing. And companies selling products and services are beginning to target these groups. The fastest-growing group of people going on-line now is women. By the year 2000, almost half of all internet users were female, mostly busy career women. Women often have to combine work with running a home and bringing up a family. Their time is precious. They use the Internet's twenty-four-hour on-line shopping, banking, e-mail, advice and research facilities to save time. Women are flocking on to the Internet in such numbers that they are an increasingly important group of customers. There are now ISPs providing services specifically for women.

More specialist web sites and ISPs will emerge to serve the needs of other special interest groups. In the USA, senior citizens control more than three-quarters of American wealth. However, they are often discriminated against because of age or

disability. ISPs aimed specifically at older people are beginning to spring up. Once senior citizens learn how to use it, they spend as much time on the Net as young people. They often use it to keep in touch by e-mail with grandchildren and other relatives in faraway places.[11]

5.4.2 Speak on the topic, using the information about your female relatives

5.5 Text V Fact or fiction?

5.5.1 Read and translate the text

The amount of information on the Net can be daunting, but its accuracy is sometimes a more serious concern. Whatever you want to know, no matter how obscure, the answer will be stored in a computer somewhere in the world. And programs called search engines will help you find it. Just visit a search engine web site, key in your question and the search engine will lead you to the web sites that hold the answers. But how do you know that the answers are correct?

Anyone can set up a web site and air their beliefs on it however strange these might be. Web sites stating that there are little green men living on the far side of the moon, or that the Earth is flat, rarely do any harm because their claims are so outlandish. But web sites that claim to have a cure for cancer or AIDS can be dangerous. Doctors are concerned about bogus or misguided medical advice on the Web. It may be difficult to tell from a web site whether or not the advice it offers is based on science or simply reflects a desire to sell worthless treatments.

Hypochondriacs (people who are abnormally concerned about their health) can now check out the thousands of medical web sites and health stories on the Web. People who use the Internet to take health concerns to these absurd lengths are nicknamed cyberchondriacs. At the mercy of the Internet (rather than the respectable medical textbooks that hypochondriacs may pore over), cyberchondriacs can fall prey to the wildest claims made in the crankiest web sites. Many of these are unknown to health and medical professionals and therefore go unchecked and unchallenged. On the plus side, however, there are web sites run by pharmaceutical companies where you can tap in your ailments and they recommend the drugs you should ask your GP to prescribe. (But they will probably only recommend the drugs that they manufacture, of course!) In the UK, a National Health Service initiative (NHS Direct) provides impartial health service information on-line. [11]

5.5.2 Give the definitions to any three words from the text your groupmates to guess

5.5.3 Compose sentences with the words below

Daunt, web sites, hypochondriacs, outlandish, check.

5.6 Text VI Webcams

You can use webcams to check out holiday resorts and look at street scenes in a town you're thinking of moving to. A handful of play-schools and preschool playgroups have installed webcams, so that working parents can access the cameras via the Web and see their children during the working day. There are built-in security measures so that only the children's parents can see the images.

Only time will tell if the use of webcams in schools and playgroups is a good idea, whether they help or harm parents' relationship with their children and whether they will be welcomed by teachers. Once webcams are placed in schools, they could be used for reasons other than parental monitoring. For example, if head teachers and school inspectors had access to classroom webcam images, perhaps the quality of teacher assessments and school inspections could be improved? But perhaps they could be used for less constructive reasons.

Governments would be able to monitor teachers and control the way they teach certain subjects. Do you think the constant monitoring of any profession would be desirable? Webcams are so small that they can be hidden anywhere. If a webcam can be placed almost anywhere, can you be sure that one isn't watching you right now? How would you feel if you discovered a webcam in your room at home, or in your classroom? Perhaps the use of webcams should be controlled? But who should control them? [11]

5.7 Text VII Virtually dead!

When someone dies, it is customary in many countries to announce the death publicly by placing a death notice or an obituary in newspapers. A number of 'virtual graveyards' have sprung up on the Web that enable people to post virtual memorials or tributes to loved ones.

The list of uses the Internet has been put to is endless. Doctors in front-line military hospitals use it to e-mail test results, images of patients and X-rays to specialists for a second opinion. Family doctors and hospital specialists give consultations to patients using on-line video links. And governments use it to promote health care and give medical advice. Climbers take digital photographs on their way up the world's highest mountains and post them on web sues by satellite telephone.

Internet news stories are updated round the clock, so news often breaks first on the Internet. So, when the first supersonic land speed record was set in the United States in 1997, digital photographs of the car and details of its speeds and times were available to the public on the team's web site within minutes. [11]

5.8 Text VIII Trend spotting

The Net serves the needs of people, so it has to adapt to match changes in our society. As a result, ISPs are in a very good position to spot changing trends in society because of their direct, interactive (two-way) links with people through the

Net. In future, changes in the Net and the services that ISPs offer may be among the first clues to changes in society at large.

The way we see Net users is altering already. A survey of 2,000 school children in 1999 found that just over half of them (fifty-one per cent) have used the Internet. More than half said they thought Internet users were clever. Nearly half (forty per cent) thought Net users were fun. Only a twentieth (five per cent) of the children thought that Net users were odd. The Net may once have been a refuge for young male computer nerds, but in less than ten years it has developed into something entirely different - a vast and diverse network that has attracted hundreds of millions of people by responding to their different needs. [11]

6 Section VI Machine Translation

6.1 Text I The development and use of machine translation systems and computer-based translation tools (by John Hutchins)

6.1.1 Read the text and discuss it

Machine translation, sometimes referred to by the abbreviation MT, is a sub-field of <u>computational linguistics</u> that investigates the use of <u>computer software</u> to <u>translate</u> text or speech from one <u>natural language</u> to another. At its basic level, MT performs simple <u>substitution</u> of words in one natural language for words in another. Using <u>corpus</u> techniques, more complex translations may be attempted, allowing for better handling of differences in <u>linguistic typology</u>, phrase <u>recognition</u>, and translation of <u>idioms</u>, as well as the isolation of anomalies.

Current machine translation software often allows for customisation by domain or <u>profession</u> (such as <u>weather reports</u>) — improving output by limiting the scope of allowable substitutions. This technique is particularly effective in domains where formal or formulaic language is used. It follows then that machine translation of government and legal documents more readily produces usable output than conversation or less standardised text.

Improved output quality can also be achieved by human intervention: for example, some systems are able to translate more accurately if the user has <u>unambiguously identified</u> which words in the text are names. With the assistance of these techniques, MT has proven useful as a tool to assist human translators, and in some cases can even produce output that can be used "as is". However, current systems are unable to produce output of the same quality as a human translator, particularly where the text to be translated uses casual language.

Historical background

Systems for automatic translation have been under development for 50 years – in fact, ever since the electronic computer was invented in the 1940s there has been research on their application for translating languages (Hutchins 1986). For many years, the systems were based primarily on direct translations via bilingual dictionaries, with relatively little detailed analysis of syntactic structures. By the

1980s, however, advances in computational linguistics allowed much more sophisticated approaches, and a number of systems adopted an indirect approach to the task of translation. In these systems, texts of the source language are analysed into abstract representations of 'meaning', involving successive programs for identifying word structure (morphology) and sentence structure (syntax) and for resolving problems of ambiguity (semantics). Included in the latter are component programs to distinguish between homonyms (e.g. English words such as light, which can be a noun, and adjective or verb, and solution, which can be a mathematical or a chemical term) and to recognise the correct semantic relationships (e.g. in The driver of the bus with a yellow coat). The abstract representations are intended to be unambiguous and to provide the basis for the generation of texts into one or more target languages. There have in fact been two basic 'indirect' approaches. In one the abstract representation is designed to be a kind of language-independent 'interlingua', which can potentially serve as an intermediary between a large number of natural languages. Translation is therefore in two basic stages: from the source language into the interlingua, and from the interlingua into the target language. In the other indirect approach (in fact, more common approach) the representation is converted first into an equivalent representation for the target language. Thus there are three basic stages: analysis of the input text into an abstract source representation, transfer to an abstract target representation, and generation into the output language.

Until the late 1980s, systems of all these kinds were developed, and it is true to say that all current commercially available systems are also classifiable into these three basic system types: direct, interlingual and 'transfer'. The best known of the MT systems for mainframe computers are in fact essentially of the 'direct translation' type, e.g. the Systran, Logos and Fujitsu (Atlas) systems. They are however improved versions of the type; unlike their predecessors, they are highly modular in construction and easily modifiable and extendable. In particular, the Systran system, originally designed for translation only from Russian into English, is now available for a very large number of language pairs: English from and into most European languages (French, German, Italian, Spanish, Portuguese), Japanese, Korean, etc. Logos, originally marketed for German to English, is also now available for other languages: English into French, German, Italian and Spanish, and German into French and Italian. The Fujitsu ATLAS system, on the other hand, is still confined to translation between English and Japanese (in both directions).

Among the most important of the mainframe 'transfer' systems was METAL, supported for most of the 1980s by Siemens in Germany. However, it was only at the end of the decade that METAL came onto the market, and sales were poor. During the 1990s, rights to METAL have been transferred to two organisations (GMS and LANT) in a complex arrangement. But the best known systems adopting the 'transfer' approach were research projects: Ariane at GETA in Grenoble, an MT project going back to the 1960s, and Eurotra funded by the Commission of the European Communities. There were hopes that Ariane would become the French national system, and there were plans to incorporate it in a translator's workstation for Eurolang (see below), but in the end nothing came of them. As for Eurotra, it was undoubtedly one of the most sophisticated systems, but after involving some hundred

of researchers in most countries of Western Europe for almost a decade, it failed to produce the working system that the sponsors wanted. It had been hoped that Eurotra would eventually replace the Systran systems that the Commission had acquired and was developing internally. In the late 1980s, Japanese governmental agencies began to sponsor an interlingua system for Asian languages, involving co-operation with researchers in China, Thailand, Malaysia and Indonesia. However, this project too has so far not produced a system after a decade of work. (For surveys of MT research and development in 1980s and early 1990s see Hutchins 1993, 1994.)

Governmental and non-commercial use

The earliest installations of MT systems were in national and international governmental and military translation services – primarily because they could afford the costs of the computer hardware required. The US Air Force introduced Systran in 1970 for translating Russian military scientific and technical documentation into English. Although some documents were edited, much of the output was passed to recipients without revision; over 90 % accuracy for technical reports is claimed. The National Air Intelligence Center, which took over the service from the USAF, now produces translations (many unedited) for a wide range of US government organisations (Pedtke 1997). As well as Russian-English it has available systems from Systran for translating Japanese, Chinese and Korean into English, and under development with Systran is a system for SerboCroat into English.

In Europe, the largest translation service is that of the European Commission, and was one of the first organisations to install MT. It began in 1976 with the Systran system for translating from English into French. In subsequent years, versions were developed for many other language pairs, covering the needs for translation among the European Union languages. While the translation of many legal texts continues to be done by human translators, the Systran systems are used increasingly not only for the translation of internal documents (with or without post-editing) but also as rough versions for the assistance of administrators when composing texts in non-native languages (Senez 1996).

Production of technical documentation

Until the 1990s the normal assumption was that MT systems were intended to be used for the production of documentation of publishable quality, primarily but not exclusively of a scientific and technical nature. The assumption was, in other words, that MT systems were to be used in conditions where otherwise human translators would be employed with expertise in the subjects concerned. Evidently, the actual quality of MT output was inadequate for direct use. It had to be extensively revised before it could be published, and translators were therefore employed as 'post-editors'. In these circumstances, the use of MT became a matter of economics. It was viable only if overall quality and speed could be achieved at lower cost than the employment of human translators.

Although today there are other uses for MT, as we have already indicated, this application remains the most important, particularly for the vendors and developers of the larger 'mainframe'-type systems (Systran and Logos). The main customers and users are the multinational companies exporting equipment in the global market (Vasconcellos 1993; Brace et al. 1995). The need here is for translation of

promotional and technical documentation. In the latter case, technical documents are often required in very large volumes: a set of operational manuals for a single piece of equipment may amount to several thousands of pages Furthermore, there can be frequent revisions with the appearance of new models. In addition, there must be consistency in translation: the same component must be referred to and translated the same way each time. This scale of technical translation is well beyond human capacity. Nevertheless, in order to be most cost-efficient, a MT system should be well integrated within the overall technical documentation processes of the company: from initial writing to final publishing and distribution. Systems developed for the support of technical writers – not just assistance with terminology, but also on-line style manuals and grammar aids – are now being linked seamlessly into translation and publishing processes.

There are numerous examples of the successful and long-term use of MT systems by multinationals for technical documentation. One of the best known is the application of the Logos systems at the Lexi-Tech company in New Brunswick, Canada; initially for the translation into French of manuals for the maintenance of naval frigates, the company has built up a service undertaking many other large translation projects. Also using Logos are Ericsson, Osram, Océ Technologies, SAP and Corel. Systran has many large clients: Ford, General Motors, Aérospatiale, Berlitz, Xerox, etc. The METAL German-English system has been successfully used at a number of European companies: Boehringer Ingelheim, SAP, Philips, and the Union Bank of Switzerland.

A pre-requisite for successful MT installation in large companies is that the user expects a large volume of translation within a definable domain (subjects, products, etc.) The financial commitment to a terminology database and to dictionary maintenance must be justifiable. Whether produced automatically or not, it is desirable for company documentation to be consistent in the use of terminology. Many companies in fact insist upon their own use of terms, and will not accept the usage of others. To maintain such consistency is almost impossible outside an automated system. However, it does mean that before an MT system can be installed, the user must have already available a well-founded terminological database, with authorised translation equivalents in the languages involved, or – at least – must make a commitment to develop the required term bank.

For similar reasons, it is often desirable if the MT system is to produce output in more that one target language. Most large-scale MT systems have to be customised, to a greater or lesser extent, for the kind of language found in the types of documents produced in a specific company. This can be the addition of specific grammatical rules to deal with frequent sentence and clause constructions, as well as the inclusion of specific rules for dealing with lexical items, and not just those terms unique to the company. The amount of work involved in such customisation may not be justifiable unless output is in a number of different languages.

Controlled language and domain-specific systems

In these circumstances, however, it has often been found feasible to introduce a greater degree of control. One of the earliest and best known examples is the application of the Systran system by the Xerox Corporation. At Xerox technical

authors are obliged to compose documents in what is called Multinational Customized English, where not only the use of specific terms is laid down but also the construction of sentences (Elliston 1979). The advantages of this approach are: the avoidance of ambiguities in the input which the MT system cannot deal with adequately, the consequential better quality output, the faster production of technical documents simultaneously in a number of different languages, and (not least) the production of more easily comprehensible English documents. These advantages have been recognised by other multinational companies, and the use of 'controlled languages' is increasing: for example, the Caterpillar Corporation has devised its own form of English to facilitate translation in a knowledge-based MT system being developed for it at the Carnegie-Mellon University (Mitamura and Nyberg 1995). There are some companies offering to build 'controlled' language MT systems for specific clients. The oldest established – and the pioneer in this approach – is the Smart Corporation, New York. Systems have been developed by Smart for a number of major clients: Citicorp, Chase, Ford, General Electric, etc. Each incorporates a system for 'normalising' English documents. This system component is considered so crucial to success that the actual translation process is regarded as virtually a 'by-product' (Lee 1994). There are Smart systems translating into French, German, Greek, Italian, Japanese, and Spanish. The largest Smart installation, perhaps, is the system designed for the Canadian Ministry of Employment, where it has been used for many years to translate information about job advertisements and similar documentation.

In Europe, the Cap Volmac company in the Netherlands and the LANT company in Belgium offer similar services, building for various clients specialised translation systems utilising their own software for controlled languages. Cap Volmac Lingware Services is a Dutch subsidiary of the Cap Gemini Sogeti Group. Over the years this software company has constructed controlled-language systems for textile and insurance companies, mainly from Dutch to English (Van der Steen and Dijenborgh 1992). However, possibly the best known success story for custom-built MT is the PaTrans system developed for LingTech A/S to translate English patents into Danish. The system is based on methods and experience gained from the Eurotra project of the European Commission (Ørsnes et al. 1996)

These last examples of systems illustrate that a growing number of companies and organisations are developing their own MT facilities, as opposed to purchasing commercial systems. This has been a feature from early days. The successful Météo system in Canada for translating weather forecasts from English into French (and later from French into English) was effectively a customer-specific system – in this case the Canadian Environment service. It may be noted that a variant of the Météo software was successfully operated during the Olympic games in Atlanta (Chandioux and Grimaila 1996). Météo is an example of a 'sublanguage' system, i.e. designed for to deal with the particular language of meteorology.

Another example of a custom-built system is TITUS, a highly constrained 'sublanguage' system for translating abstracts of documents of the textile industry from and into English, French, German, and Spanish, in regular use since 1970. Better known are the two customer-specific systems for translating between English

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and Spanish built at the Pan American Health Organization in Washington – designed and developed by workers in the organisation itself. These highly successful systems (now also available to users outside PAHO) are general-purpose systems, not constrained in vocabulary or text type, although obviously the dictionaries are strongest in the health-related social science fields (Leon and Aymerich 1997).

In the 1990s there have been a number of other examples. In Finland, the Kielikone system was developed originally as a workstation for Nokia Telecommunications. Subsequently, versions were installed at other Finnish companies and the system is now being marketed more widely (Arnola 1996). A similar story applies to GSI-Erli. This large language engineering company developed an integrated in-house translation system combining a MT engine and various translation aids and tools on a common platform AlethTrad. Recently it has been making the system available in customised versions for outside clients (Humphreys 1996).

On a smaller scale, but equally successful, has been the system developed by the translation service of a small British company Hook and Hatton. In this case, the need was for translation of chemical texts from Dutch into English (Lewis 1997). The designer began by simple pattern matching of phrases, and gradually built in more syntactic analysis as and when results were justifiable and cost-effective.

Based on experience over many years in developing knowledge-based MT and experimenting with speech translation and corpus-based methods, members of the group at Carnegie-Mellon University have developed an architecture for the rapid production of usable MT systems for specific clients in some less common languages, such as SerboCroat and Haitian Creole (Frederking et al. 1997). There is no pretence of high quality, merely 'usefulness' for languages otherwise inaccessible.

Another example of custom-built MT in a specialised area is the program developed for TCC Communications at the Simon Fraser University for translating closed captions on television programs (Toole et al. 1998). Not only are there time constraints – translation must be in real-time – but also there are the challenges of colloquialisms, dialogue, robustness, and paucity of context indicators. The system, at present running live for English into Spanish, demanded techniques otherwise found mainly in Internet applications (see below.)

In Japan, there are further examples of custom-built systems. The Japan Information Centre of Science and Technology translates abstracts of Japanese scientific and technical articles into English. In the late 1980s it assumed responsibility of the Mu Japanese-English MT system developed at the University of Kyoto. From this, it now has one of the largest MT operations in Japan (O'Neill-Brown 1996). Other custom-built systems of significance in Japan are the SHALT system developed by IBM Japan for its own translation needs, the ARGO system developed by CSK in Tokyo for translating Japanese stock market reports into English, and the NHK system for translating English news articles into Japanese.

Translation workstations

In the 1990s, the possibilities for large-scale translation broadened with the appearance on the market of translation workstations (or translator workbenches). The original ideas for integrating various computer-based facilities for translators at

one place go back to the early 1980s, in particular with the systems from ALPS. Translation workstations combine multilingual word processing, means of receiving and sending electronic documents, OCR facilities, terminology management software, facilities for concordancing, and in particular 'translation memories'. The latter is a facility that enables translators to store original texts and their translated versions side by side, i.e. so that corresponding sentences of the source and target are aligned. The translator can thus search for a phrase or even full sentence in one language in the translation memory and have displayed corresponding phrases in the other language. These may be either exact matches or approximations ranked according to closeness.

It is often the case in large companies that technical documents, manuals, etc. undergo numerous revisions. Large parts may remain unchanged from one version to the next. With a translation memory, the translator can locate and re-use already translated sections. Even if there is not an exact match, the versions displayed may usable with minor changes. There will also be access to terminology databases, in particular company-specific terminology, for words or phrases not found in the translation memory. In addition, many translator workstations are now offering full automatic translations using MT systems such as Systran, Logos, and Transcend. The translator can choose to use them either for the whole text or for selected sentences, and can accept or reject the results as appropriate (Heyn 1997).

There are now four main vendors of workstations: Trados (probably the most successful), STAR AG in Germany (Transit), IBM (the TranslationManager), and LANT in Belgium (the Eurolang Optimizer, previously sold by SITE in France). The translation workstation has revolutionised the use of computers by translators. They have now a tool where they are in full control. They can use any of the facilities or none of them as they choose. As always, the value of each resource depends on the quality of the data. As in MT systems, the dictionaries and terminology databases demand effort, time and resources. Translation memories rely on the availability of suitable large corpora of authoritative translations – there is no point in using translations which are unacceptable (for whatever reason) by the company or the client.

Although widely used by administrators within the European Commission, the full-scale MT system Systran is relatively little used by the Commission's professional translators. For them, the translation service is developing its own workstation facility, EURAMIS, i.e. European Advanced Multilingual Information System (Theologitis 1997). This combines access to the Commission's own very large multilingual database (Eurodicautom), the dictionary resources of Systran, facilities for individual and group terminology database creation and maintenance (using Trados' MultiTerm software), translation memory (again for individuals and groups), access to CELEX (the full-text database of European Union legislation and directives), software for document comparison (to detect where changes have taken place), and also, of course, access to the Systran MT systems themselves. The latter are now available from English into Dutch, French, German, Greek, Italian, Portuguese, and Spanish; from French into Dutch, English, German, Italian, and Spanish; from Spanish into English and French; and from German into English and

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French. The whole EURAMIS system is linked to other facilities such as authoring tools (spelling, grammar and style checkers, and multilingual drafting aids), the internal European Commission administrative network, and to outside resources on the Internet.

Localisation of software

One of the fastest growing areas for the use of computers in translation is in the industry of software localisation. Here the demand is for supporting documentation to be available in many languages at the time of the launch of new software. Translation has to be done quickly, but there is much repetition of information from one version to another. MT and, more recently, translation memories in translation workstations are the obvious solution (Schaeler 1996). Among the first in this field was the large software company SAP AG in Germany. They use two MT systems: METAL for German to English translation, and Logos for English to French, and plan to introduce further systems for other language pairs.

Most localisation, however, is based on the translation memory and workstation approach. Typical examples are Corel, Lotus, and Canon. It is interesting to note that much of this localisation activity is based in Ireland – thanks to earlier government and European Union support for the computer industry. However, localisation is a multi-national and global industry, with its own organisation (Localization Industry Standards Association, based in Geneva) holding regular seminars and conferences in all continents (For details see LISA Forum Newsletter)

Localisation companies have been at the forefront of efforts in Europe to define standardised lexical resource and text handling formats, and to develop common network infrastructures. This is the OTELO project coordinated by Lotus in Ireland, with other members such as SAP, Logos, and GMS. The need for a general translation environment for a wide variety of translation memory, machine translation and other productivity tools is seen as fundamental to the future success of companies in the localisation industry.

Systems for personal computers

Software for personal computers began to appear in the early 1980s (with the Weidner MicroCAT system becoming particularly successful). Nearly all the main Japanese computer companies produced systems for translation to and from English, e.g. the PIVOT system from NEC, the ASTRANSAC system from Toshiba, HICATS from Hitachi, PENSEE from Oki and DUET from Sharp.

Outside Japan, systems for personal computers began to appear a little earlier, but from relatively few companies. The first American systems came in the early 1980s from ALPS and from Weidner. The ALPS products were intended primarily as aids for translation, providing tools for accessing and creating terminology resources but they did include an interactive translation module. Although at first sold with some success, the producers concluded by the end of the decade that the market was not yet ready and the products were in effect withdrawn. Instead, ALPS turned itself into a translation service (ALPNET), using its own tools internally. By contrast, Weidner sold a full translation system in a growing number of language pairs (English, French, German, Spanish), and the business flourished. Weidner produced two versions of its systems: MicroCat for small personal computers, and MacroCat

for larger minicomputers or workstations. The company was then purchased by a Japanese company Bravis, a Japanese version was marketed, but soon afterwards the owner decided that the MT market for personal computers was still undeveloped and the business was sold. MicroCat disappeared completely, but MacroCat was purchased by Intergraph, who modified and developed it for its range of publishing software and sold it later as Transcend – recently Transcend was acquired by Transparent Language Inc. (For these developments see Hutchins 1993, 1994).

At the end of the 1980s, most of the commercial systems on the market today appeared. First came the PC-Translator systems (from Linguistic Products, based in Texas) for low-end personal computers. Over the years, many language pairs have been produced and marketed, apparently successfully as far as sales are concerned. Next came Globalink with systems for French, German and Spanish to and from English. (There was also a Russian-English system deriving essentially from the original owner's experience on the 1960s Georgetown project.) Within a few years, Globalink merged with MicroTac, a company which had been very successful in selling its cheap Language Assistant series of PC software – essentially automatic dictionaries, with minimal phrase translation facility. In the early 1990s, Globalink produced its now well-known 'Power Translator' series for translation of English to and from French, German and Spanish, and recently Globalink has marketed the more advanced 'Telegraph' series of translation software products, and Globalink itself was acquired by Lernout & Hauspie, a leading speech technology company.

Since the beginning of the 1990s, many other systems for personal computers have appeared. For Japanese and English there are now also LogoVista from the Language Engineering Corporation, and Tsunami and Typhoon from Neocor Technologies (also now owned by Lernout & Hauspie). From the former Soviet Union – where particularly in the 1960s and 1970s there was very active research on MT – we have now Stylus (recently renamed ProMT) and PARS, both marketing systems for Russian and English translation; Stylus also for French, and PARS also for Ukrainian. Other PC-based systems from Europe include: Hypertrans for translating between Italian and English; the Winger system for Danish-English, French-English and English-Spanish, now also marketed in North America; and TranSmart, the commercial version of the Kielikone system, for Finnish-English translation.

Vendors of older mainframe systems (Systran, Fujitsu, Metal, Logos) are being obliged to compete by downsizing their systems; many have done so with success, managing to retain most features of their mainframe products in the PC-based versions. Systran Pro and Systran Classic, for example, are Windows-based versions of the successful system developed since the 1960s for clients worldwide in a large range of languages; the large dictionary databases offered by Systran give these systems clear advantages over most other PC products. Both Systran Classic (for home use) and Systran Pro (for use by translators) are now sold for under a five hundred dollars in many language pairs: English-French, English-German, English-Spanish; and for English to Italian and Japanese to English. The publishing company Langenscheidt acquired rights to sell a version of METAL, in collaboration with GMS (Gesellschaft für Multilinguale Systeme, now owned by Lernout & Hauspie) –

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the system is called 'Langenscheidt T1' and offers various versions for German and English translation. Also from Germany is the Personal Translator, a joint product of IBM and von Rheinbaben & Busch, based on the LMT (i.e. Logic-Programming based Machine Translation) transfer-based system under development since 1985. LMT itself is available as a MT component for the IBM TranslationManager. Both Langenscheidt T1 and the Personal Translator are intended primarily for the non-professional translator, competing therefore with Globalink and similar products. (For these developments see proceedings of MT conferences: AMTA, EAMT, MT Summit, and MT News International.)

Sales of commercial PC translation software have shown a dramatic rise. There are now estimated to be some 1000 different MT packages on sale (when each language pair is counted separately.) The products of one vendor (Globalink) are present in at least 6000 stores in North America alone; and in Japan one system (Korya Eiwa from Catena, for English-Japanese translation) is said to have sold over 100,000 copies in its first year on the market. Though it is difficult to establish how much of the software purchased is regularly used (some cynics claim that only a very small proportion is tried out more than once), there is no doubting the growing volume of 'occasional' translation, i.e. by people from all backgrounds wanting renderings of foreign texts in their own language, or wanting to communicate in writing with others in other languages, and who are not deterred by poor quality. It is this latent market for low-quality translation, untapped until very recently, which is now being discovered and which is contributing to massive increases in sales of translation software.

MT on the Internet

At the same time, many MT vendors have been providing network-based translation services for on-demand translation, with human revision as optional extras. In some cases these are client-server arrangements for regular users; in other cases, the service is provided on a trial basis, enabling companies to discover whether MT is worthwhile for their particular circumstances and in what form. Such services are provided, for example, by Systran, Logos, Globalink, Fujitsu, JICST and NEC.

Some companies have now been set up primarily for this purpose: LANT in Belgium is a major example, based on its rights to develop the METAL system and on the Eurolang Optimizer, which it also markets (Caeyers 1997). Its speciality is the customisation of controlled languages for use with its MT and translation memory systems. In late 1997 it launched its multilingual service for the translation of electronic mail, Web pages and attached files. And in Singapore, there is MTSU (Machine Translation Service Unit of the Institute of Systems Science, National University of Singapore), using its own locally-developed systems for translation from English into Chinese, Malay, Japanese and Korean (with Chinese its main strength) and with editing by professional translators. The service is providing large scale translation over the Internet for many customers world wide (mainly multinational organisations), and including much of the localisation needs for software companies in the Chinese-language markets (LISA Forum Newsletter 4(3), August 1995, p.12.)

A further sign of the influence of Internet is the growing number of MT software products for translating Web pages. Japanese companies have led the way: nearly all the companies mentioned above have a product on this lucrative market; they have been followed quickly elsewhere (e.g. by Systran, Globalink, Transparent Language, LogoVista). As well as PC software for translating Web pages, we are now seeing Internet services adding translation facilities: the most recent example is the availability on AltaVista of versions of Systran for translating French, German and Spanish into and from English – with what success or user satisfaction it is too early to say (Yang and Lange 1998).

Equally significant has been the use of MT for electronic mail and for 'chat rooms'. Two years ago CompuServe introduced a trial service based on the Transcend system for users of the MacCIM Support Forum. Six months later, the World Community Forum began to use MT for translating conversational e-mail. Usage has rocketed (Flanagan 1996). Most recently, CompuServe introduced its own translation service for longer documents either as unedited 'raw' MT or with optional human editing. Soon CompuServe will offer MT as a standard for all its e-mail. As for Internet chat, Globalink has joined with Uni-Verse to provide a multilingual service.

The use is not simple curiosity, although that is how it often begins. CompuServe records a high percentage of repeat large-volume users for its service, about 85% for unedited MT – a much higher percentage than might have been expected. It seems that most is used for assimilation of information, where poorer quality is acceptable. The crucial point is that customers are prepared to pay for the product – and CompuServe is inundated with complaints if the MT service goes down!

It is clear that the potential for MT on, via and for the Internet is now being fully appreciated – no company can afford to be left behind, and all the major players have ambitious plans, e.g. Lernout & Hauspie (McLaughlin and Schwall 1998), which has now acquired MT systems from Globalink, Neocor and AppTek as well as the old METAL system (from GMS).

Future needs and developments

Despite the recent growth of systems for personal computers and of Internet services, it is still true to say that there is nothing yet really suitable for the independent professional translator, i.e. for those not working for large companies or in translation organizations. It is known that some translators have tried to apply commercial PC-based software to their needs, but the amount of adaptation required and the generally poor output has made them unsatisfactory and uneconomic. More suitable for the independent translator would be a cost-effective translation workstation. However, current workstations on the market are still too expensive for the individual translator. Although there is promise of low-cost computer tools for this potentially large market – e.g. terminology and concordancing software, and perhaps alignment software – there is no doubt that this segment is not being covered as well as many other areas.

Another area at present poorly served is the need for reliable but low-cost translation of documents into unknown foreign languages where users do not want to

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engage expert bilingual translators. There is no problem with translation into recipients' own languages – PC systems can give adequate 'rough' versions for users to get some idea of the basic message – but for translation into an unknown language there are still no solutions. There have been recently some cheap Japanese products which serve this specific 'foreign language authoring' demand in the case of writing business letters (based on standard phrases and document templates), but for other areas and for longer documents, where there is less 'stereotyping', there is nothing as yet. For translation into another language unknown (or poorly known) by the sender, what is really required is software which can be relied upon to provide good quality output (and most PC products are not good enough). A number of research groups are investigating interactive systems, where the sender composes an MT-friendly version of a letter or document in collaboration with the computer. With a sufficiently 'normalised' input text, the MT system can guarantee grammatically and stylistically correct output. As yet, however, this work (e.g. at GETA in France) is still at the laboratory stage (Boitet and Blanchon 1995).

The same is true for software combining MT with information access, information extraction, and summarisation software. There are no commercial systems yet on the market; developments are still at the research stages. The potential and the demand has been recognised: for example, in recent years, most research funds of the European Union have been focused not on MT or 'pure' natural language processing (as it was during the 1980s), but on projects for multilingual tools with direct applications in mind; many involve translation of some kind, usually within a restricted subject field and often in controlled conditions (Hutchins 1996; Schütz 1996). As just one example, the AVENTINUS project is developing a system for police forces in the area of drug control and law enforcement: information about drugs, criminals and suspects will be available on databases accessible in any of the European Union languages.

There is growing interest in such multilingual applications worldwide. The application that has received most attention has been 'cross-language information retrieval', i.e. software enabling users to search foreign language databases in their own languages. As yet most work has focussed on the construction and operation of appropriate translation dictionaries, for the matching of query words against words or phrases in document databases (Bian and Chen 1998, Oard 1998) – although the provision of software for fast translation of original texts into the enquirer's own language is naturally also envisaged (McCarley and Roukos 1998). Clearly it will not be long before commercial software is available for this application.

The future application that is probably most desired by the general public is the translation of spoken language. But, from a commercial (and even research) perspective, the prospects for automatic speech translation are still distant (Krauwer et al. 1997). It was only in the 1980s that developments in speech recognition and synthesis made spoken language translation a feasible objective. In Japan a joint government and industry company ATR was established in 1986 near Osaka, and it is now one of the main centres for automatic speech translation. The aim is to develop a speaker-independent real-time telephone translation system for Japanese to English and vice versa, initially for hotel reservation and conference registration transactions.

Other speech translation projects have been set up subsequently. The JANUS system is a research project at Carnegie-Mellon University and at Karlsruhe in Germany. The researchers are collaborating with ATR in a consortium (C-STAR), each developing speech recognition and synthesis modules for their own languages (English, German, Japanese). (One by-product of this research was mentioned earlier: the rapid-deployment project for custom-built systems in less-common languages.) The fourth major effort in speech translation is the long-term VERBMOBIL project funded by the German Ministry for Research and Technology which began in May 1993. The aim is a portable aid for business negotiations as a supplement to users' own knowledge of the languages (German, Japanese, English). Numerous German university groups are involved in fundamental research on dialogue linguistics, speech recognition and MT design; a prototype is nearing completion, and a demonstration product is targeted for early in the next century.

Speech translation is probably at present the most innovative area of computer-based translation research, and it is attracting most funding and the most publicity. However, few experienced observers expect dramatic developments in this area in the near future – the development of MT for written language has taken many years to reach the present stage of widespread practical use in multinational companies, a wide range of PC based products of variable quality and application, growing use on networks and for electronic mail. Despite today's high profile for written-language MT, researchers know that there is still much to be done to improve quality. Spoken-language MT has not yet reached even the stage of real-time testing in non-laboratory settings.

Comparison of human and machine translation

From this survey it should be apparent that the application of computers to the task of translating natural languages has not been and is unlikely to be a threat to the livelihood of professional translators. Those skills which the human translator can contribute will continue always to be in demand. There is no prospect, for example, that machine translation could ever attempt the translation of literary or legal texts. By contrast, for the rough translation of electronic texts on the Internet there is no rivalry for machine translation – human translators cannot compete in terms of speed, even if they were prepared to undertake poor quality translation of ephemeral material.

We may compare the relative merits of human and machine translation according to the categories of need and use outlined at the beginning of this paper. As far as the dissemination function (production of publishable translations) is concerned, human translation is more satisfactory and less costly overall whenever it is a question of translating one particular text in a unique subject domain (whether scientific, technical, medical, legal or literary). Machine translation demands the costly investment of dictionary maintenance and updating and the costly involvement of post-editing. This can be justifiable (i.e. cost-effective) only when large volumes of documentation within a particular domain are being translated. It is even more justifiable if translation is into more than one target language (when pre-editing and/or vocabulary and grammar control of original texts is possible), and when there is considerable repetition. For such tasks, the human translator would be

overwhelmed by the scale of the task, by the boring repetitiveness and by the need to maintain terminological consistency. By contrast, the computer can handle large volumes and can automatically maintain consistency. In brief, machine translation is ideal for large scale and/or rapid translation of (boring) technical documentation, (highly repetitive) software localisation manuals, and real-time translation of weather reports. The human translator is (and will remain) unrivalled for non-repetitive linguistically sophisticated texts (e.g. in literature and law).

For the translation of texts for assimilation, where the quality of output can be poorer than that for texts to be published, it is clear that machine translation is an ideal solution. Human translators are not prepared (and resent being asked) to produce 'rough' translations of scientific and technical documents that may be read by only one person who wants to merely find out the general content and information and is unconcerned whether everything is intelligible or not, and who is certainly not deterred by stylistic awkwardness or grammatical errors. Of course, they might prefer to have output better than that presently provided by most MT systems, but if the only alternative option is no translation at all then machine translation is fully acceptable.

For the interchange of information, there may still in the future continue to be a role for the human translator in the translation of business correspondence (particularly if the content is sensitive or legally binding). But for the translation of personal letters, MT systems are likely to be increasingly used; and, for electronic mail and for the extraction of information from Web pages and computer-based information services, MT is the only feasible solution.

For spoken translation, by contrast, there will be a continuing market for the human translator. There is surely no prospect of automatic translation replacing the interpreter of diplomatic and business exchanges. Although there has been research on the computer translation of telephone enquiries within highly constrained domains, and future implementation can be envisaged in this area, for the bulk of telephone communication there is unlikely to ever be any substitute for human translation.

Finally, MT systems are opening up new areas where human translation has never featured: the production of draft versions for authors writing in a foreign language, who need assistance in producing an original text; the on-line translation of television subtitles, the translation of information from databases; and no doubt, more such new applications will appear in the future. In these areas, as in others mentioned, there is no threat to the human translator because they were never included in the sphere of professional translation. There is no doubt that MT and human translation can and will co-exist in harmony and without conflict. [12]

7 Glossary of terms

access - доступ — процедура выборки информации из ЭВМ (напр. из ее памяти) либо выборки инструкций в ходе операций на компьютере.

accumulator- аккумулятор (сумматор, накапливающий регистр) —

регистр, сохраняющий результаты выполнения команды для использования в последующих операциях.

address -адрес—указание местоположения ячейки памяти в запоминающем устройстве.

algorithm- алгоритм—набор предписаний, однозначно определяющих последовательность и содержание выполнения операций для решения определенной задачи в виде пошаговой программы.

analog (analogue) system- аналоговая система—система, в которой одна (выходная) физическая величина, изменяющаяся по закону непрерывной функции, используется в значении другой (входной) величины и непрерывно с ней соотносится. Упрощенный пример: угловое перемещение стрелок часов используется как аналог хода времени.

analog (analogue) computer- аналоговый компьютер —компьютер, использующий физические величины, функционально изменяющиеся аналогично исследуемым величинам, для моделирования последних. Функционирование таких компьютеров описывается теми же уравнениями, что и решаемая задача. Пользователь получает решение, задавая параметры компьютеру, соответствующие исходным данным задачи, и измеряя параметры, соответствующие результатам.

Простейший пример «неэлектронного» компьютера - логарифмическая линейка, использующая длину в качестве аналога численной величины.

Analog-Digital converter (A/D converter) (see D/A converter) - аналого-цифровой преобразователь (АЦП) —устройство, преобразующее непрерывно изменяющуюся физическую величину в последовательность чисел.

Пример: АЦП электронно-цифровых электроизмерительных приборов, часов, весов.

analog integrated microcircuit (see digital integrated microcircuit) - аналоговая интегральная микросхема —микросхема, предназначенная для преобразования и обработки сигналов, изменяющихся по закону непрерывной функции.

application package- пакет прикладных программ (ППП) — набор программ для решения на компьютере задач определенного класса или для предоставления пользователю определенных услуг.

arithmetic/logic unit -арифметико-логическое устройство (АЛУ) — часть процессора компьютера, выполняющая операции над данными, в отличие от частей, ответственных за операции управления.

Artificial Intelligence (AI) - искусственный интеллект—раздел информатики, занимающийся методикой решения задач, для которых отсутствуют формальные алгоритмы: понимание естественного языка, обучение, распознавание изображений и т. п.

Assembler- ассемблер, язык ассемблера — язык программирования, понятия которого отражают специфику построения («архитектуру») ЭВМ: виды информационных потоков, способы их обработки и т. п.

assembler program -программа-ассемблер—обслуживающая программа, которая преобразует символические инструкции на языке ассемблера в

команды машинного кода.

bar code- бар-код, универсальный торговый код (УТК)—код, состоящий из последовательности нанесенных линий, где кодирование букв и чисел производится посредством вариации ширины линий и расстояния между ними. Бар-код наносится на упаковку товаров для их опознания в кассе магазина и т. п. с помощью оптического сканирующего (с обегающим считывающим лазерным лучом) устройства.

Простейшая поясняющая аналогия бар-кода—азбука Морзе.

BASIC (Beginner's All-purpose Symbolic Instruction Code) -БЕЙСИК— язык программирования высшего уровня, напоминающий английский и используемый в программировании для простых вычислений.

binary system- бинарная система—двоичная математическая система счисления, в которой используются только числа 0 и 1. Все остальные числа могут быть представлены позиционно размещенной последовательностью единиц и нулей. Например, число 5 изображается как 101, число 6— как 110 и т. д.

binary system code, binary code- двоичный код—код для представления данных, записываемый в виде ряда нулей и единиц, удобен в цифровой технике для компьютерных операций, так как имеет много физических аналогов: «+» и «—», «включено» и «выключено» и т. д.

bipolar- биполярный (термин относится к полупроводниковым устройствам, в которых усиление по току достигается при взаимодействии положительных и отрицательных зарядов).

bit (Binary digit) -бит, двоичный разряд—элементарная единица информации, которая может принимать одно из двух значений: либо 0, либо 1. 1024 бита составляют 1 килобит (кбит).

Например, 64 кбит содержит 64 X 1024 ==65536 битов информации.

bus - шина (данных, адресов, управления) — линия связи одного или нескольких источников с одним или несколькими приемниками информации.

byte – байт - общепринятая единица измерения информационной мощности компьютера, его информационной емкости и памяти, скорости передачи информации и т. д., соответствующая одному знаку данных: букве, цифре или символу. Один байт обычно состоит из восьми битов. 1 кбайт (килобайт) равен 1024 байтам информации или одной машинописной странице через два интервала. Для простоты часто говорят, что 1 кбайт — это тысяча байтов; 1 Мбайт (мегабайт) равен 1024 байтам, но часто говорят, что 1 Мбайт— это миллион байтов.

central (data) processor, Central Processor Unit (CPU) -центральный процессор (ЦП) —центральное устройство компьютера или вычислительной системы, включающее арифметическое устройство, устройство управления и рабочие регистры. Осуществляет, наряду с обработкой данных, управление другими устройствами компьютера или системы, например, периферийными средствами.

Charge Coupled Device (CCD) -прибор с зарядовой (посредством электростатического заряда) связью (ПЗС), используемый как память

(запоминающее устройство) с последовательной выборкой данных.

chip - чип—полупроводниковый кристалл чистого кремния, слои которого вытравлены и легированы, т. е. по специальной технологии снабжены добавками проводниковых или полупроводниковых примесей, так что они образуют различного рода электрорадиоэлементы, которые в совокупности составляют решетку законченной интегральной схемы, эквивалентной тысячам транзисторов и других индивидуально изготовляемых элементов. Как правило, чип—это секция, вырезанная из кремниевой пластины.

COBOL (COmmon Business Oriented Language) - КОБОЛ— язык программирования, применяемый в основном при решении с помощью ЭВМ коммерческих задач command команда, инструкция—единичный шаг работы компьютера, составленный в виде предписания на машинном языке и определяющий подлежащую выполнению функцию и ее необходимые признаки—атрибуты.

compiler (see interpreter) - компилятор—перелагающая программа, используемая для преобразования программы на языке программирования высокого уровня в ту же программу в машинном коде.

Complementary Metal-Oxide-Semiconductor field-effect transistor (CMOS) - дополняющий полевой транзистор типа металл-окисел-полупроводник **Computer Aided Instruction (CAI), Computer Aided Learning** (CAL) программированное обучение с помощью компьютера.

Computer Numerical Control (CNC) -микропроцессорное число вое программное управление (МП ЧПУ)-управления процессом с помощью запрограммированной в микропроцессоре последовательности команд, закодированных с помощью чисел-координат, например, координат точек чертежа детали, изготовляемой на оборудованном микропроцессорным ЧПУ станке - автомате.

digital integrated microcircuit (see analogue integrated micro-circuit) - цифровая интегральная микросхема — микросхема, предназначенная для преобразования и обработки сигналов, изменяющихся по закону дискретной («ступенчатой») функции.

Частным случаем цифровой интегральной микросхемы является логическая микросхема, оперирующая сигналами в двоичном цифровом коде

Direct Memory Access (DMAC) -прямой (непосредственный) доступ к памяти ЭВМ.

disk -диск, магнитный диск—запоминающее устройство, накопитель информации компьютера. В крупных компьютерах информация хранится в больших дисковых пакетах, состоящих из нескольких дисков, смонтированных на валике. В микрокомпьютерах используются твердые или гибкие диски. Твердые диски обычно устанавливаются в него стационарно.

disk drive -дисковод—устройство, позволяющее ЭВМ считывать с дисков и записывать на них данные. Дисковод вращает диск и управляет перемещением считывающей головки.

display- дисплей — устройство визуального отображения информации, например, цифровой индикатор, индикатор на электронно-лучевой трубке,

графический терминал.

encoder - кодер — устройство, преобразующее данные в требуемую кодированную форму.

fiber optics- волоконная оптика—оптическая система, использующая стеклянные волокна в качестве световодов для передачи оптических изображений или кодированных световых импульсов.

Field Effect Transistor (FET) - полевой транзистор—транзистор, в котором ток между двумя выводами, истоком и стоком, проходя через канал, тончайший слой с электронной или дырочной проводимостью, управляется полем, возникающим при приложении напряжения между источником и третьим выводом, затвором.

file- файл—именованная область внешней памяти для хранения программ и логически расположенных данных. В файлах могут содержаться произвольные текстовые документы и числовые данные, закодированная табличная, графическая и любая иная информация.

Простейшая аналогия: папка с подборкой газетных вырезок о спортсменах, расположенных в алфавитном порядке их фамилий.

file catalogue каталог файлов—логический раздел внешнего накопителя информации, объединяющий группу файлов и хранящий данные о названии, объеме и времени создания или последнего изменения файла.

film integrated microcircuit пленочная интегральная микросхема— микросхема, все элементы и межэлементные соединения которой выполнены в виде пленок.

flip-flop, flip-flop register, half-shift register (see trigger) - триггер— электронная схема с двумя возможными стабильными состояниями, которая может включаться и оставаться в одном из этих состояний в зависимости от вида входного сигнала, поступившего последним.

floppy disk - флоппи-диск, гибкий диск, дискет (а) — запоминающее устройство в виде диска из полимерной пленки с магнитным покрытием, заключенное в плотную бумажную или пластмассовую кассету с прорезью для доступа головок считывания и записи.

FORTRAN (FORmulae TRANslation) - ФОРТРАН—язык программирования высокого уровня, применяемый, в первую очередь, при выполнении на ЭВМ научных расчетов.

gate вентиль—полупроводниковый элемент с одним или несколькими входами, свойства которого определяют наличие и уровень выходного сигнала при подаче сигнала на вход. Выполняет функции элемента логики в цифровых схемах.

General Purpose Register (GPR) регистр общего назначения (РОН) — программно-доступный рабочий регистр процессора, который может быть использован для оперативного хранения различных элементов программ.

hardware (see software) аппаратурное обеспечение ЭВМ— ее механическое, электронное, магнитное, электрическое оборудование.

high level высокий уровень (термин употребляется применительно к языку программирования, в котором каждая инструкция соответствует

нескольким инструкциям машинного кода).

hybrid integrated microcircuit гибридная интегральная микросхема—схема, содержащая, кроме элементов, компоненты и/или кристаллы. Частным случаем гибридной интегральной микросхемы является многокристальная интегральная микросхема.

Integrated Micro-Circuit (IMC) интегральная микросхема (ИМС)—микроэлектронное изделие, выполняющее определенную функцию преобразования, обработки сигнала и/или накопления информации и имеющее высокую плотность упаковки электрически соединенных элементов (или элементов и компонентов и/или кристаллов), рассматриваемое как единое целое.

integrated microcircuit component компонент ИМС—часть ИМС, реализующая функцию какого-либо электрорадиоэлемента, например, транзистора, диода, резистора, конденсатора, которая может быть частью гибридной ИМС.

integrated microcircuit element элемент ИМС—часть ИМС, реализующая функцию какого-либо электрорадиоэлемента, например, транзистора, диода, резистора, конденсатора, которая, будучи неотделимой от кристалла или подложки, не может быть выделена как самостоятельное изделие integrated microcircuit plate плата ИМС — подложка или часть подложки ИМС, на поверхности которой нанесены пленочные элементы микросхемы, межэлементные и межкомпонентные соединения и контактные площадки.

integrated microcircuit scale of integration показатель степени сложности микросхемы, характеризуемый числом содержащихся в ней элементов и компонентов. Степень интеграции ИМС определяется по формуле: $K = \ln N$, где К—коэффициент, определяющий степень интеграции, значение которого округляется до ближайшего большего целого числа; N — число элементов и компонентов ИМС integrated microcircuit substrate подложка ИМС—заготовка платы ИМС.

interface интерфейс—совокупность средств и правил, обеспечивающих логическое или физическое унифицированное сопряжение (взаимодействие) устройств и/или программ подсистем, входящих в вычислительную систему, в частности связь ЭВМ с другой ЭВМ либо с пользователем. Физический интерфейс определяет тип стыка, уровни сигналов, импеданс (выходное сопротивление), синхронизацию и другие унифицированные параметры канала связи; программный интерфейс определяет совокупность допустимых процедур или операций и их параметров, список общих переменных, областей памяти и других объектов .

internal memory оперативная память, оперативное запоминающее устройство (ОЗУ) — устройство, где размещаются во время исполнения программы, а также используемые ими данные. ОЗУ характеризуются более высокой скоростью записи и чтения и меньшим объемом, чем внешняя память. При выключении машины содержимое ОЗУ не сохраняется .

interpreter (see compiler) интерпретатор—программа, переводящая команды программирования высокого уровня в команды машинного кода,

подлежащие немедленному исполнению.

keyboard клавиатура—устройство ввода текстов, чисел и управляющей информации в память ЭВМ. Внешне похожа на клавиатуру обычной пишущей машинки, но имеет дополнительные клавиши для расширения возможностей управления ЭВМ.

Large Scale Integrated (LSI) microprocessor большая интегральная микросхема (БИС)—интегральная микросхема, выполняющая функцию микропроцессора или его части. По существу, это БИС с процессорной организацией, разработанная специально для построения микропроцессорных систем.

Large Scale Integration (LSI) of integrated circuit высокая степень интеграции интегральной схемы.

Light-Emitting Diodes (LED) display дисплей на светодиодах. Применяется чаще всего в низковольтных электронных устройствах, например в некоторых типах электронных цифровых часов.

Liquid Crystals Display (LCD) дисплей на жидких кристаллах, например стандартное семисегментное цифровое табло карманного калькулятора.

logical element, logic circuit логический элемент—элементарная полупроводниковая схема, имеющая два устойчивых логических состояния.

machine code (see machine language,) машинный код—система кодирования, на которую рассчитан центральный процессор конкретной ЭВМ, предназначенная для представления в процессоре набора вводимых команд.

machine language (see machine code) машинный язык, язык машины — система команд ЭВМ. То же, что машинный код.

magnetic disk магнитный диск—круглая пластинка с магнитным покрытием, на которую записывается информация.

magnetic tape, magnetic stripe магнитная лента—полоска намагниченного материала, на которую могут наноситься и с которой могут считываться кодированные магнитные метки. Применяется, в первую очередь, для обмена данными между вычислительными системами, хранения резервных копий и для передачи программного обеспечения.

mainframe computer ЭВМ «полного профиля», универсальный компьютер—в отличие от мини и малых коммерческих.

mask маска—фотонегатив, применяемый в микроэлектронике для экранирования отдельных участков полупроводникового чипа, на котором печатается требуемый рисунок интегральной микросхемы. На каждой стадии изготовления чипа используются специальные маски.

memory память—устройство или схема для запоминания и хранения используемой в ЭВМ информации, позволяющее при необходимости извлекать последнюю.

memory unit ячейка памяти—регистр в памяти ЭВМ, доступ к которому возможен по определенному адресу.

Metal-lnsulator-Semiconductor (MIS) technology технология металл-диэлектрик-полупроводник (МДП-технология) —технология, применяемая при изготовлении транзисторов интегральных микросхем (ИМС) и больших

интегральных схем (БИС). МДП-структура образуется слоями указанных в названии материалов, наносимыми последовательно методами эпитаксии (наращивания), осаждения и окисления. Каждый из слоев представляет собой функциональную часть транзистора. МДП-технология обеспечивает большую плотность размещения элементов на плате .

Metal-Nitride-Oxyde-Semiconductor (MNOS) technology технология металл-нитрид-окисел-полупроводник (МНОП-технология) —технология, применяемая при изготовлении полевых транзисторов с изолированным затвором, используемых в ИМС и БИС (см, 1МС и LSI). МНОП-структура образуется четырьмя слоями: 1) металл (алюминий или золото) — затвор; 2) нитрид (нитрид кремния) и 3) окисел (двуокись кремния) — изоляция затвора; 4) полупроводник (кремнии-области истока, канала и затвора.

Metal-Oxide-Semiconductor (MOS) technology технология металл-окисел-полупроводник (МОП-технология) —технология, применяемая аналогично технологии металл-нитрид-окисел-полупроводник (см. MNOS). Имеет ту же послойную структуру, за исключением слоя нитрида.

Metal-Oxide-Semiconductor Field Effect (MOSFET) transistor полевой транзистор, изготовленный по МОП-технологии.

mouse мышь — небольшое устройство, соединенное с ЭВМ кабелем. Перемещаясь по столу, мышь контролирует курсор на мониторе, позволяя выполнять разнообразные компьютерные операции.

microcomputer микрокомпьютер, микропроцессорная электронная вычислительная машина (микроЭВМ, персональная ЭВМ, ПЭВМ)—ЭВМ, состоящая из микропроцессора (микропроцессоров), полупроводниковой памяти, средств связи с периферийными устройствами и, при необходимости, пульта управления и источника питания, объединенных общей несущей конструкцией.

microelectronics микроэлектроника—область электроники, охватывающая исследование, конструирование, изготовление и применение микроэлектронных изделий: интегральных микросхем, больших интегральных схем, микропроцессоров и т. п.

microprocessor, Micro-Processor Unit (MPU) микропроцессор (МП) — программно-управляемое устройство, осуществляющее процесс обработки цифровой информации и управление этим процессом, построенное на одной или нескольких больших интегральных схемах (БИС).

monitor монитор—экран, подобный телевизионному, на котором прочитываются данные, выдаваемые ЭВМ. Так же называется терминал с видеодисплеем.

multiple access параллельный (множественный) доступ— система, при которой несколько пользователей могут подсоединяться к одной и той же ЭВМ со своих собственных терминалов.

Numerical Control (NC) числовое управление—управление, как правило, станками-автоматами по программе, обычно наносимой на перфоленту.

on-line data processing «онлайн»—режим работы, при котором ЭВМ функционирует под непосредственным контролем центрального процессора и

обработка данных ведется в реальном масштабе времени, т. е. по мере их поступления.

operand операнд—исходный базовый элемент данных, над которыми выполняется операция.

object program объектная программа—конечная программа в машинном коде, переведенная с языка высокого уровня или языка ассемблера посредством программы-компилятора или программы-ассемблера.

operation code (op-code) код операции—код, выделяющий специфическую операцию, которая должна быть выполнена управляющим устройством ЭВМ.

operational system операционная система (ОС)—важнейшая часть программного оснащения ЭВМ, обеспечивающая управление всеми аппаратными компонентами и позволяющая отделить остальные классы программ от непосредственного взаимодействия с аппаратурой.

operational system command команда операционной системы — текстовый приказ, вводимый пользователем с клавиатуры и содержащий обращение к различным функциям операционной системы.

package пакет программ—сводная прикладная программа ЭВМ с сопровождающей документацией.

peripheral, peripheral device, peripheral unit периферийное устройство, внешнее устройство—устройство, конструктивно отделенное от основного блока ЭВМ, имеющее собственное управление и выполняющее запросы центрального процессора без его вмешательства.

photo detector фотодетектор—электронное устройство, чувствительное к световой энергии, например, фотодиод, фототранзистор, фотоэлемент.

piezoelectric пьезоэлектрик—материал, в котором под действием механических напряжений возникают электрические заряды.

punched paper tape перфолента, перфорированная лента, лента с пробитыми в определенной кодированной последовательности отверстиями.

Random Access Memory (RAM) память произвольного доступа, запоминающее устройство с произвольной выборкой ,устройство памяти, в котором информация может быть введена в любую ячейку или извлечена из нее **Read Only Memory (ROM)** постоянное запоминающее устройство (ПЗУ)-устройство памяти, содержимое которого постоянно сохраняется при выключении ЭВМ); запись информации; оно выполнять неспособно, а считывание может производится с высокой скоростью. В ПЗУ обычно находятся программы и данные, обслуживающие работу аппаратуры.

Register регистр-накопитель на переключающих элементах (например, на триггерах), емкость которого обычно равна одному машинному слову. Предназначен для хранения информации в процессе обработки данных в компьютере.

resident software резидентное программное обеспечение — набор программ для создания и отладки программного обеспечения.

semiconductor integrated microcircuit полупроводниковая интегральная микросхема (ИМС), все элементы и межэлементные соединения которой

выполнены в объеме и на поверхности полупроводника.

Silicon-On-Sapphire (SOS) integrated microcircuit кремний-сапфировая интегральная микросхема—кремниевая ИМС на сапфировой (из синтетического сапфира) подложке.

single chip microcomputer однокристальная микроЭВМ — микроЭВМ, выполненная в виде одной БИС. В этом случае на одном кристалле размещаются процессор, постоянное запоминающее устройство (ПЗУ) для хранения программы, оперативное запоминающее устройство (ОЗУ) для хранения промежуточных результатов, каналы ввода-вывода, в ряде случаев— таймер.

software (see hardware) программное обеспечение, программные средства ЭВМ—программы или набор инструкций, позволяющие ЭВМ выполнять различные операции.

solid-state integrated circuit полупроводниковая интегральная схема

source (language) program программа на входном языке (транслятора), входная (исходная) программа ЭВМ.

stack стек—серия ячеек памяти, запоминающее устройство магазинного типа, в котором первым считывается последнее записанное слово.

subroutine подпрограмма — группа программных команд, которая может быть введена в состав основной стандартной программы в различных точках по ходу выполнения последней.

system command команда операционной системы—текстовый приказ, вводимый пользователем с клавиатуры и содержащий обращение к различным функциям операционной системы.

telecommunication units (telecommunication aids) средства телекоммуникации—программные и аппаратные средства, позволяющие передавать информацию от одной ЭВМ к другой, в том числе на расстоянии

teletext телетекст — передача цифровой кодированной информации по телевизионным каналам.

terminal терминал — устройство для ввода или извлечения данных, в частности пользователем или оператором, при обмене информацией с ЭВМ. Терминал представляет собой два относительно независимых устройства: для ввода данных (клавиатура, перфоратор и т.д.) и для извлечения данных (видеодисплей, принтер, оптическое считывающее устройство и т. д.).

text editor текстовый редактор—программа для подготовки и обработки текстовой информации, которая позволяет вводить символы (буквы, цифры и другие знаки) с клавиатуры и осуществлять различные действия по редактированию (изменению) текстов пользователем.

the *n*-th level of integration *n*-ная степень интеграции микросхемы (т.е. микросхема содержит от 10" ' до 10" элементов и компонентов включительно).

timer таймер-тактовый генератор, генератор тактовых импульсов, обеспечивающий синхронную работу процессора и других.

timesharing разделение времени—метод, обеспечивающий доступ многих операторов к центральному процессору ЭВМ в течение коротких последовательных отрезков времени, что имитирует одновременное

использование системы.

transducer преобразователь, первичный преобразователь, датчик-устройство, которое преобразует неэлектрические параметры в электрические величины и электрические сигналы.

transistor транзистор-активное полупроводниковое устройство с тремя электрическими выводами, используемое в качестве усилителя и коммутатора электрических сигналов.

Transistor-Transistor Logic (TTL) транзисторно-транзисторная логика (ТТЛ) —семейство высокоскоростных цифровых интегральных логических микросхем. В значительной степени вытесняются логическими схемами, изготовляемыми по МОП-технологии, поскольку последние допускают более плотную упаковку и потребляют меньшую мощность.

translator транслятор, программа-транслятор - программа, переводящая текст с одного языка программирования на другой.

trigger (see flip-flop) триггер-электронная логическая схема, принимающая одно из двух возможных устойчивых состояний, соответствующих нулю и единице.

Very Large-Scale Integration circuit (VLSl-circuit) сверхбольшая интегральная схема (СВИС).

videodisk видеодиск-алюминиевый диск с пластиковым покрытием для хранения и воспроизведения высококачественного изображения и звука. Для записи используется цифровая техника: информация наносится на поверхность диска лазерным лучом в виде закодированной последовательности выплавленных ямок. Считывание производится на специальном видеопроигрывателе также лазерным лучом, а затем считываемые данные переносятся на экран видеомонитора. Видеодиски, или оптические диски используются для хранения и видеозаписи информации ЭВМ .

video display, Visual Display Unit (VDU) видеодисплеи, устройство визуального отображения - сходный с телевизором видеотерминал, основной частью которого является электронно-лучевая трубка. На экране видеодисплея могут текстовые документы, графики, диаграммы.

videotext - система доступа пользователя к Удаленным базам данных, обеспечивающая прием текстов и изображении. В качестве приемника может служить бытовой телевизор со специальной клавиатурой.

Winchester disk винчестер-диск—запоминающее устройство (накопитель) на жестком магнитном диске, помещаемом в кожух кассетного типа, используемое в качестве замены гибких дисков. Вместе с диском в кожухе размещаются магнитные головки и другие механические части. Обеспечивает большую плотность записи.

word слово, машинное слово—количество битов, которое ЭВМ способна обработать за один этап вычислений. Длина слова обычно равна 32, 36, 48 или 64 битам в зависимости от типа ЭВМ.

word processing - 1) пословная обработка машинных слов информации в ЭВМ;

2) обработка текстов на видеодисплее.

8 Section VII Useful vocabulary

A

ability - способность, возможность делать что-л., умение что-л. делать, квалификация, ловкость;

accord - одобрение, согласие, соглашение, договор, договорённость, сделка, согласовываться, гармонировать, соответствовать;

accurate - верный, правильный, точный, скрупулезный, тщательный;

accustom – приучать, делать знакомым, привычным;

adage - афоризм, изречение, максима, поговорка, пословица;

additive - добавление, дополнение, добавка, добавка, присадка;

adherence – приверженность, верность, строгое соблюдение;

advance - движение вперед, продвижение, успех, прогресс, достижение, двигать вперед, продвигать;

affect - аффект, подвергать физическому воздействию, давлению, приносить вред, наносить ущерб;

agent - деятель, личность, агент, представитель, посредник, доверенное лицо;

agricultural – сельскохозяйственный, аграрный, земельный, земледельческий;

aircraft – самолет, авиация;

although - хотя, если бы даже; несмотря на то, что;

amazing - изумительный, ошеломительный, ошеломляющий, поразительный, удивительный;

amount - величина, количество, итог, результат, сумма;

annually – ежегодно;

apply - обращаться с просьбой, заявлением, применять, использовать, употреблять;

assembly - сбор, собрание, сходка ассамблея;

attractive - заманчивый, манящий, привлекательный, притягательный, соблазнительный;

automotive - самоходный, самодвижущийся, автомобильный;

allow – допускать, позволять;

anticipated- опережать, упреждать, предупреждать;

assembling- сборка, монтаж, компоновка;

affordable- позволенный;

annual- ежегодный;

abundant- избыточный, обильный;

able- способный;

adjacent- смежный, соседний;

attempt- попытка, покушение;

auto-dialer- автонабор;

amused- забавлять;

appear- появляться, показывать, выступать;

availability- допустимо;
alertness- бдительность;
abiding- способность;
appreciate- оценивать, понимать;
asynchronous- асинхронный;
astonishingly- удивительно;
accessory- добавочный, второстепенный;
arrange- приводить в порядок, устраивать;
anxious-озабоченный, беспокойство;
acclaim – приветствовать, провозглашать;
advance – продвижение, успех, прогресс;
announce – объявлять, давать, знать;
annual – ежегодный, годовой;
arguable – спорный, требующий доказательства, сомнительный;
assume – принимать на себя, притворяться;
attorney – поверенный; адвокат; юрист; атторней, прокурор;
awful – ужасно;
accomplish - совершать , делать совершенным, достигать совершенства;
achieve – достигать, успешно выполнять;
adopt – усыновлять, принимать, заимствовать;
allow – позволять, предоставлять, допускать;
alter – изменять;
anniversary – годовщина, ежегодный;
approach – приближение, подступ;
aught – что-нибудь, что-то;

B

benefit – выгода; польза; прибыль; преимущество;
bureaucracy – бюрократия:
brain – мозг;
barbed – колючий;
billionth- миллиардный;
bigger- больше, больший;
by-pass- обходить, обход;
borrow- заимствовать, заем;
bulletin- бюллетень;
bits-бит, кусочек;
bagel – рогалик, бублик;
bark – ошибиться;
belt – пояс, ремень;
board – полка, доска;
buffo – забавный, комический, смешной;
bake – печь, -ся, сушить на солнце;
beyond – по ту сторону, вдали, на расстоянии;

bulb – луковица, Эл. Лампочка;

bar code - штриховой или линейчатый код, штрих-код (на продаваемой продукции);

beige - ткань из натуральной неокрашенной шерсти, цвет беж, бледность (серовато-желтого цвета);

below - внизу, ниже, вниз, ниже нуля, дальше, далее, ниже;

blanket - шерстяное одеяло, попона общий, полный, всеохватывающий, без особых оговорок, покрывать одеялом, покрывать;

bounce - громкий удар при падении чего-л. тяжелого; прыжок, отскок, прыжок самолета при (неаккуратной) посадке, упругость;

break through - прорваться, пробиться, добиться успеха, преодолеть, одержать победу;

blighter – вредитель, тот, кто отравляет удовольствие, портит настроение, отталкивающий человек;

bulk - груда, кипа, казаться большим, принимать преувеличенные размеры;

bulletproof – пуленепробиваемый;

bursting - взрыв, разрыв, взрывание, звук взрыва, взрыв, разрывной;

C

CERN – Conseil Europeen pour la Recherche Nucleaire (European Organization for Nuclear Research) – Европейская организация тестирования и сертификации (обеспечивает общеевропейское признание сертификатов соответствия по товарам, не проходящим по законодательству Европейского сообщества);

clerical work – конторская работа;

consortium – консорциум;

cost –Стоить;

capable- способный;

cheap –дешёвый;

cleanup- очистка;

complexing –сложный;

content –удовлетворять;

circumstances –обстоятельства;

courtesy –вежливость;

campus - Университетский городок;

considerably- значительно;

cleverness –сообразительность;

convenience –удобный;

crop – посев;

connive- потворствует;

capable – способный, одаренный, умелый;

circumstance – обстоятельство, случай;

clamorous – громкий; шумный; крикливый; шумящий, галдящий;

clunky – большой, неуклюжий, тяжеловесный, тяжелый;

confuse – смешивать, спутывать;

commit – поручать, вверять;

comprehensive – объемлющий, обширный;

cram – переполнять, наполнять доверху;

career – карвер, карьера, мчаться;

clarity – ясность, прзрачность;

cobble – булыжник, выклад-ть булыжником, чинить;

coincident – совпадающий , соответсвующий;

colleague – сослуживец;

columnist – сотрудник газеты;

commonplace – банальный , банальность, плоский;

completely – совершенно, полностью;

constrained – вынужденный, напряженный, натянутый;

contrary – противоположный, вопреки;

coverage – охват;

current- поток, текущий, общераспространенный;

capability – одаренность, талантливость, способность, (потенциальные) возможности, мощность, производительность, способность, потенциал;

cause - послужить причиной / поводом для чего-л., мотивировать что-л.;

catalyst – катализатор;

cheap – дешевый;

circuit - цепь, оборот;

circumstance – обстоятельство;

citizen – гражданин;

clay - глина, глиняный;

coloration – окраска;

combat - бороться, борьба, боевой;

commonplace – банальность;

complain – жаловаться;

compound - составлять, состав, сложный;

conductive – проводящий;

conductivity - удельная электропроводность;

conscious - сознательный;

consequence – последствие, последовательность;

consequently – следовательно;

consignment - груз, консигнация, консигнационный;

constraint – ограничение;

construction - конструкция, строительство, строительный;

consumption – потребление;

contain- содержать, содержание;

contaminant - загрязняющее вещество;

contamination – заражение;

convenient - удобно, удобный;

copper - медь, медный;
corresponding - соответствовать, соответствующий;
costly – дорогой;
counter – счетчик, прилавок, встречный;
counterfeit – подделывать, подделка, поддельный;
cure – лечить, восстанавливать, лечение;

D

daily – ежедневно, ежедневный;
damade – повреждать, ущерб, возмещение убытков, аварийный;
delivery – поставка;
depend – зависеть;
deploy – развертывать, развертывание;
deposition – депонирование;
design – разрабатывать, создавать, предназначать, проект, разработка, проектый, расчетный;
destruction – уничтожение;
diagnose – диагностировать;
diffuse – рассеивать, рассеянный;
diminish – уменьшать;
dirt – грязь;
discover – обнаруживать;
disease – болезнь;
dishwasher - посудомоечная машина;
dot - ставить точку, точка, точечный;
durable – прочный;
discretely- дискретно;
desired – преданная;
degree – степень;
deserve- заслуживает;
dirty грязь;
daily – ежедневный, повседневный;
decency – благопристойность, приличие; правила хорошего тона;
deliberate – предупредительный, осмотрительный, осторожный;
deliver – доставлять, разносить;
demote – понижать в должности, в звании;
despite – злоба, вопреки, несмотря на;
devote – уделять, жертвовать (время, деньги; to);
dint – след, вмятина, отпечаток;
distinguish – различить, разглядеть;
diverse – иной, отличный от чего-л., различный; несходный;
donate – дарить, жаловать, жертвовать;
dying – угасание, затухание;
dearly – дорого, немного;

decade – десятилетие, десяток ;
departed – покойник, былой, прошлый;
dispute – диспут, ссора, спорить ;
disseminate – рассеивать, разбрасывать;
divide – водораздел, делиться;
division – деление, перегородка;
dreary – мрачный, унылый, скучный;
diminish – убывать, уменьшаться;

E

earlier – раньше, более ранний;
electricity – электричество;
embed – вставлять;
emit – выдавать, испускать;
enable – приспосабливать, позволять, допустимый;
encapsulation - инкапсуляция;
encourade – способствовать, содействовать, поощрительный;
ensure – гарантировать, проверять;
entitle – называть, иметь право;
environment – среда, условия;
enzyme – энзим;
eradication – уничтожение;
essential – существенно, существенный;
excess – избыток, избыточный;
exciting – возбуждать, восхитительный;
exemplifiy – пояснять;
exhibit – показывать, приложение, экспонат;
expect – ожидать;
explosive - взрывоопасное вещество, взрывной;
extend – расширять, распространять, расширенный;
external – импровизированный;
eascinate – увлекать;
extremely чрезвычайно;
existing существовать,существующий;
extinct вымерший, потухший;
each каждый;
executes выполнять;
effort усилие;
expected ожидать;
exhibition выставка;
essentially по существу;
embarrassment затруднение;
explorarions исследование;
enormous огромный;

employees служащий;

embrace – объятие, объятия;

emerge – появляться; всплывать; выходить;

endow – обеспечивать постоянным доходом; передавать завещанное наследство; делать вклад, снабжать, обеспечивать (материально);

engage – подвергать(ся) риску, затрагивать(ся);

enrich – обогащать(ся) (with), улучшать(ся);

ensure – гарантировать, обеспечивать, ручаться;

executive – исполнительный, принадлежащий к структурам исполнительной власти;

essential – существенный; внутренне присущий, неотъемлемый; затрагивающий существо дела;

endless – бесконечный, нескончаемый;

enquire – вопрос, допрос;

evidence – очевидность, свидетельство;

evolve – развертывать, развивать, выделять;

Effort – употребляется в сочетаниях - Voluntary Oil Industry Communications Effort – Информационная программа нефтяной промышленности (готовится для средств массовой информации Американским нефтяным институтом);

eliminate – устранять, исключать;

enthusiast – восторженный человек; энтузиаст;

enquire – = inquire – осведомляться, справляться, спрашивать, узнавать;

envisioned – воображать что-л., рисовать в своем воображении; представлять себе, предвидеть;

encourage – ободрять; поощрять, поддерживать (в чем-л. - in);

enhance – увеличивать, усиливать, улучшать (особ. качество, значимость, ценность, важность, привлекательность чего-л.);

eventually – в конечном счете, в итоге, в конце концов; со временем;

F

fatigue – усталость, утомление;

far-flung – обширный;

fate – судьба;

field – область;

firefighter – пожарный;

fit - устанавливать, приступ, годный;

flame – пламя;

flood – затоплять, наводнение;

floor – пол, зал, этаж;

flour – мука;

flourescent – люминесцентный;

fossil – ископаемое, ископаемый;

fragrance – аромат;

frame – фрейм, фреймовый;

fuel - снабжать топливом, топливо;

fume – дымить, дым;

fueled - снабжать топливом, топливо;

feasibility – возможность;

famine - голод;

foundations - основание, фонд, фундамент;

fortunately - к счастью;

foolishness - глупость;

fill – наполнять;

force - заставлять (принудительно);

further - дальше;

facilit – облегчать;

firmware – микропрограмма;

fresh-air - свежий воздух;

fate – назначать, предназначать, предопределять;

fear – бояться, страшиться, пугаться;

feat – ловкость, искусство, мастерство;

flourish – расцвет, высшая точка развития, "самый сок";

Foresight – благоразумие, дальновидность, предусмотрительность;

Freshman – лицо, находящееся на данном посту первый год;

Filthy – запачканный, немытый, замаранный, нечистый;

Faith – вера, обещание, обет;

Fare стоимость, быть, проживать;

G

giant – великан, гигант; титан;

glimpse – проблеск, слабый свет, слабая вспышка; мелькание, мимолетное впечатление;

goofiness – глупость;

grow up – созревать; становиться взрослым;

groupie – поклонница знаменитости;

growth – рост, происхождение, увеличение;

garment – одежда, предмет одежды;

generate – генерировать;

graffiti - надпись на стене;

grain – зерно;

H

hacking – подделка;

helpful – полезный;

hence – следовательно;

huge – огромный;

habit – обыкновение; обычай, традиция, заведенный порядок;

handful – пригоршня, горсть;

hate – ненавидеть;

heat – жара, жар, тепло, теплота (как внутреннее, так и внешнее); жаркий период года; жар, повышенная температура;

henceforth – с этого времени, впредь;

hire – нанимать, предоставлять работу, приглашать на работу;

hit – попадание; удачная попытка;

hung – вешать, развешивать, подвешивать (что угодно);

hopefully – надеющийся, многообещающий;

Hypertext transfer protocol (HTTP) – протокол передачи гипертекстовых файлов, протокол HTTP (используемый WWW-браузерами и WWW-серверами при передаче HTML-файлов);

Hypertext markup language (HTML) – язык гипертекстовой разметки, язык HTML (основанный на SGML язык для создания гипертекстовых документов)

Headquarter – устраивать штаб, штаб-квартиру где-либо;

hiring – наем;

harmless – безвредный;

handle – оперировать, ручка;

harness – упряжь;

harsh – жесткий;

hazard – рисковать, риск, паразитный импульс;

healing – излечивать, заживать, заживление, заживляющий;

healthcare – здравоохранение;

heavy – тяжелый;

household – дом, семейный;

housing – жилье, корпус, жилищный;

huge – огромный;

I

incompatible – несовместимый, несовмещающийся, несочетающийся, несовместный (with);

include – заключать, включать в себя, содержать в себе;

involve – втягивать, вовлекать (in, with);

interoperability – возможность взаимодействия сетей;

inconvenient – причиняющий беспокойство, неудобный, стесняющий, мешающий (for);

initially – в начальной стадии, в начале; в исходном положении;

illness болезнь;

introduction введение,предисловие;

inexpensive недорогой;

intention намерение, стремление;

inherent присущий;

irresponsible безответственный;
immense – безмерный, очень большой, огромный;
investment – инвестирование, вложение денег, капитала;
insect – ничтожество;
indeed – в самом деле, действительно;
instantly – мгновенно;
illict – незаконный;
impart – наделять;
implication – импликация;
improve – улучшать;
incorporate – включать, регистрировать;
increasingly – чрезвычайно;
inhale – вдыхать;
insitu - на месте происхождения;
instantaneous – немедленный;
interconnect – взаимосвязь;
internal – внутренний;
invent – изобретать;
involve – включать, связывать;
isolation – изоляция;

J

juncture – соединение, положение дел;

K

keen – острый, стремящийся;
knock on - стучать в;

L

low – запись при вводе-выводе;
lustrous – блестящий, яркий ;
launch – бросать, спускать, катер
log – колода, чурбан, бревно;
lLowly – скромный;
lace - пробивать отверстия, шнурок, кружево;
land – сажать, посадить, приземляться, земля, страна;
lasting – продолжаться, выдерживать, длительный, прочный;
lead – вести, лидировать, свинец, лидерство, вывод, ход, свинцовый;
length – длина, продолжительность, отрезок;
lightweight – легкий;
lit – зажигать, освещенный;
lucrative – выгодный;

M

manner – способ;

measure – измерять, мера;

mention – упоминать, ссылка;

merely – просто;

monitoring – проверять, проверка;

miniaturization- миниатюризация;

marriage- брак, женитьба;

meeting- собрание, встречать;

mischievous- вредный;

mistake- ошибка;

memory-mapped- карта памяти;

mammoth – гигантский, громадный, похожий по размерам на мамонта;

merely – только, просто; единственно (часто с предшествующим словом "not");

miracle – удивительная вещь, выдающееся событие;

Memory substitute – управление при помощи программы, хранимой в памяти;

mental – интеллектуальный, умственный;

MIT – 1 master instruction tape главная программная лента; 2 Massachusetts Institute of Technlogy Массачусетский технологический институт, Эм-Ай-Ти (США);

measurement – снятие мерок, измерение (действие), обмер;

mMood – настроение; расположение духа;

maintenance – поддержание; сохранение;

mMultitude – множество, большое число, масса;

measure – мера, единица измерения;

N

novel- роман, новый;

notice- обращать внимание;

nevertheless- тем не менее;

nonprofit – некоммерческий;

noodle – простак, дурень;

newsgroup – (сетевая теле) конференция (сетевая служба, рассылающая информацию по определенной теме);

nonlinear – нелинейный;

necessitate – делать необходимым; неизбежно влечь за собой;

necessary – необходимый, нужный, необходимо;

neighbourhood – окрестность;

note – отмечать, иметь в виду, примечание;

notorious – известный;

O

oversight – 1 недосмотр, оплошность, упущение; 2 контроль, надзор, присмотр;

obvious – очевидный;

odour – запах;

ongoing – продолжение, постоянный;

offer – предлагать, предложение;

onto – на;

opportunities – возможность;

oxidize – окислять;

obsolete – устарелый, старый, немодный;

odd – непарный, разрозненный;

offer – предлагать; делать предложение;

opportunity – благоприятный случай, стечение обстоятельств, возможность;

overblown – миновавший, пронесшийся (о буре и т. п.);

oversight – недосмотр, оплошность, упущение;

opportunity – удобный случай;

overcome – побороть, победить;

P

pattern – образец, модель;

proposal – предложение; план;

punched card – перфокарта; перфорированная карта;

purpose – назначение, намерение, цель; замысел, стремление;

permanent – постоянный, неизменный; долговременный; перманентный;

pale – бледный;

particle – частица;

particularly – особенно;

performance – исполнение;

pharmaceutical – фармацевтический;

pinpoint – определять;

polish – шлифовать, отделка, польский;

pollution – загрязнение;

pollutant - загрязняющее вещество;

pose – предлагать, поза;

potentially – потенциально;

precious – драгоценный;

precise – точный;

prescription – предписание, рецепт;

pressure – давление;

prevention – предотвращение;

process – обрабатывать, процесс;

property – собственность, свойство;
provide – обеспечивать, предоставлять;
purification – очистка;
proposes- предложение;
pollution- загрязнение;
plenary- полный;
particular- конкретный;
packed- switched;
pat – похлопывание; хлопанье, шлепанье;
passion – страсть, страстное увлечение; предмет страсти, пассия; страсти, неспокойные переживания;
perry – грушевый сидр;
plug – пробка, затычка (тж. перен.);
pond – пруд; маленькое озеро;
prefect – руководитель, начальник, старший ученик, следящий за дисциплиной;
pass – проходить, проезжать, пропускать;
permit – позволять;
plenty – изобилие, вполне;
poster - столб, вывешивать объявления, почта;
pretend – притязать, претендовать;

Q

quality – качество;
quantify - определять количество;
quantum – квант, квантовый;
quite – совсем;
qualify – определять, называть;
quite – вполне, совершенно, совсем;

R

researcher – исследователь;
routine – обычный порядок; общепринятая практика; определенный режим;
raises – 1 лицо, выполняющее действие, описанное глаголом raise; 2 селекционер (выращивающий новые сорта растений); 3 приспособление для подъема (чего-л.); подъемник; 4 поднимающая мышца; 5 дрожжи, закваска, фермент; 6 подступень лестницы;
rarely – нечасто, редко;
racquet – ракетка;
range – колебаться, диапазон, область;
rapidly – быстро;
reach – достигать;

reactive – реактивный;

recently – недавно;

reclaim – восстанавливать, исправление;

recognize – признавать, распознавать, осознавать;

recycle – находиться;

reduse – уменьшать, сводить;

reinforce – усиливать;

relation – отношение;

release – выпускать, выпуск, версия;

remove – удалять, удаление;

renewal – восстановление;

repel – отталкивать;

repellent - средство от насекомых;

rescuer – спаситель;

resistance – сопротивление;

responsible - ответственный;

reuse - использовать многократно;

robust – прочный, живучий;

raw- грести, колонка;

research- исследовать;

relevant- важный, актуальный;

rake – делать строгий выговор;

rapt – восхищенный, приведенный в восторг;

regent – правитель, член правления в некоторых американских университетах;

release – избавлять, освобождать (от обязательств и т. п. - from);

relic – след, остаток (of - чего-л), пережиток, реликт (прошлого);

require – приказывать, требовать;

responsible – ответственный, несущий ответственность, отвечающий (за что-л.);

reveal – открывать; разоблачать;

random – наобум, наугад;

Random Access Memory (RAM) память произвольного доступа, запоминающее устройство с произвольной выборкой ,устройство памяти, в котором информация может быть введена в любую ячейку или извлечена из нее Read Only Memory (ROM) постоянное запоминающее устройство (ПЗУ)- устройство памяти, содержимое которого постоянно сохраняется при выключении ЭВМ); запись информации; оно выполнять неспособно, а считывание может производится с высокой скоростью. В ПЗУ обычно находятся программы и данные, обслуживающие работу аппаратуры;

rapid – быстрый, скорый;

recally – подлый;

relate – рассказывать, приводить в связь;

require – приказывать, требовать;

reservation – оговорка;

reside – проживать, принадлежать;
roam – бродить, странствовать, скитаться;

S

safety – безопасность, безопасный;
sample – образец, выборка;
scale up - пропорционально увеличивать;
scent – аромат, запах, духи;
scratch – царапать, царапина, временный;
scrub – мыть;
seam – шов;
sediment – осадок;
seedy – зернистый, потрепанный;
sensibly – разумно;
sensing – считывать, считывание;
separation – разделение;
shape – формировать, форма;
shock absorber – амортизатор;
sign – подписывать, знак, подпись, признак;
site – располагать, место, сайт, место заложения, централизованный;
skier – лыжник;
smart – умный;
solvent – растворитель, платежеспособный;
spectator – зритель, свидетель;
sprayed – разбрызгивать, разбрызганный;
spun – крутить, пряденый;
stain – пятнать, пятно;
state – указывать, состояние, штат, государственный;
steam – парить, пар;
stolen – красть, украденный;
storage – хранение, память;
store – хранить, загружать, магазин, запас, загрузка;
stream – течь, поток;
strength – сила, прочность, численность;
suburb – пригород, окрестность;
sufficient – достаточный;
suit – подходить, иск, судебное дело, костюм;
sunscreen - солнцезащитный крем;
support – поддерживать, поддержка;
surface – всплывать, поверхность, поверхностный;
scale – чешуя, снимать чешую, чаша;
self-replicating- само- копирование;
safe- безопасный;
spread- распространение (ть);

similar- аналогичный, подобный;

scratch- царапать, временный;

seldom- редко;

slim- плоский, стройный;

societies- общество;

sheer – абсолютный, полнейший, сущий, явный;

shelf – полка, стеллаж;

skill – искусство, мастерство, умение; ловкость, сноровка;

smooth – плавный, спокойный; беспрепятственный;

sophisticate – извращать, подделывать, фальсифицировать;

stockholder – акционер, владелец государственных ценных бумаг;

sue – преследовать судом; подавать в суд, возбуждать иск, предъявлять иск;

sycophant – льстец, подхалим, лизоблюд;

scroll – свиток, легенда;

setting – окружающая обстановка, музыка к словам, постановка;

shuttle – челнок;

sign - знак, отметка, ставить знак;

span –пядь, измерять пядями;

spare – охранять, оберегать;

spawn –икра, метать икру, размножаться;

splendid – великолепный, блистательный, роскошный;

stuff – вещество, набивать, заполнять;

suppose – предполагать, полагать;

survive – переживать, остаться в живых;

scheme – нечто задуманное, спланированное, план, проект; программа; схема;

signed – подписанный;

steadily – 1 монотонно, 2 неизменно, 3 неуклонно, 4 постоянно;

T

transmit – 1 передавать, отдавать, 2 отправлять, пересылать, посылать;

tag – этикетка;

technique - техника;

term - характеризовать, срок, условие, термин;

threat – угроза;

throw – бросать;

tiny – небольшой;

trace – прослеживать, след, трассировка, чуть-чуть;

transform – превращать;

tremendous – огромный;

twice – дважды;

treat- относиться;

thereafter- согласно этому, с тех пор;

tend – иметь тенденцию (к чему-л.); клониться, склоняться (к чему-л.);

transition – перемещение, переход;

tune – мелодия; напев (of, to);

Tantric – тантрический;

terrestrial – земной, светский, обитающий на Земле;

tribal – родовой, племенной;

U

unique – уникальный;

unpleasant – неприятный;

undisputed- бесспорный;

underpinning – подведение фундамента, крепление;

unexciting – неволнующий, незахватывающий;

unfair – несправедливый; пристрастный; незаслуженный, неправильный;

upscale – выше среднего уровня, высококачественный;

unencumbered – необремененый, незаложенный;

unique – единственный, однозначный, уникальный;

upon – на;

urgency – безотлагательность, настойчивость, порыв;

Universal resource identifier (URI) – универсальный идентификатор ресурса (вариант URL);

Uniform resource locator (URL) – унифицированный указатель информационного ресурса (стандартизованная строка символов, указывающая местонахождение документа в сети Internet);

V

vehicle – машина, средство, повозка;

vest – наделять, облачать, жилетка;

vital – живой, важно;

vector- traced- направление вектора;

valuable – ценный; дорогой, дорогостоящий, драгоценный;

vilification – поношение;

vintage – модель, тип; склад характера;

vivid – яркий, живой, ясный;

Ww

wear – носить (одежду, прическу, украшения и т. п.);

wise – мудрый, умудренный;

wave – вал, волна, море;

web-content – веб-содержание;

whatever – какой бы ни было, любой;

witness – свидетель, очевидец, понятой;

workaholic – человек, "горящий" на работе;
walled - обнесенный стеной;
warning – предупреждать, предупреждение;
waste – тратить, отход, пустая порода;
wavelength - длина волны;
whole – целый;
wing - крыло;
wound – ранить, рана;

Z

zip – свист пули, живость, застежка-молния.

Список использованных источников

1 Bill Gates - Wikipédia [Electronic resource]. - Mode access :http://fr.wikipedia.org/wiki/Bill_Gates

2 The People Who Shape Our World [Electronic resource]. - Mode access: www.time.com/time/2006/time100/

3 Sir Arthur Clark 90th Birthday reflections [Electronic resource]. - Mode access: http://www.youtube.com/

4 Ада Лавлейс: программа максимум// COSMOPOLITAN. - 2006. - №6. - С. 308-310.

5 **Prodromou, Luke** First Certificate STAR: Student`s Book/ Luke Prodromou. – London: Macmillan Heinemann, 1998. – 240 p.

6 **Azimov, I.** Boy's best friend /I.Azimov [Electronic resource]. - Mode access: http: //www.fenzin.org/book/14013/

7 **Simak, Cl.** Limiting Factor/ Cl. Simak [Electronic resource]. - Mode access: http: //www.fenzin.org/book/4295/

8 Nanotechnology [Electronic resource]. - Mode access: http://www.nano.gov/html/facts/nanoscale.html/

9 CERN [Electronic resource]. - Mode access: http://www.ibiblio.org/pioneers/bush.html

10 **Cornwall, Hugo** The Hacker's Handbook/ H. Cornwall. Great Britain: Century Communication Ltd. Portland House, 12-13 Greek Street, London WIV SLE, 1985. – 148 p. – ISBN 0-7126-0650-5.

11 **Graham, Ian** Internet: The impact on our lives/ Ian Graham. – London. : Hodder Wayland, 2000. – 64 p.

12 The development and use of machine translation systems and computer-based translation tools [Electronic resource]. - Mode access: http://www. en.wikipedia.org/wiki/MT